WJEC GCSE MATHEMATICS (UNITISED)

MATHS



EXAM QUESTION PACK

UNIT 1 HIGHER TIER 4351 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

S16-4351-02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life

HIGHER TIER

A.M. THURSDAY, 26 May 2016

1 hour 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **10**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**4**	
3.	**4**	
4.	**3**	
5.	**5**	
6.	**3**	
7.	**2**	
8.	**3**	
9.	**4**	
10.	**7**	
11.	**3**	
12.	**3**	
13.	**6**	
14.	**5**	
15.	**6**	
16.	**3**	
Total	**65**	

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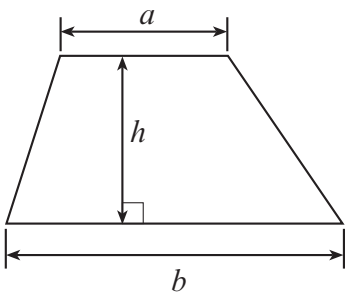
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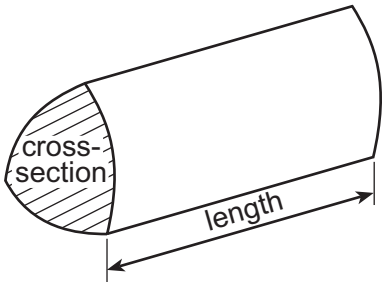
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Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

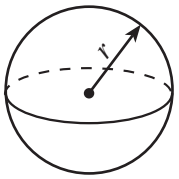


Volume of prism = area of cross-section × length



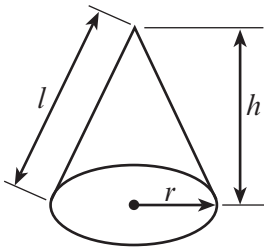
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

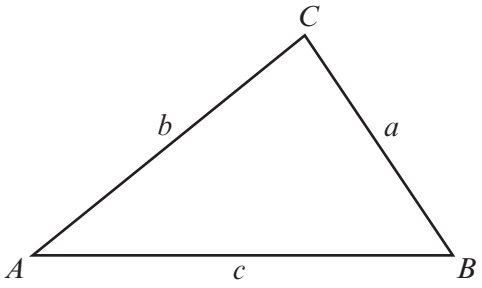


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

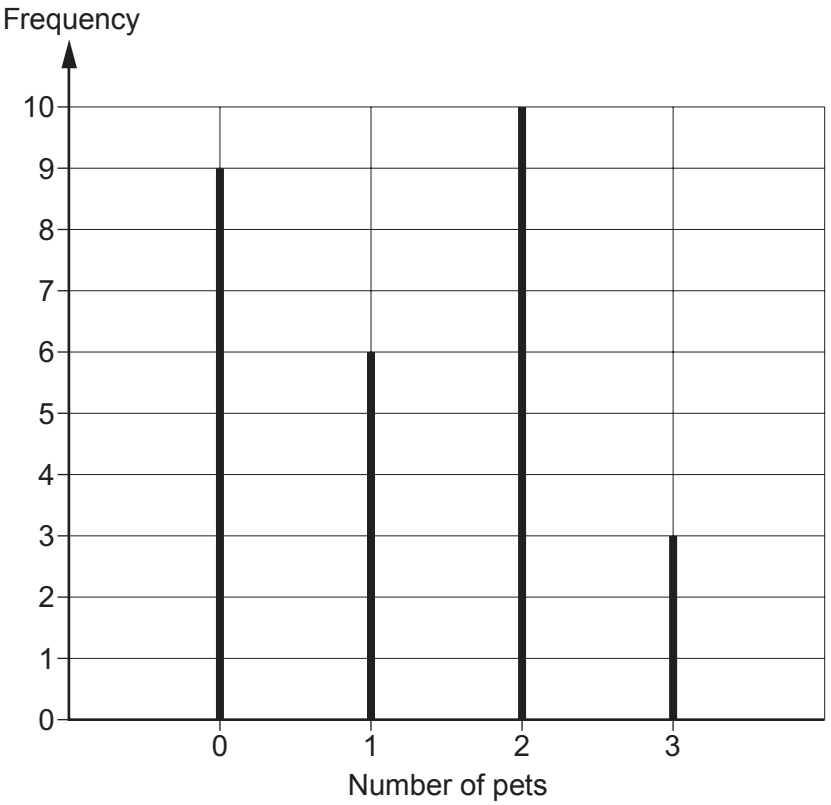
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1. The children in a primary school class were asked how many pets they each owned.

The information was displayed on a vertical line diagram, as shown below.



Complete the frequency table below and calculate the mean number of pets per child. [4]

Number of pets	Frequency

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2. Orienteering is a competition that involves running and using a compass to find directions. It is usually held in wooded and hilly areas of the country.
Liam and Krysta are competing in an orienteering event.

Liam starts from point *A* and Krysta starts from point *B*.
They are only given the finish point *P* of the race once they are at their starting positions.
Liam is told that point *P* is on a bearing of 108° from point *A*.
Krysta is told that point *P* is on a bearing of 230° from point *B*.

(a) By drawing suitable lines, mark the position of point *P* on the diagram below. [3]





(b) When training together, Liam and Krysta have the same running speed.
Neither of them stopped during the race. Both went as fast as they could and there were no injuries.
Both started at the same time.

Give a possible reason why the person who started furthest away from point P got there first. [1]

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3. Heather invests £900 for 3 years at 2% per annum compound interest.
Calculate the value of her investment at the end of the 3 years.
Give your answer correct to the nearest penny. [4]

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4. The formula $\mathbf{P = \frac{2{\cdot}65N - C}{D}}$

is used to calculate the profit (**P**) a company makes, in pounds, when selling a particular item it manufactures.

N is the number of items sold.
C is a fixed manufacturing cost, in pounds.
D is a tax adjustment rate.

When the company sold 8000 of the items, it made a profit of £14 160.
The tax adjustment rate was 1·25.

Calculate the fixed manufacturing cost. [3]

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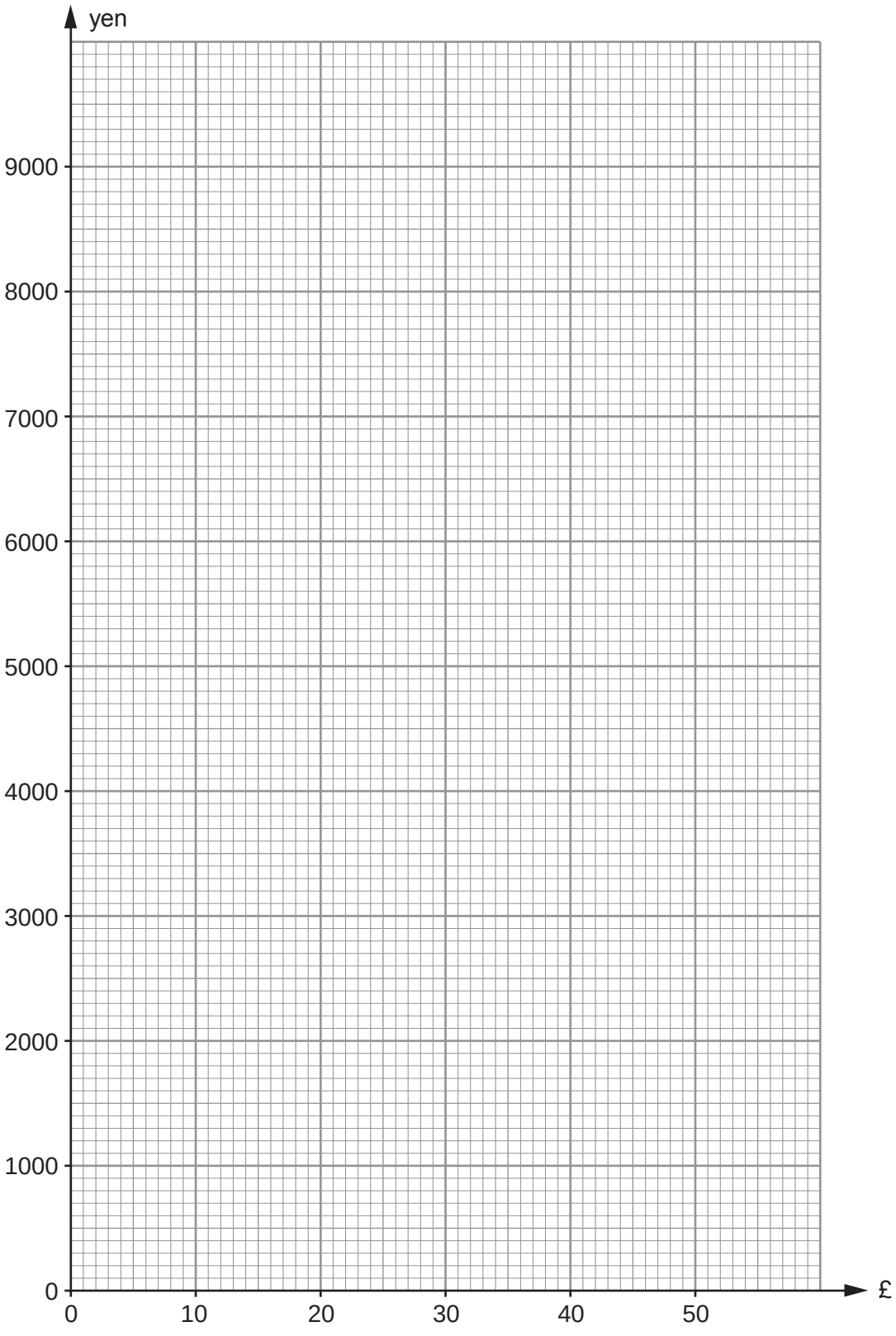
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5. Dylan is going on a trip to Japan.
The exchange rate at the time of his trip is £1 ≡ 175 yen.

(a) Draw a conversion graph between £ and yen on the graph paper below.
The graph should show the conversion from £0 to £50. [3]



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(b) Use your graph, or otherwise, to convert 20 000 yen into pounds. Give your answer correct to the nearest pound. [2]

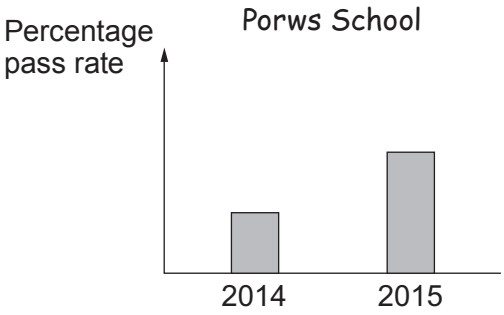
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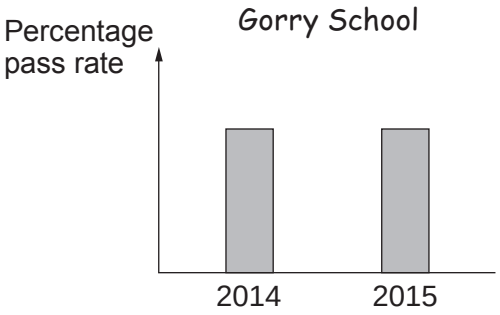
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6. *(a)* Explain why the following statement and diagrams may give a misleading impression. Include an example to show how this could happen. [2]

'Porws School celebrates, as percentage pass rate doubles, but no increase at Gorry School.'



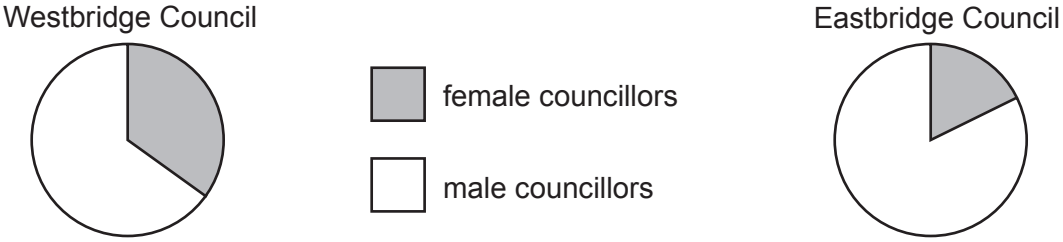


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(b) Explain why the statement beneath the following pie charts may not be true. [1]



'There are more female councillors on Westbridge council than on Eastbridge Council.'

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7. Calculate $\frac{854 \cdot 7}{43 \cdot 2 - 37 \cdot 6^{3}}$, giving your answer correct to 3 significant figures. [2]

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8. In a game, it is possible for **each** player to score between 1 and 10 points.
Lois and Beca play the game five times.

The table below shows the points scored by Lois in each game.

	Game 1	Game 2	Game 3	Game 4	Game 5
Lois	5	2	8	5	1
Beca					

Beca had a higher mean score than Lois.
Beca had a lower median score than Lois.
Beca had a lower range of scores than Lois.

Complete the table above with a set of possible scores gained by Beca. [3]

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9. A sprinter covers 100 metres in 10 seconds.

Calculate his average speed in miles per hour. [4]

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10. *You will be assessed on the quality of your written communication in this question.*

People can choose to *'Gift Aid'* the amount of money that they donate to a charity.
This means that for every £10 donated with *'Gift Aid'*, the charity can claim an extra £2.50 from the Government.

A certain charity received donations of £24 810 last year.

The charity was able to claim *'Gift Aid'* on one third of this amount.

Calculate the extra amount of money that the charity was able to claim from the Government.
[7]

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11. A pump is used to fill empty tanks with oil.
It takes 27 minutes to fill 6 identical tanks when the flow rate is 5 litres per second.

Calculate how long it would take to fill 8 of these tanks when the flow rate is 9 litres per second. [3]

12. Bethan sold her house for £137 750.
She lost 5% of the price she had paid for the house.
How much had she paid for her house? [3]

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13. A company logo is made up of three parts: a square and two identical sectors attached to two of its sides, as shown below.

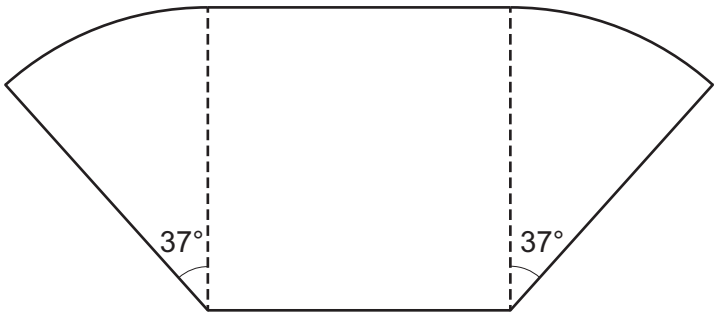


Diagram not drawn to scale

The logo displayed outside the company's head office has a central square with a side length of 7 metres.

(a) Calculate the total area of this logo. [3]

(b) Calculate the total length of the perimeter of this logo. [3]

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14. Last month, Salim used his car to travel 1000 miles, correct to the nearest 100 miles.
He used 26 gallons of petrol, correct to the nearest gallon.

Calculate the least and greatest possible values for the number of miles travelled per gallon by this car last month.
Give your answers correct to 1 decimal place. [5]

Least = ... mpg Greatest = ... mpg

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15. Two solid, identical spheres are attached to the ends of a solid cylinder, as shown below.

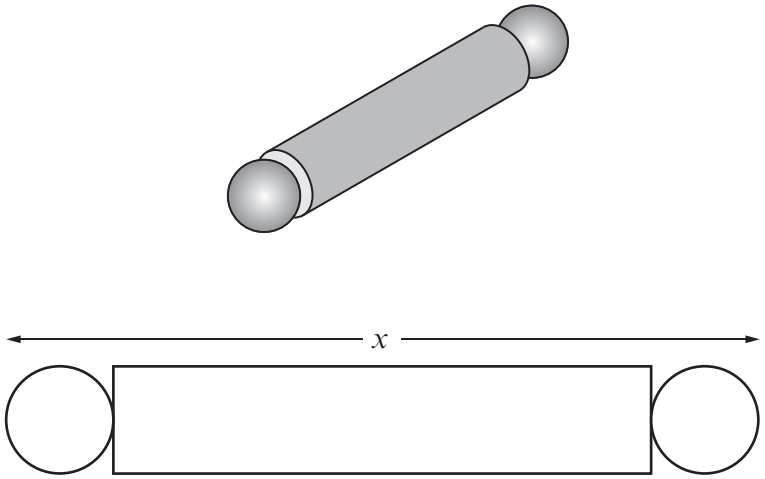


Diagram not drawn to scale

The radius, r, of each sphere is the same as the radius of the cylinder.
The length of the cylinder is $9r$.
The volume of the whole object is $3340\,\text{cm}^3$.

Calculate the total length, x, of the object. [6]

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16. A and B are two hollow cones.

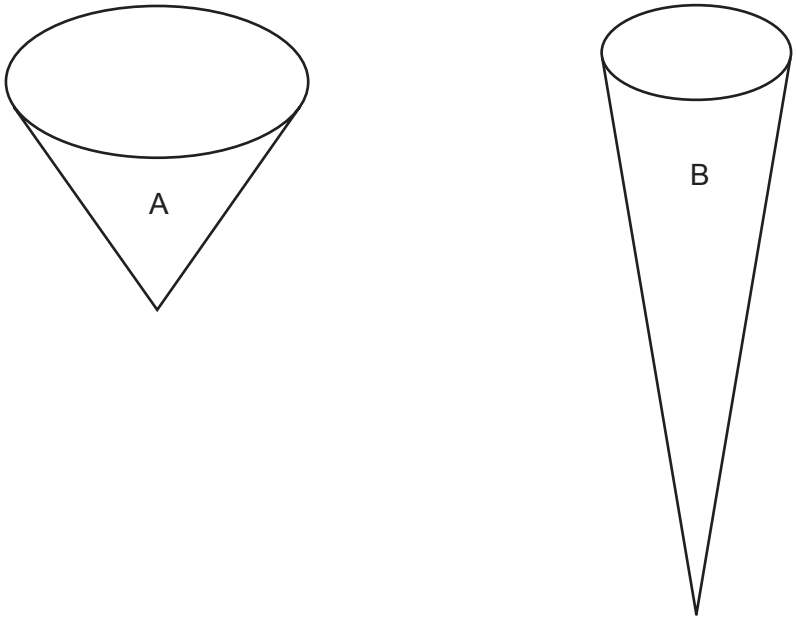


Diagram not drawn to scale

The base radius of cone B is half the base radius of cone A.
The height of cone B is twice the height of cone A.

Cone A is completely filled with water.
Is it ever possible to pour all of this water into cone B without it overflowing?
You must show working to justify your answer. [3]

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END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS UNITISED UNIT 1
HIGHER TIER

4351/02

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INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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GCSE Mathematics - Unitised Unit 1 Higher Tier
Summer 2016 Mark Scheme

Summer 2016 Unitised Unit 1 Higher Tier	✓	Mark	Comments
1. N^o of pets | Frequency 0 | 9 1 | 6 2 | 10 3 | 3 (9×0 +) 6×1 + 10×2 + 3×3 (= 35) ÷ 28 = 1·25 ISW		 B1 M1 m1 A1	 Table completed and all correct. FT 'their table'. Attempt at $\sum fx$. C.A.O. for 'their table'.
2(a) **Use overlay** Position at 108° from A. Position at 230° from B. Position marked OR two intersecting lines.		 M1 M1 A1	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. FT if at least M1 and two intersecting lines. (Lines must originate from point A and point B respectively)
2(b) Some comment about the different nature of the terrain between the points and the finish OR that the route was different in some way. E.g. 'Uphill from B downhill from A', 'there was (*insert obstacle name)* between B and P', 'Krysta wasn't able to run in a straight line', 'easier terrain', 'it was straighter', 'it was flat', 'a more direct route', 'Krysta went the wrong way' etc.		E1	Do not accept any reference to different running speeds or tactics.
3 900 18 918 18.36 936.36 18.72(72) 955.08(72) (£) 955.09 OR 95509(p)		B1 M1 A1 A1	For the evaluation of a correct 2% OR Sight of 1·02 (54 and 954 imply use of 3× 18 and gain B1) For attempting to find 3 different 2%. OR $900 \times 1{\cdot}02^3$. Or A1 for sight of (£)55.08(….) or (£)55.09. FT one error if rounding required and shown. Note $900 \times 1{\cdot}02^3 = 955.10$ is B1,M1,A0 (incorrect) and A0 (no rounding shown). Accept £955.09p. Do not accept 955.09p. Mark final value of investment (i.e. do not penalise if they continue to give £55.09)
4. $14160 = \frac{2{\cdot}65 \times 8000 - C}{1{\cdot}25}$ (C =) 2·65 × 8000 − 1·25 × 14160 (21200 − 17700) = (£) 3500		B1 M1 A1	For correct substitution into given formula. Also B1 for $14160 = \frac{21200 - C}{1{\cdot}25}$ Allow 1·25 × 14160 − 2·65 × 8000 (= −C) CAO If B1 not awarded allow SC1 for (£)2800.

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Summer 2016 Unitised Unit 1 Higher Tier	✓	Mark	Comments
Ribbon marking for 5(a) and 5(b) 5(a) A correct point plotted at $(k,175k)$ $k \neq 0$ A line joining (0,0) and their plotted point. Correct line drawn between (0, 0) and (50, 8750 ± 50).		 B1 B1 B1	*Allow (±£0.50, ±50yen) i.e. '½ a small square'.* B0 if any incorrect plots used e.g. 'dog-leg'. Allow unambiguous attempt at plotting an inappropriate point e.g. (1, 175) which may lead to B1,B1,B0. If no line drawn award B1 for any 4 correct plots. CAO but award B1 if line starts at (10, 1750) This implies all previous marks.
Ribbon marking for 5(a) and 5(b) 5(b) Correct method using their graph e.g. 4 × reading at 5000 yen (£)114(to nearest £)		M1 A1	F.T. 'their graph'(allow ± ½ a small square). Must be to the nearest pound. E.g. using graph to give 5000yen = £29, so 20000yen = £116 is M1A1 <u>*Alternative method*</u> *20 000 ÷ 175* *M1* *(£)114(to nearest £)* *A1* *(£)114.28……. or (£)114.29 gains M1A0* If graph not used then allow SC1 for £114 < Answer ≤ £115 (may be from trial and improvement).
6(a) Valid reason for misleading impression e.g. 'No scale (numbers / %) for pass rate.' Suitable example, e.g. '*Porws* may have gone from 10% to 20% but *Gorry* may (be better) at constant 80%'. '*Gorry'*s results are better'.		E1 E1	<u>Must</u> refer to there being no information regarding scale for this E1'. Do not accept e.g. 'different number of pupils'. Allow any form of suggestion that *Gorry School* (may) still have better results than *Porws School*.
6(b) A statement that refers to the actual numbers not being known. e.g. 'no figures given'.		E1	'There could be more councillors at Eastbridge' is E1. 'There could be more councillors at Westbridge' is E0.
7. 4·87		B2	B1 for sight of 4·86(68…) or 4·9(0) or 4·8(0) or 4·870.
8. Beca's total score >21 Beca's median score < 5 Beca's range < 7		 B1 B1 B1	Mark scores given in table. Possible to allow if table not completed if total > 21. Possible to allow if enough of table completed to ensure median < 5. All of table must be completed for this B1. Penalise −1 from any marks gained if a score > 10 is included in the table.
9. 100 × 6 × 60 or equivalent (e.g. ÷ 0·0027…) ÷ 1000 × 5/8 or equivalent (e.g. ÷ 1·6) = 22·5 (mph)	 ✓ ✓ ✓ ✓	 M1 M1 M1 A1	Calculations <u>must</u> be linked to the 100 at some stage before any M marks can be awarded. If a calculation using any of the values is repeated (e.g. ×6×60 followed by ÷360, or ÷1000 used twice) then M0. Ignore units throughout solution. Award the M1 at any stage. Allow FT if a previous M1 has not been awarded. C.A.O. Mark final answer.

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Summer 2016 Unitised Unit 1 Higher Tier	✓	Mark	Comments
10. (Declared as *Gift Aid* = ⅓ × £24810 =) (£)8270 (Claimed as *Gift Aid*) $\frac{8270}{10}$ = 827 827 × (£)2.5(0) = (£)2067.5(0)	✓ ✓ ✓ ✓ ✓	B1 M1 A1 M1 A1	For sight of (£)8270 F.T. 'their (£)8270' (even £24810) FT 'their 827' (even if not a whole number). Mark final answer for claimed amount. *Alternative methods.* *(FT previous values for each M)* *8270* *B1* *2481* *B1* *8270 × 1·25* *M1* *2481 × 2·50* *M1* *(£)10337.50* *A1* *(£)6202.50* *A1* *10337.50 – 8270* *M1* *6202.50 ÷ 3* *M1* *(£)2067.50* *A1* *(£)2067.50* *A1* *8270* *B1* *8270 × 0·25* *M2* *(£)2067.50* *A2*
Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=' , '+', '–', '×' and '÷' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	✓ ✓	QWC 2	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar. An unsupported answer is QWC0.
11. $27 \times \frac{8}{6} \times \frac{5}{9}$ = 20 (min).		M1 M1 A1	M2 for correct use of the '27' with all four of the numbers 8, 6, 5 and 9. M1 for correct use of the '27' with any two of the numbers 8, 6, 5 and 9. C.A.O.
12. 95% ≡ (£)137 750 $\frac{(£)137\,750 \times 100}{95}$ or equivalent. =(£)145 000		B1 M1 A1	Accept any indication.

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Summer 2016 Unitised Unit 1 Higher Tier	✓	Mark	Comments
13.(a) (Area of one sector =) $\frac{37}{360} \times \pi \times 7^2$		M1	
$= 15{\cdot}8(2\ldots)(m^2)$		A1	Accept 15·81 to 15·83 inclusive OR 15·8. Accept 16 provided correct working seen. *Also accept combining sectors and working with 74° to give 31·64(m^2) for M1A1.*
(Total area = $2\times15{\cdot}82 + 7^2$ =) $80{\cdot}6(4)(m^2)$		A1	F.T. 'their 15·82'. Allow SC1 for 58(·0..) [9·04 + 49]
13.(b) (Arc length =) $\frac{37}{360} \times 2 \times \pi \times 7$		M1	
$= 4{\cdot}5(2..)(m)$		A1	Accept 4·51 to 4·53 inclusive OR 4·5. *Also accept combining sectors and working with 74° to give 9(·04)(m) for M1A1.*
(Perimeter length = 2×4·52 + 28 =) 37(·04m)		A1	F.T. 'their 4·52'. Allow SC1 for 59·6(..)(m) [31·64 + 28] *For those who take diameter to be 7m allow SC1 for giving arc length as 2·25 to 2·3 inclusive AND A further SC1 for final answer of 32·5 to 32·6 inclusive.*
14. Sight of 950(miles) AND 1050(miles)	✓	B1	Allow 1049·9… recurring.
Sight of 25·5(gallons) AND 26·5(gallons)	✓	B1	Allow 26·49….recurring. If both B0 allow SC1 for any two correct values. (e.g. 950 with 1049 AND 25·5 with 26·49 is B0B0,SC1) F.T. only if 900≤ lowest distance <1000, 1000< greatest distance ≤1100, 25 ≤ lowest gall.< 26 and 26< highest gall.≤ 27.
Sight of $\frac{950}{26{\cdot}5}$ and Sight of $\frac{1050}{25{\cdot}5}$	✓ ✓	M2	M1 for each.
(Lowest) 35·8(mpg) AND (Highest) 41·2(mpg)	✓	A1	Must be unambiguously identified AND given correct to 1 decimal place.
15.			
(Volume of TWO spheres =) $\frac{8\pi r^3}{3}$	✓	B1	Accept $\frac{4\pi r^3}{3} + \frac{4\pi r^3}{3}$
(Volume of cylinder =) $9\pi r^3$	✓	B1	Accept $\pi r^2 9r$.
$\frac{8\pi r^3}{3} + 9\pi r^3 = 3340$	✓	M1	F.T. 'their volumes' ONLY if dimensionally correct and 2 different shapes involved.
$r^3 = 91(\cdot1\ldots.)$ or equivalent	✓	A1	C.A.O.
$r = 4{\cdot}5$(cm)	✓	A1	F.T. from 'their r^3' if M1 awarded. Note that an unsupported answer of 4·5(cm) is zero marks.
$x = 58{\cdot}5$(cm)	✓	B1	F.T. 13 × 'their stated r'
16.			F.T. 'their consistent notation for radius and height'.
Sight of correct corresponding values for volumes. E.g. $\frac{1}{3}\pi r^2 h$ with $\frac{1}{3}\pi(r/2)^2(2h)$ or $\frac{1}{3}\pi(2r)^2 h$ with $\frac{1}{3}\pi r^2(2h)$ etc.		B2	B1 for unambiguous intent but missing brackets.
'NO' because $\frac{\pi r^2 h}{3} > \frac{\pi r^2 h}{6}$ or $\frac{4\pi r^2 h}{3} > \frac{2\pi r^2 h}{3}$		E1	Dependent on B2 AND correctly simplified in order to convincingly state 'NO'. A convincing statement required. SC2 for correctly evaluated answers using specific numerical values for radius and height of cone A and correct corresponding values for radius and height of cone B AND stating 'No'. SC1 for correct answers with no (or an incorrect) conclusion.

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

W16-4351-02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life

HIGHER TIER

A.M. MONDAY, 11 January 2016

1 hour 15 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**2**	
2.	**6**	
3.	**2**	
4.	**4**	
5.	**4**	
6.	**3**	
7.	**4**	
8.	**8**	
9.	**4**	
10.	**4**	
11.	**3**	
12.	**4**	
13.	**6**	
14.	**6**	
15.	**5**	
Total	**65**	

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ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

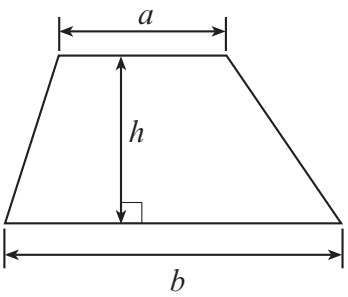
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **8**.

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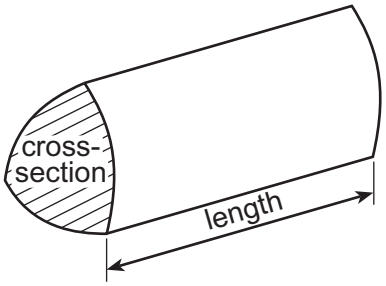
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

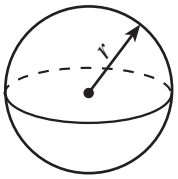


Volume of prism = area of cross-section × length



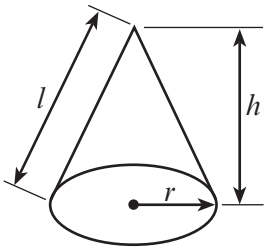
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

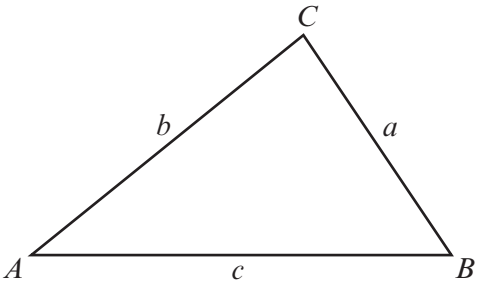


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where a, b and c are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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Examiner only

1. A piece of land is to be used as a car park.
The shape and dimensions of the land are shown below.

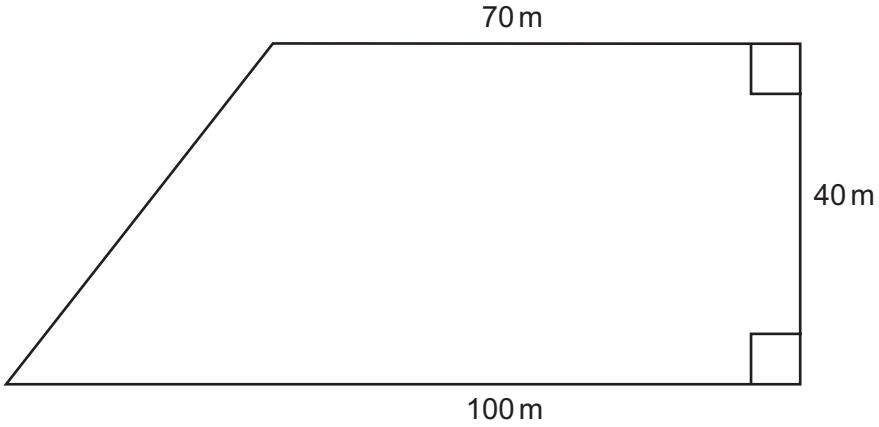


Diagram not drawn to scale

Calculate the area of this piece of land. [2]

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Turn over.

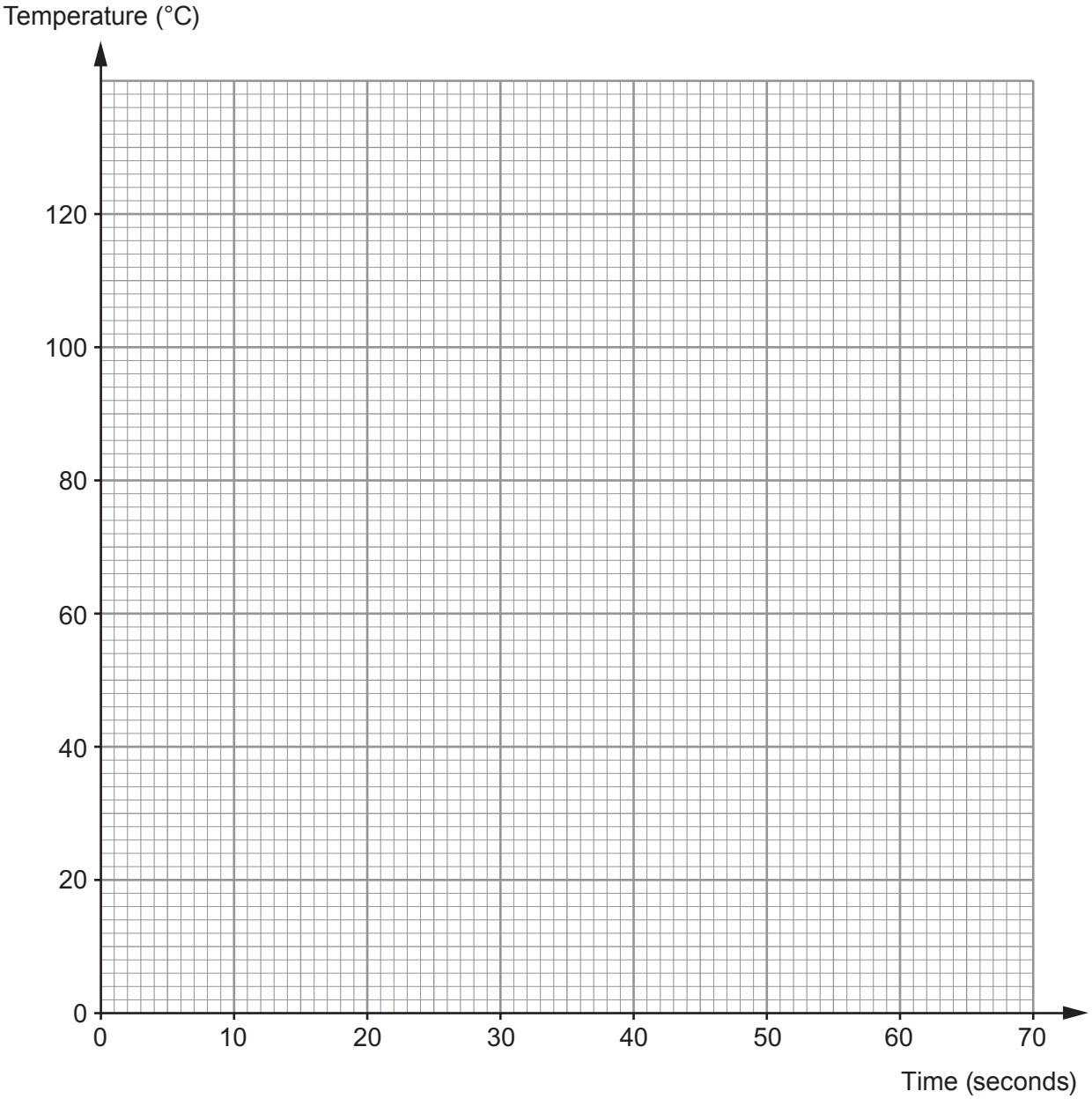
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2. A scientist is conducting an experiment where an object is placed in a temperature-controlled container.
The following four steps are taken after the object is placed in the container.

- Step 1: Set the temperature at 20°C and start the timer.
- Step 2: Increase the temperature at a constant rate of 2°C per second for 30 seconds.
- Step 3: Keep the temperature constant for 10 seconds.
- Step 4: Reduce the temperature at a constant rate so that it is again 20°C at a time of 60 seconds from the start of the experiment.

(a) Show this information on the graph below. [4]



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(b) What was the rate at which the temperature decreased?
Give your answer in °C per second. [2]

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Rate of decrease = ... °C per second

6

3. Calculate $\sqrt[3]{(8{\cdot}5-3{\cdot}6)^2}$, correct to 2 significant figures. [2]

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4. *(a)* The Sharks swimming club has 18 members.
The number of medals won by the Sharks over the last year is summarised in the table below.

Medals won	Number of members
5	4
8	6
9	7
13	1

Calculate the mean number of medals won per member of the Sharks club.
You must show all your working. [3]

(b) The Dolphins is a different swimming club with 10 members.
They also won some medals last year.
One member of the Dolphins won 8 medals last year.
The range of the number of medals won by members of this club was 4.

Which club had the member with the most medals?
You must explain how you decided on your answer. [1]

4

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5. Dewi was driving along a 10 mile stretch of road that had a speed limit of 40 mph.

The time was 14:50 as Dewi's car entered this speed limit zone.
As he left the 10 mile zone, the time was 15:10.

Calculate Dewi's average speed over this 10 mile journey.
Could Dewi have driven faster than the speed limit during this journey? Explain your answer. [4]

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6. Would a cylindrical can of radius 5 cm and height 14 cm be able to contain 1 litre of liquid?
You must show all your working and explain your decision. [3]

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7. Thomas invests £5720 for 2 years at 3% per annum compound interest.
Find the compound interest earned in the 2 years.
Give your answer correct to the nearest penny. [4]

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8. *You will be assessed on the quality of your written communication in this question.*

A company has challenged each of its salespeople to show an increase in their sales total each year. This increase should be at least 6% of their sales total for the previous year.

In 2013 both Ms Farah and Mr Price had a sales total of £18 000.

Their sales totals for 2013, 2014 and 2015 were as follows.

	Ms Farah	Mr Price
2013	£18 000	£18 000
2014	£22 000	£20 000
2015	£23 000	£21 500

Write a short note (no more than three lines) to each of these two salespeople to inform them of how well, or otherwise, they have met the challenge given to them each year.
You must show all the calculations necessary to support your notes. [8]

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Dear Ms Farah,

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Dear Mr Price,

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9. Jamal was preparing for a trip to the USA and Mexico.
He exchanged an equal amount of pounds for US dollars and for Mexican pesos.

He had to cancel his trip at the last moment.
The money he had exchanged into dollars and pesos had to be exchanged back into pounds.
Data on the exchange values at that time are shown below.

	US dollars ($)	Mexican pesos
Conversion from pounds	£1 = $1.62	£1 = 20.24 pesos
Conversion back to pounds	£1 = $1.84	£1 = 22.45 pesos

Calculate on which of the two currency exchanges Jamal lost the most money. [4]

4

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10. A window cleaning company has been asked to clean the glass on 36 identical large greenhouses owned by a fruit farmer.
On the first day, 5 cleaners managed to clean the glass on 15 of the greenhouses in 8 hours.
The cleaning company wishes to complete the cleaning of the remaining 21 greenhouses within 6 hours on the second day.

What is the minimum number of cleaners that should be used on the second day?
You may assume that all the cleaners work at the same rate. [4]

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11. The members of a rock band think that they can perform live on stage at two concerts, both held on the same date.
The first concert is held in London and the second in New York.

Use the following information to decide if it is possible.

- The time in London is 5 hours ahead of the time in New York.
- Both concerts start at 6 p.m. and end at 11 p.m. local time.
- The band will perform on stage for 20 minutes at each concert.
- The flight time between London and New York is 7 hours 20 minutes.
- As it is a charity event, the two cities, airports and airline have all guaranteed that
  (i) the time from leaving the stage in London to the plane taking off will be 1 hour,
  (ii) the time between the plane landing and the band reaching the stage in New York will be 40 minutes.

You must show all your working and clearly explain how you decided whether it is possible or not possible. [3]

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12. *(a)*



SALE
45% OFF

Now only £451

What was the original price of the sofa being advertised? [2]

(b) The following headline is seen in a financial paper.

'Denham Ltd announce a share price of £48.

Up $\frac{1}{3}$ on last year's price.'

What was the share price last year? [2]

4

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13. *(a)* Rachel and Eleri both ran in a marathon race.

Rachel completed the race in 2 hours and 54 minutes, measured correct to the nearest minute.
Eleri completed the race in 3 hours and 7 minutes, measured correct to the nearest minute.

What was the maximum possible difference between their race times? [2]

(b) The length of a side of a square piece of land is measured correct to the nearest metre.

The largest possible area of this land is calculated to be $756{\cdot}25\,m^2$.
What is the least possible area of this land? [4]

6

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14. *(a)* A sector of a circle of radius 30 cm subtends an angle of 42° at the centre as shown below.

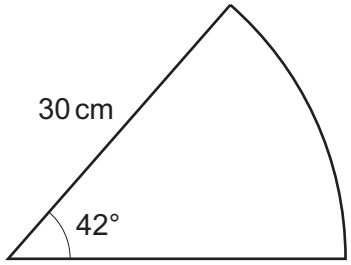


Diagram not drawn to scale

Calculate the total perimeter of the sector. [3]

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(b) A sector of a circle of radius 30 cm has an area of 534 cm^2 as shown below.

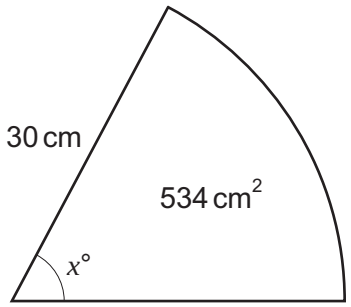


Diagram not drawn to scale

Calculate the size of angle x. [3]

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15. A child's wooden toy is made up of a solid hemisphere symmetrically attached to one face of a solid cube, as shown below.
The radius of the circular face of the hemisphere is r centimetres.
The diameter of the circular face has the same length as the sides of the cube.

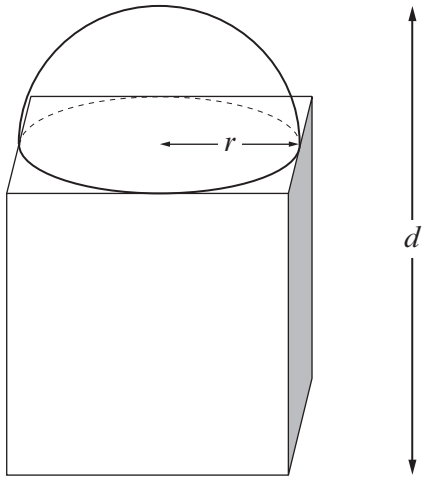


Diagram not drawn to scale

The volume of the whole toy is 1261·8 cm^3.
Calculate the height, d, of the toy. [5]

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END OF PAPER

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GCSE MARKING SCHEME

JANUARY 2016

MATHEMATICS UNITISED - UNIT 1
HIGHER TIER
4351/02

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INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

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January 2016 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments (Page 1)
1. (Area =) $\frac{70 + 100}{2} \times 40$ OR $\frac{40 \times 30}{2} + (70 \times 40)$ $= 3400(m^2)$	M1 A1 2	
2. (a) Line starts at (0 , 20). A straight line with gradient 2°C / sec. A straight line from (30,80) to (40,80). A straight line from (40,80) to (60,20). (b) 60(°C) in 20 (seconds) or equivalent. 3	B1 B1 B1 B1 M1 A1 6	Accept plot if no line drawn. Need not end at (30 , 80) *BUT see below*. F.T. from 'their (30,80)'. F.T. 'their (40,80)' . Ignore any line drawn beyond 60 seconds. Penalise −1 once only if no straight lines drawn between plots. *If <u>all four</u> B1s gained but graph incorrect (e.g. first line did not end at (30,80) penalise -1.* OR FT from their graph
3. 2·9	B2 2	B1 for 2·8(8…..)
4(a) Attempt at $5\times4 + 8\times6 + 9\times7 + 13\times1$ (144) ÷ 18 = 8 (medals) (b) Sharks because the highest possible number in the Dolphins is 12.	M1 m1 A1 E1 4	M1 for the attempt at $\sum fx$. C.A.O. Unsupported answer of 8 is M0m0A0. Must refer to '12' for E1 to be awarded.
5. Attempt at using Speed = distance / time. (Average speed =) 10 / ⅓ or equivalent = 30(mph) Yes he could have gone over the speed limit as the 30mph is only an average speed. E.g. 'Yes because it's only an average (speed)' (E1) 'Yes, he could have gone faster, then slower' (E1) BUT 'Yes he could have gone faster'. (E0).	M1 m1 A1 E1 4	e.g. 10(miles) / 20(min) or 10 / 'their time difference'. C.A.O. Independent mark. Must state, or unambiguously imply, 'Yes' AND give a clear explanation. FT 'their average speed' <u>provided</u> it is 40mph or less.
6. (Volume =) $\pi \times 5^2 \times 14$ $= 1099{\cdot}5(..)\ (cm^3)$ or 350π. 'Yes' because 1 litre is (only) $1000cm^3$	M1 A1 B1 3	 Accept answers between 1099 and 1100 inclusive. F.T. from 'their <u>derived</u> cylinder volume'. 350π must be evaluated for comparison. Must indicate that 1 litre equals $1000(cm^3)$. 'Yes' may be implied.
7. 5720 <u>171.6(0)</u> 5891.6(0) <u>176.74(8)</u> 6068.34(8) or 6068.35 OR 171.6(0) and 176.74(8) (£)348.35	B1 M1 A1 A1 4	For a correct evaluation of 3% OR Sight of 1·03 (343.2 implies 2× 171.6 and gains B1). For correctly attempting to find 2 different 3%. OR $5720 \times 1{\cdot}03^2$. F.T. one error. Must be given correct to the nearest penny. (£) 348.34 is B1M1A1A0. Treat depreciation as a misread.

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January 2016 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments (Page 2)
8. *(2013 to 2014 calculations)* $\frac{4000}{18000}$ (× 100) OR $\frac{2000}{18000}$ (× 100) OR 0·06 × 18000 OR 1·06 × 18000	M1	(*Calculation for Ms Farah OR Mr Price gains M1A1)* Sight of any one gains M1.
22(·2..)(%) OR 11(·1..)(%) OR (£)1080 OR (£)19080	A1	Sight of any one gains A1.
(2014 to 2015 calculations) $\frac{1000}{22000}$ (× 100) AND $\frac{1500}{20000}$ (× 100)	M1	(*Calculation for Ms Farah AND Mr Price required with no arithmetical error.))* Both required for M1.
= 4·5(..)(%) AND = 7·5(%)	A1	Both required for A1.
OR 0·06 × 22000 AND 0·06 × 20000 = (£)1320 AND = (£)1200	(M1) (A1)	(Both required for M1.) (Both required for A1.)
OR 1·06 × 22000 AND 1·06 × 20000 = (£)23320 AND = (£)21200	(M1) (A1)	(Both required for M1.) (Both required for A1.)
(Dear Ms Farah) A correct interpretation of the results in the context of the question. [Ms Farah did not have a 6% increase each year (despite higher overall sales)].	B1	F.T. correct interpretation for their derived results. Do not award marks for simply re-stating their results with no reference to the (6%) challenge set.
(Dear Mr Price) A correct interpretation of the results in the context of the question. [Mr Price did have a 6% increase each year (despite lower overall sales)].	B1	*If no marks gained allow SC1 for sight of* *(1·12 × 18000 =) (£)20160* *OR (1·06^2 × 18000 =) (£)20224.8(0)*
Look for • spelling • clarity of text explanations and correct units shown • the use of notation QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answers QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answers	QWC 2	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.
	8	

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January 2016 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments (Page 3)
9. Strategy to find (Fractional or % or actual) return for either currency.	M1	E.g. $\frac{1.62}{1.84}$ (×100) or $\frac{20.24}{22.45}$ (×100) OR using £x £x × $\frac{1.62}{1.84}$ or £x × $\frac{20.24}{22.45}$
($) 0·88(04..) or 88(·04..%) (Return)	A1	If x = £100, £88(.04) return or £11.96 (or £12) lost.
(peso) 0·90(15..) or 90(·15..%) (Return)	A1	If x = £100, £90(.16) return or £9.84 (or £10) lost. Allow rounding, from a correct calculation, as long as a correct comparison is still possible.
More is lost on the Dollar ($)	A1 4	F.T. their calculated amounts.
10. $5 \times \frac{21}{15}$	M1	M2 for correct use of the '5' with all four of the numbers 21, 15, 8 and 6.
$\times \frac{8}{6}$	M1	M1 for correct use of the '5' with any two of the numbers 21, 15, 8 and 6.
= 9·3(....)	A1	C.A.O. Pre approximation that does not lead to 9·3 is A0
10 (cleaners required)	A1 4	F.T. provided at least M1 gained and rounding up of 'cleaners' required.
11. A correct strategy.	S1	e.g. Attempt to add times 20m + 1h + 7h20m + 40m + 20m (= 9h 40m) OR Attempt to find 'time steps' 18:00, 18:20, 19:20, 02:40, 03:20, 03:40. For the S1 and M1 do not penalise incorrect calculation or if final 20m session omitted.
'Their 9h 40m' + 18:**00** – 5(hours) OR 'their 03:40' – 5(hours)	M1	For a correct attempt at addressing the 5 hour time difference. The 5 hours may be subtracted at any point along the 'time steps'.
YES (as they finish their slot at) 22:40 (NY time) or equivalent unambiguous statement.	A1 3	A0 if any incorrect calculations made. (No F.T.) 'YES' must be stated or implied. Allow sight of 22:20 as final time calculation if clear implication made that there is enough time to perform. Allow '10:40', for this question, to infer '10:40 p.m.'.
12(a) $\frac{451}{55} \times 100$ or equivalent	M1	
= (£)820	A1	
(b) (£)48 × $\frac{3}{4}$ or equivalent	M1	M1A0 for premature approximation. E.g. '48 ÷ 1·33 = £36.09' or '48 ÷ 1·3 = £36.92'.
= (£)36	A1 4	

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January 2016 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments (Page 4)
13(a) 14 (minutes)	B2	From 3h 7½m – 2h 53½m or equivalent. OR from for 3h 7m – 2h 54 m + 1m B1 for a correct time difference of 'a time > 3h 7m' – 'a time < 2h 54m'. (But only if the times used are seen). OR 3h 7½m – 2h 53½m attempted, but not evaluated correctly OR B1 for 3h 7m – 2h 54 m + 1m attempted, but not evaluated correctly.
(b) Sight of $\sqrt{756{\cdot}25}$	M1	
$= 27{\cdot}5$ (m)	A1	
(So least length =) 26·5 (m)	A1	
(Least area =) 702·25(m^2)	A1 6	
14(a) (Arc length =) $\frac{42}{360} \times 2 \times \pi \times 30$	M1	
$= 21{\cdot}9...$(cm) or 22 (cm) or 7π	A1	
(Perimeter =) 82 (cm)	B1	F.T. 'their derived 22' + 60. Mark final answer.
(b) $\frac{x}{360} \times \pi \times 30^2 = 534$	M1	
$x = \frac{534 \times 360}{\pi \times 30^2}$	m1	
$= 68(°)$	A1 6	Allow 67·9(..). Mark final answer.
15. Sight of $\frac{2}{3}\pi r^3$ AND $(2r)^3$	B1	
$\frac{2}{3}\pi r^3 + (2r)^3 = 1261{\cdot}8$	M1	F.T. only if volume of hemisphere = $a\pi r^3$ AND volume of cube = br^3 where a and b are constants ($\neq 0$).
$r^3 = 125$	A1	C.A.O.
$r = 5$	A1	F.T cube root of 'their 125' if M1 awarded.
$d = 15$(cm)	B1 5	F.T 3 × 'their r' (even from an M0)

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

S15-4351-02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life

HIGHER TIER

A.M. THURSDAY, 21 May 2015

1 hour 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **1**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**3**	
3.	**4**	
4.	**4**	
5.	**4**	
6.	**4**	
7.	**3**	
8.	**3**	
9.	**5**	
10.	**5**	
11.	**3**	
12.	**4**	
13.	**7**	
14.	**6**	
15.	**3**	
Total	**65**	

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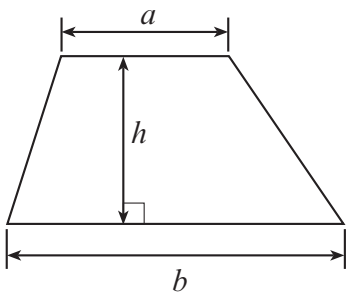
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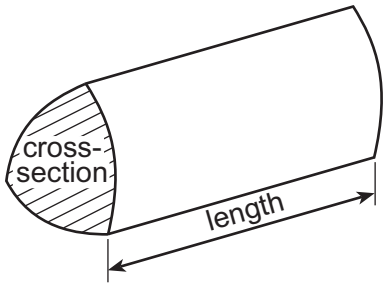
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

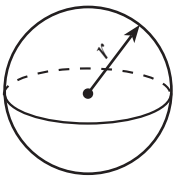


Volume of prism = area of cross-section × length



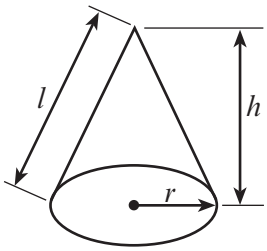
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

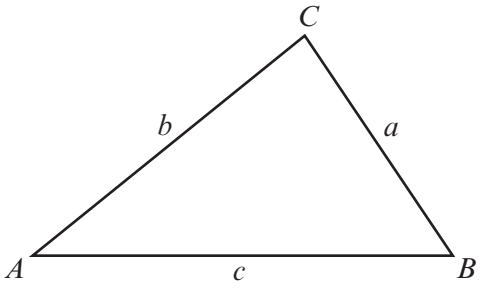


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where a, b and c are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. *You will be assessed on the quality of your written communication in this question.*

A shop offers a discount of 15% off all marked prices on the items it sells.
It also allows its customers to pay for the items bought in 12 equal monthly instalments.
Andrew buys a fridge-freezer which has a marked price of £720.

Calculate the amount he has to pay each month.
Show all your working. [7]

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2. Nerys wants to test the following hypothesis.

'Dog owners are fitter than the average person.'

She plans to:

- hand out a short questionnaire between 9 a.m. and 10 a.m., as people arrive at a local dog show,
- ask the following questions in the questionnaire,

(i) How fit are you?

(ii) How often do you walk your dog?

1 – 5 times ☐ 6 – 10 times ☐ 10 or more times ☐

- collect the completed questionnaires between 4 p.m. and 5 p.m., as people are leaving the dog show.

Write down **three** unfavourable comments about this plan. [3]

1. .....

.....

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2. .....

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3. .....

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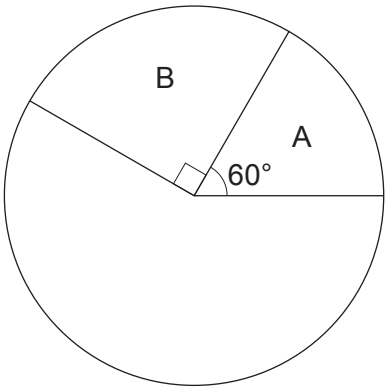
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3. A number of people were asked to choose which of four brands of ice cream they liked the most. The brands were labelled A, B, C and D respectively.

Dimitar has begun to show the results using a pie chart.



He knows that:

- 10 people chose brand A,
- 30 people chose brand C.

Calculate how many people chose brand D. [4]

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4. The dimensions of a playing field *ABCDEF* are shown on the diagram below.

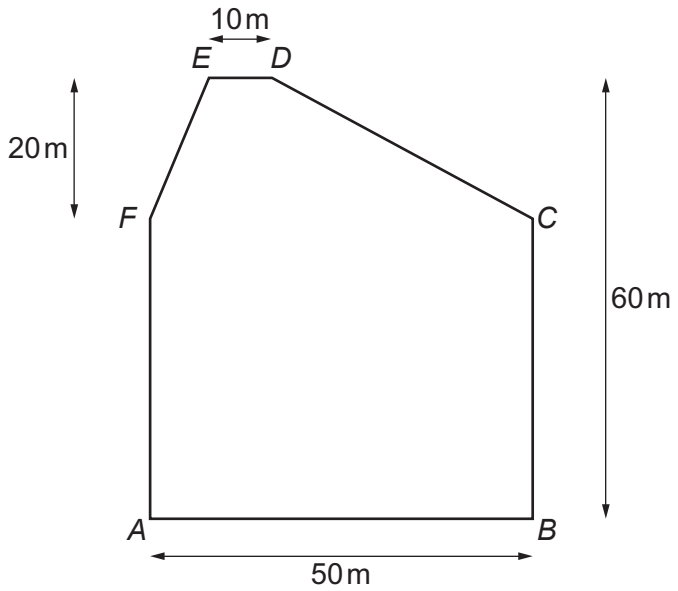


Diagram not drawn to scale

ABCF is a rectangle and sides *AB* and *ED* are parallel.

Calculate the area of the playing field. [4]

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5. Elfed invests £3500 for 2 years at 1·5% per annum compound interest.
Calculate the value of his investment at the end of the 2 years.
Give your answer correct to the nearest penny. [4]

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6. Sofia had planned to exchange £300 for euros during a visit to the local town one Saturday. She had checked the exchange rate for that day, and found it to be £1 = 1.20 euros.

Unfortunately, she had to cancel her visit to town that day, and it was not until the following Saturday that she was able to exchange her £300 for euros.
By this date the exchange rate was £1 = 1.17 euros.

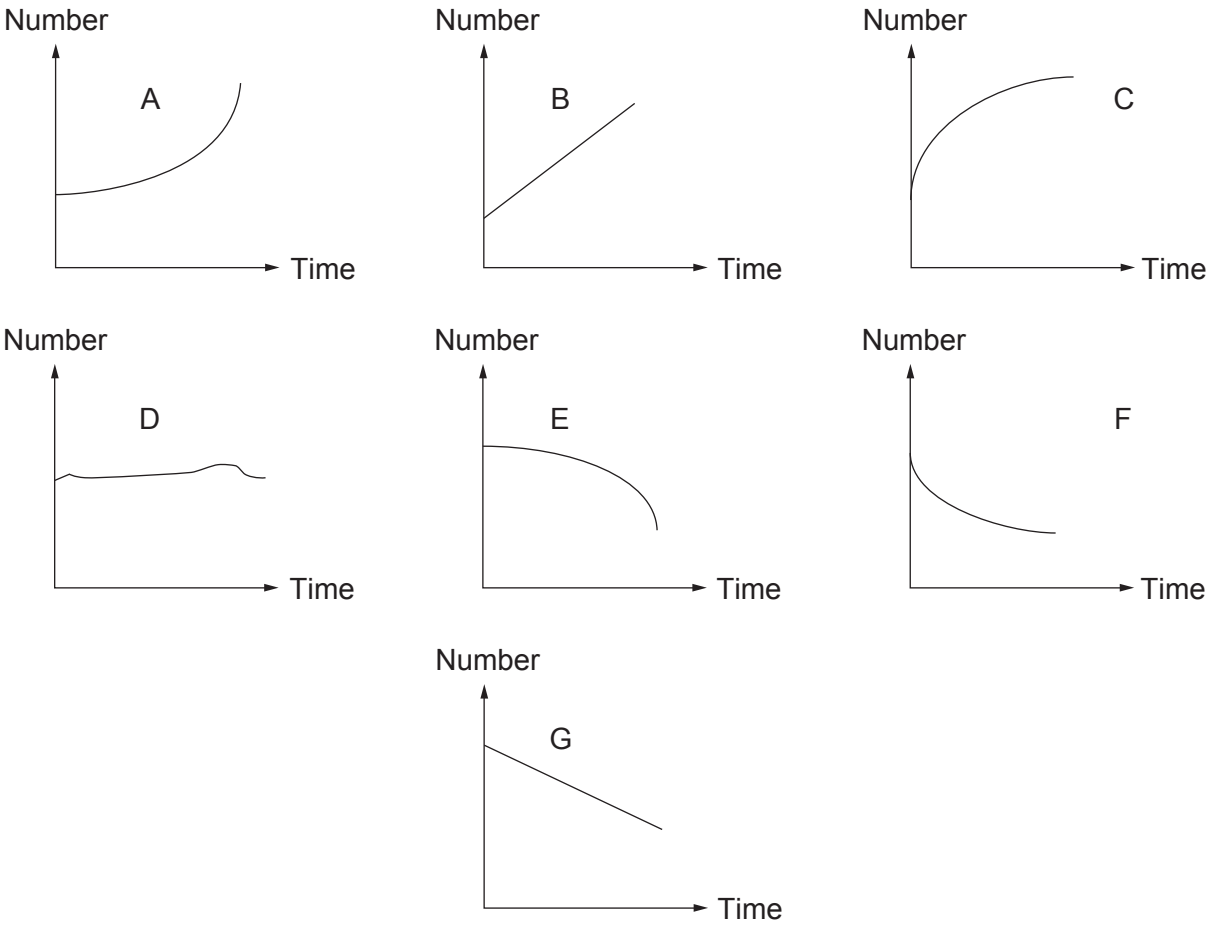
How many fewer euros did she receive due to this delay?
What percentage loss was caused by this delay? [4]

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7.



Choosing from the graphs A to G, decide which graph matches each of the following newspaper headlines. [3]

'The increase in the number of top grades has been constant.'

Graph .....

'New opening hours have made little difference to the number of visitors.'

Graph .....

'Rate of decrease in the number of road accidents is slowing down.'

Graph .....

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8. A survey was carried out on the age profile of people who attended a food fair.
A summary of the results is shown below.

Age	Under 18	18 to 25	26 to 40	41 to 60	61 and over
Number of people	120	162	205	341	148

(a) Using the table, explain fully how it is possible that there could have been more people under the age of 20 than over the age of 50 attending the food fair. [2]

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(b) From the numbers shown in the table, write down the smallest possible range in the ages of those attending the food fair. [1]

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9. Helen makes greetings cards which she sells at a weekly market.
Her weekly profit (**P**), in pounds, is given by the formula

$$P = 2{\cdot}99S - 0{\cdot}7M$$

where **S** is the number of cards she sells and **M** is the number of cards she made.

(a) One week she sold 60 cards but made a loss of £30.60.
How many cards had she made? [3]

(b) What was the minimum number of cards she needed to sell that week in order to make a profit? [2]

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10. Identical wooden sheds are displayed side by side along a straight wall in a builder's yard.
The sheds are 270 cm wide, measured correct to the nearest 10 cm.
The wall is 36 m long, measured correct to the nearest metre.

Show that it is not always possible to fit 13 of these sheds along the wall. [5]

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11. Aafreen is studying a scale drawing that shows a road *AB* and a tower *BC*.



Drawn to scale

Aafreen knows that the actual length of the road *AB* is 44 yards.
He also knows that the actual height of the tower *BC* is 24 metres.

Using these facts, and the scale drawing, convert 1 metre into yards. [3]

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1 metre = ... yards

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12. A fruit grower knows that it usually takes 20 workers 8 hours to pick 420 kg of strawberries. She needs to pick 360 kg of strawberries in 5 hours.

What is the minimum number of workers she should employ?
You may assume that all workers pick strawberries at the same rate. [4]

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13. A sector is removed from a circle of radius 12 cm, as shown below.

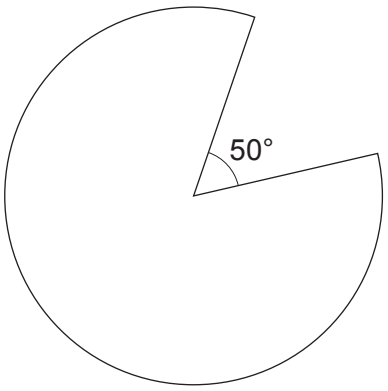


Diagram not drawn to scale

(a) Calculate the area of the **remaining** shape. [3]

(b) What is the perimeter of the **sector that has been removed**? [4]

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14. A part of an engine is made up of a hemisphere attached to a cylinder of radius r cm, as shown below.

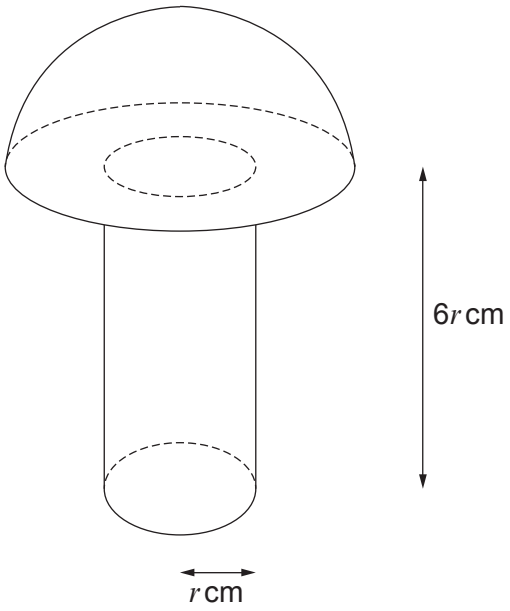


Diagram not drawn to scale

The height of the cylinder is $6r$ cm.
The radius of the hemisphere is two times the radius of the cylinder.

The volume of the whole part is $3244{\cdot}48\,\text{cm}^3$.

Calculate the total height of the whole engine part. [6]

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TURN OVER

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15. Diego makes the following statement.

'If you drive any distance at a constant speed, it would take the same amount of time to complete the journey as if you travelled half of that distance at twice that speed and the other half at half that speed.'

Show that this is incorrect. [3]

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

SUMMER 2015

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2015 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 1 - Higher Tier	4
Unit 2 - Foundation Tier	8
Unit 2 - Higher Tier	14
Unit 3 - Foundation Tier	20
Unit 3 - Higher Tier	24

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UNIT 1 - FOUNDATION TIER

June 2015 UNIT 1 Foundation	✓	Mark	Comments
1. **Ribbon marking for 1(a) and 1(b).** (a) (Two adult tickets = 2 × £15 =) (£)30 (One child's ticket =) (£)7.5(0) (Three child's tickets = 3 × £7.50 =) (£)22.5(0) (Total cost =) (£)52.5(0) Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=' and '+' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	✓ ✓ ✓ ✓ ✓ ✓	B1 B1 B1 B1 QWC 2	Sight of (£)7.5(0) or may be implied in further work. F.T. 3 × 'their £7.50' , but **not** 3 × £15 F.T. 'their amounts' but not if simply £15 or £7·50. Correct answer gains B4. QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar. <u>An unsupported answer is QWC0.</u>
Ribbon marking for 1(a) and 1(b). 1(b) (£)47.25		B2	F.T. 0·9 × 'their total cost'. B1 for (£)5.25 OR a correct evaluation of 0·1 × 'their total cost'.
2. (170 – 199) (200 – 229) **230 – 259** (260 – 289) Using a tally convention. (7) 6 11 4	✓ ✓ ✓ ✓	B1 B1 B2	Need not be accurate. B2 for all three correct. B1 for 1 or 2 correct.
3. (Total cost =) 45 × 12 + 50 = (£)590 (Each paid) £590 ÷ 8 = (£)73.75	✓ ✓ ✓ ✓	M1 A1 M1 A1	M0 if 45 × 12 not attempted. E.g. '45×12+50 = 45×62 OR '45×12+50 = 107' are both M0. F.T. 'their 590' ÷ 8.
4. 4 3 5 2		B2	B1 for 4325 or 4235 or 4253 OR B1 for any even number using all given digits once only.
5. 13:21 train from Sheffield chosen. Attempt to find time difference between 14:02 and 13:21 = 41 (min) (So total time =) 66 (min) or equivalent.	✓ ✓ ✓ ✓	B1 M1 A1 B1	May be implied in further work. F.T. for 'their chosen train' (Other trains take 1hr 31m, 1hr 11m, 1hr 1m, 1hr 31m) F.T. time for 'their train journey' + 25min. *<u>Alternative method</u>* *(Arrives at Leeds station) 14:02* *B1* *F.T. 'their train arrival' + 25min* *(Arrives at hotel) 14:27* *B1* *F.T. 'their times'* *Attempt to find time difference between 14:27 and 13:21* *M1* *(So total time =) 66 (min) or equivalent.* *A1*

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June 2015 UNIT 1 Foundation	✓	Mark	Comments
6(a)(i) 52 + 29 + 78 + 56 + 24 + 37 (= 276) 276 ÷ 6 = 46		M1 m1 A1	For an attempt to add the scores. Allow if one score 'missed'. F.T. 'their total'. C.A.O. Mark final answer.
6(a)(ii) (Range =) 54		B1	
6(b)(i) Group A AND Reference to higher scores in group A		B1	B0 if full calculation (2×22 + 2×25 + 1×26 + 1×28) / 6 is seen
6(b)(ii) Group A AND Reference to group B's scores only between 22 and 28.		B1	Allow 'Group A, they are more spread out'. Accept 'B's range is (only) 6
7(a) 5500		B1	
7(b) 6:40 (a.m.)		B1	
7(c) Graph extended to show zero litres 1 (hr) 50 (min) or equivalent		M1 A1	Allow M1 for sight of 7:50(a.m.) ± 2min. *Alternative method* *Correct rate of flow given e.g. 50litres per minute M1* *110 minutes or equivalent A1*
8. (Volume of cuboid =) 2 × 3 × 5 = 30(m^3) (Weight of cuboid =) 7200 (kg) 0·95 × 7200 or 7200 – 0·05 × 7200 = 6840 (kg) (Weight of each shape =) 1710(kg)	✓ ✓ ✓ ✓ ✓ ✓	M1 A1 B1 M1 A1 B1	F.T. 'their volume' × 240. F.T. 'their weight' including 240(kg). F.T. 'their 6840' ÷ 4. *Alternative method for final three marks.* *Sight of 1800(kg) F.T. 'their 7200' /4 B1* *0·95 × 1800 or 1800 – 0·05 × 1800 M1* *= 1710 (kg) A1* *Alternative method* *2 ×3 × 5 M1* *= 30(m^3) A1* *0·95 × 30 M1* *= 28·5(m^3) A1* *(× 240) 6840(kg) B1 0R (÷ 4) 7·125(kg)* *(÷ 4) 1710(kg) B1 OR (× 240) 1710(kg).*
9. Use of 0·625 × 1760 or equivalent (Approximately) 1100		M1 A1	Allow answers between 1090 and 1110 inclusive.
10(a) Use of 'Distance' / 'Time' (Average speed =) 225 / 4·5 OR 225 / 270 = 50 (mph) OR 0·83(…) miles per min.		M1 m1 A1	Allow time as 4(h) 30(min) or 4:30 or 4·3 or 270 for M1 '25 miles per ½ hour' gains M1m1. C.A.O. Units must be given if in miles per min.
10(b) 450 / 40 = 11·25 (gallons) 11·25 × 4·546 (Litres bought =) 52	✓ ✓ ✓ ✓ ✓	M1 A1 M1 A2	SC1 for 5·625 (gallons). Do not allow the A1 (or SC1) if 'rounded' value used for next calculation. F.T. 'their 11·25' × 4·546. A1 for 51(·1425). Similarly A1 for a 'correct' F.T. answer that is not rounded up to nearest whole number.

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June 2015 UNIT 1 Foundation	✓	Mark	Comments
11. Three different valid comments. e.g. 'Not representative of population'		B3	*Ignore irrelevant statements.* B1 for each different valid comment. Accept equivalent statements e.g. 'Biased' (by interest group). Do not give more than one mark for similar criticism(s).Reference to location should only be credited once.
'Fitness not defined' or 'Vague' or 'No options given'.			(criticisms of question (i)) Treat these three as similar comments.
'Might not have a dog' or 'No room for 'Never''			(criticisms of question (ii)) Treat these two as similar comments.
'Does not specify over what period of time', 'Can tick one of two boxes if answer is 10'			These are different comments.
'People might have left the show before 4p.m.' 'People might arrive later than 10a.m.'			(criticism of the method of distribution / collection) Treat these two as similar criticisms.
12. 1 person represented by 6° OR (B =) $10 \times \frac{90}{60}$ OR (Total =) $10 \times \frac{360}{60}$	✓	M1	
(B =) 15	✓	A1	Implies M1.
(Total =) 60	✓	A1	Implies M1.
(D =) 5 (people)	✓	A1	F.T. 'their 60' – 'their 15' – 10 – 30. *Alternative method* *C total represented by 180° B1* *D total represented by 360 – (60 + 90 + 180) M1* *= 30° A1* *(D =) 5 (people) A1*
13. 130		B2	B1 for sight of 129(·4...) or 129·5
14. 3500 52·50 3552·50 53.28(75) 3605.78(75) (£) 3605.79 OR 360579(p)	✓ ✓ ✓ ✓	B1 M1 A1 A1	For the evaluation of a correct 1·5% OR Sight of 1·015 (105 or 3605 imply use of 2× 52·5 and gain B1) For correctly attempting to find 2 different 1·5%. OR $3500 \times 1{\cdot}015^2$. C.A.O. F.T. one arithmetic error. Must be to nearest penny. Accept £3605.79p. Do not accept 3605.79p. Mark final value of investment (i.e. do not penalise if they continue to give £105.79 *If extra year OR depreciation mark accordingly, then penalise −1.*
15. 1·20 × 300 – 1·17× 300 or equivalent. = 9 (euros)	✓ ✓	M1 A1	
$\frac{1{\cdot}20 \times 300 - 1{\cdot}17 \times 300}{1{\cdot}20 \times 300}$ (× 100) or equivalent. = 2·5 (%)	✓ ✓	M1 A1	F.T. 'their 9 euros' for numerator value.
			Alternative method *$\frac{1{\cdot}20 - 1{\cdot}17}{1{\cdot}20}$ (× 100) M1* *= 2·5 (%) A1* *F.T. 'their 2·5%'* *0·025 × 300 × 1.2(0) or equivalent. M1* *= 9 (euros) A1*

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June 2015 **UNIT 1 Higher**	✓	**Mark**	**Comments**
1. (Price reduction =) 0·15 × (£)720	V	M1	
= (£)108	V	A1	M2 for 0·85 × 720
(New price = £720 – £108 =) (£)612	V	A1	F.T. £720 – 'their £108'.
(Monthly payment =) (£)612 ÷ 12	V	M1	F.T. 'their £612'.
= (£)51	V	A1	
			Alternative methods *(Original monthly payment =) (£)720 ÷ 12* *M1* *= (£)60* *A1* *(Monthly reduction =)* 0·15 × (£)60 *M1 FT* *= (£)9* *A1* *(Monthly payment =) (£)51* *A1* *OR* *(Price reduction =) 0·15 × (£)720* *M1* *= (£)108* *A1* *(Monthly saving = £108/12 =) (£)9* *B1 FT* *(Monthly payment=) 720/12 – 9* *M1* *= (£)51* *A1* *Note: Allocate marks for one method only (do not 'mix and match'). Use method that maximises total mark.*
Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=' , '+', '–', '×' and '÷' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	V V	QWC 2	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar. An unsupported answer is QWC0.
2. Three different valid comments. e.g. 'Not representative of population' 'Fitness not defined' or 'Vague' or 'No options given'. 'Might not have a dog' or 'No room for 'Never'' 'Does not specify over what period of time', 'Can tick one of two boxes if answer is 10' 'People might have left the show before 4p.m.' 'People might arrive later than 10a.m.'		B3	*Ignore irrelevant statements.* B1 for each different valid comment. Accept equivalent statements e.g. 'Biased' (by interest group). Do not give more than one mark for similar criticism(s).Reference to location should only be credited once. (criticisms of question (i)) Treat these three as similar comments. (criticisms of question (ii)) Treat these two as similar comments. These are different comments. (criticism of the method of distribution / collection) Treat these two as similar criticisms.

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June 2015 UNIT 1 Higher	✓	Mark	Comments
3. 1 person represented by 6° OR (B =) $10 \times \frac{90}{60}$ OR (Total =) $10 \times \frac{360}{60}$	✓	M1	
(B =) 15	✓	A1	Implies M1.
(Total =) 60	✓	A1	Implies M1.
(D =) 5 (people)	✓	A1	F.T. 'their 60' – 'their 15' – 10 – 30. *Alternative method* *C total represented by 180° B1* *D total represented by 360 – (60 + 90 + 180) M1* *= 30° A1* *(D =) 5 (people) A1*
4. Sight of (area of ABCF =) $2000(m^2)$	✓	B1	
(Area of FCDE =) $\frac{(50 + 10)}{2} \times 20$	✓	M1	Allow M1 for correct intent, e.g missing brackets '50 +10 × 0·5 × 20'.
$= 600(m^2)$	✓	A1	C.A.O.
(Total area =) $2600(m^2)$	✓	A1	F.T. 'sum of their two values'.
5. 3500 52·50 3552·50 53.28(75)	✓	B1	For the evaluation of a correct 1·5% OR Sight of 1·015
	✓	M1	(105 or 3605 imply use of 2× 52·5 and gain B1) For correctly attempting to find 2 different 1·5%.
3605.78(75)	✓	A1	OR $3500 \times 1{\cdot}015^2$. C.A.O.
(£) 3605.79 OR 360579(p)		A1	F.T. one arithmetic error. Must be to nearest penny. Accept £3605.79p. Do not accept 3605.79p. Mark final value of investment (i.e. do not penalise if they continue to give £105.79) *If extra year OR depreciation mark accordingly, then penalise −1.*
6. $1{\cdot}20 \times 300 - 1{\cdot}17 \times 300$ or equivalent.	✓	M1	
= 9 (euros)	✓	A1	
$\frac{1{\cdot}20 \times 300 - 1{\cdot}17 \times 300}{1{\cdot}20 \times 300}$ (× 100) or equivalent.	✓	M1	F.T. 'their 9 euros' for numerator value.
= 2·5 (%)	✓	A1	*Alternative method* *$\frac{1{\cdot}20 - 1{\cdot}17}{1{\cdot}20}$ (× 100) M1* *= 2·5 (%) A1* *F.T. 'their 2·5%'* *0·025 × 300 × 1.2(0) or equivalent. M1* *= 9 (euros) A1*
7. B D F		B3	B1 for each.
8.(a) An explanation that refers to enough (all) of the 162 people in the 18-25 group could be under 20 AND enough (all) of the 341 people in the 41-60 group could be under 50		B2	B1 if the explanation refers to only one of these facts. B1 for an explanation that only refers to the fact that we can't tell, e.g. 'Don't know how many under 20 and how many over 50'.
8.(b) (61 – 17 =) 44(years)		B1	Accept 43< range ≤ 44

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9. **Ribbon marking for 9(a) and 9(b).** (a) $-30\cdot6(0) = 2\cdot99 \times 60 - 0\cdot7M$ $M = \frac{2\cdot99 \times 60 + 30\cdot6(0)}{0\cdot7}$ $= 300$ (cards)		M1 m1 A1	C.A.O. If no marks gained allow SC1 for 212(·5…). SC2 for 213.
Ribbon marking for 9(a) and 9(b). (b) $\frac{300 \times 0\cdot7}{2\cdot99}$ or equivalent (Minimum number =) 71 (cards)		M1 A1	F.T. 'their 300'. Allow M1 for any attempt at finding how many '2·99 there are in 210'. E.g. 'Repeated additions of 2·99 aiming for 210.' OR 'trial and improvement of S × 2·99 aiming for 210.' M1, A0 for an answer of 70(·2...)
10. Sight of 275(cm) or 2·75(m) ('biggest shed') Sight of 3550(cm) or 35·5(m) ('smallest wall') $\frac{3550}{275}$ or $\frac{35\cdot5}{2\cdot75}$ $= 12\cdot9(...)$ Clear statement that 13 sheds will not always fit.	V V V V V	B1 B1 M1 A1 A1	F.T 'their smallest wall' only if 'their biggest shed' 'their smallest wall if $3500 \le w < 3600$ AND 'their biggest shed' if $270 < s \le 280$. or equivalent in metres. *Alternative methods (for M1A1A1)* *13 × 2·75* *M1* *= 35·75(m)* *A1* *Clear statement that they will not fit.* *A1* *OR* *35·5 / 13* *M1* *= 2·73....* *A1* *Clear statement that they will not fit* *A1*
11 Stating 5cm represents 44yards AND 3cm represents 24 metres. Equating a 'common cm. value' representing both yards and metres correctly. e.g. 1cm ≡ 8·8 yards and 1cm≡ 8 metres so 8metres = 8·8 yards 1 metre = 1·1 yards		B1 M1 A1	Accept any unambiguous statement. Implies previous B1. No F.T. from a B0. Allow sight of 'corresponding' values. E.g. sight of 8 and 8·8. Also e.g. 15cm ≡ 132 yards and 15cm≡ 120 metres so 120 metres = 132 yards. Allow equivalent fractions e.g. 11/10, 88/80, 132/120 etc.
12. $20 \times \frac{360}{420}$ or equivalent. $\times \frac{8}{5}$ or equivalent. $= 27\cdot4(....)$ 28 (people required).	V V V V	M1 M1 A1 B1	M2 for correct use of the '20' with all four of the numbers 360, 420, 8 and 5. M1 for correct use of the '20' with any two of the numbers 360, 420, 8 and 5. C.A.O. (to 1dp) F.T. rounding up.
13(a) Use of $310^{(o)}$ (Area =) $\frac{360 - 50}{360} \times \pi \times 12^2$ $= 389\cdot5(.....)(cm^2)$ or 124π.		B1 M1 A1	Must be used with π. M2 for $\pi 12^2 - \frac{50}{360} \times \pi \times 12^2$ Accept answers between 389·35 and 389·75 inclusive. Allow $390(cm^2)$ from correct work. SC1 for $62\cdot8(.....)(cm^2)$ or 20π.
13. (b) $\frac{50}{360} \times 2 \times \pi \times 12$ $= 10\cdot4(7..)(cm)$ or $10\cdot5(cm)$ or $10\pi/3$. (Perimeter =) $10\cdot4(7..) + 24$ $= 34\cdot4(7..)$ (cm)	V V V V	M1 A1 M1 A1	F.T. 'their derived 10·4(7..)' + 24. 'Their derived 10·4(7..)' must involve the use of π.

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14. (Volume of cylinder =) $\pi \times r^2 \times 6r$	V	B1	
(Volume of hemisphere =) $\frac{2}{3} \times \pi \times (2r)^3$	V	B1	Or equivalent e.g. $16\pi r^3 / 3$
$6\pi r^3 + \frac{16\pi r^3}{3} = 3244{\cdot}48$ or equivalent	V	M1	F.T. for 'their volumes' only if Vol. cylinder = $a \times \pi r^3$ AND Vol. hemisphere = $b \times \pi r^3$ with $a \neq b$
$r^3 = 91(\cdot 1\ldots)$	V	A1	C.A.O.
$r = 4{\cdot}5$	V	A1	F.T cube root of 'their 91·1..'.
(Height of part =) 36(cm)	V	B1	F.T. 8 × 'their 4·5'.
15. Use of Time taken = $\frac{\text{Distance travelled}}{\text{Speed}}$		M1	Allow numerical examples or use of symbols.
Sight of $\frac{\text{Distance} / 2}{\text{Speed} \times 2}$ (+) $\frac{\text{Distance} / 2}{\text{Speed} / 2}$		M1	'Distance' and 'Speed' used must be consistent with those of previous M1.
Convincing explanation of why Diego's statement is not correct.		A1	Sight of correct numerical calculations sufficient for A1. *Examples of acceptable solutions* *(i) (Time at constant speed =) D/V* M1 *Sight of* $\frac{½D}{2V} + \frac{½D}{½V}$ *M1* *Convincing explanation e.g.* $\frac{5D}{4V} > (\text{or} \neq) \frac{D}{V}$ or $\frac{D}{4V} + \frac{D}{V} > (\text{or} \neq) \frac{D}{V}$ *A1* *(ii) Using numerical values e.g.100 miles at 50mph* *(Time at constant speed =) 100/50 (=2hrs)* M1 *Sight of* $\frac{50}{100} + \frac{50}{25}$ *M1* *Convincing explanation e.g.* *2½(hrs) >(or≠) 2(hrs)* *A1* *Also accept a statement, e.g.* *'So they are not the same', if two correct calculations have been made.*

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

W15-4351-02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life

HIGHER TIER

A.M. FRIDAY, 9 January 2015

1 hour 15 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**3**	
3.	**5**	
4.	**5**	
5.	**3**	
6.	**3**	
7.	**5**	
8.	**3**	
9.	**3**	
10.	**6**	
11.	**5**	
12.	**8**	
13.	**7**	
Total	**65**	

4351 020001

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

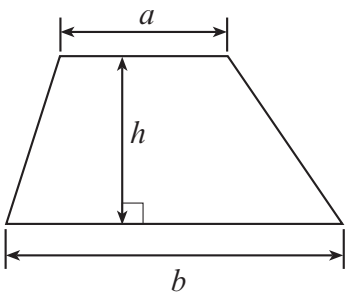
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **1**.

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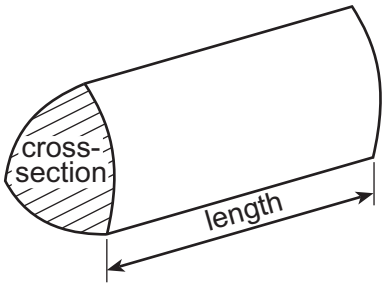
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

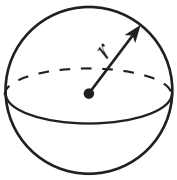


Volume of prism = area of cross-section × length



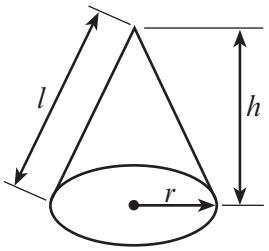
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

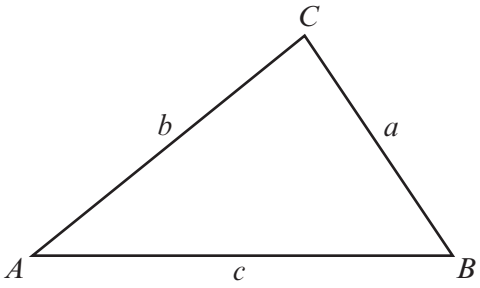


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where a, b and c are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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1. *You will be assessed on the quality of your written communication in this question.*

Laura lives 80 miles from the port of Dover.
She is thinking about buying a computer in a local store, priced at £1650.
Her friend tells her that the same model of computer can be bought in a shop in Calais, France, for 1500 euros.

Laura decides to drive to Dover, take the ferry to Calais, buy the computer in Calais, and then return home.

Using the following information, calculate how much money Laura would save by doing this compared with buying the computer at her local store.

- Her car travels 40 miles per gallon.
- A gallon of fuel costs £6.24.
- A return ferry ticket costs £23.75.
- The exchange rate at this time is £1 = 1.18 euro.

Show all your working and give your answer correct to the nearest pound. [9]

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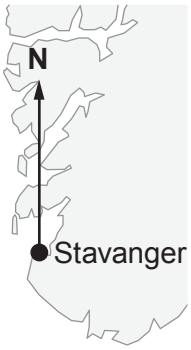
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2. The map shows a scale diagram of part of the North Sea coastline.

A ship is on a bearing of 035° from Aberdeen in Scotland and on a bearing of 290° from Stavanger in Norway.

By drawing suitable lines on the diagram below, find and mark the position of the ship. [3]





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3. 800 students from the UK and 300 students from Russia apply to attend a Summer Camp. 20% of the UK students and 30% of the Russian students are chosen to attend the camp.

What percentage of all the students who are chosen to attend the camp are from Russia? [5]

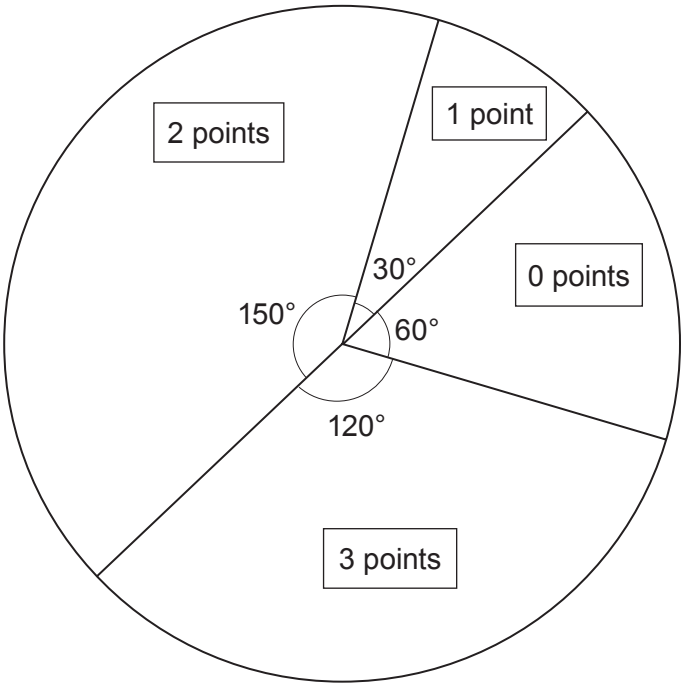
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4. Sara plays a game 72 times.
Each game results in Sara gaining 0 points, 1 point, 2 points or 3 points.

The pie chart below summarises the results of the 72 games played.



Use the information from the pie chart to complete the frequency table below, and then calculate the mean number of points Sara scored per game.
Give your answer correct to 1 decimal place. [5]

Points gained	Number of games
0	
1	
2	
3	

.....

.....

.....

.....

.....

.....

Mean = ... points

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5. *(a)* Evaluate $\sqrt[3]{8{\cdot}4^2 - 2{\cdot}7^3}$, correct to 3 significant figures. [2]

(b) Evaluate $10\frac{2}{3} \div 2\frac{2}{9}$.

Your answer must be given as a whole number and a fraction (not as a decimal). [1]

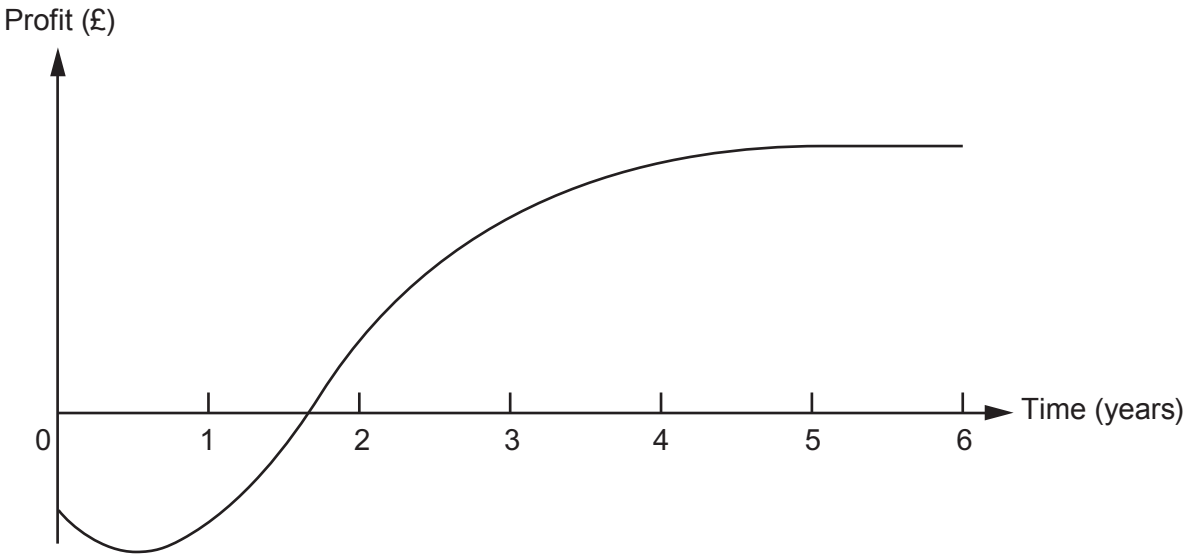
6. Each year, a fruit-growing company reduces the number of strawberry plants it grows by $\frac{1}{8}$ of the number of plants it grew the previous year.
In 2012, it grew 5440 strawberry plants.
How many strawberry plants did the company grow in 2014? [3]

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7. *(a)* A company that manufactures and sells wooden toys was set up six years ago. It has produced a graph, shown below, to illustrate how profitable the business has been over these six years.



(i) What significant fact can be stated about what happened during the company's second year in business? [1]

.....

.....

(ii) What seems to have happened after four years? [1]

.....

.....

(iii) Describe what happened during the first six months after the business was set up. [1]

.....

.....

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(b) The profit (***P***), in pounds, made on one type of toy, is calculated using the formula

$$P = 2{\cdot}75S - 0{\cdot}18M - 247$$

where ***S*** is the number of toys sold,
and ***M*** is the number of toys manufactured.

Calculate how many of these toys were sold when the company made a profit of £1220 from the 650 toys it manufactured. [2]

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8. Equal-sized trucks were hired to carry 250 tons of soil from one building site to another.

On the first day, it took 10 hours for 3 of these trucks to move 100 tons of soil.
On the second day, 5 of these trucks were used to move the remaining 150 tons of soil.

How long did it take to complete the work on the second day?

You may assume that all other conditions remained the same for both days. [3]

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9. In a competition, Dewi threw the javelin 69·93 metres.
This was an improvement of 8% on his previous best throw.

Calculate the length of his previous best throw. [3]

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10. Thin aluminium strips were attached, end to end, around the square base of a statue. The strips were bent around the corners of the base, where necessary.

The length of each side of the square base was 350 cm, measured correct to the nearest 10 cm. Each aluminium strip was 20 cm long, measured correct to the nearest centimetre.

Find the smallest possible number of strips that could have been used. [6]

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11. Vinisha uses the following rough guide when calculating how much fuel her car uses.

Speed	Miles per gallon
70 mph	42
50 mph	48
30 mph	40

For one particular journey, Vinisha noted that she had driven

- at a speed that was constantly around 50 mph for an hour and a half, then
- at a speed that was constantly around 70 mph for 3 hours, and finally
- at a speed that was constantly around 30 mph for 30 minutes.

How much fuel did she use for this journey?
Give your answer to the nearest gallon. [5]

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12. The diagram shows two concentric circles with centre O.
OP = 10 cm and OR = 6 cm.
The area of the shaded section is 48·03 cm^2.

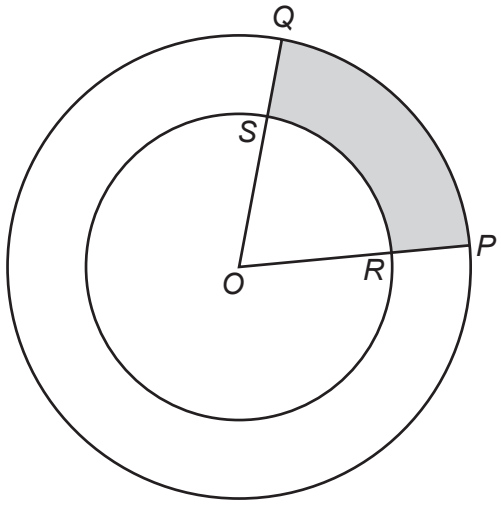


Diagram not drawn to scale

(a) Calculate the size of $P\hat{O}Q$. [4]

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(b) Using your answer to part *(a)*, calculate the length of the perimeter of the shaded section, *PQSR.* [4]

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13. *(a)* A solid wooden object is formed by removing two hemispheres from the top and bottom of a wooden cylinder, as shown below.

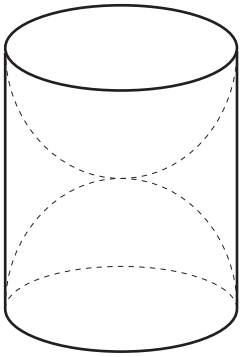


Diagram not drawn to scale

- The radius of each hemisphere is 15 cm.
- The hemispheres touch at the centre of the cylinder.

Calculate the volume of wood in the object. [3]

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(b) A solid cone shape is removed from a solid wooden cube, as shown below.

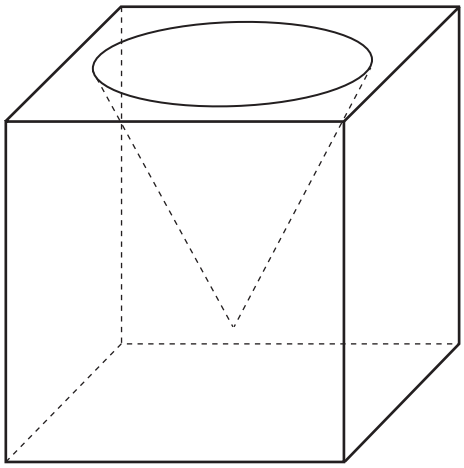


Diagram not drawn to scale

The length of each side of the cube is x cm.
The base radius of the cone is $0{\cdot}4x$ cm.
The height of the cone is $0{\cdot}9x$ cm.

Once the cone has been removed, the volume of the remaining wood is $849{\cdot}2\,\text{cm}^3$.

Calculate the value of x. [4]

END OF PAPER

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

JANUARY 2015

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2015 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 1 - Higher Tier	4
Unit 2 - Foundation Tier	7
Unit 2 - Higher Tier	11
Unit 3 - Foundation Tier	14
Unit 3 - Higher Tier	18

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UNIT 1 - FOUNDATION TIER

January 2015 UNIT 1 Foundation	Mark	Final Mark Scheme Comments
1(a) 25068 (b) 4932 (c)(i) 31000 (ii) 1/2	B1 B1 B1 B1 4	Also allow F.T. 30000 – 'their 25068'.
2. (a) Comedy 18 Adventure 10 Science Fiction 9 Romantic 13 (b) Labelled bars of equal width for Comedy, Adventure, Science Fiction and Romantic. **AND** vertical axis labelled 'Frequency' (or equivalent) Uniform scale starting at 0. Four bars at correct heights.	B2 B1 B1 B2 6	For all four correct. B1 for two or three correct. Allow unambiguous indication in either 'Tally' or 'Frequency' column (Frequency column takes precedence). Labels may be indicated on the bars themselves or underneath the axis. Accept C, A, SF and R. Accept 'Number (of films)' as a label. B0 for ambiguous placing of numbers between grid lines. B1 for three correct heights. **F.T.** their frequencies. If no scale assume one square to represent a frequency of 1. Mark heights on uniform scale that does not start at 0 (e.g. starts at 1 or −1) accordingly.
3(a)(i) 7(litres) (ii) Height of water shown at 4·5 litres. (b) Indicates '1st notch to the right of 27'.	B1 B1 B1 3	 Allow any unambiguous indication between 4 and 5 litres (**not inclusive**) Allow unambiguous intent.
4(a) (Points gained =) $13 \times 3 + 7 \times 1$ $= 46$ (b) $\frac{30 - 9}{3}$ $= 7$ (games won)	M2 A1 M1 A1 5	M1 for $13 \times 3 + k \times 1$ $(k \neq 0)$ if seen. C.A.O.
5. 3 correct locations marked. (One per 'tolerance range')	B3 3	**Mark with overlay.** *Allow ±0·2cm in any direction.* B1 for each correct point. Penalise any incorrect 'extras' −1, once only If no marks gained, allow SC1for an arc, radius 6cm, centred at point P OR an arc of a different radius with 3 points marked

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January 2015 UNIT 1 Foundation	Mark	Final Mark Scheme Comments
6 Sight of 30 adults AND 30 children.	B1	May be implied.
(Portions ordered for the children =) 15	B1	F.T. 'their number of children'.
(Total number of portions required =) 45	B1	F.T. 'their number of adults' + 'their number of child portions'. No F.T. if 'number of child portion' = 30
(Total number of portions ordered =) 50	B1	F.T. rounding up to nearest 10 from 'their number of portions required'. B0 if already a multiple of 10. An unsupported answer of 50 implies all four B marks.
(Total cost =) (£) 600	B1	F.T. 'their number of portions ordered' × £12. *Note: Sight of (£)360 and (£)180 implies first three B1s. Sight of (£)540 as **final** answer implies B1B1B1B0B1.*
Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=', '+' and '–' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC 2 7	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar. <u>An unsupported answer is QWC0.</u>
7(a) 500 / 74 OR 5 / 0·74	M1	Allow M1 for any attempt to find how many '74p in £5'. M0 for 5÷74 or 500÷0·74 unless rectified.
(She can buy) 6 (pots)	A1	Allow unambiguous embedded answer e.g. 6×74=444. 6·7(56...) implies M1.
(b) 6 × (£)0.74 OR 6 ×74(p) OR (£)4.44 OR 444(p) OR 56(p) OR (£)0.56	M1	F.T. 'their whole number of pots bought'.
NO because change is 56p (and there is no 56p coin)	A1 4	'NO' must be stated and the correct change for their number of pots shown or indicated. If number of pots >6 then only M1A0 possible.
8(a) Strategy of having 'four sets of 4 + 1 other'	S1	Allow any indication of attempt at correct strategy.
(£)24 + (£)24 + (£)24+ (£)24 + (£)8 or equivalent.	M1	Accept any unambiguous intention.
= (£)104	A1	
(b) Trialling <u>both</u> offers for an <u>equal</u> number of boards.	M1	A correct method must be attempted for '*Get Noticed'*.
A correct value for the cost of their stated number of boards at '*Get Noticed'* .	A1	(if ordering 17 boards this is £108 and gains M1A1.) SC1 for a correct cost for '*Get Noticed'* for a number of boards not considered for *'Boards for All'*.
<u>Correct</u> costs for <u>both</u> offers for an <u>equal</u> number of boards that show the cost at '*Get Noticed'* is lower than the cost at *'Boards for All'*.	A1 6	(This will require 19 or 21 or more boards to be costed.)

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January 2015 UNIT 1 Foundation	Mark	Final Mark Scheme Comments
9 (a) Uniform scale on vertical axis. Plotting (12,340). Correct line drawn from (0,0) to (12,340±5) (b) (50 lb =) 800 (oz) Any correct strategy, e.g. 100 times their value at 8oz. OR $\frac{340}{12} \times 800$ A correct answer <u>for their line</u> OR 22666(·6..) (gm) = 22·667 (kg)	B1 P1 L1 B1 M1 A1 B1 7	*P0, L0 if no <u>attempt</u> at uniform scaling.* ± '½ a small square'. Allow P1 if attempt made at uniform scaling. Allow line starting at (2,57±1). Correct line implies P1L1. B0 for incorrect units e.g. 800 lb or 800 kg. F.T. 'their graph' and also F.T. 'their 800oz'. If using their graph allow ± '½ a small square' in reading of grams at 8oz. F.T. 'their answer in grams' / 1000 Accept unsupported answers between 22·5 and 22·8. Similarly with F.T. answers. *<u>Alternative method</u>:* *1kg ≈ 2·2lb B1* *50 ÷ 2·2 M1* *= 22·7(...) ISW A2*
10. 9 × 24 (= 216) $\frac{9 \times 24}{45}$ 5 (tins)	M1 M1 A1 3	C.A.O. M1,M1,A0 for an answer of 4·8. Allow <u>unambiguous</u> embedded <u>final</u> answer e.g. 5 × 45 = 225(m^2) for all three marks.
11. Position at 035° from Aberdeen. Position at 290° from Stavanger. Position marked OR two intersecting lines.	 M1 M1 A1 3	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. (Lines must originate from Aberdeen and Stavanger respectively)
12. 0·2 × 800 OR 0·3 × 300 = 160 = 90 $\frac{90}{250} \times 100$ = 36(%)	M1 A1 A1 M1 A1 5	F.T. 'their 90' and 'their 160 + 90'. Do not F.T. 300 / 1100.
13. 5 × 4 (+) $\frac{10 \times 5}{2}$ (+) $\frac{\pi \times 2^2}{2}$ = 20 (+) 25 (+) 6·28(...) = 51·3(m^2)	M2 A2 A1 5	M1 for one or two correct. A1 for 20 AND 25, A1 for 6·28(...) or 6·3 F.T. provided M1A1 gained and three values added with an answer given to 1 d.p.
14. Least Value Greatest Value 7·5 8·5 15 25	 B4 4	B1 for each correct entry. Accept 8·49 recurring but not 8·49. Accept 24·9 recurring but not 24·9.

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UNIT 1 - HIGHER TIER

January 2015 UNIT 1 Higher	Mark	Final Mark Scheme Comments
1. (Fuel cost =) $\frac{160}{40} \times$ (£)6.24	M1	
= (£)24.96	A1	SC1 for (£)12.48
(Total cost of travel =) (£)48.71 or (£)49	B1	F.T. 'their £24.96 '+ £23.75.
(Cost of computer in pounds =) $\frac{1500}{1{\cdot}18}$	M1	
= (£)1271.18(...) or (£)1271.19 or (£)1271	A1	
(Total spent =) (£)1319.89(...) or (£)1319.90 or (£)1320	B1	F.T. 'their derived £48.71' + 'their derived £1271.18'
(Amount saved to the nearest £ =) (£)330	B1	F.T. £1650 – 'their £1319.89(...)'. B0 if not given to the nearest pound. *Alternative method* *M1A1B1 then (Total in euros)=48.71×1·18 +1500* *M1* *= 1557.48* *A1* *(Total in £) =(1557.48 ÷ 1·18 =) (£)1319.20* *B1* *(Amount saved to the nearest £ =) (£)330* *B1*
Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=', '+' and '–' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC 2 9	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.
2. Position at 035° from Aberdeen. Position at 290° from Stavanger. Position marked OR two intersecting lines.	 M1 M1 A1 3	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. (Lines must originate from Aberdeen and Stavanger respectively)
3. 0·2 × 800 OR 0·3 × 300	M1	
= 160	A1	
= 90	A1	
$\frac{90}{250} \times 100$	M1	F.T. 'their 90' and 'their 160 + 90'. Do not F.T. 300 / 1100.
= 36(%)	A1 5	

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January 2015 UNIT 1 Higher	Mark	Final Mark Scheme Comments
4. Points / No. Games (0) 12 (1) 6 (2) 30 (3) 24 Attempt at $\sum f \times x$ (138) Division by $\sum f$ (72) (Mean =) 1·9 (points) ISW	B2 M1 m1 A1 5	B2 for all four correct. B1 for 2 or 3 correct. If no marks gained allow B1 for indicating that 1 game is equivalent to 5°. F.T. their completed table. *Or 690 (M1) ÷ 360 (m1)* C.A.O. for 'their table'.
5(a) 3·71 (b) $4^4/_5$	B2 B1 3	B1 for 3·7(05.....) Accept equivalent such as $4^{48}/_{60}$. B0 for 4·8.
6. $5440 \times (7/8)^2$ or equivalent = 4165	M2 A1 3	M1 for 5440 × (7/8) or equivalent. M1, A1 for sight of 4760. Treat increase as a mis-read.
7(a) (i) A statement that indicates that the company started to make a profit. (ii) A statement that indicates that the profit made by the company has 'levelled out'. (iii) A statement that indicates that the company was losing money. (b) $\frac{1220 + 0{\cdot}18 \times 650 + 247}{2{\cdot}75}$ = 576	B1 B1 B1 M1 A1 5	 Accept any equivalent statement that shows an understanding of the nature of the curve drawn from year 4 onwards. Allow use of the word 'profit' in e.g. 'the profits are getting less' or 'the profits are plummeting'. M1 awarded at this stage.
8 $10 \times \frac{150}{100} \times \frac{3}{5}$ = 9 (hours)	M1 M1 A1 3	M2 for the correct use of the '10' with all four of the numbers 150, 100, 3 and 5. M1 for the correct use of the '10' with any two of the numbers 150, 100, 3 and 5. C.A.O.
9. 108% ≡ 69·93 (Previous best throw) $\frac{69{\cdot}93}{108} \times 100$ = 64·75 (m)	B1 M1 A1 3	Accept any indication. Or equivalent.

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January 2015 UNIT 1 Higher	Mark	Final Mark Scheme Comments
10. Sight of 345(cm) Sight of 20·5(cm) Use of $\frac{345}{20{\cdot}5}$ (× 4) = 67·3(17....) (Least number required =) 68	B1 B1 M1 A2 A1 6	F.T. 'their least base length' if < 350, and 'their greatest strip length' if > 20. A1 if '×4' not calculated (16·8…) F.T. rounding up if of equivalent difficulty. *Note:Allow B0,B1,M1,A2,A1 for* *1395 ÷ 20·5 B0,B1,M1* *=68(·04..) A2* *69 (strips) A1* *If no marks gained,* *SC2 for an answer of 73* *OR SC1 for sight of 355(cm) AND 19·5 (cm)*
11. Correct use of Distance = Speed × Time 75 (miles) AND 210 (miles) AND 15 (miles) Correct use of 'Fuel used' = Distance ÷ 'mpg' 1·5625 (gal) AND 5 (gal) AND 0·375 (gal) 7 (gallons)	M1 A1 M1 A1 A1 5	One correct implies first M1. F.T. 'their distances'. One correct implies second M1. Allow 1·6 and 0·4. F.T. 'their values' only if all three found using 'dist / mpg'. Must be to the nearest gallon. A correct answer gains the previous A1.
12(a) Sight of $\frac{\theta}{360} \times \pi \times 10^2$ OR $\frac{\theta}{360} \times \pi \times 6^2$ $\frac{\theta}{360} \times \pi \times 10^2 - \frac{\theta}{360} \times \pi \times 6^2 = 48{\cdot}03$ $\theta = \frac{48{\cdot}03 \times 360}{64\pi}$ $= 86^{(\circ)}$ (b) Sight of $\frac{86}{360} \times 2\pi \times 10$ OR $\frac{86}{360} \times 2\pi \times 6$ = 15 OR = 9 (PQSR =) 15 + 9 + 4 + 4 = 32(cm)	B1 M1 m1 A1 M1 A1 M1 A1 8	Or equivalent. SC1 for $55^{(\circ)}$ OR SC1 for $152{\cdot}8\ldots^{(\circ)}$ or $153^{(\circ)}$ (as well as a possible B1) F.T. 'their 86°'. Accept 15 to 15·02 inclusive. Accept 9 to 9·01 inclusive. F.T. 'their evaluated arc lengths' only if 86/360 and π used. C.A.O. for 'their 86°'.
13. (a) Sight of $\pi \times 15^2 \times 30$ OR $\frac{2}{3} \times \pi \times 15^3$ OR $\frac{4}{3} \times \pi \times 15^3$ $\pi \times 15^2 \times 30 - 2 \times \frac{2}{3} \times \pi \times 15^3$ = 7068(·....)(cm^3) or 2250π (b) Sight of $\frac{1}{3} \times \pi \times (0{\cdot}4x)^2 \times 0{\cdot}9x$ $x^3 - \frac{1}{3} \times \pi \times (0{\cdot}4x)^2 \times 0{\cdot}9x = 849{\cdot}2$ $x^3 = 1000$ or equivalent x = 10(cm)	B1 M1 A1 B1 M1 A1 A1 7	(Look for 21205·... – 14137·....) Accept answers between 7065 and 7071·5 inclusive. B0 if M1 awarded for use of $0{\cdot}4x^2$ Only F.T. allowed is use of $0{\cdot}4x^2$ instead of $(0{\cdot}4x)^2$. F.T. their x^3 value.

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Surname	Centre Number	Candidate Number
Other Names		0

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GCSE

4351/02

A14-4351-02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics In Everyday Life

HIGHER TIER

A.M. WEDNESDAY, 5 November 2014

1 hour 15 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**5**	
3.	**2**	
4.	**3**	
5.	**6**	
6.	**4**	
7.	**6**	
8.	**4**	
9.	**5**	
10.	**5**	
11.	**4**	
12.	**5**	
13.	**7**	
14.	**6**	
Total	**65**	

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ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

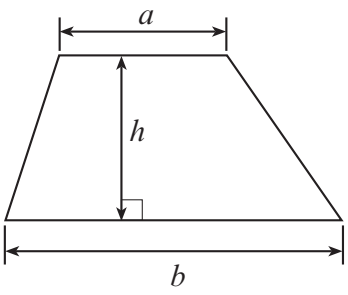
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **5**.

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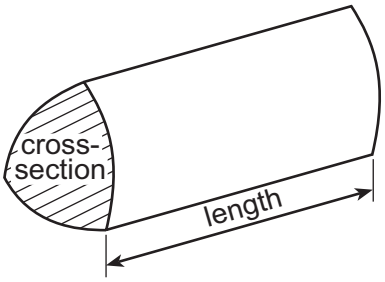
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

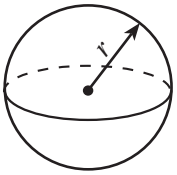


Volume of prism = area of cross-section × length



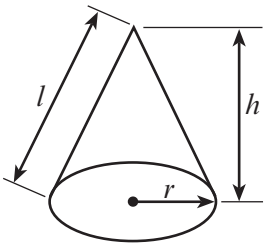
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

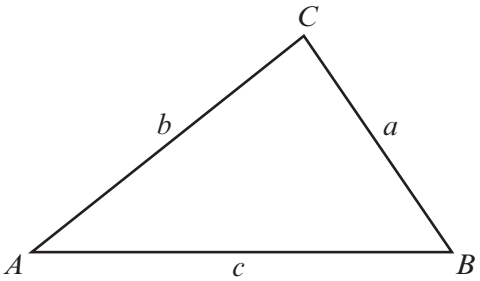


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where a, b and c are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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1. In a Park and Ride scheme, people leave their cars on the outskirts of a town and travel into town by bus.
A survey was carried out to decide if a town should start a Park and Ride scheme.

Shoppers in the town were asked the following four questions.

Q1. Did you travel into town by car?

YES ☐ *NO* ☐

Q2. What type of car do you have?

.....

Q3. Was it easy to find a place in town to park your car?

YES ☐ *NO* ☐

Q4. How many times would you use a Park and Ride, if available?

1-5 times ☐ *6-10 times* ☐ *more than 10 times* ☐ *less than 20 times* ☐

(a) Which one of the first **three** questions would you remove?
You must give a reason. [1]

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(b) Give **two** reasons why question 4 is not suitable. [2]

Reason 1 .....

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Reason 2 .....

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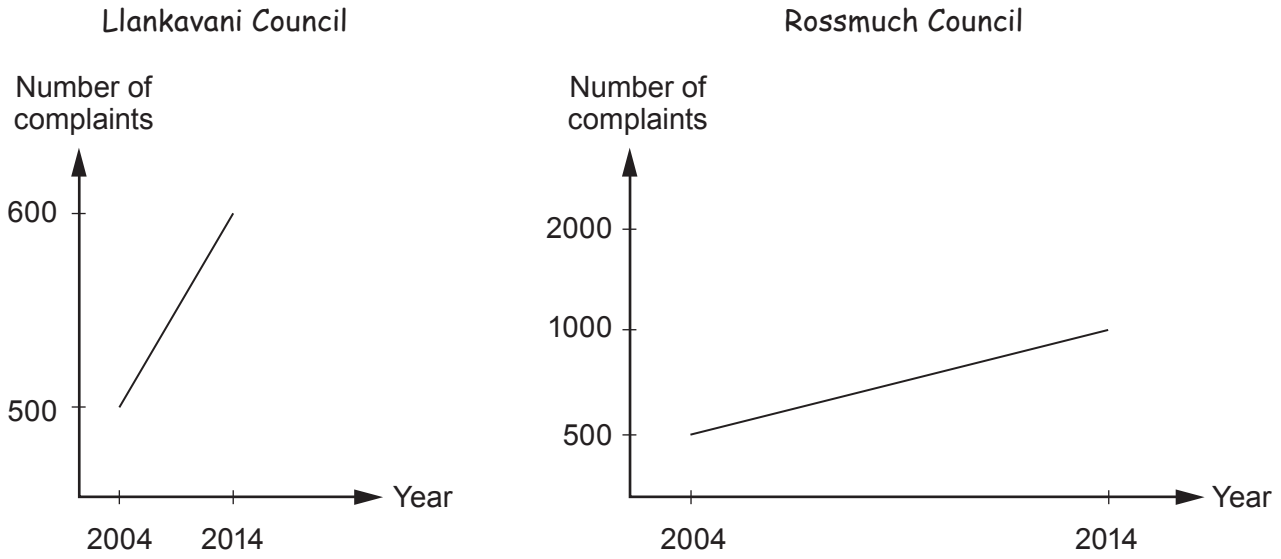
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2. The district councils for Llankavani and Rossmuch have both been considering the number of complaints received from residents over a ten-year period.
The graphs shown below were published in a local newspaper under the following headline.

How satisfied are you with your Council?



(a) Looking only at the two graph lines drawn, how could someone mistakenly think that there has been a greater increase in complaints to the Llankavani council than to the Rossmuch council? [1]

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.....

.....

(b) Give **one** reason why these graphs cannot be easily compared. [1]

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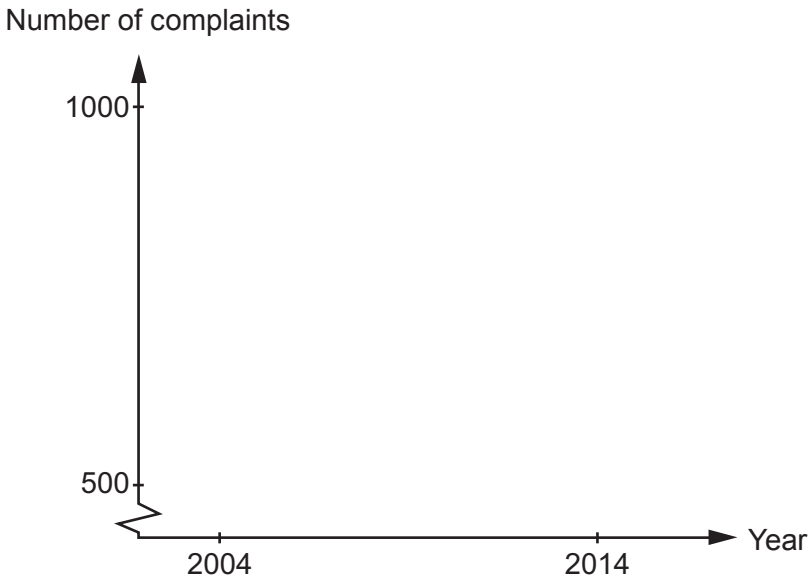
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(c) On the diagram below, use a suitable uniform scale on the vertical axis and draw two lines that will show the information for Llankavani and Rossmuch.
Label each line with the name of the council it represents. [3]



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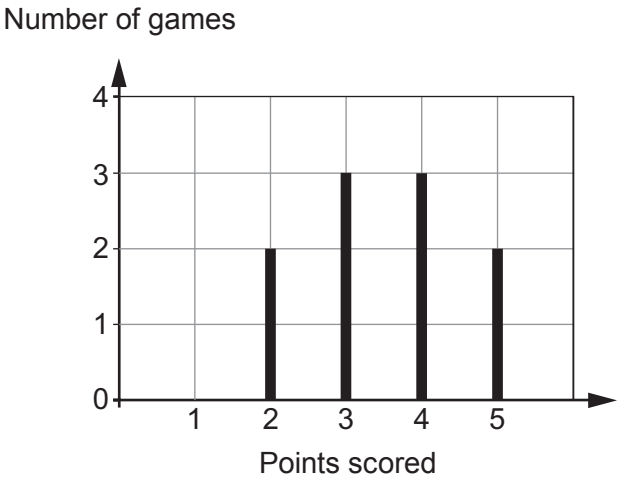
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3. Catrin and Samir each played a game ten times.
In each game, between one and five points were scored.

Catrin had a mean score of 2·7 points for her ten games.
The range of the number of points she scored on her games was 4.

Samir recorded his scores as shown on the grid below.



(a) Who had the bigger mean score?
You **must** give a reason for your answer. [1]

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(b) Who had the bigger range of the number of points scored?
You **must** give a reason for your answer. [1]

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4. A warehouse displays price labels which are **exclusive** of VAT on all the items it sells.
Brendan bought a weed-killer spray which had a price label of £27.50.
VAT is currently 20%.

How much change did he receive when he paid for the item with two £20 notes? [3]

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5. *You will be assessed on the quality of your written communication in this question.*

A town planning committee has asked for a report on the percentage increase in the town's population between 2001 and 2011.

Given the following fact, present a clear report to the committee showing all the necessary calculations.

- Population has gone up from 12 502 to 14 497 between 2001 and 2011.

You should use **appropriate** approximations.
You must show all your working. [6]

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6. Eleri invests £3700 for 3 years at 2% per annum compound interest.
Calculate the value of her investment at the end of the 3 years.
Give your answer correct to the nearest penny. [4]

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Turn over.

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7. The grid below can be used to find the distances, in miles, between four schools labelled A, B, C and D.

	A	**B**	**C**	**D**
A		9	7	4
B	9		12	6
C	7	12		5
D	4	6	5	

For example, the distance between school D and school B is 6 miles.

	A	B	C	D
A		9	7	4
B	9		12	6
C	7	12		5
D	4	(6)	5	

Mr Morgan, from school A, was required to visit all the other three schools and then return to school A.
He went from A to B, then from B to C, then from C to D before returning from D to A. This was a total of 30 miles.

(a) Mr Morgan took 1 hour and 30 minutes to travel this distance of 30 miles in his car. Calculate his average speed, in miles per hour. [3]

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(b) Find **two** other **different** routes Mr Morgan could have taken, starting and finishing at school A.
You must calculate the total distance covered in each case. [3]

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8. A company's logo is a white right-angled triangle on a grey circle.
The logo, which is painted on the wall of the company's factory, is described below.

The longest side of the triangle is along the vertical diameter of the circle.
All three vertices of the triangle touch the circumference of the circle.
The dimensions are as shown in the following diagram.

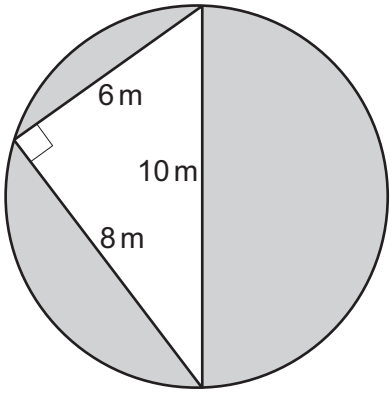


Diagram not drawn to scale

Calculate the total area of the three grey sections.
Give the units of your answer. [4]

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9. The following is a formula that is used by engineers to measure the velocity of an object travelling in a straight line under certain conditions.

$$v^2 = u^2 + 2as$$

- s is the distance travelled from the start
- v is the object's velocity after it has travelled a distance s
- u is the object's initial velocity
- a is the constant acceleration of the object

(a) The initial velocity of an object is 4 metres per second.
After travelling a distance of 64 metres, its velocity is 20 metres per second.
Find the acceleration of the object. [3]

(b) Assuming the acceleration remains the same, show whether or not the object has reached a velocity of 25 metres per second when it is at a distance of 100 metres from the start. [2]

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10. Since being given a new feed, a pig has shown a 25% increase in weight.
The pig now weighs 297 pounds (lb).
What did the pig weigh when it was first started on the new feed?
Give your answer in **kilograms** (**kg**). [5]

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11. At an oil refinery, it takes 2 hours for 11 pumps to deliver 60 thousand litres of oil to a storage tank.
How long would it take for 8 of these pumps to deliver 40 thousand litres of oil to the tank?
The rate of delivery is equal and constant for each pump.
Give your answer in hours and minutes. [4]

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12. A machine is supposed to deliver a single chemical capsule into a water-purifying tank once every 20 minutes.
The timing mechanism used to release the capsules is started when the first capsule is released.
The timing mechanism is only accurate to the nearest minute.

Calculate both the least number and the greatest number of capsules that could be released into the tank in a period of 24 hours. [5]

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13. A concrete patio *ABCD* is shaped as shown below.

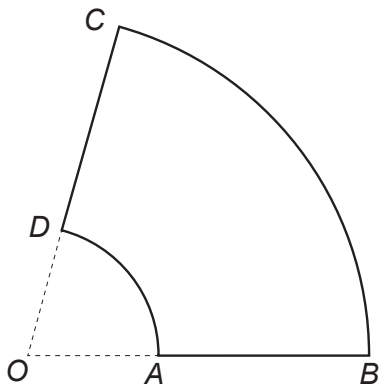


Diagram not drawn to scale

Arcs *BC* and *AD* are formed from circles whose centres are both at point *O*.
Radius *OC* = 20 m and radius *OA* = 7 m.
The area of the patio is 199·1 m^2.

(a) Calculate the size of $B\hat{O}C$, giving your answer to the nearest degree. [3]

(b) Using your answer to part *(a)*, calculate the length of the perimeter of patio *ABCD*. [4]

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14. A solid hemisphere has a radius of 20 cm.
A right circular cone, with base radius 15 cm, is removed from the hemisphere, as shown in the diagram.

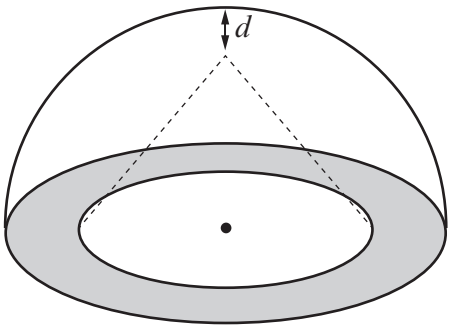


Diagram not drawn to scale

The volume of the cone is $\frac{9}{40}$ of the volume of the hemisphere.
Calculate the distance between the top of the cone and the top of the hemisphere (indicated as distance d on the diagram). [6]

END OF PAPER

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

NOVEMBER 2014

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INTRODUCTION

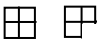
The marking schemes which follow were those used by WJEC for the November 2014 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 1 - FOUNDATION TIER

GCSE Mathematics - Unitised Unit 1 Foundation Tier November 2014	Mark	Final Mark Scheme Comments
1(a) January December February November March (b) 3 (c) 15(°C) (d) - 2(°C)	B1 B1 B1 B1 4	Accept any unambiguous indication of correct order including - 8, - 5, - 2, 3, 7. Do not accept a list of months. Allow - 15(°C)
2. Horizontal line 11cm long. Circle with radius 4cm. Midpoint unambiguously identified. Line drawn at an angle of 70° as per sketch.	 B1 B1 B1 B1 4	*Allow lengths to be ° 2mm and angle ° 2°.* Accept intent to be horizontal. Do not accept 'free hand' drawing. F.T. their line length. If <u>all</u> four marks gained but logo not as intended (e.g. centre of circle not at identified midpoint), penalise −1.
3. Finding (0·9) 0·82 and 0·75 OR 90% (82%) and 75% OR 90/100 82/100 and 75/100 or equivalent. OR three correct calculations for a common amount. AND stating 'NO'.	B3 3	All correct decimals, OR all correct %, OR all correct fractions <u>with common denominator</u>, OR correct work using a common amount for sales made, OR a valid combination AND stating 'NO'. (The 'NO' must follow from a correct reason). B2 for the above BUT with 'NO' not stated or stated for an incorrect reason. B1 for having only two correct values that may be compared (with or without a statement). Ignore subsequent working if marks gained.
4(a) 28 (b) 70 (c) Scotland  England Ireland and Wales  or equivalent.	B1 B1 B1 B1 4	 7 symbols. Ignore poor drawings. 1 full symbol plus ¾ of the symbol. F.T. their answer to (b), provided it is of equal difficulty, correct to the nearest 10. Penalise contiguous or disjointed symbol −1, once only.

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GCSE Mathematics - Unitised Unit 1 Foundation Tier November 2014	Mark	Final Mark Scheme Comments
5. (Rented out first year =) ¾ × 60 = 45 (Rent collected first year 45 × (£)150 =) (£)6750 (Rented out second year =) 0·8 × 60 = 48 (Rent collected second year = 48 × 150 =) (£)7200 (Total collected over the two years =) (£)13950	M1 A1 A1 M1 A1 A1 B1	F.T. their number of allotments. F.T. 'their 48' × £150. Number of allotments rented must be different to number for first year. F.T. their two amounts. *Alternative Methods* *OR* *60 × (£)150 M1 ¾ × 60 M1* *= (£)9000 A1 = 45 A1* *¾ × (£)9000 M1 0·8 × 60 M1* *= (£)6750 A1 = 48 A1* *0·8 × (£)9000 M1 (45+48 =) 93 B1* *= (£)7200 A1 93 × (£)150 M1* *(Total =) (£)13950 B1 (Total =) (£)13950 A1*
Look for ¶ spelling ¶ clarity of text explanations, ¶ the use of notation (watch for the use of '=', '£' and '×' being appropriate) QWC2: Candidates will be expected to ¶ present work clearly, with words explaining process or steps AND ¶ make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to ¶ present work clearly, with words explaining process or steps OR ¶ make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC2 9	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.
6. Nigel 2 Rhian 6	B2 2	Must be whole numbers. SC1 if reversed. B1 for 'their score for Rhian' = 'their score for Nigel' + 4. B1 for 'their score for Rhian' = 'their score for Nigel' × 3.
7(a) (Insurance =) (£)144 - (£)30 × 4 = (£)24 (b) (⅔ × £144 =) (£)96 (Each paid) $\frac{(£)144 - (£)96}{2}$ = (£)24	M1 A1 B1 M1 A1 5	Allow embedded answers. For sight of (£)96. F.T. 'their £96'. *Alternative Methods 7(b)* *(⅓ × £144 =) (£)48 OR Sight of $^1/_6$ B1* *(£)48 · 2 OR $^1/_6$ × 144 M1* *= (£)24 A1*

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GCSE Mathematics - Unitised Unit 1 Foundation Tier November 2014	Mark	Final Mark Scheme Comments
8(a) Use of Volume = length × width × height. (Volume =) $3 \times 2 \times 0{\cdot}5$ $= 3(m^3)$ (b) (Total length =) $3 + 2 + 3 + 2 + 4 \times 0{\cdot}5$ $= 12(m)$ (Cost =) (£)48	M1 m1 A1 M1 A1 A1 6	Allow $3 \times 2 \times 50$ Also accept $300 \times 200 \times 50$. C.A.O. For attempt to add at least 5 lengths. C.A.O. F.T. 4 × 'their total length'.
9(a) $480 \times 13{\cdot}25$ = 6360 (rand) (b) $795 \cdot 13{\cdot}25$ = (£)60 (A difference of) (£)8	M1 A1 M1 A1 A1 5	 F.T. 'their (£)60' – (£)8. *Alternative method.* *795 - (52 × 13·25) M1 (106 rand gains M1)* *· 13·25 m1* *= (£)8 A1*
10. $320 \times 1{\cdot}6$ OR $480 \times 0{\cdot}625$ = 512 (km) OR = 300 (miles) (Difference =) 32km OR 20 miles AND 'England'	M1 A1 A1 3	Or equivalent e.g. $320 \times 8/5$ OR $480 \times 5/8$. F.T. their calculation if M1 awarded. Correct units must be given and England identified as the country in which most distance was covered.
11. (a) A comment that refers to the fact that the gradient of the 'Llankavani line' appears to be greater than that of the 'Rossmuch line'. (b) Some reference made to the different scales used on either the vertical or the horizontal axis. (c) Uniform vertical scale of 1cm ≡ 100 complaints. Line from (2004, 500) to (2014, 600) AND labelled 'Llankavani'. Line from (2004, 500) to (2014, 1000) AND labelled 'Rossmuch'.	E1 E1 B1 L1 L1 5	 A reference to 'gradient (steeper)' gains E1. A reference to '(different) scale' gains E1. Allow these marks whether given in (a) or (b). *Allow ° 2mm.* *Allow 'notches' with no values written.* *Allow intent for both L1 marks.* *Penalise −1 if <u>both</u> lines start from (2004,0) or <u>both</u> lines start from (year,500) year ≠ 2004.* *Penalise −1, once only, if lines continue significantly beyond 2014.* *B0, (possible)L1, L1 if no scale shown.* SC1 if <u>both</u> lines 'correct' but not labelled or incorrectly labelled.

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GCSE Mathematics - Unitised Unit 1 Foundation Tier November 2014	Mark	Final Mark Scheme Comments
12.(a) Samir AND a valid reason given.	B1	e.g. 'Most of his points were 3 or over', 'Samir had a mean of 3·5'. B0 if an incorrect mean given for Samir.
(b) Catrin AND a valid reason given.	B1	e.g. 'Samir's range was (only) 3' also allow 'Samir's range was 2 to 5 (or 5 to 2)'. B0 if an incorrect range given for Samir.
	2	
13 (a) Question 2 because it is not relevant.	B1	Allow e.g. 'not valid' for 'not relevant'. Do not credit 'too personal'. Q2 with no reason, or an incorrect reason, is B0.
(b) Two valid reasons given. E.g. "No box for 'Never'". "'More than 10' and 'less than 20' are not exclusive". "Less than 20 overlaps all the other three answers". "Over what period of time?"	B2	B1 for each different reason (maximum of 2 marks). Ignore extra incorrect statements such as, '2nd and 3rd boxes overlap' or 'last box should be more than twenty' if marks have been awarded for correct reasons.
	3	
14(a) Use of 'Distance' / 'Time' (Average speed =) 30 / 1·5 = 20 (mph)	M1 m1 A1	Allow 1(h)30(m) or 1·3 or 90(min) etc. for this M1. C.A.O.
(b) Correct strategy.	S1	Shows understanding of table values with at least two distances correctly noted.
Two different routes shown AND a correct distance given in each case.	B2	B1 for each. A-B- D-C-A = 27(miles) A-C- B-D-A = 29(miles) A-C- D-B-A = 27(miles) A-D- B-C-A = 29(miles) A-D- C-B-A = 30(miles)
	6	
15. 3700 74 3774 75.48 3849.48 76.98(96) 3926.46(96) (£) 3926.47 OR 392647(p)	B1 M1 A1 A1	For the evaluation of a correct 2% OR Sight of 1·02 (222 and 3922 imply use of 3× 74 and gain B1) For attempting to find 3 different 2%. OR $3700 \times 1{\cdot}02^3$. Or sight of (£)74 AND (£)75.48 AND (£)76.98(..) F.T. one error. Accept £3926.47p. Do not accept 3926.47p. Mark final value of investment (i.e. do not penalise if they continue to give £226.47)
	4	

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UNIT 1 - HIGHER TIER

GCSE Mathematics - Unitised Unit 1 Higher Tier November 2014	Mark	Final Mark Scheme Comments
1. (a) Question 2 because it is not relevant.	B1	Allow e.g. 'not valid' for 'not relevant'. Do not credit 'too personal'. Q2 with no reason, or an incorrect reason, is B0.
(b) Two valid reasons given. E.g. "No box for 'Never'". "'More than 10' and 'less than 20' are not exclusive". "Less than 20 overlaps all the other three answers". "Over what period of time?"	B2 3	B1 for each different reason (maximum of 2 marks). Ignore extra incorrect statements such as, '2nd and 3rd boxes overlap' or 'last box should be more than twenty' if marks have been awarded for correct reasons.
2 (a) A comment that refers to the fact that the gradient of the 'Llankavani line' appears to be greater than that of the 'Rossmuch line'.	E1	A reference to 'gradient (steeper)' gains E1. A reference to '(different) scale' gains E1. Allow these marks whether given in (a) or (b).
(b) Some reference made to the different scales used on either the vertical or the horizontal axis.	E1	
(c) Uniform vertical scale of 1cm ≡ 100 complaints.	B1	Allow ° 2mm. Allow 'notches' with no values written. Allow intent for both L1 marks.
Line from (2004, 500) to (2014, 600) AND labelled 'Llankavani'.	L1	Penalise −1 if <u>both</u> lines start from (2004,0) or <u>both</u> lines start from (year,500) year ≠ 2004.
Line from (2004, 500) to (2014, 1000) AND labelled 'Rossmuch'.	L1 5	Penalise −1, once only, if lines continue significantly beyond 2014. B0, (possible)L1, L1 if no scale shown. SC1 if <u>both</u> lines 'correct' but not labelled or incorrectly labelled.
3 (a) Samir AND a valid reason given.	B1	e.g. 'Most of his points were 3 or over', 'Samir had a mean of 3·5'. B0 if an incorrect mean given for Samir.
(b) Catrin AND a valid reason given.	B1 2	e.g. 'Samir's range was (only) 3' also allow 'Samir's range was 2 to 5 (or 5 to 2)'. B0 if an incorrect range given for Samir.
4. (Cost =) (£)27.50 × 1·2 or equivalent. = (£)33 (Change =) (£)7	M1 A1 A1 3	 FT 40 – 'their 33' If no marks, SC1 for sight of (£)18.

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GCSE Mathematics - Unitised Unit 1 Higher Tier November 2014	Mark	Final Mark Scheme Comments
5. (Increase in population between 2001 and 2011 =) (14500 - 12500 =) 2000 (% increase ≈) $\frac{2000}{12500} \times 100$ or equivalent. = 16(%) Working with appropriate approximations in calculation of the percentage. Look for ¶ spelling ¶ clarity of text explanations (presented as a clear report) ¶ the use of notation (watch for the use of '=' and % being appropriate) QWC2: Candidates will be expected to ¶ present work clearly, with words explaining process or steps AND ¶ make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to ¶ present work clearly, with words explaining process or steps OR ¶ make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	B1 M1 A1 B1 QWC2 <

GCSE Mathematics - Unitised Unit 1 Higher Tier November 2014	Mark	Final Mark Scheme Comments
7(a) Use of 'Distance' / 'Time' (Average speed =) 30 / 1·5 = 20 (mph) (b) Correct strategy. Two different routes shown AND a correct distance given in each case.	M1 m1 A1 S1 B2 6	Allow 1(h)30(m) or 1·3 or 90(min) etc. for this M1. C.A.O. Shows understanding of table values with at least two distances correctly noted. B1 for each. A-B- D-C-A = 27(miles) A-C- B-D-A = 29(miles) A-C- D-B-A = 27(miles) A-D- B-C-A = 29(miles) A-D- C-B-A = 30(miles)
8. Sight of either $\pi \times 5^2$ OR $\frac{1}{2} \times 8 \times 6$ (Area =) $\pi \times 5^2 - \frac{1}{2} \times 8 \times 6$ = 54·5(...) m^2	B1 M1 A1 U1 4	$\pi \times 5^2$ must be for area of circle not semicircle. Allow B1 for $(\pi \times 5^2)/2$ if clearly area of semicircle. Look out for M0 for $\pi \times 5^2 - (6 + 8 + 10)$. Accept 54·5 to 54·6 inclusive. Correct units for final answer. Independent of all other marks.
9(a) $20^2 = 4^2 + 2 \times a \times 64$ $\frac{20^2 - 4^2}{2 \times 64}$ (= a) = 3(ms^{-2}) (b) (v^2 =) $4^2 + 2 \times 3 \times 100$ (= 616) (v =) 24·8(...)(ms^{-1}) (so velocity of 25ms^{-1} not reached)	B1 B1 B1 M1 A1 5	For correct substitution. F.T. their acceleration from part (a). A0 if 24·8 approximated to 25 and 'Yes' stated. *Alternative methods. (Using v = 25)* $a = \frac{25^2 - 4^2}{2 \times 100}$ *OR* $u^2 = 25^2 - 2 \times 3 \times 100$ *M1* *= 3·045* *u = 5* *So a = 3 not enough.* *So u = 4 not enough* *A1* *('not enough' must be indicated for A1)* *Also (continuing from position reached in (a))* (v^2 =) $20^2 + 2 \times 3 \times 36$ (= 616) M1 (v =) 24·8(...)(ms^{-1}) A1 (so velocity of 25ms^{-1} not reached)
10. 125% ≡ 297(lb) (Initial weight =) $\frac{297 \times 100}{125}$ = 237·6(lb) ≈ $\frac{237·6}{2·2}$ (kg) or $\frac{237·6 \times 5}{11}$ = 108(kg)	B1 M1 A1 M1 A1 5	Accept any indication. Or equivalent e.g. 297 / 1·25. F.T. 'their 237·6'.

Alternative method

$\frac{297}{2·2}$ M1

= 135(kg) A1

125% ≡ 135 B1 F.T.

(Initial weight)

$\frac{135}{125} \times 100$ M1

= 108(kg) A1

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GCSE Mathematics - Unitised Unit 1 Higher Tier November 2014	Mark	Final Mark Scheme Comments
11. $2 \times \frac{11}{8}$ or equivalent. $\times \frac{40}{60}$ or equivalent $= 11/6$ (hrs) $= 1$hrs 50min	M1 M1 A1 B1 4	M2 for correct use of the '2' with all four of the numbers 11, 8, 40 and 60. M1 for correct use of the '2' with any two of the numbers 11, 8, 40 and 60. C.A.O. or equivalent e.g. 1·83...(hrs). F.T. conversion from 'their 11/6' only if of equivalent difficulty (not ½ an hour). Allow 2hrs 11min or 2hrs 10min as FT from 2·18…hrs.
12. Sight of 19·5(min) AND 20·5(min) Sight of 24×60 (= 1440)(min) $\frac{24 \times 60}{19{\cdot}5}$ OR $\frac{24 \times 60}{20{\cdot}5}$ 73·8(....) AND 70·2(...) (Greatest number =) 74 AND (Least number =) 71	B1 B1 M1 A1 A1 5	Accept 19min 30sec. AND 20min 30sec. for B1. May be implied in calculations. F.T numerator only for $24 \times 60 \times 60$ or 60×60. F.T. if 'least $19 \leq t < 20$ OR greatest $20 < t \leq 21$'. F.T. 'their 73·8' AND 'their 70·2' rounded up. A0 for 73 and 70 (First capsule not considered).
13(a) $\frac{\theta}{360} \times \pi \times 20^2 - \frac{\theta}{360} \times \pi \times 7^2 = 199{\cdot}1$ $(\theta =) \frac{199{\cdot}1 \times 360}{\pi \times (20^2 - 7^2)}$ $= 65(°)$ (b) Sight of $\frac{65}{360} \times 2 \times \pi \times 20$ OR $\frac{65}{360} \times 2 \times \pi \times 7$ $= 22{\cdot}7$ OR $= 7{\cdot}9$ (Perimeter =) $22{\cdot}7 + 7{\cdot}9 + 13 + 13$ $= 56{\cdot}6$(m)	M1 m1 A1 M1 A1 M1 A1 7	Or equivalent. SC1 for 57(°) FT 'their 65' for all 4 marks Accept 22·6(...) and 7·9(...). F.T. their 'arc lengths' only if the method used for finding each of the arcs is correct.
14 Sight of $\frac{2}{3} \times \pi \times 20^3$ or 16755(·1...) or $16000\pi/3$ Sight of $\frac{1}{3} \times \pi \times 15^2 \times h$ $\frac{1}{3} \times \pi \times 15^2 \times h = 9/40 \times \frac{2}{3} \times \pi \times 20^3$ $(20 - d =)$ or $(h =) \frac{9 \times 2 \times \pi \times 20^3 \times 3}{40 \times 3 \times \pi \times 15^2}$ or equivalent. $= 16$(cm) $(d =)$ 4(cm)	B1 B1 M1 A1 A1 6	B0 if $\frac{2}{3} \times \pi \times 20^3$ evaluated incorrectly and used in further work. *'h' clearly being the height of the cone.* *May be written as (20 - d). Do not penalise lack of brackets at this stage.* F.T. 'their cone vol.' = 9/40 × 'their hemisphere vol.' For M1. (l.h.s. =235·6..× h r.h.s. =3769·9 or 3770). *Allow M1only if (20 - d) is used without acknowledgement of the brackets.* (3770 ÷ 235·6) F.T. 20 - 'their 16' if M1 gained.

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life

HIGHER TIER

A.M. MONDAY, 9 June 2014

1 hour 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**3**	
3.	**9**	
4.	**5**	
5.	**2**	
6.	**7**	
7.	**5**	
8.	**4**	
9.	**8**	
10.	**3**	
11.	**4**	
12.	**6**	
13.	**6**	
Total	**65**	

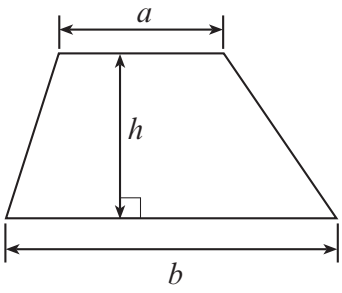
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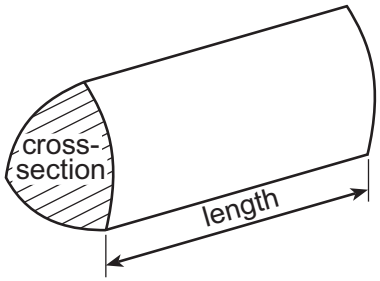
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Formula List

Area of trapezium $\frac{1}{2}(a+b)h$

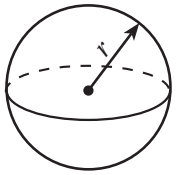


Volume of prism = area of cross-section × length



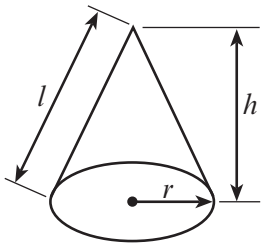
Volume of sphere $\frac{4}{3}\pi r^3$

Surface area of sphere $4\pi r^2$



Volume of cone $\frac{1}{3}\pi r^2 h$

Curved surface area of cone πrl

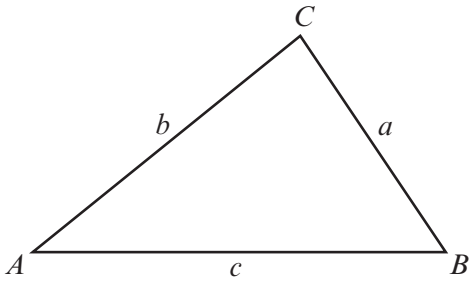


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where a, b, c are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. Martha wants to test the following hypothesis.

'More men than women buy a daily newspaper.'

She plans to

- hand out a short questionnaire at a Women's Institute meeting,
- ask the following questions in the questionnaire,

(i) How old are you?

(ii) How often do you buy a newspaper?

Never ☐ 1-3 times ☐ 3-5 times ☐ More than 5 times ☐

- collect their replies at the next meeting.

Write down **three** unfavourable comments about this plan. [3]

1. .....

.....

.....

2. .....

.....

.....

3. .....

.....

.....

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2. The diagram shows the positions of two ships *A* and *B*.
Ship *A* and ship *B* both receive a distress call at the same time.
Ship *A* locates the call on a bearing of 135°.
Ship *B* locates the call on a bearing of 215°.

On the diagram below show the position from where the distress call was sent. [3]



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3. *You will be assessed on the quality of your written communication in this question.*

Bethan's current annual salary is £30 000.
After tax and other deductions, she receives 70% of this salary.
Over one year, her work involves travelling 8000 miles.
Her car travels 40 miles per gallon, and a gallon of petrol costs £6.25.

She is considering a new job, working from home.

Her new salary would be $\frac{2}{3}$ of her current salary, with the same percentage deduction.

Find the difference, in terms of money, that this change of job would make.
You must show all of your calculations. [9]

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4. A currency exchange shop displays the following two posters.

Need some euros this Summer?

£1 will buy you 1·28 euros.

Back from holiday?
Need to change your euros into pounds?

1·50 euros will buy you £1.

Keith went to the exchange shop to buy 600 euros for his trip to Portugal.
The following day he realised that he would be unable to go on the trip.
He returned to the exchange shop and changed the 600 euros back into pounds.
The shop was displaying the same information as shown above.

How much money did Keith lose because of these two transactions? [5]

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5. Calculate $\sqrt{24{\cdot}6 - 13{\cdot}8^3}$, correct to 3 significant figures. [2]

.....

.....

6. *(a)* A company was set up with 500 workers.
At the end of each of the first three years the company employed more workers.
The number of additional workers employed each year was equal to two-fifths of the number of workers that were there at the start of that year.

How many people worked for the company in the fourth year? [4]

.....

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(b) Calculate the percentage increase in the number of workers from the first year to the fourth year. [3]

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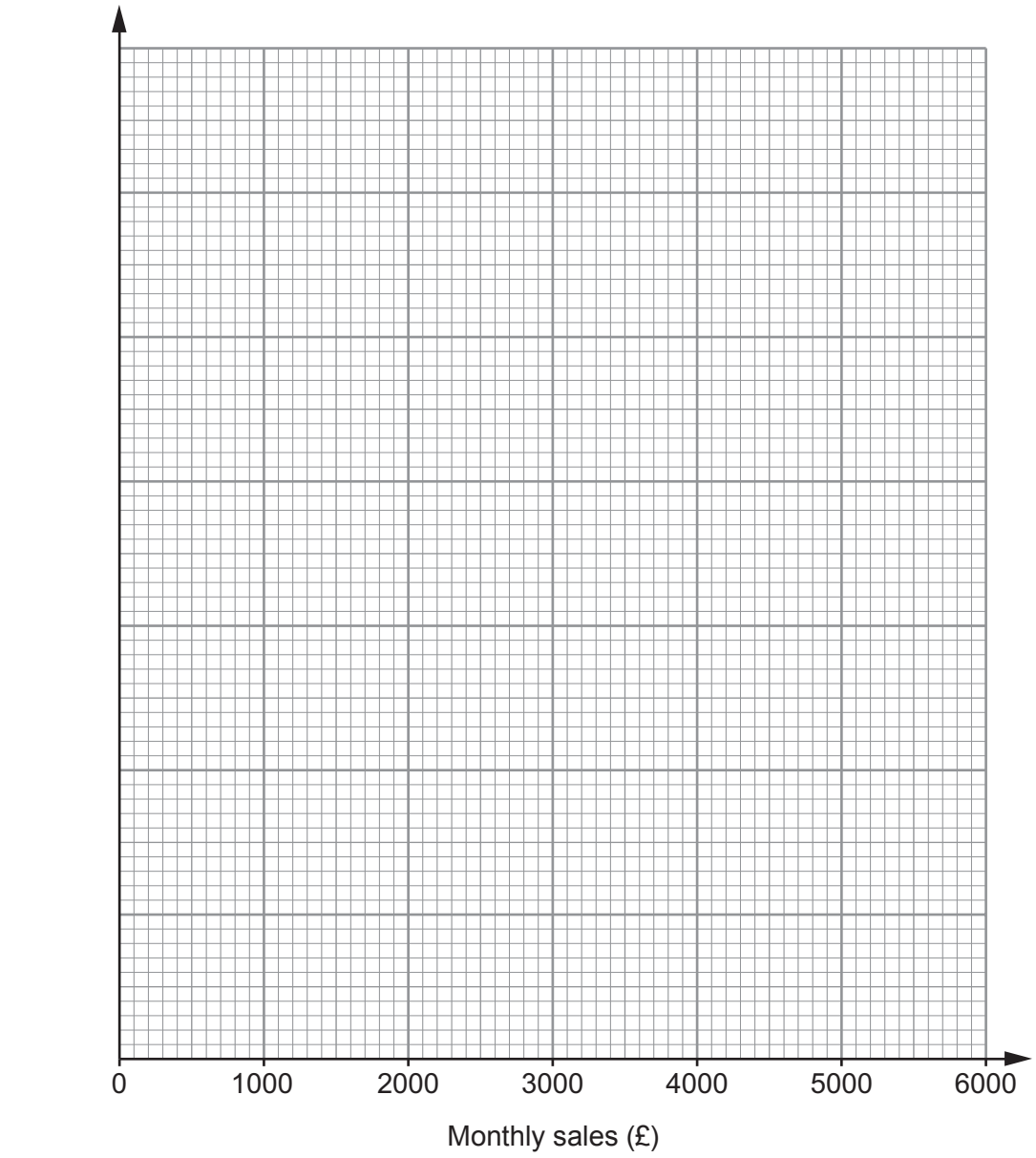
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7. *(a)* A company pays its sales staff a basic monthly salary of £500.
The sales staff also earn a monthly bonus that is equal to 10% of the **sales** that they make in that month.
On the graph paper below, draw a line that will show the total monthly income received by sales staff when their **sales** are between £0 and £6000. [3]

.....

.....

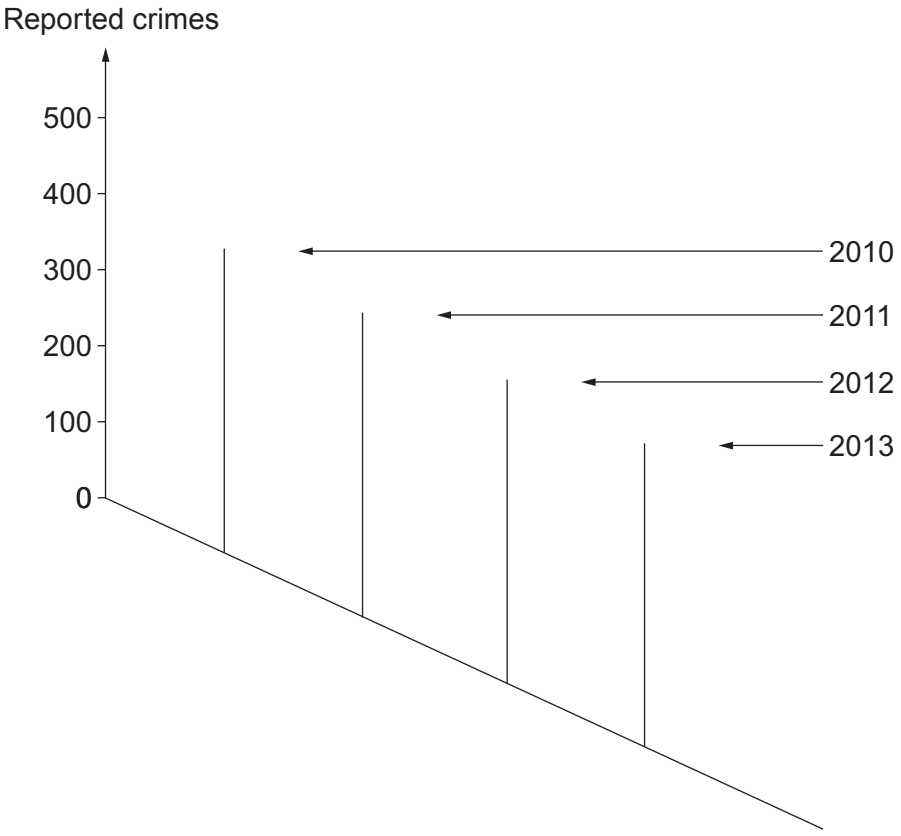


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(b) A newspaper published the following graph.



Comment on how this graph could be misunderstood and give the reason for this. [2]

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8. A water company engineer is investigating a leaking pipe.
He finds that, between 2:00 p.m. and 7:00 p.m., the volume of water that has leaked from the pipe was 8 litres, **measured correct to the nearest litre**.

Calculate the greatest possible volume of water that would be lost in 7 days at this rate. [4]

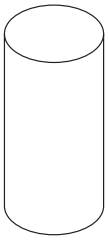
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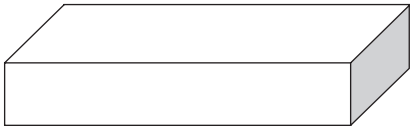
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9. Twelve spherical balls, each of diameter 10 cm, are to be packed into containers. There are two types of container available.

Container A	Container B
Cylinders: radius 5·5 cm and height 63 cm	Boxes: cuboids 42 cm by 32 cm by 11 cm





Diagrams not drawn to scale

(a) Calculate the volume of one spherical ball. [2]

.....

.....

(b) Compare the total volume of empty space when the 12 balls are packed into cylindrical containers, with the total volume of empty space when they are packed into box containers. Assume that the minimum number of containers required is used in each case. [6]

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10. A building society is advertising the following savings scheme.

SUPER SAVER

Interest rate: 6% per annum
Interest is paid to you every 4 months

The building society must tell customers what the Annual Equivalent Rate (AER) is on this savings scheme.
The formula used to calculate this AER is

$$\text{AER} = \left[\left(1+\frac{R}{100N}\right)^{N} - 1\right] \times 100$$

Where R is the percentage interest rate per annum shown in the advert,
and N is the number of interest payments you receive in one year.

Calculate the AER on this Super Saver scheme.
Give your answer correct to 2 decimal places. [3]

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11. Samir was test-driving a new model of car.

Samir travelled from point *A* to point *B* in 1 hour.

For $\frac{1}{3}$ of this **time** he travelled at a speed of 30mph.

For another $\frac{1}{3}$ of the **time** he travelled at 45mph.

For the final $\frac{1}{3}$ of the **time** he travelled at 60mph.

Samir travelled back from point *B* to point *A* along the same route.

For $\frac{1}{3}$ of this **distance** he travelled at 30mph.

For another $\frac{1}{3}$ of the **distance** he travelled at 45mph.

For the final $\frac{1}{3}$ of the **distance** he travelled at 60mph.

How long did the return journey take? [4]

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12. A gardener is marking out the border of a flowerbed.
The flowerbed is in the shape of a sector AOB of a circle centre O as shown below.

The complete border is 28 metres long.
$OA = OB = 8{\cdot}6\,\text{m}$.

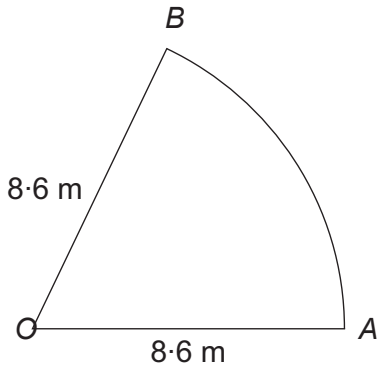


Diagram not drawn to scale

(a) Calculate the size of $A\hat{O}B$. [4]

(b) Calculate the area of the flowerbed. [2]

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13. A Christmas decoration consists of a cone resting on a cube.

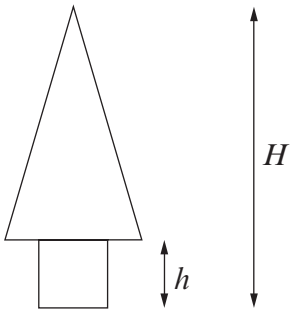


Diagram not drawn to scale

The height of the cube is h cm.
The height of the cone is four times the height of the cube.
The base radius of the cone is equal to the height of the cube.
The volume of the whole decoration is 648·6 cm^3.

Calculate the overall height H of the decoration. [6]

END OF PAPER

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

SUMMER 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2014 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 1 - Higher Tier	4
Unit 2 - Foundation Tier	7
Unit 2 - Higher Tier	10
Unit 3 - Foundation Tier	12
Unit 3 - Higher Tier	15

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UNIT 1 - FOUNDATION TIER

<table>
<tr><th>JUNE 2014 UNIT 1
Foundation Tier</th><th>P</th><th>Mark</th><th>Comments</th></tr>
<tr><td>Ribbon marking for 1(a) and 1(b).
1. (a) 69025
Five hundred and fifty thousand seven hundred and four

(b) Sight of 481679
482000</td><td></td><td>B1
B1

B1
B1</td><td>
Ignore incorrect spelling.

F.T. 550704 – ‘their number for Anglesey’
F.T. from their calculation. Implies first B1 if no contradicting work.</td></tr>
<tr><td>2. (a) 0, 1, 2, 3 and 4 shown on the horizontal axis.
Uniform scale starting at 0 on the frequency axis.
Five vertical lines at correct height (± 2mm).</td><td>P
P
P
P</td><td>B1
B1
B2</td><td>Ignore unequal spacing.

F.T. where possible from a previous B0.
Accept intent to draw vertical lines.
B1 for four vertical lines at correct height.
B1 for five bars drawn at correct height.
B1 for sight of five correct plots.</td></tr>
<tr><td>2. (b) $(6 \times 0) + 8 \times 1 + 5 \times 2 + 2 \times 3 + 1 \times 4$

$= 28$</td><td></td><td>M1

A1</td><td>For the intent to multiply values by their frequencies and then add.
C.A.O.</td></tr>
<tr><td>3. View with diagram
<table><tr><td>Berlin</td><td>Paris</td><td>London</td><td>Prague</td></tr><tr><td>25</td><td>26 to 29</td><td>32</td><td>34 to 36</td></tr></table></td><td></td><td>B3

B1</td><td>View with diagram for B3 marks.
B3 for four correct entries. B2 for three correct entries.
B1 for one or two correct entries. Allow on diagram.
For correct order. F.T. their temperatures.</td></tr>
<tr><td>4(a) A correct combination with cost.

A different combination with cost.

Look for
• spelling
• clarity of text explanations,
• the use of notation (watch for the use of ‘=’, £ being appropriate)
• correct units shown

QWC2: Candidates will be expected to
• present work clearly, with words explaining process or steps.
AND
• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer.
QWC1: Candidates will be expected to
• present work clearly, with words explaining process or steps.
OR
• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer.</td><td>P
P

P
P

P
P</td><td>B2

B2

QWC 2</td><td>B1 for a correct possible choice with no cost or an incorrect cost.
B1 for an incorrect combination of at least four containers with a correct cost.
B1 for a different correct possible choice with no cost or an incorrect cost.
B1 for a different incorrect combination of at least four containers with a correct cost.

<table><tr><th>Small</th><th>Medium</th><th>Large</th><th>Cost</th></tr><tr><td>0</td><td>4</td><td>1</td><td>(£)44</td></tr><tr><td>1</td><td>5</td><td>0</td><td>(£)46</td></tr><tr><td>4</td><td>0</td><td>2</td><td>(£)48</td></tr><tr><td>5</td><td>1</td><td>1</td><td>(£)50</td></tr><tr><td>6</td><td>2</td><td>0</td><td>(£)52</td></tr></table>
QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.

QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar.
OR
Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.

QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.</td></tr>
<tr><td>4(b) Use of 15×11
Sight of $165(m^2)$ AND ‘Medium box’</td><td></td><td>M1
A1</td><td>Implied by sight of $165(m^2)$.
Accept ‘$25(m^2)$ box’ or ‘£8 box’ for ‘Medium box’.
‘$25(m^2)$ box’ or ‘£8 box’ or ‘Medium box’ alone is M0A0.</td></tr>
</table>

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JUNE 2014 UNIT 1 Foundation Tier	P	Mark	Comments
5(a) (Charge =) (£)2 × 64 + (£)12 = (£)140		M1 A1	SC1 for an answer of (£)1292 or (£)129.2(0)
5(b) $\frac{205 - 15}{2}$ or equivalent = 95 950(metres)		M1 A1 A1	F.T. 'their 95' × 10 only if M1 gained. *Trial and improvement should show ÷10, ×2, +15 for M1 Then A2 C.A.O.*
Ribbon marking for 6(a)(i), 6(a)(ii) and 6(b). **All parts to be viewed with diagram.** 6(a)(i) Points A and B in correct position. (ii) 8 (± 0·2) × 25 = 200 (± 5) (m) (b) 132(±4) (°)		 B2 M1 A1 B2	**Use overlay and measuring tools.** B1 for each (ignore labelling). *Use overlay for tolerance allowance.* F.T. their AB length (±0·2cm) × 25. B1 for 48(±4) (°). F.T. from their diagram.
7. (£)103 – 5 × (£)7 = (£)68 (£)68 ÷ 17 = (£)4	P P P P	M1 A1 M1 A1	F.T. 'their £68'.
8. (Time driving = 2hrs 15min + 1hr 45min) = 4 (hours) or 240(min) (Av. Speed =) $\frac{200}{4}$ = 50 m.p.h.	 P P P P P	 B2 M1 A1 U1	B1 for sight of either 2(hrs) 15(min) or 135(min) OR 1(hr) 45(min) or 105(min) *Alternative method* *4hours 25min – 25min* *= 4(hours) B2* *B1 for sight of 4(hrs) 25(min) or 265(min).* F.T. their time. Do not penalise if they incorrectly note 'their F.T. time' (e.g. use 3·3 for 3hrs 30 min). A0 if they have incorrectly used 'their F.T. time'. Independent of other marks. Allow any unambiguous correct notation. *200 / 240 = 0·83(33..). m.p.min gains M1,A1,U1.* *200 / 240 = 0·83(33..). m.p.h gains M1,A1,U0.* *200 / 240 = 0·83(33...) gains M1,A1,U0.*
9. Use of 'Volume = length × width × height' (Volume =) 5·5 × 3·8 × 0·12 = 2·5(08 m^3)		M1 m1 A1	Allow m1 for 550 × 380 × 12 C.A.O. If 0 marks awarded, SC1 for sight of 0·12
10. **Use overlay** Position at 135° from ship A. Position at 215° from ship B. Position marked OR two intersecting lines.		 M1 M1 A1	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. (Lines must originate from ship A and ship B respectively)
11. (cost of 600 euros =) $\frac{600}{1·28}$ = (£)468.75 (600 euros bought) $\frac{600}{1·50}$ = (£)400 (Keith lost) (£)68.75	P P P P P	M1 A1 M1 A1 A1	 F.T. their amounts. Dependent on **both** M1.

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JUNE 2014 UNIT 1 Foundation Tier	P	Mark	Comments
12. Three different valid comments. e.g. 'Not representative of population' 'Not relevant to the hypothesis being tested' 'Personal' 'Gender not asked' 'Does not specify over what period of time', 'Can tick one of two boxes if answer is 3' 'People might forget to bring them' 'Might be different people at the next meeting'	P P P	B3	*Ignore irrelevant statements.* B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by gender or interest group). Do not give more than one mark for similar criticism(s).Reference to location should only be credited once. (criticisms of question (i)) (criticisms of question (ii)) (criticisms of the method of collection)
13. 35·5		B2	B1 for 35·4(924.....)
Ribbon marking for 14(a) and 14(b). 14. (a) $500 + 500 \times {}^{2}/_{5}$ or equivalent $= 700$ Two further correct steps. (Number of workers =) 1372 (b) (1372 – 500 =) 872 872 / 500 × 100 = 174(·4%)	P P P P P A1	M1 A1 M1 A1 B1 M1 A1	Allow M1A0 for '200'. Allow M1A1 for '200 extra'. M1A1 implied by sight of 1100 (or 1300). Ignore continuing to an additional year. C.A.O. Mark final answer. *Alternative method.* $500 \times (1{\cdot}4)^3$ *M2* $= 1372$ *A2* *Allow* $500 \times (1{\cdot}4)^4$ *M2* $= 1920{\cdot}8$ *(or 1921)* *A1* F.T. 'their 1372'. FT 'their 1372 – 500' If no marks gained then allow SC1 for an answer of 274(·4%) or equivalent on F.T.

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UNIT 1 - HIGHER TIER

June 2014 UNIT 1 Higher Tier	P	Mark	Comments
1. Three different valid comments. e.g. 'Not representative of population' 'Not relevant to the hypothesis being tested' 'Personal' 'Gender not asked' 'Does not specify over what period of time', 'Can tick one of two boxes if answer is 3' 'People might forget to bring them' 'Might be different people at the next meeting'	P P P	B3	*Ignore irrelevant statements.* B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by gender or interest group). Do not give more than one mark for similar criticism(s).Reference to location should only be credited once. (criticisms of question (i)) (criticisms of question (ii)) (criticisms of the method of collection)
2. **Use overlay** Position at 135° from ship A. Position at 215° from ship B. Position marked OR two intersecting lines.		M1 M1 A1	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. (Lines must originate from ship A and ship B respectively)
3. (Salary received) (£)30000 × 0·7 = (£)21000 (Cost of petrol) $\frac{8000}{40}$ × (£)6·25 = (£)1250 (New salary received) = (£)14000 (Loss) (£)21000 – (£)1250 – (£)14000 = (£)5750 Look for • spelling • clarity of text explanations, • the use of notation (watch for the appropriate use of '=' and operators) • '£' shown where appropriate. QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	P P P P P P P P P	M1 A1 M1 A1 B1 M1 A1 QWC 2	Or F.T. 2/3 × 'their 21000'. F.T. their <u>three stated</u> values. (Look for '19750 – 14000' or '21000 – 15250') QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar

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June 2014 UNIT 1 Higher Tier	P	Mark	Comments
4. (cost of 600 euros =) $\frac{600}{1{\cdot}28}$	P	M1	
= (£)468.75	P	A1	
(600 euros bought) $\frac{600}{1{\cdot}50}$	P	M1	
= (£)400	P	A1	
(Keith lost) (£)68.75	P	A1	F.T. their amounts. Dependent on **both** M1.
5. 35·5		B2	B1 for 35·4(924.....)
Ribbon marking for 6(a) and 6(b).			
6. (a) $500 + 500 \times {}^{2}/_{5}$ or equivalent	P	M1	Allow M1A0 for '200'. Allow M1A1 for '200 extra'.
= 700	P	A1	M1A1 implied by sight of 1100 (or 1300).
Two further correct steps.		M1	Ignore continuing to an additional year.
(Number of workers =) 1372	P	A1	C.A.O. Mark final answer.
	P		*Alternative method.* *$500 \times (1{\cdot}4)^3$ M2* *= 1372 A2* *Allow* *$500 \times (1{\cdot}4)^4$ M2* *= 1920·8 (or 1921) A1*
(b) (1372 – 500 =) 872		B1	F.T. 'their 1372'.
872 / 500 × 100		M1	FT 'their 1372 – 500'
= 174(·4%)		A1	If no marks gained then allow SC1 for an answer of 274(·4%) or equivalent on F.T.
7. (a) Appropriate uniform scale on vertical axis.		B1	Must allow for all plots up to (£6000, £1100). Need not start at 0. Allow 'steps of £1000'.
Line starts at (0, 500).		B1	Accept plot at (0,500) if no line drawn.
Straight line with correct gradient (£100 per £1000).		B1	
7.(b) A comment that states that it may appear that reported crime has decreased because the axes are not perpendicular.		B2	Accept any wording that suggests this. B1 if only refers to the misunderstanding. B1 if only refers to the reason.
8. Sight of 8·5 (litres) or equivalent	P	B1	
Sight of $\frac{7 \times 24}{5}$	P	M1	Allow for (7×24) / an attempt at time difference.
× 8·5	P	m1	F.T. 'their 8·5' (including use of 8).
= 285·6 (litres)	P	A1	C.A.O. Allow 286 (litres) or 285 (litres) from correct working.
Ribbon marking for 9(a) and 9(b).			
9. (a) (Volume of sphere) $4/3 \times \pi \times 5^3$		M1	
= 523·6 (cm^3) or $\frac{500\pi}{3}$		A1	Accept 523 to 524 inclusive.
(b) (Volume of cylinder) $\pi \times 5{\cdot}5^2 \times 63$	P	M1	
= 5987·1(cm^3)	P	A1	Accept 5984 to 5989·5 inclusive.
(Empty space for cyl.) $2 \times 5987{\cdot}1 - 12 \times 523{\cdot}6$	P	M1	F.T. their derived volumes only if more than one cylinder required.
	P		
= 5691(cm^3)	P	A1	
(Empty space for box) $42 \times 32 \times 11 - 12 \times 523{\cdot}6$	P	M1	F.T their volume for a sphere.
= 8500(·8..)(cm^3)		A1	
10. Use of R = 6 AND N = 3		B1	
$\left[\left(1+\frac{6}{100\times 3}\right)^3 - 1\right] \times 100$		M1	Allow FT for N = 4 only.
(AER =) 6·12 (%)		A1	N = 4 leads to an answer of 6.14 (%)

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June 2014 UNIT 1 Higher Tier	P	Mark	Comments
11. (Distance) $30 \times ⅓ + 45 \times ⅓ + 60 \times ⅓$ $= 45$ (miles)	P P	M1 A1	*Note: 45 minutes is M0A0.*
(Time) 15/30 + 15/45 + 15/60 $= 1^{1}/_{12}$ (hr) or 65(min) or equivalent. ISW	P P	M1 A1	May be implied. F.T. 'one third of their distance'.
Ribbon marking for 12(a) and 12(b). 12(a) Sight of (arc length =) 10·8(m) Use of $A\hat{O}B /360 \times 2 \times \pi \times 8{\cdot}6 = 10{\cdot}8$ $A\hat{O}B = \frac{10{\cdot}8 \times 360}{2 \times \pi \times 8{\cdot}6}$ $= 71{\cdot}9(..)$ or $72^{(°)}$ (b) (Area =) $72/360 \times \pi \times 8{\cdot}6^2$ $= 46{\cdot}4(..)$ (m^2)	P P P P	B1 M1 m1 A1 M1 A1	F.T. 'their arc length' (including use of 28). F.T. 'their 72°'. Accept 46·4 to 46·5 inclusive.
13. (Total volume =) $h^3 + ⅓ \times \pi \times r^2 \times 4h$ $h^3 + ⅓ \times \pi \times r^2 \times 4h = 648{\cdot}6$ $h^3 + ⅓ \times \pi \times h^2 \times 4h = 648{\cdot}6$ $h^3 = 125$ $h = 5$(cm) $H = 25$ (cm)	P P P P P P	B1 M1 m1 A1 A1 B1	Radius 'r' may be shown as 'h'. F.T. h^3 + 'their cone volume'. C.A.O. F.T. 'their h^3' if M1 gained F.T. 5 × 'their derived h'.

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life
HIGHER TIER

A.M. FRIDAY, 10 January 2014

1 hour 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**7**	
3.	**8**	
4.	**4**	
5.	**5**	
6.	**3**	
7.	**5**	
8.	**3**	
9.	**4**	
10.	**6**	
11.	**8**	
12.	**9**	
Total	**65**	

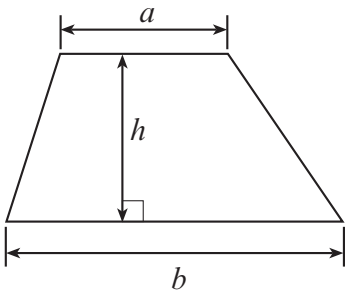
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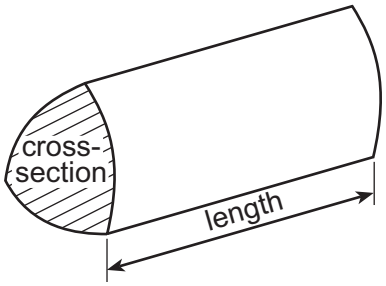
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

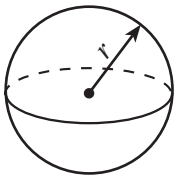


Volume of prism = area of cross-section × length



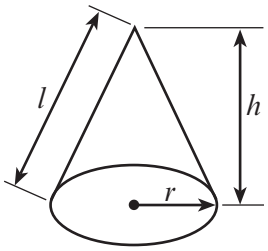
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

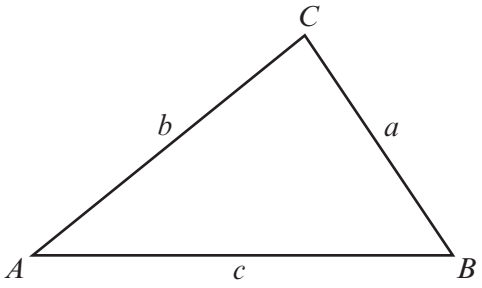


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where a, b and c are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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1. Asif used his calculator to find the value of

$$\frac{85 \square 43}{17 + 35}.$$

He pressed the following buttons on his calculator in this order.

8	5	×	4	3	÷	1	7	+	3	5	=

The answer he got was 250. This answer is incorrect.

(a) Explain what Asif did wrong. [1]

.....

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(b) Find the correct value of

$$\frac{85 \square 43}{17 + 35}.$$

Write your answer correct to 3 significant figures. [2]

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2. At a stall in a school fair, thirty-two people each paid £3 to choose a sealed envelope from a bag. Each envelope contained a shopping voucher.

The table below shows the number of each type of voucher in the bag.

Value of voucher	Number of vouchers
£1	15
£2	10
£5	5
£10	2

(a) The person in charge of the stall was asked,

"What was the average value of the vouchers?"

She replied,

"Are you asking for the mode, the median or the mean value?"

Show clearly that these three values are different. [5]

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(b) Did this stall make a profit or a loss?
You must calculate the amount of this profit or loss. [2]

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3. *You will be assessed on the quality of your written communication in this question.*

Each day, Sion uses $\frac{3}{5}$ of a 1 litre carton of long life milk.

He buys 1 litre cartons of long life milk on the Saturday of each week.
He always buys the least number of 1 litre cartons so that he has enough milk to last him for the next seven days.

On a particular Saturday Sion had no long life milk at all in the house.

Calculate the least number of 1 litre cartons he should buy

(i) on the Saturday and (ii) on the following Saturday.

You must show all your working. [8]

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4. Grace invests £8240 for 2 years at 3% per annum compound interest.
Find the compound interest earned in the 2 years.
Your answer should be given correct to the nearest penny. [4]

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5. A white circular card is to be placed on a grey square card, whose side measures 20 cm.



The size of the circle is such that it can be placed on the square card with its edge just touching, but not overlapping, each of the four sides of the square.

Calculate the percentage of the grey card that will be still visible when the circle is placed on the square card as described. [5]

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6. The bill for repairing a washing machine came to £151.68, inclusive of VAT at 20%. What was the cost before VAT was added? [3]

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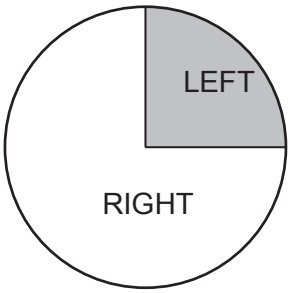
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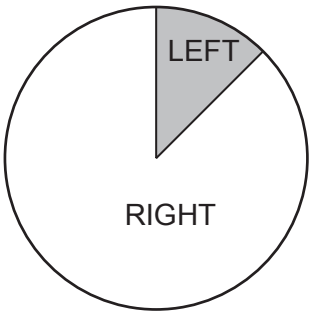
7. *(a)* Clearly explain why the statements that accompany each of the following diagrams in a newspaper may not be true.
Your comments should be based on the diagrams and not on your personal opinion.

(i) Taken from an item about left-handedness. [1]

Teenagers



Over 75 years old



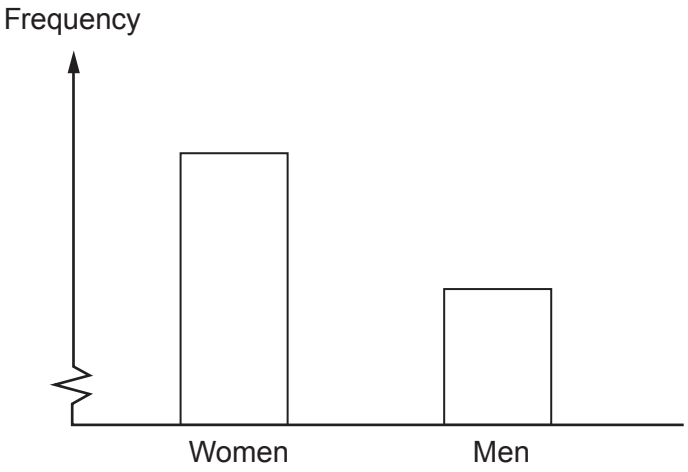
'There are twice as many left-handed teenagers as there are left-handed people over 75 years old.'

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(ii) Taken from an item about accidents in the home. [1]



'Twice as many women as men have accidents in the home.'

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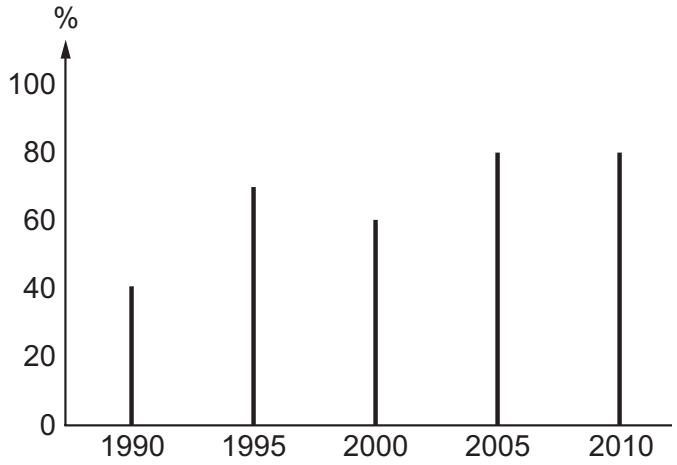
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(iii) Taken from an item about a school's examination percentage pass rates. [1]



'The percentage pass rate has remained constant between 2005 and 2010.'

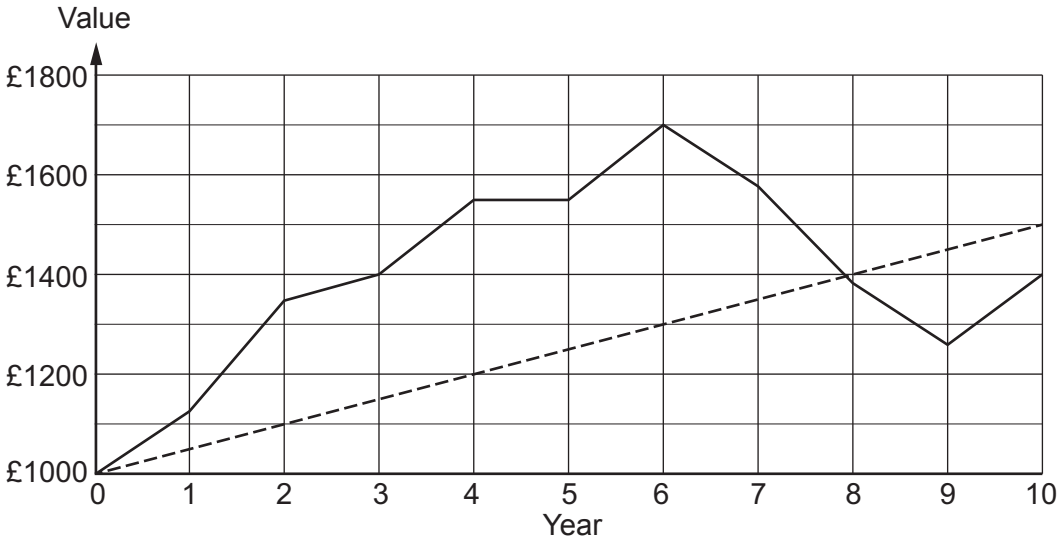
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(b) The graph below was published in a newspaper.
The graph compares the value of an investment of £1000 in

- a company's shares (———)
- a fixed interest savings account (– – – – –)

over a ten year period.



Explain clearly why the following statement is true. [2]

'At its greatest, the difference in the value of the shares and the savings account was 40% of the investment.'

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8. A construction company used 36 manual workers to prepare a building site.
The site measured 42 acres and the work was completed in 10 days.

The company is asked to do similar work on a similar site measuring 70 acres.
This contract has to be completed in 15 days.

Calculate the least number of manual workers the company should employ for this contract.

[3]

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9. A gas company uses the following formula to calculate how much to charge its customers.

$$\textbf{charge (in pence)} = (U \times 11{\cdot}546 + D \times 31{\cdot}48) \times 1{\cdot}05$$

The number of units of gas used by a customer is **U** and the number of days in the billing period is **D**.

A customer was charged £165.53 over a billing period of 90 days.
Calculate the number of gas units this customer used during this period. [4]

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10. Lois ran 7 km in 25 minutes and 23 seconds.

The distance was measured correct to the nearest 10 metres.
The time was measured correct to the nearest second.

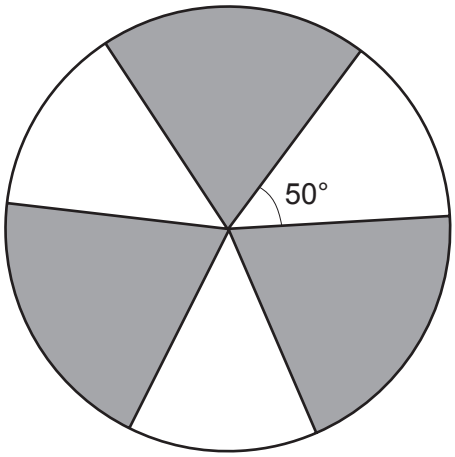
Calculate her greatest possible average speed.
Give your answer in metres per second.
You **must** show how you arrived at your answer. [6]

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11. A circular logo, with radius 8 cm, is shown below.



All three white sectors are equal in size and shape.
All three shaded sectors are equal in size and shape.

(a) Calculate the total area of the shaded sectors. [4]

(b) The whole perimeter of all the shaded sectors is to be drawn in red.
Calculate the total length of all these red boundary lines. [4]

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12. An ornamental garden spike is in the form of a square based pyramid with a cone attached to the centre of its base as shown below.

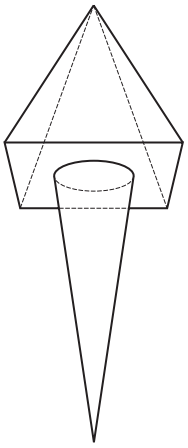


Diagram not drawn to scale

The radius of the base of the cone is 4 cm.
The height of the cone is twice the height of the pyramid.
The volume of the cone is equal to the volume of the pyramid.

(a) Calculate the length of the base of the pyramid. [5]

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(b) The total volume of the spike (cone and pyramid together) is 335·1 cm^3.

Calculate the total length of the spike (from the tip of the cone to the top of the pyramid). [4]

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

JANUARY 2014

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2014 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 1 - FOUNDATION TIER

UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
1.(a) (2 tins of salmon) (£5.38) (3kg of potatoes) (£)3.45 (3 boxes of matches) (£)0.96 (½kg of sausages) (£)2.8(0) TOTAL (£)12.59 (b) (£)20(.00) – (£)12.59 = (£)7.41	 B1 B1 B1 B1 M1 A1 6	 Accept 96 unless total amount implies £96. Do not accept 0.96p unless total amount implies £0.96 F.T. their amounts. B0 if any 'cost space' left blank. F.T. £20 – 'their total'. M0 if their total ≥ £20. An unsupported answer of (£)8.41 implies M1A0.
2.(a) Showing '20 to 24' AND '25 (to 29)' Showing a tally method used. Showing (6) 8 5 13 (b) Uniform scale for the frequency axis starting at 0. Four bars at correct height	B1 B1 B2 B1 B2 7	 These need not be correct number of tallies. FT their intervals, provided not overlapping. For the 8, 5 and 13. B1 for one or two of them correct. B0 for ambiguous placement of scale numbers. B1 for three correct heights. F.T. their numbers in (a). If no scale shown, assume intervals of 1 from 0 to 15. Penalise uneven bar widths −1.
3. Karim Bob Elin Alice Dewi –8 –6 –4 (+)5 (+)7	B1 B3 4	For a correct order. **Strictly** F.T. their scores. There must be at least two different negative scores. For all five correct scores. B2 for three or four correct scores. B1 for two correct scores.
4. (Total distance travelled) 571 (miles) Correct substitution (571 × 4·546) / 62 42 (m.p.g.)	B1 M1 A2 4	May be implied by sight of 2595(·7..) or 2596 (i.e. 571 × 4·546) F.T. 'their 571' if between 300 and 850 inclusive OR an attempt at a sum of distances seen. A1 for 41·8(67...)

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UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
5.(a) (Blue =) 6(m^2) (Orange =) 1(m^2)	B2 B2	If no marks gained, allow a B1 for use of Area = length × width. Allow 2 × 1 or 2 × (1+1+1) or (2+2+2) × 1. OR 0·25 × 1 or 0·25 × (1+1+1+1) or (0·25+0·25+0·25+0·25) × 1 to illustrate understanding. Also allow B1 for (Blue =) 2×3×3 (=18) or (Orange =) 0·25×4×4 (=4). Clear use of perimeter instead of area is B0.
Look for • spelling • clarity of text explanations, • the use of correct units. For **QWC2** blue and orange areas must be clearly **identified** AND the **correct units** must be given for the areas. QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC 2	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar
(b) 6/3 × 2.50 (£)5	M1 A1 8	FT 'their blue area' /3, rounded to the nearest whole number above, and then multiplied by 2·5
6.(a) 90(litres) (b) A correct method shown 80(litres)	B1 M1 A1 3	e.g attempt to read graph at 64 yellow and × 10. OR attempt to read graph at 80 yellow and × 8.
7. C B A D	B1 B1 B1 B1 4	
8. (Aled) 12 × 14 + 8 = 176(lbs) (Thomas) 85 × 2·2 = 187(lbs) Thomas by 11lbs	M1 A1 M1 A1 A1 5	M1A0 for 176kg. M1A0 for 187kg. F.T. only if 160lbs ≤ Aled's weight ≤ 190lbs . Name and correct units must be given. *<u>Alternative methods:</u>* *12 × 14 + 8* *85 × 2·2* *M1* *= 176(lbs)* *= 187 (lbs)* *A1* *176 / 2·2* *187/ 14* *M1* *= 80(kg)* *13·35(7..)(st)* *A1* *Thomas by 5kg* *Thomas by 0·78(..)st (accept 0·8 st) ISW* *A1(FT)* *(allow 10·9lb to 11·2lb inc.)*

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UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
9.(a)		For each B mark, do not award if an incorrect reason is clearly shown.
Mode value given as (£)1.	B1	Must be unambiguously shown as the mode value.
Median value given as (£)2.	B1	Must be unambiguously shown as the median value.
(Mean =) 15 × (£)1 + 10 × (£)2 + 5 × (£)5 + 2 × (£)10	M1	M1 for a clear attempt at finding Σfx.
÷ 32	m1	
= (£)2.5(0)	A1	C.A.O.
(b) 32 × (£)3 – 32 × (£)2.5(0) or equivalent.	M1	F.T. 'their mean'.
= £16 AND 'Profit'	A1	Also M1 for 32 × (£)3 – 'their Σfx' OR 15 × (£)2 + 10 × (£)1 – 5 × (£)2 – 2 × (£)7 (= (£)30 + 10 – 10 – 14 = (£)16) SC1 for sight of 96 and 80.
	7	
10. (a)		Alternative method
720 – ¼ × 720 – 2/5 × 720	M1	1 –¼ – 2/5 or equivalent M1
Sight of (£)180	B1	= 7/20 or equivalent A1
Sight of (£)288	B1	7/20 × 720 or equivalent M1
		= (£)252 A1
(Amount left) (£)252	A1	For A1, F.T. (£)720 – 'their (£)180' – 'their (£)288' provided at least one B1 gained. Two amounts must be subtracted from (£)720.
(b) 252 / 720 × 100	M1	F.T. 'their £252'
= 35(%)	A1	Alternative method
		100(%) – 25(%) – 40(%) M1
		= 35(%) A1
	6	
11.(a) A valid explanation that shows an understanding that the 35 was not included in the divisor.	E1	Do not accept 'he pressed the wrong buttons'. Allow e.g. 'He forgot the brackets'. Also allow a correct explanation (an explanation, not just a calculation) of what Asif should have done.
(b) 70·3	B2	B1 for 70·2(8846...)
	3	
12. Least Value Greatest Value		B1 for each correct entry.
9950 10050		Accept 10049·9 recurring but not 10049·9.
	B4	
72·5 73·5		Accept 73·49 recurring but not 73·49. Allow 72min. 30(sec). and 73min 30(sec).
	4	
13. 8240		
247.2(0)	B1	For the evaluation of a correct 3% OR Sight of 1·03 (494.4 implies 2× 247.2 and gains B1).
8487.2(0)		
254.61(6)	M1	For attempting to find 2 different 3%. OR 8240 × $1{\cdot}03^2$.
8741.81(6) or 8741.82 OR 247.2(0) and 254.61(6)	A1	
(£)501.82	A1	F.T. one error. Must be given correct to the nearest penny. (£)501.81 is B1M1A1A0. Treat depreciation as a mis-read.
	4	

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UNIT 1 - HIGHER TIER

UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
1. (a) A valid explanation that shows an understanding that the 35 was not included in the divisor. (b) 70·3	E1 B2 3	Do not accept 'he pressed the wrong buttons'. Allow e.g. 'He forgot the brackets'. Also allow a correct explanation (an explanation, not just a calculation) of what Asif should have done. B1 for 70·2(8846...)
2.(a) Mode value given as (£)1. Median value given as (£)2. (Mean =) 15 × (£)1 + 10 × (£)2 + 5 × (£)5 + 2 × (£)10 ÷ 32 = (£)2.5(0) (b) 32 × (£)3 – 32 × (£)2.5(0) or equivalent. = £16 AND 'Profit'	 B1 B1 M1 m1 A1 M1 A1 7	For each B mark, do not award if an incorrect reason is clearly shown. Must be unambiguously shown as the mode value. Must be unambiguously shown as the median value. M1 for a clear attempt at finding Σfx. C.A.O. F.T. 'their mean'. Also M1 for 32 × (£)3 – 'their Σfx' OR 15 × (£)2 + 10 × (£)1 – 5 × (£)2 – 2 × (£)7 (= (£)30 + 10 – 10 – 14 = (£)16) SC1 for sight of 96 and 80.
3. (Milk required 1st week) $7 \times {}^{3}/_{5}$ $= 4{}^{1}/_{5}$ OR ${}^{21}/_{5}$ (Needs to buy) 5 (cartons) (Milk required 2nd week) He has 4/5 of a litre left over. (Requires an extra) $4{}^{1}/_{5} - {}^{4}/_{5}$ $(= 3{}^{2}/_{5})$ (Needs to buy) 4 (cartons)	M1 A1 B1 B1 M1 A1	 F.T. only if there is a requirement to round up. Sight of 4/5 gains B1. F.T. 'their 5 cartons'. F.T. 'their $4{}^{1}/_{5}$' – 'their ${}^{4}/_{5}$' *<u>Alternative method for 2nd week</u>* *Required for 14 days* $14 \times {}^{3}/_{5}$ *M1* *9 cartons A1* *So extra 4 cartons required for 2nd week B1*
Look for • spelling • clarity of text explanations, • the use of correct units. QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC 2 8	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar

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UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
4. 8240 247.2(0) 8487.2(0) 254.61(6) 8741.81(6) or 8741.82 OR 247.2(0) and 254.61(6) (£)501.82	 B1 M1 A1 A1 4	 For the evaluation of a correct 3% OR Sight of 1·03 (494.4 implies 2× 247.2 and gains B1). For attempting to find 2 different 3%. OR $8240 \times 1{\cdot}03^2$. F.T. one error. Must be given correct to the nearest penny. (£)501.81 is B1M1A1A0. Treat depreciation as a mis-read.
5. (Area of square =) 400 (cm^2) (Area of circle =) $\pi \times 10^2$ 100π OR 314 to 314·3 inclusive (Percentage visible =) $\frac{400 - 100\pi}{400} \times 100$ = 21(·46...%)	B1 M1 A1 M1 A1 5	Or consistent algebraic equivalent F.T. their two values for area. Accept answers between21(%) and 22(%) inclusive. *Alternative consistent algebraic method* e.g *Use of 'side length' = 2 × 'radius'* *B1* *(Area of square =)* $4r^2$ *B1* *(Area of circle =)* πr^2 *B1* *(% visible =)* $\frac{4r^2 - \pi r^2}{4r^2} \times 100$ *M1* = 21(·46...%) *A1*
6. (£)151.68 ≡ 120% (Original cost) $\frac{151.68}{120} \times 100$ or equivalent = (£)126.4(0)	B1 M1 A1 3	Accept any indication.
7(a) (i) A comment that states or implies that we do not know the number of teenagers and number of 75 year olds considered. (ii) A comment that states or implies that we do not know the actual number of women nor the actual number of men (iii) A comment that states or implies that we do not know the percentage pass rate between 2005 and 2010. (b) Evidence of looking at values in Year 6. A statement that (£)400 is 40% of (£)1000.	B1 B1 B1 B1 B1 5	Accept e.g. 'they might have looked at different numbers'. Accept e.g. 'there are no numbers on the frequency axis'. Accept e.g. 'they might have been different in 2007'. This may be implied e.g. sight of '(£)400 difference' or '(£)1300 AND (£)1700'. 40% alone is B0. e.g. 'Its 40% in Year 6' gains B1B0.

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UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
8. $36 \times \frac{70}{42}$	M1	Or equivalent.
$\times \frac{10}{15}$	M1	Or equivalent (the 36 must have been used). M1 for correctly using two of the operators '×70', '÷42', '×10' and ' ÷15' with the 36.
= 40 (workers)	A1	C.A.O. Do not penalise pre-approximations as long as 40 given as the final answer. *Alternative presentation.* *Area Time Workers* *42 10 36* *..... Award M1 for correct step(s) to reach 70.* *..... Award M1 for correct step(s) to reach 15.* *..... ....* *70 15 **40** A1 C.A.O.*
	3	
9. Correct substitution into formula.	M1	Do not penalise using (£)165.53 at this stage.
Using 16553(p)	m1	
$U = \frac{16553/1{\cdot}05 - 90 \times 31{\cdot}48}{11{\cdot}546}$ or equivalent	m1	The two 'm' marks may be awarded in either order.
(Units used =) 1120	A1	C.A.O. Accept answers of 1120 ± 1
	4	
10. Sight of 7005 (metres)	B1	
Sight of 1523 (seconds)	B1	
Sight of 1522·5 (seconds) or 25min 22·5sec	B1	FT their conversion to seconds. 1522·5 implies 2nd B1.
Use of 'Distance' / 'Time'	M1	
(Greatest av. Speed) $\frac{7005}{1522{\cdot}5}$	M1	F.T. 'their greatest distance' / 'their least time' only if 'greatest distance' >7000 AND 'least time' < their 1523.
$= 4{\cdot}6(009. .ms^{-1})$	A1	Do not accept an answer unless the correct method has been shown. An answer of 4·6 found using values which are not their greatest distance and least time is M0A0.
	6	
11(a) (Angle subtended in the shaded sector =) 70(°)	B1	May be implied by sight of 210°
Use of $\frac{70}{360} \times \pi \times 8^2 \times 3$	M2	F.T. 'their 70°'. M1 for $\frac{70}{360} \times \pi \times 8^2$ A1 for 39(.09...))
$= 117{\cdot}28(6..)(cm^2)$ or $112\pi/3$	A1	Allow answers between 117·2 to 117·4 inclusive. Do not penalise final answer of 117(cm^2) if previous permissible answer seen. *Note: Using 50° instead of 70° giving a final answer of 83·7(7..) is B0, M2(on follow through), A1.* *BUT if candidates then use $\pi \times 8^2 - 83{\cdot}7(7..) = 117{\cdot}3$, then all marks awarded.*
(b) Use of $\frac{70}{360} \times 2 \times \pi \times 8$ OR sight of 9·77(....)	M1	F.T. 'their 70°'.(*Note: Use of 50° gives 6·98)*
× 3	m1	
+ 48	m1	
= 77·3(.... cm)	A1	Allow 77 (cm) .(*Note: Use of 50° gives 68·9..)* Mark their final answer.
	8	

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UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
Mark parts (a) and (b) together.		*Take care that the length of the base of the pyramid (10cm) is not confused with the height of the cone (also 10cm).* *If the height of the cone is found in part (a) then award the appropriate marks for this work in part (b).*
12(a) Sight of $\frac{1}{3}\times\pi\times r^2\times h_1$ AND $\frac{1}{3}\times$(area of base)$\times h_2$	B1	For B1 allow unconventional use of notation and symbols as long as accurate intent is clear (e.g. h_1 and h_2 may both be given as 'h' or 'height').
A clear intention to use $h_1 = 2h_2$ in the above.	B1	
$1/3 \times \pi \times 4^2 \times 2h = 1/3 \times (\text{length})^2 \times h$	M1	
$(\text{length})^2 = 32\pi$	A1	Accept 100·45 to 100·6 inclusive.
(side length =) 10(·0.. cm)	A1	SC1 for an answer of 7(·08..cm) (using $h_1 = h_2$). [*Note 10(cm) = height of cone for part (a) is M0A0A0 (unless then used to find the length of the base of the pyramid) but will gain the M1m1A1 in part (b) and possibly go on to gain the final A1 in part (b)].*
(b) $\frac{1}{3} \times \pi \times 4^2 \times$ (cone height) $= 335{\cdot}1 \div 2$ OR $\frac{1}{3} \times 32\pi \times$ (pyramid height) $= 335{\cdot}1 \div 2$ OR $\frac{1}{3} \times \pi \times 4^2 \times 2l/3 + \frac{1}{3} \times 32\pi \times l/3 = 335{\cdot}1$	M1	F.T. using ('their side length')^2 for 32π. Or equivalent e.g. using '2h' and 'h' (where h = pyramid height).
(cone height =) $\frac{3 \times 167{\cdot}55}{16\pi}$ or equivalent OR (pyramid height =) $\frac{3 \times 167{\cdot}55}{32\pi}$ or equivalent OR $l = \frac{3 \times 3 \times 335{\cdot}1}{32\pi + 32\pi}$ or equivalent	m1	Do not penalise approximating 32π as 100. (Pyramid height given as 5·026).
(cone height =) 10(cm) OR (pyramid height =) 5(cm)	A1	OR $l = 15$ is A2
Overall length = 15(cm)	A1 9	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics In Everyday Life

HIGHER TIER

A.M. WEDNESDAY, 6 November 2013

1 hour 15 minutes

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **5**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**4**	
3.	**5**	
4.	**3**	
5.	**8**	
6.	**3**	
7.	**6**	
8.	**4**	
9.	**3**	
10.	**6**	
11.	**4**	
12.	**5**	
13.	**6**	
14.	**5**	
TOTAL MARK		

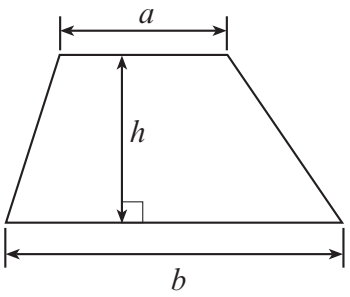
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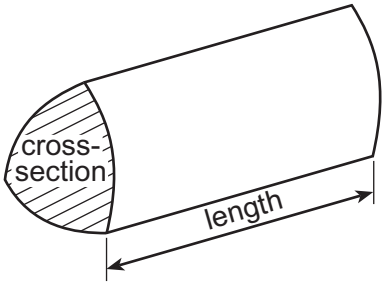
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

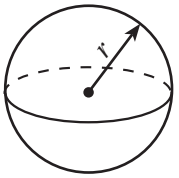


Volume of prism = area of cross-section × length



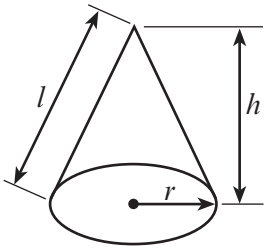
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

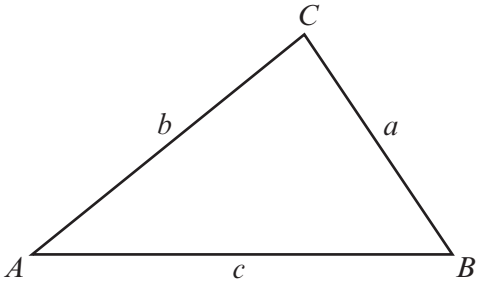


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where a, b and c are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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1. A survey was carried out in Newcastle in the north of England.

The following two questions were asked.

Q1. *Do you think it is right to play all of England's international matches down in London, which makes it difficult for people from the north of England to attend?*

YES ☐ *NO* ☐

Q2. *How often have you visited the new Wembley stadium in London?*

1-5 times ☐ *6-10 times* ☐ *10 or more times* ☐

(a) Write down **one** criticism of the first question. [1]

.....

.....

.....

(b) Give **two** reasons why the second question is **not** suitable. [2]

Reason 1 .....

.....

.....

Reason 2 .....

.....

.....

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Turn over.

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2. The bearing of a ship in the Irish Sea is measured from two coastal locations.
The ship is on a bearing of 040° from Moelfre and on a bearing of 335° from Hoylake.

(a) By drawing suitable lines on the diagram below, mark the position of the ship. [3]



(b) Write down the bearing of the ship from Douglas. [1]

.....

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3. On 25 April 2013, David exchanged £650 into Russian roubles before departing for Moscow. During his stay in Moscow he spent 21 240 roubles.
He returned to the UK on 7 May 2013 and exchanged the roubles he had left into pounds.

Data on the exchange values at these times is shown below.

	25 April 2013	7 May 2013
Conversion from pounds	£1 = 43.2 roubles	£1 = 44.7 roubles
Conversion back to pounds	£1 = 48.8 roubles	£1 = 49.5 roubles

Calculate how much he received for his roubles on his return to the UK.
Give your answer correct to the nearest penny. [5]

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4. The formula used for converting a temperature measured in degrees Celsius (°**C**) to its value in degrees Fahrenheit (°**F**) is

$$F = \frac{9C}{5} + 32.$$

Metal is heated to a temperature of 140°F.
What is this temperature in degrees Celsius? [3]

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5. *You will be assessed on the quality of your written communication in this question.*

A company had an order for 600 identical thin flat glass items, each one of the shape and dimensions shown in the diagram.

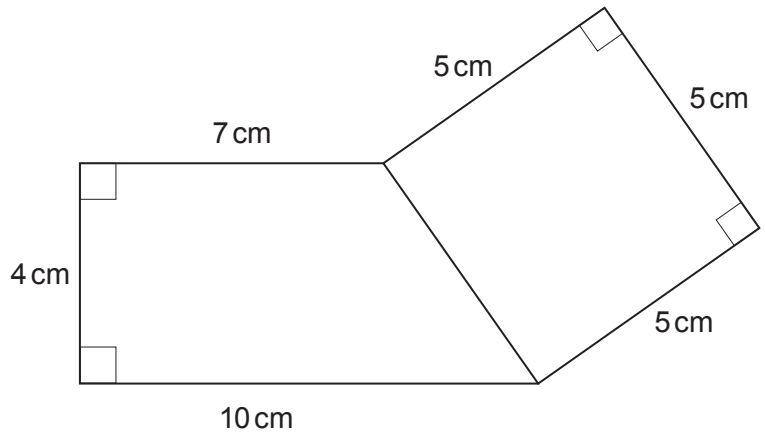


Diagram not drawn to scale

The company charged £6 per 250 cm^2 of glass used in producing these items.

Calculate how much the company charged for the 600 items. [8]

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6. A car production line uses robot-operated machinery.
A rust-proofing machine treats 5 identical components in 37 minutes.

How long would it take this machine to treat 17 of these components?
Give your answer in hours, minutes and seconds. [3]

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Answer: ..... hours ..... minutes ..... seconds

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7. An empty cylindrical tank has a base radius of three metres and is four metres high.

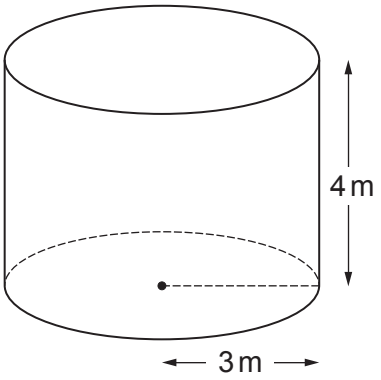


Diagram not drawn to scale

(a) Calculate the volume of this tank. [2]

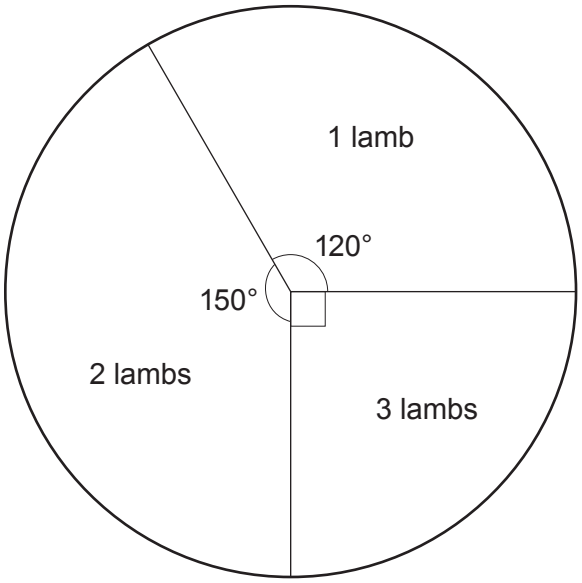
(b) Water is pumped into the tank at a constant rate of 1800 litres per minute.
The pump stops automatically immediately before the tank overflows.
For how many whole minutes is water pumped into the tank? [4]

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8. Twenty four sheep each gave birth to one, two or three lambs.
The proportions of sheep that gave birth to one, two or three lambs are shown in the pie chart below.



Calculate the mean number of lambs born per sheep.
Give your answer correct to 1 decimal place. [4]

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9. A major high street store employs 3655 people.
This is a reduction of 14% in the number of people it employed last year.

How many people were employed by the store last year? [3]

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10. The inside of a large industrial container has a height of 3 metres, measured correct to the nearest 10 centimetres.
It is used to hold a single stack of flat metal plates.
Each metal plate has a thickness of 4 centimetres, measured correct to the nearest millimetre.

(a) Find the greatest possible number of these plates that could be stacked in the container. [3]

.....

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(b) Is it always possible to stack 73 of these plates in the container?
You must show all your working. [3]

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11. Amira travelled 180 miles by car.
She completed the first two-thirds of her journey in 3 hours.

Her average speed for the remainder of her journey was 75% of her average speed for the first 3 hours.

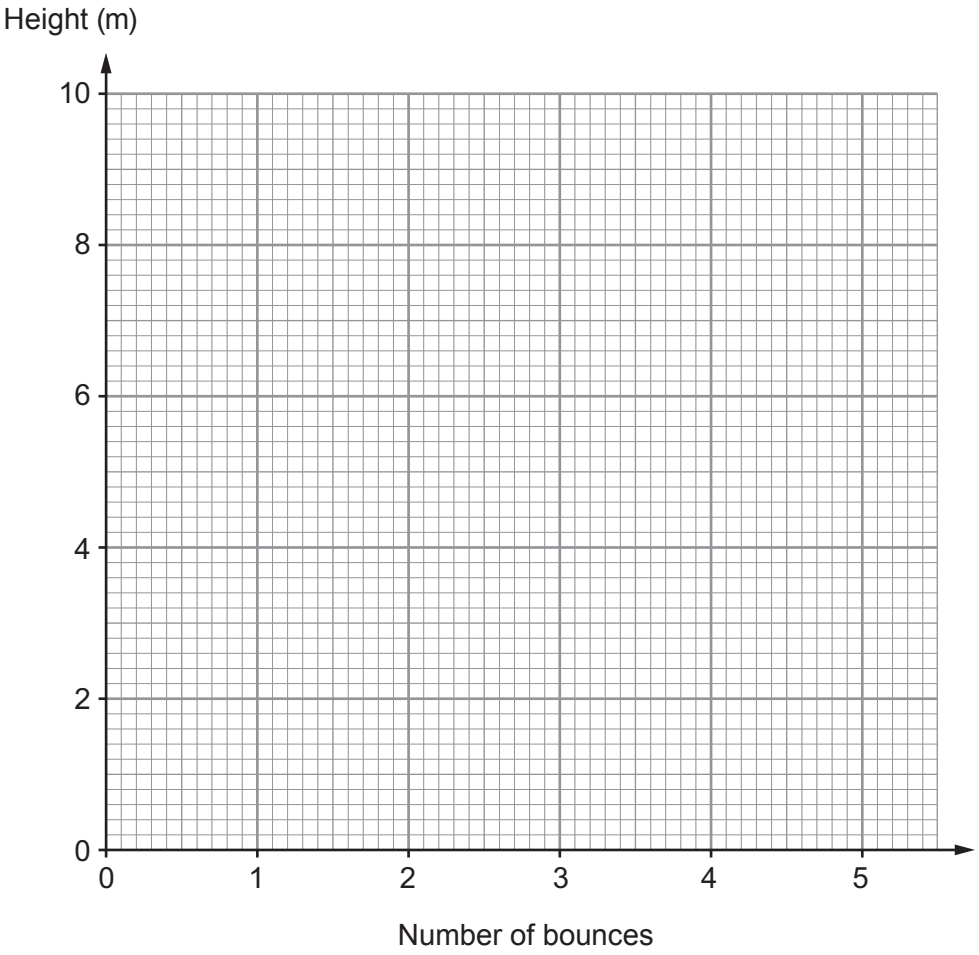
How long did it take Amira to complete her whole journey? [4]

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12. A ball is dropped vertically from a height of 10 metres onto a smooth horizontal surface. After each bounce the ball reaches a height equal to 70% of its previous height.

(a) On the graph below, plot the height the ball reaches after each bounce, up to and including the fifth bounce. [4]



(b) Explain clearly why you should **not** connect the points you have plotted on the graph. [1]

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13. The diagram below shows two circles, both with O as their centre.
$OA = 12\,\text{cm}$, $OC = 8\,\text{cm}$ and $A\hat{O}B = 70°$.

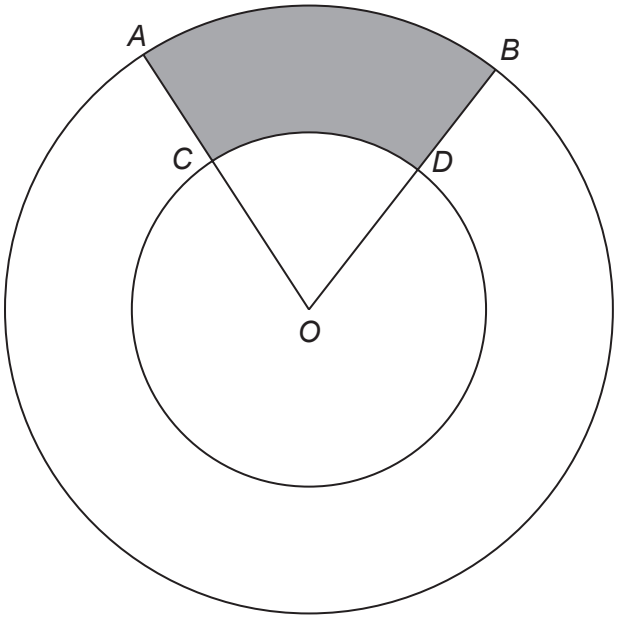


Diagram not drawn to scale

(a) Calculate the length of the arc AB. [2]

(b) Calculate the area that has been shaded. [4]

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14. Diana has created a very large sculpture for display in a city centre park.
It is called *'Mother and Child'* and is in the form of a large hemisphere with a small hemisphere attached as shown.

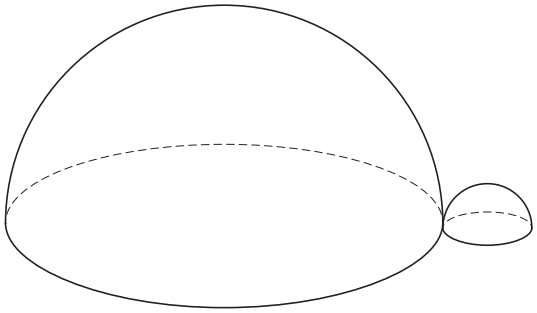


Diagram not drawn to scale

The radius of the small hemisphere is one-fifth of the radius of the large hemisphere.
The total volume of the sculpture is 456 m^3.

Calculate the radius of the large hemisphere. [5]

END OF PAPER

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GCSE MARKING SCHEME

MATHEMATICS UNITISED

NOVEMBER 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2013 examination in GCSE Mathematics Unitised. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 1 - FOUNDATION TIER

NOVEMBER 2013 UNIT 1 Foundation	Mark	Final MARK SCHEME (14/11/13) Comments (Page 1)
1. (a) 3 024 756 (b) 63 000 (c) (i) 408 (ii) ⅔ or equivalent. ISW.	B1 B1 B1 B1 4	 Accept if given in words.
2. 200 grams 324m $600m^2$ $2000m^3$	B1 B1 B1 B1 4	Accept any unambiguous indication in each case.
3. (a) Thursday. (b) 43 (c) 13 × (£)12.5(0) = (£)162.5(0) (d) Any indication that the orders taken on Thursday were worth more money. e.g. 'Prices were higher (on Thursday)' 'She gave discounts on Wednesday' 'The size of each order was smaller on Wednesday'.	B1 B1 M1 A1 E1 5	Do not accept 11. SC1 for (£)225 or (£)137.5(0) or (£)300 or (£)237.5(0) For any comment that refers to 'prices' as opposed to number of orders.
4. (a) 12 × 30(p) + (£)5 AND an attempt to multiply '12 by 30' or '12 by 0·3' AND adding 500 or 5. = (£)8.6(0) or 860(p) (b) $\frac{(£)7.4(0) - (£)5}{0.3(0)}$ or equivalent. = 8 (passengers)	 M1 A1 M1 A1 4	*Penalise consistent attempt in (a) and (b) to differentiate between driver and passengers –1once only.* Do not penalise 'mixed units' at this stage. Allow £8.60p but £860 or 8.60p is A0. For correct substitution with subtraction and division. Allow division by 30 for M1. Accept an embedded answer.
5. Correct start time for 2nd programme. First two programmes 'Nature Trails' and either 'Theatre Review' or 'The Comedy Slot'. 3rd programme starts at 12:10 Correct start time for 4th programme. Final two programmes 'Your Songs' and remaining one of 'Theatre Review' or 'The Comedy Slot'.	 B1 B1 B1 B1 B1 5	*a.m. and p.m. not required but penalise once if incorrect* **F.T.** 'their first programme'. In either order. Accept unambiguous indication. **F.T.** 'their third programme'. In either order. Accept unambiguous indication.
6. (Shop A) (£)20 (Shop B) 6 × 4 × 0·8 or equivalent. = (£)19.2(0) (Difference of) 80p or £0.8(0)	B1 M1 A1 B1 4	 F.T. their stated amounts. Units required otherwise B0. Allow £0.80p
7. (a) Accurate drawing with lines of 6cm and 4·5cm meeting at 90°. 'Steel cable' line drawn to top of mast. (b) Actual length of steel cable given (75m)	 B2 B1 B2 5	*Allow ±0·2cm and ±2°. Use overlay.* For all 3. B1 for 2 of them. Must be in correct orientation. B0 for 45m or 60m. Otherwise F.T. an unambiguous line or distance from their drawing that represents the cable × 10. Must give units. B1 if no units or incorrect units given OR length on diagram given (7·5cm). B1 for an incorrect measurement seen to be correctly multiplied by 10 AND correct units given. *Ignore sight of 75m + 60m =135m and allow B2 for the 75m.*

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NOVEMBER 2013 UNIT 1 Foundation	Mark	Final MARK SCHEME (14/11/13) Comments (Page 2)
8. (a) Labelling of BOTH axes. Uniform scale for BOTH axes. All 7 correct plots. Appropriate curve drawn. (b) Correct reading from their curve (or line).	B1 B1 P1 C1 B1 5	Units need to be given in both cases else B0. May be implied by their curve (or line). F.T. their plots if at least 4 are correct. Allow within '½ a small square'.
9. (Area of lawn) 9×3 $= 27(m^2)$	M1 A1	F.T. 'their area' (may be implied) for further B marks only if $\geq 12(m^2)$
For one correct possible choice AND its cost.	B2	B1 for a correct possible choice with no cost or an incorrect cost. B1 for an incorrect combination of at least four containers with a correct cost.
For a different correct possible choice AND its cost.	B2	B1 for a different correct possible choice with no cost or an incorrect cost. B1 for a different incorrect combination of at least four containers with a correct cost.
Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', '£', × and m^2 being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	QWC2 8	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.

Area (m^2)	Large	Medium	Small	Cost
28	2	1	1	(£)25
28	1	3	1	(£)27
28	0	5	1	(£)29
28	1	0	6	(£)32
28	0	2	6	(£)34
29	2	0	3	(£)28
29	1	2	3	(£)30
29	0	4	3	(£)32
29	0	1	8	(£)37

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NOVEMBER 2013 UNIT 1 Foundation	Mark	Final MARK SCHEME (14/11/13) Comments (Page 3)
10. Sight of (Won) 15, (Drew) 12 and (Lost) 9 Correct pie chart drawn (Angles are 150º, 120º and 90º)	B1 B3 4	May be implied by a correct pie chart. F.T. their amounts. *Allow ± 2°. Use overlay.* B3 for all correct and labelled. B2 for all correct but not labelled. B1 for one correct and labelled. If no marks awarded for pie chart, then award M1 for equating 1 match to the correct number of degrees (10º).
11. (a) The question is biased or leading. (b) Any two from, e.g. 'No box for those who have never been', '10 times is not exclusive', 'No time period indicated'.	B1 B2 3	Accept any statement that implies question is biased or leading. Do not accept an answer that implies the question is biased because of the location. B1 for each different reason (maximum of 2 marks).
12. (a) Bearing of 040° from Moelfre. Bearing of 335° from Hoylake. Position marked or two lines intersecting. (b) Correct three figure bearing given.	 M1 M1 A1 B1 4	*± 2° (use overlay).* Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. (Lines must originate from Moelfre and Hoylake respectively and intersect at sea.) F.T. their ship's position. Allow ± 2°.
13. (a) (Volume =) $\pi \times 3^2 \times 4$ $= 113{\cdot}1\ (m^3)$ OR $36\pi\ (m^3)$ (b) Correct strategy. $\frac{113100\ (l)}{1800\ (l)}$ OR $\frac{113{\cdot}1\ (m^3)}{1{\cdot}8\ (m^3)}$ OR $\frac{113100000\ (cm^3)}{1800000\ (cm^3)}$ $= 62{\cdot}8(.....)$ OR 20π = 62(minutes)	M1 A1 S1 M1 A1 A1 6	Also $\pi \times 300^2 \times 400$ Accept answers in the range 113 m^3 to 113.2 m^3 or equivalent in cm^3 (e.g. 113 000 000) Allow S1 for sight of 'their volume' ÷ 'digits 18' F.T 'their volume' from (a). Incorrect 'compensating' conversion errors that may lead to an answer of 62·8... is M0A0A0. For truncating to nearest whole number of minutes.
14. 17000 2040 14960 1795.2(0) 13164.8(0) 1579.77(6) 11585.02(4) (£)11600	B1 M1 A1 A1 4	For the evaluation of a correct 12% OR Sight of 0·88 (6120, 10880 or 23120 implies 3× 2040 and gains B1). For attempting to find and subtract 3 different 12%. OR $17000 \times 0{\cdot}88^3$. F.T. one error. *Treat calculation for 2 or 4 years as a misread.* *Penalise an appreciation calculation –1.*

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UNIT 1 - HIGHER TIER

NOVEMBER 2013 UNIT 1 Higher	Mark	Final MARK SCHEME (14/11/13) Comments (Page 1)
1. (a) The question is biased or leading.	B1	Accept any statement that implies question is biased or leading. Do not accept an answer that implies the question is biased because of the location.
(b) Any two from, e.g. 'No box for those who have never been', '10 times is not exclusive', 'No time period indicated'.	B2 3	B1 for each different reason (maximum of 2 marks).
2. (a) Bearing of 040° from Moelfre. Bearing of 335° from Hoylake. Position marked or two lines intersecting. (b) Correct three figure bearing given.	 M1 M1 A1 B1 4	*± 2° (use overlay).* Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. (Lines must originate from Moelfre and Hoylake respectively and intersect at sea.) F.T. their ship's position. Allow ± 2°.
3. 650 × 43·2 = 28080 (roubles) (Roubles left) 6840 6840 ÷ 49·5 = (£)138.18	M1 A1 B1 M1 A1 5	 F.T. 'their 28080' – 21240. F.T. 'their 6840'. £138.1818.... is A0. Mark final answer.
4. $9C + 32 \times 5 = 140 \times 5$ OR $\frac{9C}{5} = 140 - 32$ $C = \frac{140 \times 5 - 32 \times 5}{9}$ OR $(C =) \frac{140 - 32}{9} \times 5$ = 60(°C)	M1 M1 A1 3	For correct substitution in this form. Accept an embedded answer.
5. Correct method to find area of trapezium. (Trapezium area =) 34(cm^2) (Area of whole shape =) 59(cm^2) 59 × 600 ÷ 250 × (£)6 = (£)849.6(0) Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ and cm^2 being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 B1 M2 A1 QWC2 <

NOVEMBER 2013 UNIT 1 Higher	Mark	Final MARK SCHEME (14/11/13) Comments (Page 2)
6. $37 \times \frac{17}{5}$	M1	
$= 125\ ^{4}/_{5}$ or equivalent	A1	
2 hours 5 minutes 48 seconds	B1	F.T. only if time in minutes greater than 60 and includes a fraction $\neq$ ½. Accept F.T. answers to nearest second.
	3	
7. (a) (Volume =) $\pi \times 3^2 \times 4$	M1	Also $\pi \times 300^2 \times 400$
$= 113{\cdot}1\ (m^3)$ OR $36\ \pi\ (m^3)$	A1	Accept answers in the range 113 m^3 to 113.2 m^3 or equivalent in cm^3 (e.g. 113 000 000)
(b) Correct strategy.	S1	Allow S1 for sight of 'their volume' ÷ 'digits 18'
$\frac{113100\ (l)}{1800\ (l)}$ OR $\frac{113{\cdot}1\ (m^3)}{1{\cdot}8\ (m^3)}$ OR $\frac{113100000\ (cm^3)}{1800000\ (cm^3)}$	M1	F.T 'their volume' from (a). Incorrect 'compensating' conversion errors that may lead to an answer of 62·8... is M0A0A0.
$= 62{\cdot}8(.....)$ OR $20\ \pi$	A1	
$= 62$(minutes)	A1	For truncating to nearest whole number of minutes.
	6	
8. Showing 8 sheep with 1 lamb 10 sheep with 2 lambs 6 sheep with 3 lambs	B1	
$8\times1 + 10\times2 + 6\times3$ (46)	M1	F.T. their values.
$\div 24$	m1	
$= 1{\cdot}9$	A1	Must be to 1 decimal place with no errors in working. *Alternative method* $1 \times 120 + 2 \times 150 + 3 \times 90$ M1 $\div 360$ m2 $= 1{\cdot}9$ A1
	4	
9. 86% ≡ 3655	B1	Accept any indication.
(Last year) $\frac{3655}{86} \times 100$	M1	Or equivalent e.g. 3655 / 0·86.
$= 4250$	A1	
	3	
10. (a) Sight of 305(cm) or 3·05(m) AND 3·95(cm) or 0·0395(m)	B1	*The B1 may be awarded if these values are seen in (a) or in (b) and need not be of the same units.*
$\frac{305}{3{\cdot}95}$ or $\frac{3{\cdot}05}{0{\cdot}0395}$	M1	FT 'their 305', provided it is > 300 and $\leq$ 310 AND 'their 3·95', provided it is $\geq$ 3 and < 4
$= 77$	A1	77·2.... is A0.
(b) Sight of 295(cm) or 2·95(m) AND 4·05(cm) or 0·0405(m)	B1	*The B1 may be awarded if these values are seen in (a) or in (b) and need not be of the same units.*
$\frac{295}{4{\cdot}05}$ or $\frac{2{\cdot}95}{0{\cdot}0405}$	M1	FT 'their 295', provided it is $\geq$ 290 and < 300 AND 'their 4·05', provided it is > 4 and $\leq$ 5
$= 72{\cdot}8...$ AND NO	A1	*Alternative methods* $73 \times 4{\cdot}05$ M1 $= 295{\cdot}6(5)$ AND 'NO' A1 OR 295/73 M1 $= 4{\cdot}04$ AND 'NO' A1
	6	

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NOVEMBER 2013 UNIT 1 Higher	Mark	Final MARK SCHEME (14/11/13) Comments (Page 3)
11. $120 \div 3$ $= 40$ (m.p.h.) $60 \div 30$ $(= 2)$ Total time = 5 (hours)	M1 A1 M1 A1 4	 F.T. (180 – 'their 120') / (0·75 × 'their 40').
12. (a) One correct 70% calculated At least 4 attempts at repeated 70% of different values. 5 correct values 7, 4·9, 3·43, 2·40(1) and 1·68(07) All plotted correctly and not joined. (b) Some indication that the heights indicated between the bounces would not be correct.	B1 M1 A1 P1 E1 5	 Allow only arithmetical errors. All five correct (to 1dp) F.T. their values if M1 awarded. Accept plots within ½ a 'small square'. Plotting (0,10) not required but P0 if incorrect plot. Correct plots imply previous B1,M1,A1. E.g. 'there is no 1½ bounce', 'We don't know what happens in-between (bounces)'.
13. (a) (Arc AB =) $\frac{70}{360} \times 2 \times \pi \times 12$ $= 14{\cdot}6(6...)$(cm) or $\frac{14\pi}{3}$ (b) Use of $\frac{70}{360} \times \pi \times 12^2$ OR $\frac{70}{360} \times \pi \times 8^2$ $= 87{\cdot}9(6....)(m^2)$ OR $39{\cdot}0(9....)(m^2)$ OR 28π OR $112\pi/9$ (Shaded area) $\frac{70}{360} \times \pi \times 12^2 - \frac{70}{360} \times \pi \times 8^2$ $= 48{\cdot}8(7...)$ (m^2) OR $\frac{140}{9}\pi$	M1 A1 M1 A1 M1 A1 6	Allow M1 for (Major arc AB =) $\frac{290}{360} \times 2 \times \pi \times 12$ Accept answers between 14·65 and 14·7 inclusive. Allow A1 for (Major arc AB=) 60·7(3..) or $\frac{58\pi}{3}$ Accept answers between 60·7 and 60·8 inclusive for the major arc. Accept 87·9 to 88·0 inc. OR 39·0 to 39·15 inc. This implies both M marks. *(70/360 ×π × 80 is M1M1A1)* F.T. their values.
14. $\frac{2}{3} \times \pi \times R^3 + \frac{2}{3} \times \pi \times (R/5)^3 = 456$ $R^3 = \frac{456 \times 125 \times 3}{2 \times \pi \times 126}$ or equivalent $= 216$ (Radius =) 6(m)	M2 A1 A1 A1 5	M1 if $R^3/5$ is used. Allow M1 if 4/3 used instead of ⅔. F.T. if M1 awarded. F.T. 'their R^3' if at least M1 awarded. Correct to 1dp. SC1 for an answer of 6·(01..) found by using large hemisphere alone. *Note use of r for smaller radius* *$\frac{2}{3} \times \pi \times r^3 + \frac{2}{3} \times \pi \times (5r)^3 = 456$* *M2* *$r^3 = \frac{456 \times 3}{2 \times \pi \times 126}$ or equivalent* *A1* *$= 1{\cdot}7279...$* *A1* *$(5 \times r) = 6(m)$* *A1* *Mark accordingly, but penalise premature approx -1.*

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life
HIGHER TIER

A.M. TUESDAY, 11 June 2013

$1\frac{1}{4}$ hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

A ruler, a protractor and a pair of compasses may be required.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **9**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**6**	
3	**3**	
4	**3**	
5	**4**	
6	**4**	
7	**3**	
8	**4**	
9	**7**	
10	**5**	
11	**5**	
12	**3**	
13	**6**	
14	**7**	
TOTAL MARK		

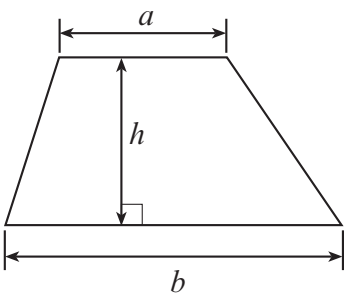
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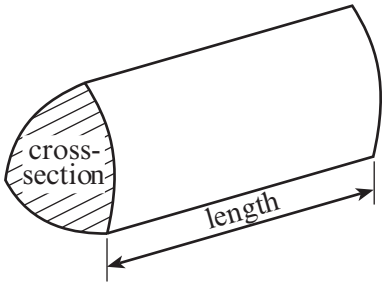
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Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

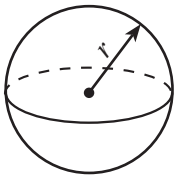


Volume of prism = area of cross-section × length



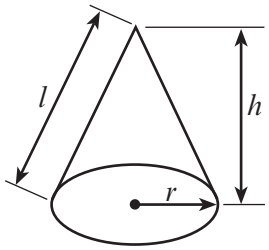
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl

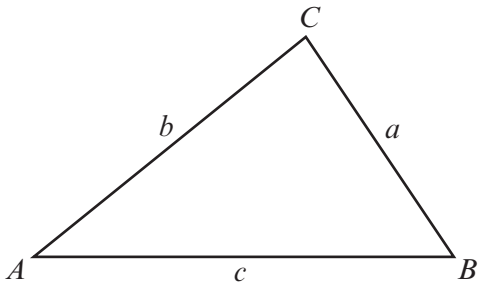


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. An electricity bill, for a period of three months, showed that 1380 units had been used at a cost of 12·3 pence per unit.
The standing charge for this period was £13.86.
VAT at 5% is payable on the total cost of the units used and the standing charge.

Calculate the total amount to be paid.

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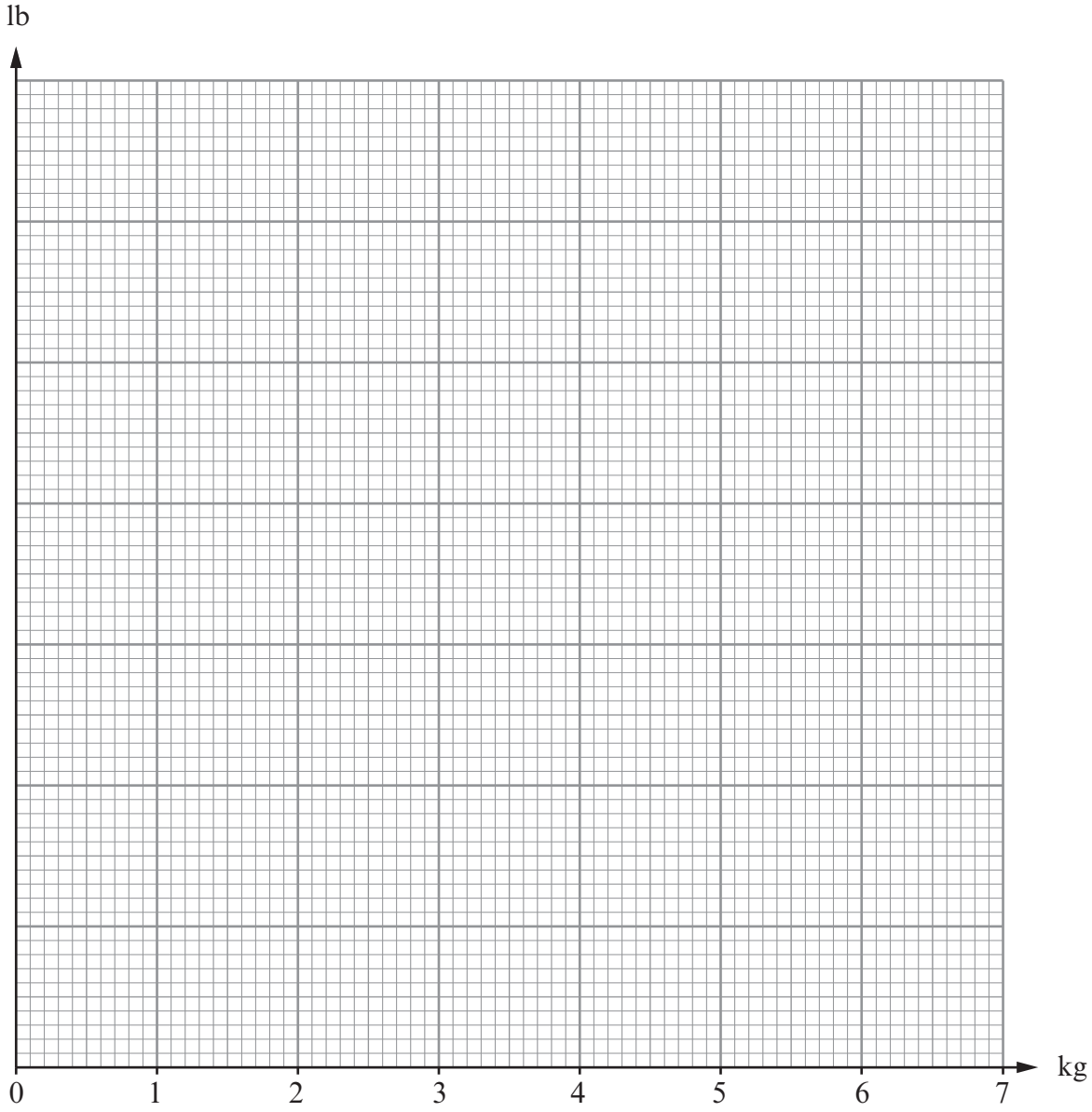
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2. The following two pieces of information, given in both kilograms (kg) and pounds (lb), were seen in a cookery magazine.

Use 5 kg (11 lb) of apples. Wash and peel them.

Use 2 lb (0·9 kg) of sugar. Warm the sugar before use.

(a) Use the information to draw a conversion graph between kilograms and pounds.



[3]

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(b) A person weighs 10 stone. (1 stone = 14 lb.)

Use your graph to estimate the weight of this person in kilograms.
Remember to show the method you have used.

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Turn over.

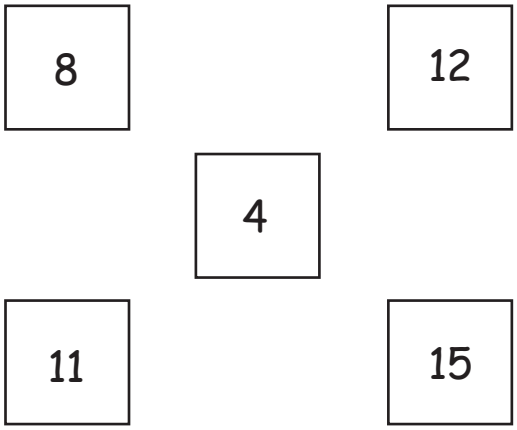
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3. Matthew is playing a game that uses numbered tiles.

The game involves working out the range and mean of the numbers on five tiles.

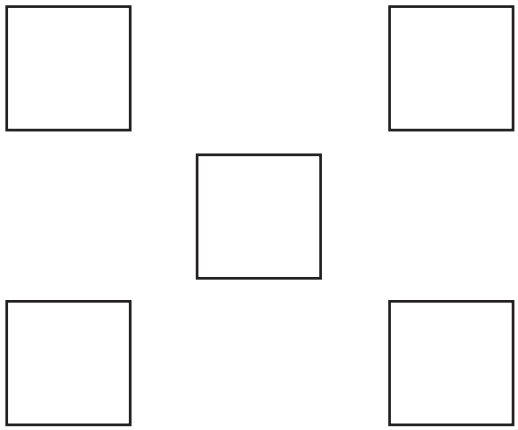
Matthew has these five tiles.



With his final move in a game, Matthew must replace **exactly two** of his tiles with two different tiles.

To win the game he must keep the **same range** as above but **increase the mean by 1**.

Fill in the numbers on the tiles below to show the three tiles he has kept, and the new numbers on the two tiles he has changed, if he is to win.



For working:

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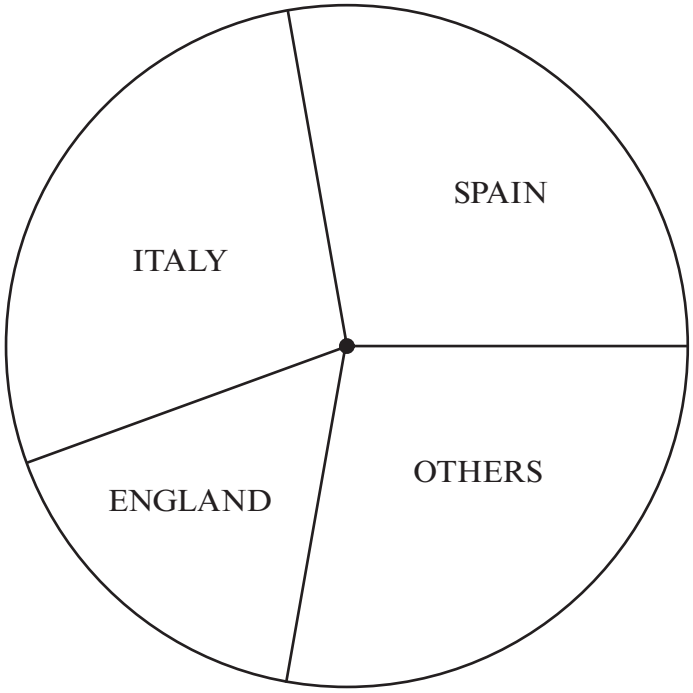
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4. A sports magazine used the following pie chart to illustrate the countries from which the first 18 European Championship League winners came.



How many times did a team from Spain win the Championship?

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5. A plot of land labelled $ABCD$ is shown below.
AB is parallel to DC and BC is perpendicular to AB.
AB = 100 metres and DC = 40 metres.

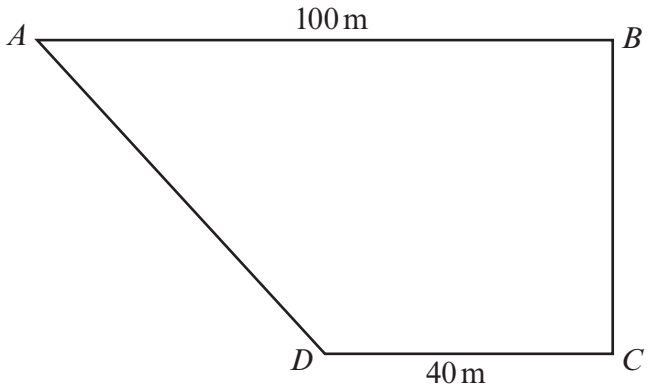


Diagram not drawn to scale

The area of this plot of land is 3500 m^2.

A cable is to be laid from point B to point C.

Calculate the length of this cable.

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6. Nicola used her car to travel from her home to her friend's house.
It took her two and a half hours, driving at an average speed of 30 mph.

Her return journey home, along the same route, took three hours.

Calculate her average speed on her journey home.

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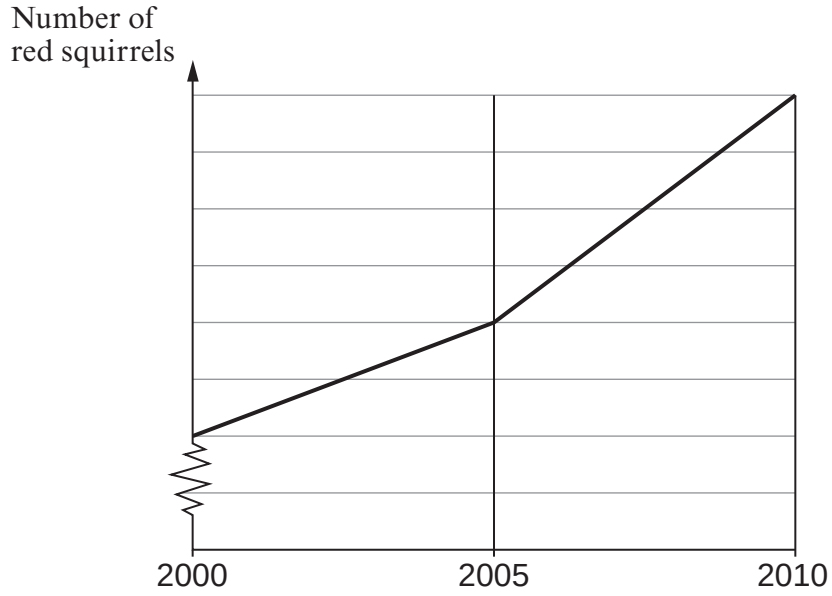
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7. *(a)* The following comment and graph appeared in a newspaper.

'The number of red squirrels doubled between 2000 and 2005 and doubled again between 2005 and 2010.'



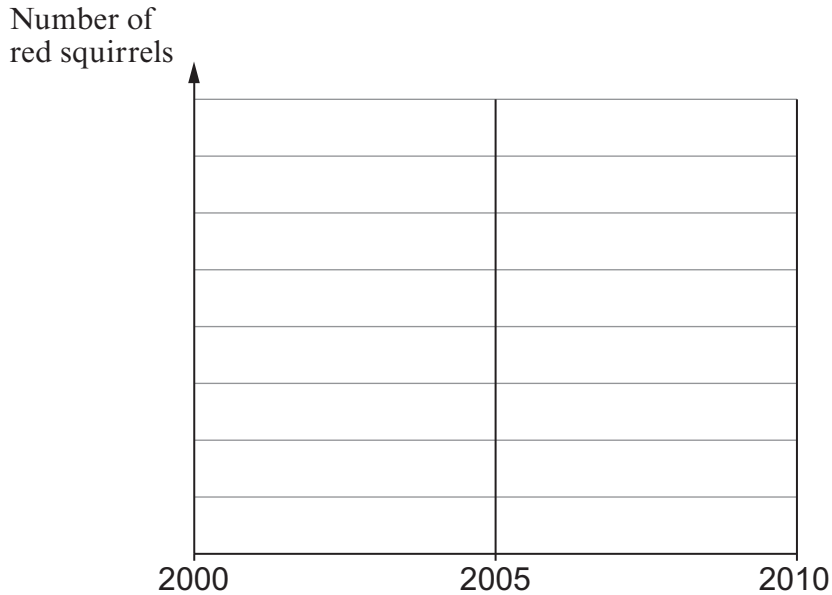
(i) Explain why it is not possible to check from the diagram whether the comment is true or not.

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[1]

(ii) There were 40 red squirrels in 2005. Complete the diagram shown below to **clearly** make the comment in the newspaper correct.



[1]

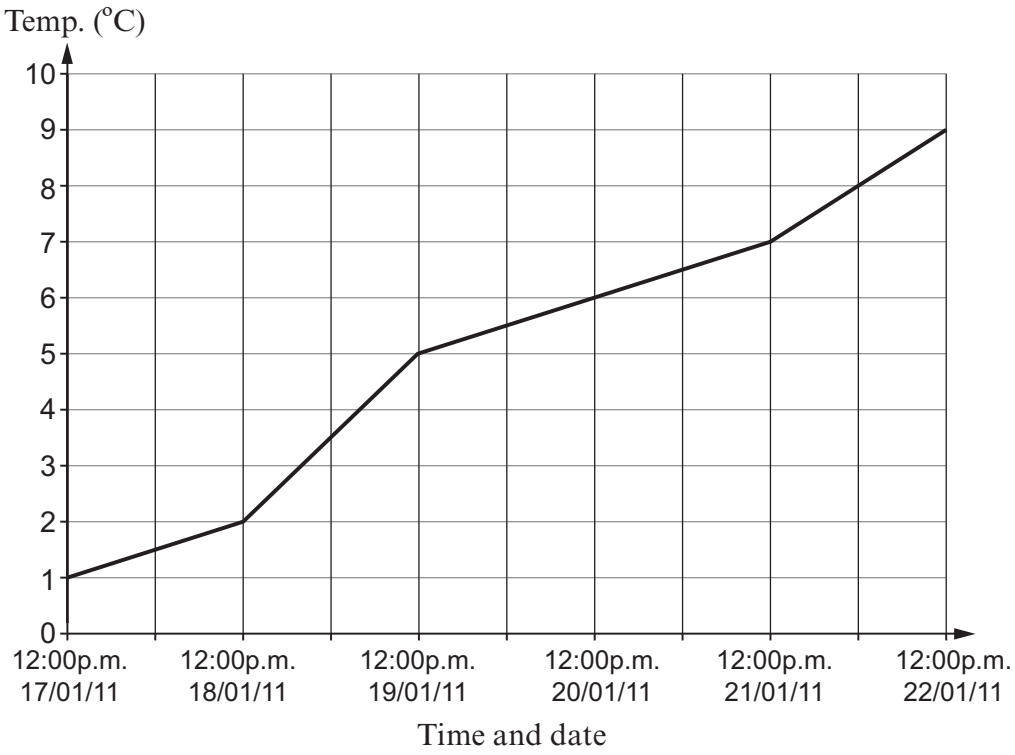
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(b) In another newspaper, the following comment and graph were published.

'Temperature has risen on each of the last five days.'



How could this graph mislead you to make an incorrect temperature reading at certain times?

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[1]

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Turn over.

Examiner only

8. Dylan invests £12 000 for 3 years at 4% per annum compound interest.
Find the compound interest earned in the 3 years.
Your answer should be given correct to the nearest penny.

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9. *You will be assessed on the quality of your written communication in this question.*

A handrail alongside a straight path is 60 metres long, measured correct to the nearest 10 cm.

Thin strips of metal of length 40 cm, measured correct to the nearest centimetre, are attached, end to end, along the top of the handrail.
These metal strips must cover the whole length of the handrail.

What is the minimum number of metal strips required to guarantee that the whole length of the handrail is covered?

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10. *(a)* A school's new photocopier will copy three times as many sheets as its old photocopier in the same amount of time.
It used to take 20 minutes to copy 500 sheets on the old photocopier.
How long will the new photocopier take to copy 600 similar sheets?

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(b) In one round of a competition, Sian is given an initial score of $6\frac{3}{5}$.

Her score is to be revised to take into account the degree of difficulty of that round.

Her new score is found by calculating $6\frac{3}{5} \div \frac{9}{10}$.

Find Sian's new score.

Your answer must be given as a whole number and a fraction (not as a decimal).

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11. At a particular time, the following three exchange rates were available.

£1 = 1.20 euros, £1 = $1.58, 1 euro = $1.26

A sum of money is exchanged from pounds (£) to euros.
That amount of euros is then changed to dollars ($).

Calculate the **percentage** loss in doing this compared with changing the initial sum of money directly into dollars.

[5]

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12. A farmer decided that he would gradually decrease the number of acres he was using for growing wheat.

His plan was to reduce the number of acres each year by $\frac{1}{4}$ of what it was the previous year.

He now has 450 acres for growing wheat.
How many acres did he have for growing wheat two years ago?

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13. A landing area, as shown below, is marked out for a throwing event in a sports field. AB is an arc of a circle centre O. The angle $A\hat{O}B = 60^{\circ}$ and $OA = OB = 80\,\text{m}$.

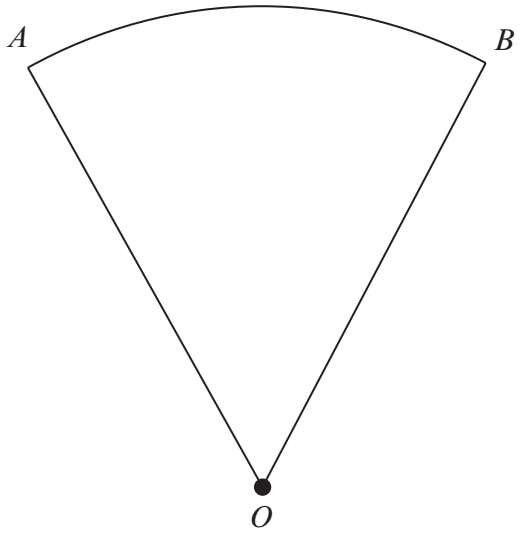


Diagram not drawn to scale

A rope is used to mark the boundary of the whole landing area.

(a) Calculate the area enclosed by the rope.

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(b) What is the total length of the rope that is used to mark the landing area?

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Turn over.

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14. A solid object is made out of two identical cones and a sphere.
The three shapes are joined together as shown in the diagram, with the sphere touching the centres of the circular bases of both cones.

Side View

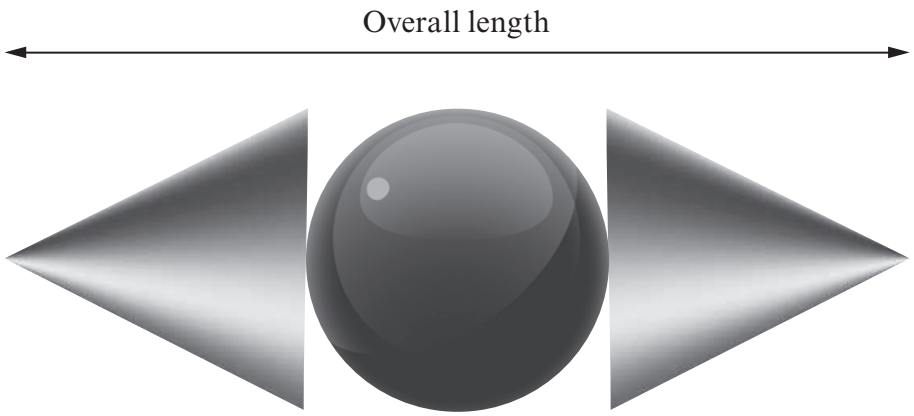


Diagram not drawn to scale

The radius of the sphere and the radius of the circular base of each cone is 3 cm.
The volume of the whole object is 245 cm^3.

Calculate the overall length of the object.

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END OF PAPER

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Question number	Additional page, if required. Write the question numbers in the left-hand margin.

Examiner only

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

SUMMER 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2013 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 1 - Foundation Tier	1
Unit 1 - Higher Tier	4
Unit 2 - Foundation Tier	7
Unit 2 - Higher Tier	10
Unit 3 - Foundation Tier	12
Unit 3 - Higher Tier	15

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GCSE MATHEMATICS - UNITISED - MARK SCHEME

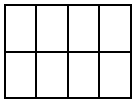
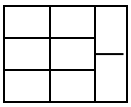
SUMMER 2013

UNIT 1 - FOUNDATION TIER

JUNE 2013 UNIT 1 Foundation	✓	Mark	FINAL MARK SCHEME Comments
1. (Scarf £30.00) (2 bottles of shampoo at £3.99 each) (£) 7.98 (+) (Total bill) £37.98	V V	B1 B1	F.T. £30 + 'their £7.98'. (£)37.98 implies B1B1.
(Total value of vouchers) (£)35(.00)	V	B1	
(Extra cash required £37.98 – £35.00 =) (£)2.98	V	B1	F.T. 'their £37.98' – 'their £35'. *Alternative methods* *(£)35 – (£)30 =(£)5 OR (£)35 – (£)7.98 = (£)27.02* *(£)7.98 – (£)5 =(£)2.98 (£)30 – (£)27.02 = (£)2.98* *B1 for (£)35, B1 for (£)7.98, B1 for (£)5 or (£)27.02 and B1 for (£)2.98.*
Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=', '+' and '–' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	V V	QWC 2	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar. <u>An unsupported answer is QWC0.</u>
2. (a) 12 m^3		B1 U1	Independent of the B1
2. (b) 10 m^2		B1 U1	Independent of the B1
3.(a) 80		B1	
3.(b) 95		B1	
3.(c) 'Two and a half' symbols drawn.		B1	Ignore size and poor diagrams if intention is clear.
3.(d) Explanations such as e.g. 'the symbol is only suited for multiples of 5', '62 is not in the five times table', '2 would be difficult to show'.		B1	Accept equivalent statements BUT there must be a consideration of the 62 in some way e.g. Allow 'It (only) goes up in 5s' for B1, but B0 for 'each triangle is worth 5'.
4. A line of length 6cm drawn. An angle of 55° drawn at correct position.		 B1 B1	***Use overlay.*** Allow ± 0·2cm. Allow ± 2°.

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JUNE 2013 UNIT 1 Foundation	✓	Mark	FINAL MARK SCHEME Comments
5. (Cost of trees =) 24 × (£)5 = (£)120 (Time taken =) 24 × ¼ = 6(hours) (Total bill =) 6 × (£)10 + (£)120 = (£)180	V V V V V V	M1 A1 M1 A1 M1 A1	24 × 15 = 360 is M0A0 but allow F.T. of 360 for final M1A1. F.T. 'their time taken' BUT not 15 or 0·25 or 0·15 or 24. F.T 'their cost of trees' BUT not (£)5 or (£)24.
6. (May UK Single) May UK Touring May I Single May I Touring Sept UK Single Sept UK Touring Sept I Single Sept I Touring		B3	Accept any unambiguous indication for month, destination and type. Do not credit or penalise repeated combinations For all 7 correct. B2 for 5 or 6 correct. B1 for 3 or 4 correct.
7.  	V V V V V	B2 B3	*If both of the two <u>different</u> ways shown are of the sort which could gain a B3 then allow B3in the first instance and B2 for the second one.* B1 for strategy of 2+2+2+2 = 8 OR 3+3 = 6. BUT B0 if more than 8 tiles shown. B0 if any inconsistent matching of tile sides (e.g. implying 2m = 3m). Or equivalent. B1 for strategy 2+2+2 = 6. B1 for strategy 3+3+2 = 8. BUT B0 if more than 8 tiles shown. B0 if any inconsistent matching of tile sides (e.g. implying 2m = 3m).
8.(a) 9·58		B1	
8.(b) A statement that recognises that 6·3m = 6m 30cm or 6m + 4cm = 6.04 metres e.g. 'No she must increase her jump by more than 30cm' or 'her jump would be only 6.04 metres'.		B1	Accept 'She must jump 31cm further'. Also allow 'She must jump 40cm further' as an indication that the candidate realises that 100cm = 1 m.
9. (£)44 – (£)12 = (£)32 32 ÷ 8 = 4 (Hired mixer for) 5(days)	V V V V V	M1 A1 M1 A1 A1	F.T. 'their 32'. F.T. 'their 4' + 1. SC1 for 44/8 = 5½ (or 6) days SC2 for 44/8 = 5½ (or 6) days , therefore 6½ (or 7)days
10. (a) 750 × 1·2(0) = 900 (euros)		M1 A1	
10(b) 96 ÷ 1·2(0) = (£)80 (A difference of) (£)5		M1 A1 A1	OR (85 × 1·2) – 96 M1 (6euros gain M1) ÷ 1·2 m1 (£) 5 A1
10 (c)(i) 3000 (metres)		B1	
10(c) (ii) 3 × 5/8 (= 15/8) 2 (miles)		M1 A1	An answer of 2(miles) clearly found from an incorrect method e.g. 3 × ½ = 1½ ≈ 2(miles) is M0A0. For this question allow 1·5km ≈ 1mile so 3km ≈ 2miles.

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JUNE 2013 UNIT 1 Foundation	✓	Mark	FINAL MARK SCHEME Comments
Ribbon marking for 11(a) and 11(b). 11. (a) Uniform scale on vertical axis.		B1	*P0,L0 if no attempt at uniform scaling.*
Plotting at least two correct points.		P1	± '½ a small square'. The origin may be one of the points.
Correct line drawn.		L1	Correct line implies P1L1.
(b) (10 stone =) 140 (lbs)		B1	For sight of 140. It may be implied in further work.
Any correct strategy, e.g. 14 times their value at 10 lbs.		M1	Accept 10 times their value at 14lbs, if line drawn extends that far.
A correct answer <u>for their line</u>.		A1	F.T. their line, OR B1, M1, A1 for answers between 63(kg) and 64(kg) inclusive.
12. (Cost of units) 1380 × 12·3	V	M1	
(£)169.74 or 16974(p)	V	A1	Allow £169.74p but A0 for £16974 or 169.74p.
(Cost of units and std.chg.) (£)183.6(0) or 18360(p)	V	B1	F.T. 'their cost of units' + £13.86. However, B0 if 'mixed units' used after award of A1.
(£)183.60 × 1·05 OR (£)183.60 + (£)183.60 × 0·05	V	M1	F.T. their total cost. Accept working in pence.
= £192.78 or 19278p	V	A1	Units must be given or clearly implied from previous work.
13.			B0,B0,B0 if fewer than five numbers shown.
Showing only two numbers changed.	V	B1	
Numbers give a range of 11.	V	B1	B0 if using the same five numbers.
Numbers give a mean of 11.	V	B1	
14. <u>28000 – 22960</u> (× 100) 28000		M1	
= 18(%)		A1	
15. (Distance =) 2½ × 30	V	M1	Allow M1 for 2·3(0) × 30.
= 75 (miles)	V	A1	C.A.O.
(Average speed =) 75 ÷ 3	V	M1	F.T. 'their 75'.
= 25 (mph)	V	A1	

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JUNE 2013 UNIT 1 Higher	✓	Mark	FINAL MARK SCHEME Comments
1. (Cost of units) $1380 \times 12{\cdot}3$ (£)169.74 or 16974(p)	V V	M1 A1	Allow £169.74p but B0 for £16974 or 169.74p.
(Cost of units and std.chg.) (£)183.6(0) or 18360(p)	V	B1	F.T. 'their cost of units' + £13.86. However, B0 if 'mixed units' used after award of A1.
(£)183.60 × 1·05 OR (£)183.60 + (£)183.60 × 0·05 = £192.78 or 19278p	V V	M1 A1	F.T. their total cost. Accept working in pence. Units must be given or clearly implied from previous work.
Ribbon marking for 2(a) and 2(b). 2. (a) Uniform scale on vertical axis.		B1	*P0,L0 if no attempt at uniform scaling.*
Plotting at least two correct points.		P1	± '½ a small square'. The origin may be one of the points.
Correct line drawn.		L1	Correct line implies P1L1.
(b) (10 stone =) 140 (lbs)		B1	For sight of 140. It may be implied in further work.
Any correct strategy, e.g. 14 times their value at 10 lbs.		M1	Accept 10 times their value at 14lbs, if line drawn extends that far.
A correct answer <u>for their line</u>.		A1	F.T. their line, OR B1, M1, A1 for answers between 63(kg) and 64(kg) inclusive.
3.			B0,B0,B0 if fewer than five numbers shown.
Showing only two numbers changed.	V	B1	
Numbers give a range of 11.	V	B1	B0 if using the same five numbers.
Numbers give a mean of 11.	V	B1	
4. Sight of 360 / 18 or $20^{(\circ)}$ OR sight of $100^{(o)}$		B1	Clear incorrect methods such as 18/4 = 4·5 so 5 wins is B0,M0,A0.
(Spanish winners =) 100 / 20 OR 18 × 100/360 = 5 (wins)		M1 A1	*Allow SC2 for an answer of 4(wins) when 80° is seen to be used instead of 100°.*
5. Sight of $\frac{(100 + 40)}{2} \times BC$ or equivalent	V	B1	For a correct expression for the total area of ABCD in terms of BC. F.T. their area only if in terms of BC and is dimensionally correct.
$\frac{(100 + 40)}{2} \times BC = 3500$	V	M1	For equating their expression for area, <u>in terms of BC</u>, with 3500.
$BC = 2 \times 3500 / 140$ = 50(m)	V V	A1 A1	Further F.T. only if of equivalent difficulty
6. (Distance =) 2½ × 30 = 75 (miles)	V V	M1 A1	Allow M1 for 2·3(0) × 30. C.A.O.
(Average speed =) 75 ÷ 3 = 25 (mph)	V V	M1 A1	F.T. 'their 75'.
7. (a) (i) There is no scale on the 'number of squirrels' axis.		B1	Accept equivalent valid statement.
(ii) 40 shown on vertical axis **and** a correct graph that shows 'consecutive doubling'.		B1	
7(b) States that 'interim' readings between consecutive noon times are not correct.		B1	Accept statements that imply this, e.g. 'temperatures at midnights are wrong', 'only accurate at 12pm.'

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JUNE 2013 UNIT 1 Higher	✓	Marks	FINAL MARK SCHEME Comments
8. 12000 480 12480 499.2(0) 12979.2(0) 519.16(8) 13498.36(8) OR 480, 499.2(0) and 519.16(8) (Compound interest earned =) (£)1498.37	V V V V	B1 M1 A1 A1	For the evaluation of a correct 4% OR Sight of 1·04 (1440 implies 3× 480 and gains B1). For attempting to find 3 different 4%. OR B1 M1 for $12000 \times 1{\cdot}04^3$. F.T. one error. Accept (£)1498.36 A0 for (£)1498.368 *Treat calculation for 2 or 4 years as a misread.* *Penalise a depreciation calculation –1.*
9. (Greatest length of handrail =) 6005 (cm) (Least length of metal strip=) 39·5(cm) (Minimum number of strips required) 6005 / 39·5 = 152·02(....) (Minimum required) 153.	V V V V V	B1 B1 M1 A1 B1	For sight of 6005 or 60·05(m). For sight of 39·5 or 0·395(m). Or equivalent. Must use same units of length. F.T. their values only if 'rail' > 6000 and 'strip' < 40. F.T. 'their 152·02..' only if a division 'Path / Strip' seen and an attempt to use the same units.
Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=' and '÷' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	 V V	QWC2	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar. <u>An unsupported answer is QWC0.</u>
10(a) $20 \times \frac{600}{500} \times \frac{1}{3}$ = 8 (min) or 480 seconds.		M1 M1 A1	Or equivalent. Or equivalent. C.A.O. *For partial work for old photocopier* *Award M1 for stating '600 sheets in 24 min'.* *For partial work for new photocopier* *Award M1 for stating '500 sheets in 20/3 or 6·66.. min'.*
10(b) 7⅓ ISW		B2	Accept $7^{15}/_{45}$ or $7^{3}/_{9}$. B1 for sight of 33/5 × 10/9 or 22/3 or equivalent. B0 for 7·3..... B0 for $7^{3}/_{10.}$

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JUNE 2013 UNIT 1 Higher	✓	Marks	FINAL MARK SCHEME Comments
11. Use of 1·2 × 1·26	V	M1	*These values may be used in conjunction with the*
= 1·512	V	A1	*candidate's choice of initial sum of pounds.*
			F.T. only if M1 gained.
Sight of ('loss of') 0·068	V	B1	*Alternative method for final three marks.*
Use of $\frac{1{\cdot}58 - 1{\cdot}512}{1{\cdot}58}$ (× 100)	V	M1	*1 – 1·512 (×100) M1*
			1·58
= 4·3(03..)(%) ISW	V	A1	*Sight of 0·957... B1* *allow 0·96 for B1*
			4·3(03..)(%) ISW A1 but 4(%) is then A0
12. 450 × 4/3		M1	Sight of 600 gains M1.
× 4/3		M1	
= 800 (acres)		A1	C.A.O.
13. (a) $\frac{60}{360} \times \pi \times 80^2$		M1	
= 3351 (m^2)		A1	Accept answers between 3349 and 3353 inclusive.
13. (b) $\frac{60}{360} \times 2 \times \pi \times 80$	V	M1	
= 83·7(77..)(m)	V	A1	Accept answers between 83·70 and 83·85 inclusive.
(Length of rope =) 83·8 + 80 + 80	V	M1	F.T. 'their derived 83·8'.
= 243·8 (m)	V	A1	
14. (Volume of cone) $\frac{1}{3} \times \pi \times 3^2 \times h$	V	B1	Correctly substituted (with their 'height' notation)
			Implied by 3πh or 9·42*h* to 9·43*h* (also 18·84*h* to 18·86*h*)
(Volume of sphere) 36π	V	B1	Implied by 113·0 to 113·2 inclusive.
(Total volume) 6π*h* + 36π or 18·85*h* + 113.1	V	B1	For F.T. 'cone volume' must be in terms of *h*. F.T. 2 × 'their cone volume' + 'their sphere volume'.
6π*h* + 36π = 245	V	M1	F.T. 'their total volume' only if it is expressed as two terms one of which contains '*h*'.
$h = \frac{245 - 36\pi}{6\pi}$	V	A1	Correctly making *h* the subject of their equation.
= 7(cm)	V	A1	
(Overall length =) 20(cm)	V	A1 (7)	F.T. 2 × 'their 7' + 6.
Alternative method			
(Volume of cone) $\frac{1}{3} \times \pi \times 3^2 \times h$	V	B1	Correctly substituted (with their 'height' notation) Implied by 3πh or 9·42*h* to 9·43*h* (also 18·84*h* to 18·86*h*)
(Volume of sphere) 36π	V	B1	Implied by 113·0 to 113·2 inclusive.
(Total volume of **2** cones) 131·9	V	B1	Must be TWO cones F.T. 245 – 'their sphere volume'.
$\frac{1}{3} \times \pi \times 3^2 \times h = 66$ or $2 \times \frac{1}{3} \times \pi \times 3^2 \times h = 131.9$	V	M1	Implied by 9·42*h* = 66 or 18·85*h* = 131· 9 F.T. 'their 66' and 'their 9·42*h* '.
$h = \frac{131{\cdot}9}{18{\cdot}85}$ or $\frac{66}{9{\cdot}42}$	V	A1	
= 7(cm)	V	A1	
(Overall length =) 20(cm)	V	A1 (7)	F.T. 2 × 'their 7' + 6.

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Surname	Centre Number	Candidate Number
Other Names		0

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GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics in Everyday Life
HIGHER TIER

A.M. FRIDAY, 11 January 2013

$1\frac{1}{4}$ hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **6**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**2**	
2	**6**	
3	**3**	
4	**6**	
5	**5**	
6	**9**	
7	**5**	
8	**4**	
9	**5**	
10	**3**	
11	**5**	
12	**5**	
13	**7**	
TOTAL MARK		

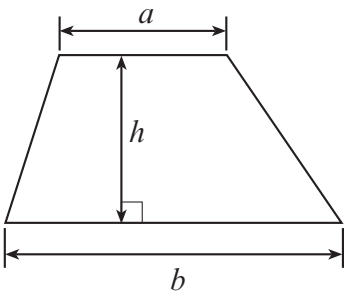
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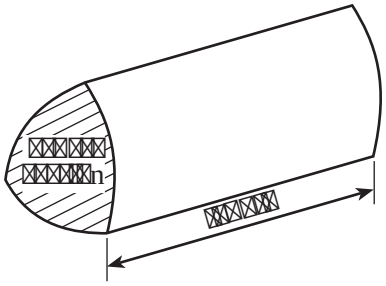
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

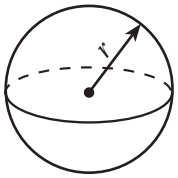


Volume of prism = area of cross-section × length



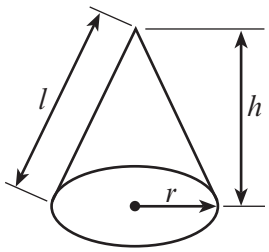
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

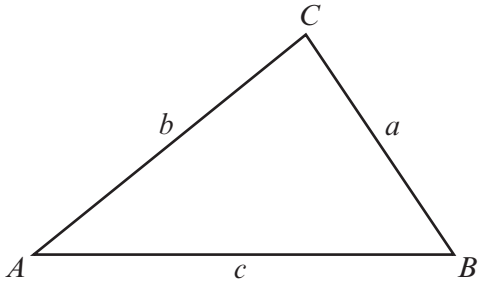


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. A scientist has found that under certain conditions the force (F) acting on a moving particle is given by the following formula,

$$F = 100t - t^2$$

where t is the time measured in seconds from the time the particle started to move.

Calculate the value of the force after 1 minute 40 seconds.

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[2]

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2. Pedro has kept a record of the total number of goals he scored in each of the twenty seasons that he played professional football.
The table below shows this information.

Goals scored	Number of seasons
4	3
6	8
7	2
11	6
22	1

(a) Calculate the mean number of goals scored by Pedro per season.

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[3]

(b) Two football magazines, *Kick* and *Penalty!*, print the scoring records of players.

(i) Complete each of the following tables that give Pedro's scoring record.

Kick

Goals scored	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30
Number of seasons						

Penalty!

Goals scored	1 - 10	11 - 20	21 - 30
Number of seasons			

[2]

(ii) Which magazine's table do you consider to be most useful?
You **must** give a reason for your choice.

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[1]

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3. Denise wants to test the following hypothesis.

'New cars use less fuel than old cars.'

She plans to

- send a short questionnaire to every house in her street,
- ask the following two questions,
  - (i) Do you have a car?
  - (ii) How much fuel does it use?

Write down three unfavourable comments about this plan.

1. .....

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2. .....

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3. .....

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[3]

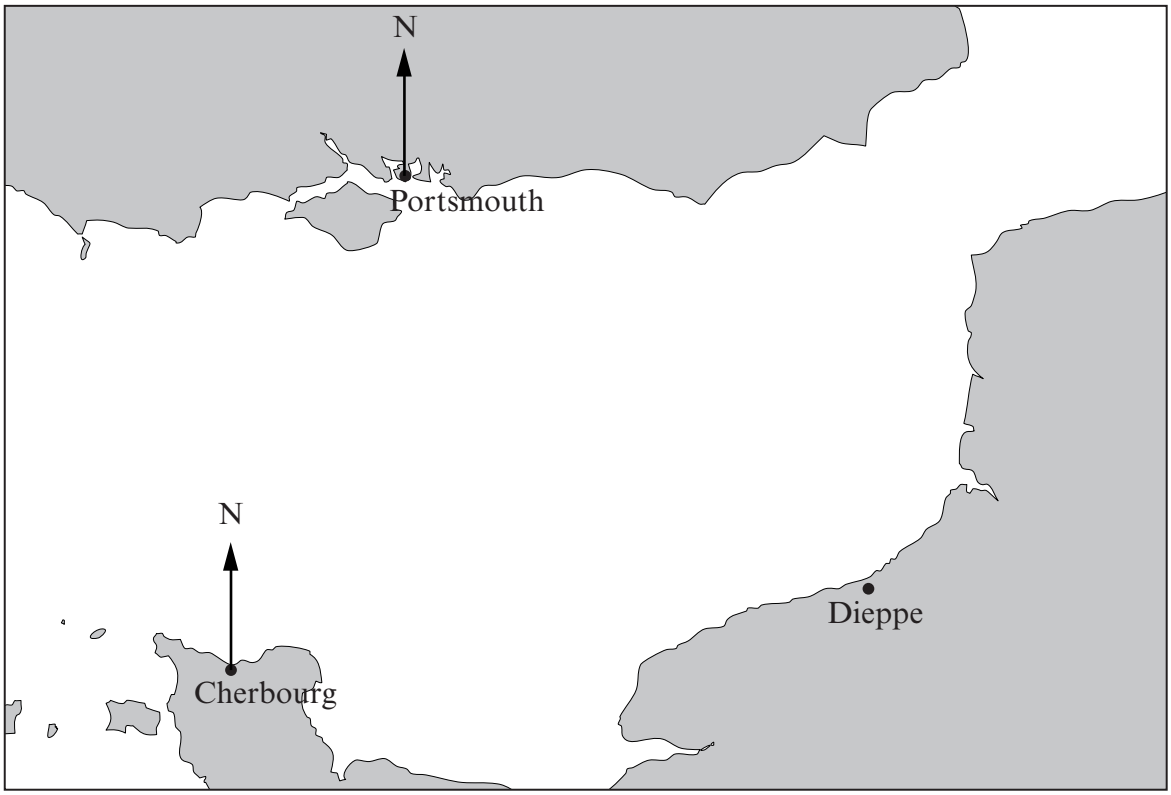
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4. The map shows a scale diagram of part of the English Channel.

Scale : 1 cm represents 20 km



(a) A ship is on a bearing of 058° from Cherbourg and on a bearing of 135° from Portsmouth.
By drawing suitable lines on the diagram above, find and mark the position of the ship.
[3]

(b) At this position, a motor boat is lowered from the ship into the sea.
The motor boat, travelling in a straight line, arrives at Dieppe 4 hours later.
Calculate the average speed of the motor boat in kilometres per hour.

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[3]

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5. Jack has returned to the UK having been working in Europe.
He has 450 euros, which he wants to exchange into pounds.
The exchange rate he is offered at the bank for changing euros into pounds is £1 = 1.20 euros.

His sister Gillian is about to go on holiday to France and intends to exchange £400 into euros.
The exchange rate she is offered at the bank for changing pounds into euros is £1 = 1.08 euros.

Rather than going to the bank,
- Jack gives Gillian his 450 euros,
- Gillian gives Jack her £400.

Show how both Jack and Gillian save money by doing this.

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[5]

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Turn over.

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6. *You will be assessed on the quality of your written communication in this question.*

Karen has the following information for the last financial year.

Taxable income = Total income received – Personal allowance

Tax rates: 20% of taxable income up to £35 000
40% of taxable income over £35 000

- Her total income for the year was: £24 000 from a pension scheme
  and £20 600 from other work.
- Her personal allowance for the year was £7475.

Karen suspects that she has paid too much income tax for the last financial year.

The amount of tax Karen actually paid was 20% of her **total** income.

Check whether or not Karen's suspicion is correct.

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[9]

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7. Carol's telephone answering machine has not been set to the correct time.
She returns home on a Saturday after being away since the previous Monday.
The following new message is on the answering machine.

"It's me, Bryn, please call me",
followed by,
"This person called on Wednesday at 6:24 a.m."

In order to check when the call was actually made, Carol phoned her house number using her mobile phone. She did not answer the house phone but left a message.
When the answering machine was now played it gave the following message.

"Hello myself, it is now Saturday and the time is 5:40 p.m.",
followed by,
"This person called on Thursday at 10:30 a.m."

Showing your strategy, work out what the actual day and time were when Bryn phoned.

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[5]

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8. The financial press has just published the following headline.

PURKOZI Ltd.

Annual profit £4,760,000

Down 13% from last year

What was the profit made by this company last year?
Give your answer to the nearest ten thousand pounds.

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[4]

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9. Heather wants to attach tape around the rim of the bases of two decorative displays.
In each case the tape attached does not overlap itself.

One of the bases is circular with a diameter of 50 cm.
The other base is a rectangle 45 cm long and 32 cm wide.
All the above measurements are correct to the nearest centimetre.

Show that it is not certain that the length of tape around the circular base will be longer than the length of tape around the rectangular base.

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[5]

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10. A printer takes 12 hours to complete a job printing 54 000 advertising leaflets using his old print machine.
How long will he take to print another 72 000 similar leaflets using a new machine that works twice as quickly as his old machine?

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[3]

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11.

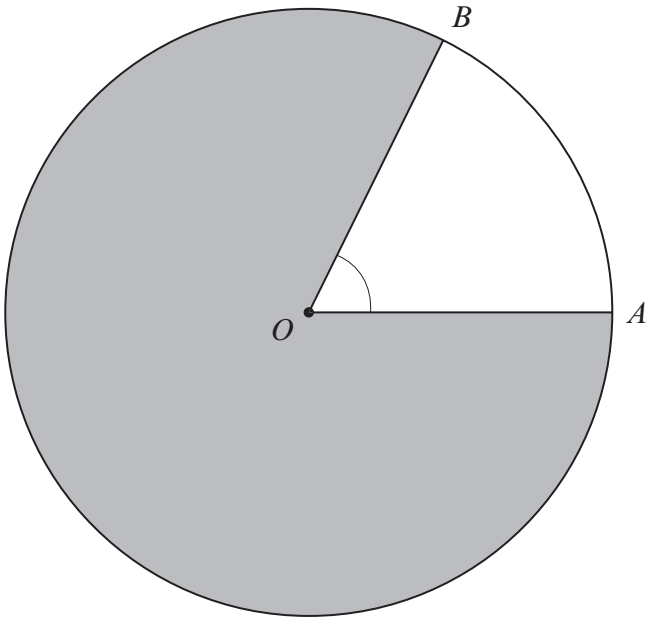


Diagram not drawn to scale

The points A and B lie on a circle with centre O.
The radius of the circle is 15 cm and $A\hat{O}B = 80^\circ$

(a) Calculate the length of the minor arc AB.

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[2]

(b) Calculate the area of the shaded sector of the circle.

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[3]

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12. A speed camera registers a car travelling 60 metres in 3 seconds.
Calculate an estimate for the average speed of the car in miles per hour.

[5]

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13. A hollow water container is shown below.

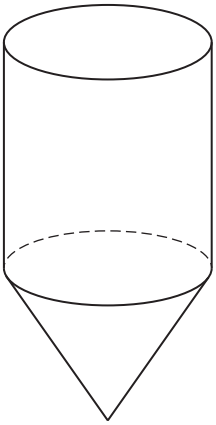


Diagram not drawn to scale

The radius of the circle formed at the join between the cone and the cylinder is 12 cm.
The height of the cylinder is five times the height of the cone.

When full, the container holds 20 litres of water.

Calculate the total height of the container.

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[7]

END OF PAPER

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Question number	**Additional page, if required. Write the question numbers in the left-hand margin.**

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

JANUARY 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 1 – Higher Tier	4
Unit 2 – Foundation Tier	7
Unit 2 – Higher Tier	10
Unit 3 – Foundation Tier	14
Unit 3 – Higher Tier	17

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UNIT 1 - FOUNDATION TIER

UNIT 1 Foundation Tier	P	Mark	Final Mark Scheme Comments
1(a) (i) 72034		B1	
1(a)(ii). Five hundred and forty thousand, two hundred and seven.		B1	
1(b). (Ten percent =) 6657 6657 × (£)3 = (£)19971 (To nearest thousand) (£)20000.	P P P P	B1 M1 A1 A1	 F.T. 'their 6657'. F.T. 'their 19971'.
2(a). 38		B1	
2(b). Indicates '2nd notch to the right of 80'.		B1	Allow unambiguous intent.
3. An attempt to find values that may be directly compared. Finding (25%) 30% and 20% OR 25/100 30/100 and 20/100 or equivalent. OR 0·25 0·3 and (0·2) OR three correct calculations for a common amount. (Best bonus scheme from) Company B		M1 A1 A1	All %, OR all fractions with common denominator, OR all decimals, OR using a common amount for sales made, OR a valid combination. Accept 2·5/10 if comparing 'tenths'. F.T. if only one error made. Accept any unambiguous indication that Company B has been chosen (e.g. '3/10 is best'). SC1 if Company B chosen but with no supporting work.
4. (75 – 99) (100 – 124) **125 – 149** (150 – 174) Using a tally convention. (6) 8 12 4	P P P P	B1 B1 B2	 Need not be accurate. B2 for all three correct. B1 for 1 or 2 correct.
Ribbon marking for 5(a) and 5(b). 5(a). Cost = 24 × (£)35 + (£)70 = (£)910 5(b). Monthly payment = $\frac{(£)530 - (£)50}{24}$ = (£)20		 M1 A1 M1 A1	 Correctly substituted. M0 if 24 × (£)105 attempted. Correct substitution showing subtraction and division. Allow embedded reference to the correct answer.
6. Position / Name of Dog / Weight 1 / Nell / (10·6kg) 2 / Smot / (9kg 624gm) 3 / Buster / (8·72kg) 4 / Rover / (8·572kg) 5 / Peg / (7964gm)		B3	Mark the order of names only. Disregard any weights that are not given in the question. Allow unambiguous use of friends' names or weights instead of dogs' names. B1 for Nell AND Peg in correct positions B1 if 'Smot > Buster'. B1 if 'Buster > Rover'. *SC1 for complete reversal of names.*
7(a). 6		B1	
Ribbon marking for 7(b), 7(c) and 7(d). 7(b). 4 (min) 8 (sec) 7(c). 3 (min) 47 (sec) 7(d). 21 s(econds)		 B1 B1 B2	 SC1 if both correct answers to (b) and (c) are reversed. (Award this SC1 in part (c).) F.T. the time difference between their (b) and their (c). B1 for 21 OR B1 for -21 s(econds) B0 for -21
8. Showing an understanding of range. (Maximum range for Adam =) 59 (Minimum range for Ben =) 41		S1 B1 B1	Must be for runs scored. OR B2 for finding a possible range for Adam that is greater than a possible range for Ben.

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UNIT 1 Foundation Tier		Mark	Final Mark Scheme Comments
9. (Water used in shower =) $\frac{15 \times 60}{10}$	P	M1	
= 90 (litres)	P	A1	
			Alternative methods
(40% of 150 litres =) $150 \times 0{\cdot}4$	P	M1	*OR*
			$\frac{90}{150} \times 100$ M1 *Using 60% B1*
= 60 (litres)	P	A1	
So, 60% of the water = 90 (litres)	P	A1	*= 60(%) (of Liam's amount) A1* *150 × 0·6 M1*
			(which is) 40(%) less A1 *= 90(litres) A1*
			OR
			60(litres) less B1
			$\frac{60}{150} \times 100$ M1
			= 40(%) A1
'Yes, Tina's claim was correct.'	P	A1	F.T. their values.
Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', litres, % being appropriate)	P P	QWC 2	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer			QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.
QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer			QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar
10. Repeated attempt to find 1/10 followed by a subtraction of two different amounts. OR Attempt to find 9/10 of two different amounts.		M1	M1 awarded for intent.
(End of 2nd year) 360 (complaints)		B1	
(End of 3rd year) 324 (complaints)		A1	Penalise extra work –1 (e.g. 4th year) , only if M1B1A1 already awarded. Treat 'increase' as a misread.
11. A correct strategy to find area.	P	S1	Dividing floor area into rectangles.
$6\times13 + 5\times4$ OR $6\times8 + 10\times5$ OR $10\times13 - 8\times4$	P	M1	
$= 98(m^2)$	P	A1	
(Weekly rent =) $98 \times$ (£)5	P	M1	F.T. 'their 98 '.
= (£)490	P	A1	
12. A		B1	
B		B1	
D		B1	

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UNIT 1 Foundation Tier		Mark	Final Mark Scheme Comments
Ribbon marking for 13(a) and 13(b). 13(a). Bearing of 058° from Cherbourg. Bearing of 135° from Portsmouth. Position marked OR two lines intersecting. 13(b). $3{\cdot}9 \times 20$ 78 (km)		 M1 M1 A1 M1 A1	**Use overlay.** ± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. **Use measuring tool.** F.T. their ship's position. Accept ± 0·2cm. Answers in the range 74 to 82 (km) gain M1A1.
14. Three different valid comments. e.g. 'Not representative.' 'Should only be distributed to car owners', 'Does not ask about the age of the car', 'Does not specify over what period of time', 'How are the questionnaires returned?' 'People might confuse quantity with cost', 'Engine size' 'Type of fuel (diesel/petrol)'	 P P P	B3	B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by location). Do not give more than one mark for the same criticism(s).
15. Least Value Greatest Value 265 275 27·5 28·5		 B4	 B1 for each correct entry. Accept 274·9 recurring but not 274·9. Accept 28·49 recurring but not 28·49.
16. 6000 120 6120 122.4(0) 6242.4(0) 124.84(8) 6367.24(8) (£) 6367.25 OR 636725(p)	P P P P	B1 M1 A1 A1	For the evaluation of a correct 2% OR Sight of 1·02 (360 and 6360 imply use of 3× 120 and gain B1) For attempting to find 3 different 2%. OR $6000 \times 1{\cdot}02^3$. F.T. one error. Accept £6367.25p. Do not accept 6367.25p. Mark final value of investment (i.e. do not penalise if they continue to give £367.25)

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UNIT 1 - HIGHER TIER

UNIT 1 Higher Tier	P	Mark	Final Mark Scheme Comments
1. (F =) $100 \times 100 - 100^2$ $= 0$		M1 A1	
2(a). Attempt at $\sum f \times x$ (162) Division by $\sum f$ (20) (Mean =) 8·1 (goals)		M1 m1 A1	 C.A.O. Accept 8 (goals) only if 162/20 seen.
Ribbon marking for 2(b)(i) and 2(b)(ii). 2(b)(i). 1-5 | 6-10 | 11-15 | 16-20 | 21-25 | 26-30 3 | 10 | 6 | 0 | 1 | 0 1-10 | 11-20 | 21-30 13 | 6 | 1 2(b)(ii) E.g. '*Kick* because it is more detailed'. '*Penalty!* because its less cluttered'.		 B2 E1	 'Blank spaces' to be taken as 0. For all 9 correct entries. B1 for 7 or 8 correct entries. Allow F.T. from '*Kick'* table to *'Penalty!'* table. Reason must be valid for their choice.
3. Three different valid comments. e.g. 'Not representative.' 'Should only be distributed to car owners', 'Does not ask about the age of the car', 'Does not specify over what period of time', 'How are the questionnaires returned?' 'People might confuse quantity with cost', 'Engine size' 'Type of fuel (diesel/petrol)'	 P P P	B3	B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by location). Do not give more than one mark for the same criticism(s).
Ribbon marking for 4(a) and 4(b). 4(a). Bearing of 058° from Cherbourg. Bearing of 135° from Portsmouth. Position marked OR two lines intersecting. 4(b). (Distance =) $3{\cdot}9 \times 20$ (= 78) (Speed =) $\frac{3{\cdot}9 \times 20}{4}$ = 19·5 (km/h)		 M1 M1 A1 M1 M1 A1	**Use overlay.** ± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines. **Use measuring tool.** F.T. their ship's position. Accept ± 0·2cm. Dependent on both M marks.
5. (Jack receives) $450 \div 1{\cdot}2$ = (£)375 (Gillian receives) $400 \times 1{\cdot}08$ = 432(euros) A clearly stated explanation that <u>each</u> would have received more of their required currency by swapping.	P P P P P	M1 A1 M1 A1 E1	*<u>Alternative method</u>* *$450 \div 400$* *M1* *$= 1{\cdot}125$* *A1* *$1{\cdot}08 < 1{\cdot}125 < 1{\cdot}2$* *E1* *$1{\cdot}125 < 1{\cdot}2$better for Jack* *E1* *$1{\cdot}125 > 1{\cdot}08$better for Gillian* *E1* Explanation should refer to amounts. Allow one arithmetical slip when awarding E mark.

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UNIT 1 Higher Tier	P	Mark	Final Mark Scheme Comments
6. (Total income =) (£)44600 (Taxable income =) (£)37125 A correct method of finding 20% or 40% of a relevant value. (Tax due =) (£) 850 (+ 7000) = (£)7850. (Tax paid =) (£)8920 AND a correct statement for their amount Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ , % being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	P P P P P P P P P	B1 B1 M1 A1 A1 A2 QWC 2	F.T. 'their total income' – 7475. F.T. 40% of ['their 37125' – 35000]. F.T. 'their 850' + 'their 7000'. F.T. 20% of 'their 44600'. OR showing £7850 to be 17·6% of £44600. A1 if no statement or an incorrect statement. QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.
7. *(The following are for using the two times linked to Carol as a starting point).* Looking at time differences. (Differences) 2days, 7hours, 10min (Bryn phoned on 'Wed 6.24am + 2days 7hrs 10min') Friday at 1 : 34 p.m. OR *(The following are for using the two times linked to the answering machine as a starting point).* Looking at time differences. (Differences) 1days, 4hours, 6min (Bryn phoned on 'Sat 5.40pm – 1day 4hrs 6min') Friday at 1 : 34 p.m.	 P P P P P OR P P P P P	 M1 A2 A2 OR M1 A2 A2	 Award M1 if any one of the following is being considered, Sat/Thurs OR 5pm/10am OR 40/30. A1 for one correct difference. Units not required as long as each value is unambiguously identifiable. F.T. their differences. A1 for one correct. Must have p.m. (or a.m. on a FT) or correct 24-hour time for the A2. OR Award M1 if any one of the following is being considered, Wed/Thurs OR 6am/10am OR 24/30. A1 for one correct difference. Units not required as long as each value is unambiguously identifiable. F.T. their differences. A1 for one correct. Must have p.m. (or a.m. on a FT) or correct 24-hour time for the A2.
8. 87% ≡ (£)4760000 (Last year's profit) $\frac{4760000}{87} \times 100$ = (£)5471264(.368) = (£)5470000	P P P P	B1 M1 A1 B1	Accept any indication. F.T. from above if of equivalent difficulty.

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UNIT 1 Higher Tier	P	Mark	Final Mark Scheme Comments
9. Sight of (diameter =) 49·5 (cm) Sight of (length =) 45·5 (cm) AND (width =) 32·5(cm) (Circumference =) $\pi \times 49{\cdot}5$ OR (Perimeter =) $2 \times (45{\cdot}5 + 32{\cdot}5)$ (Crcmf. =) 155·5(cm) AND (Perim. =) 156(cm) A clear statement that the length of tape around the rectangular base can be longer than the length around the circular base.	P P P P P	B1 B1 M1 A1 A1	Or (radius =) 24·75 (cm) *Ignore other values.* F.T. their values as long as 'diameter ' < 50, 'length' > 45 and 'width' > 32. Accept 155·4 to 155·6 for circumference. Accept equivalent wording as long as it is consistent with 'Perimeter' > 'Circumference'.
10. $12 \times \frac{72000}{54000}$ $\times \frac{1}{2}$ = 8 (hrs)		M1 M1 A1	Or equivalent work. Or equivalent work. C.A.O.
Ribbon marking for 11(a) and 11(b). 11(a) . $\frac{80}{360} \times 2 \times \pi \times 15$ = 20·9(4....) (cm) OR $20\pi/3$ 11(b). $\frac{360 - 80}{360} \times \pi \times 15^2$ = 549(·77...) (cm^2) OR 175π		M1 A1 M2 A1 5	 Accept 20·9 to 21 inclusive. M1 for $\frac{80}{360} \times \pi \times 15^2$ and A1 for 157(·07..) Accept 549 to 550 inclusive.
12 Use made of 'Distance / Time'. Use made of '1000 metres in 1 km'. Use made of '1 mile ≈ 1·6km'. Use made of '3600 seconds in 1 hour'. $\left[\frac{60 \times 3600}{1000 \times 1{\cdot}6 \times 3}\right]$ = 45 (mph)	 P P P P P	 M1 M1 M1 M1 A1	Candidates may earn these M marks (or some of them) in the order that they undertake each step. *(Watch out for embedded 'multiple method' steps.)* *(Ignore units at this stage.)* E.g. (i) $60/3 = 20(ms^{-1})$ $20 \times 3600 = 72000(mh^{-1})$ $72000/1000 = 72(kmh^{-1})$ 72/1·6 E.g. (ii) 1mile = 1600m (2^{nd} M1 and 3^{rd} M1) 1600/20 = 80 (1^{st} M1 implied by 20) 3600/80 (4^{th} M1) (To gain <u>all four</u> M marks then candidates must make <u>correct use</u> of each one.) *Note when part methods are earned* *E.g. 20/1600 (= 0.0125)* *M1, M1, M1, M0* A0 if any pre-approximations used.
13. (Volume of cone =) $\frac{1}{3} \times \pi \times 12^2 \times h$ (Volume of cylinder =) $\pi \times 12^2 \times 5h$ 20 litres = 20000 (cm^3) $20000 = \frac{1}{3} \times \pi \times 12^2 \times h + \pi \times 12^2 \times 5h$ $h = \frac{3 \times 20000}{144 \times \pi \times 16}$ or equivalent = 8·28(93..) (Total height =) 49·7(.....) (cm)	P P P P P P	B1 B1 B1 M1 A1 A1 A1	Accept any notation or word(s) for 'height'. B1 given only when its height is noted as 5× height of cone. F.T their '20000'. F.T. their two volumes only if of equivalent form (i.e. contains 'π' AND the <u>height of the cylinder expressed as a multiple of the height of the cone</u>.) Accept correct to 1dp. F.T. 6 × 'their 8·28(93..)'.

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Surname	Centre Number	Candidate Number
Other Names		0

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GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: Mathematics In Everyday Life

HIGHER TIER

A.M. TUESDAY, 6 November 2012

$1\frac{1}{4}$ hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **5**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**3**	
2	**4**	
3	**6**	
4	**5**	
5	**7**	
6	**4**	
7	**5**	
8	**6**	
9	**3**	
10	**3**	
11	**7**	
12	**5**	
13	**7**	
TOTAL MARK		

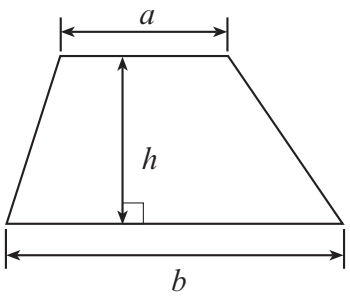
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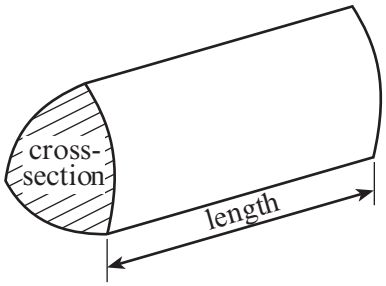
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Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

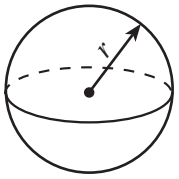


Volume of prism = area of cross-section × length



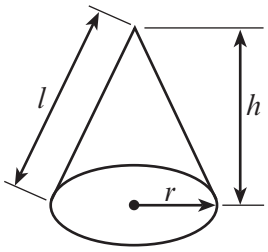
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

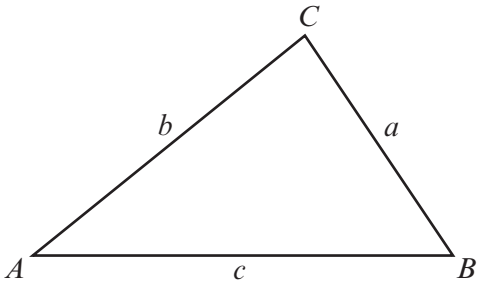


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

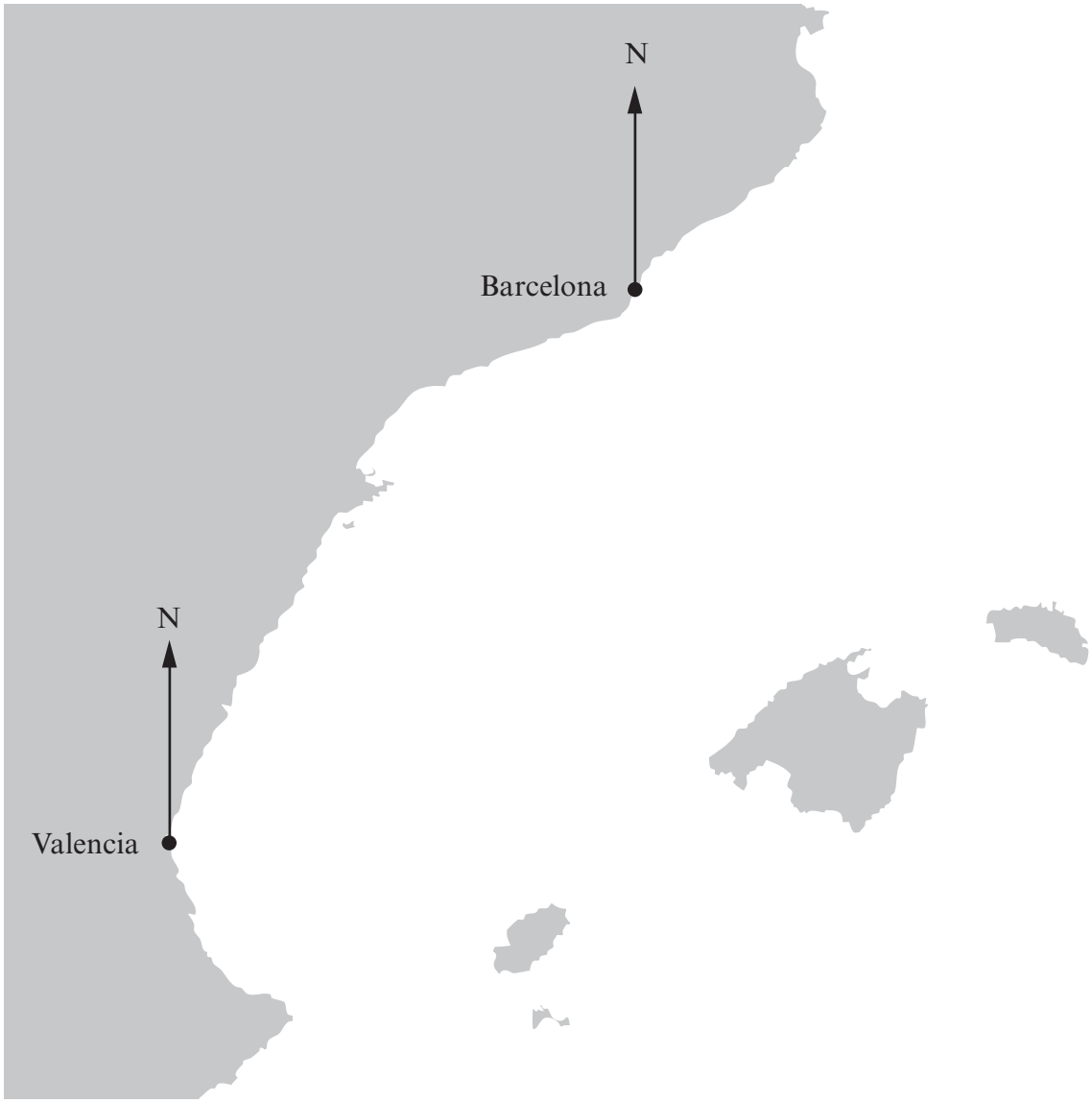
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. The map shows part of the Spanish Mediterranean coastline.



A ship is on a bearing of 070° from Valencia and on a bearing of 200° from Barcelona.
By drawing suitable lines on the diagram above, find and mark the position of the ship.

[3]

4351
020003

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Turn over.

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2. *(a)* A class sat a Geography test and a French test.
The marks gained by the pupils in these tests are summarised in the table below.

Mark	0	1	2	3	4	5	6	7	8	9	10
Number of pupils – Geography					2	4	5	13	5	1	
Number of pupils – French		2	5	4	6	5	0	4	3	0	1

(i) For which subject was there a greater range of marks?
You must give an explanation for your choice.

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[1]

(ii) **Without making any calculations**, which subject had the greater mean mark for the test?
You must give an explanation for your choice.

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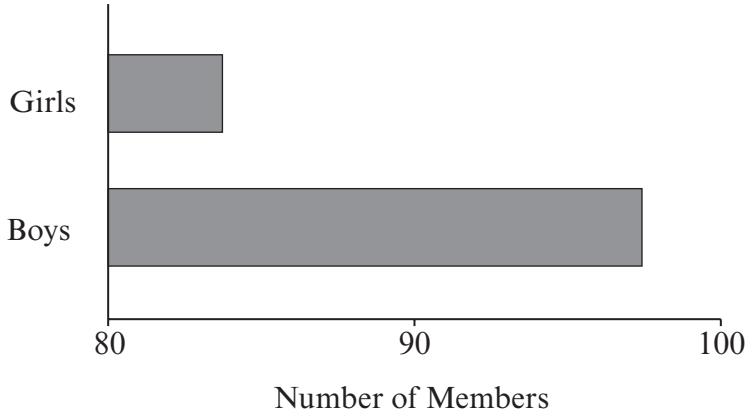
[1]

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(b) The following diagram is intended to show the number of girls and the number of boys who are members of a youth club.



In what way could the information shown in the diagram be misunderstood?

.....

.....

.....

What is the reason for this?

.....

.....

[2]

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3. Olga wants to paint one side of a garden wall.
The wall is 2 metres high and 35 metres long.

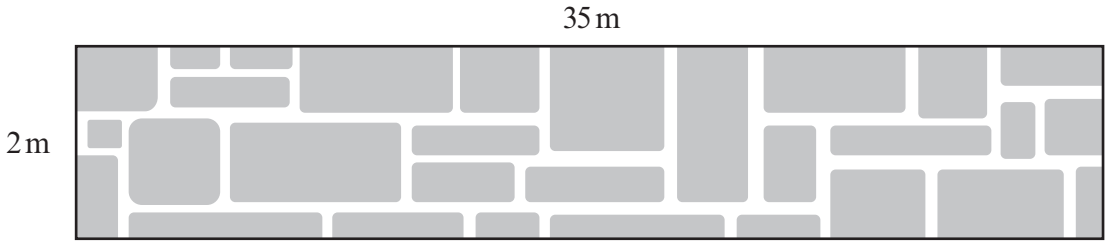


Diagram not drawn to scale

She has found the following information about the special paint that she needs.

- It is only sold in 5 litre and 2 litre tins
- One litre is enough to cover an area of 6 m^2
- The tins are sold at a price of
  - £12 for a 5 litre tin
  - £6 for a 2 litre tin

Showing all your calculations, find the least amount she has to pay for enough paint to cover the wall.

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[6]

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4. *(a)* A hollow container has a volume of $2\,m^3$.

(i) Calculate this volume when given in cm^3.

.....

.....

[2]

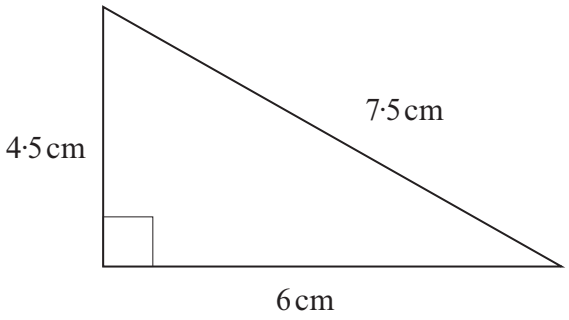
(ii) How many litres of water would this container hold when full?

.....

.....

[1]

(b) Calculate the area of the triangle below.



.....

.....

.....

.....

[2]

4351
020007

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5. *You will be assessed on the quality of your written communication in this question.*

A book store displays the following offer.



Karl wants to buy seven books costing £5.99, £7.50, £7.50, £7.99, £7.99, £10 and £10.
Karl wants to pay as little as possible for the books.

Show whether this offer is as good for Karl as another offer, which would give him 25% off the total cost of the seven books.

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[7]

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6. Heather invests £9000 for 3 years at 5% per annum compound interest.
Find the compound interest earned in the 3 years.

.....

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[4]

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7. *(a)* A British company manufactures and sells souvenir plates in France.

The profit (**P**) it makes, in pounds, is calculated using the formula

$$\mathbf{P = \frac{1{\cdot}8N - F}{E}}$$

where **N** is the number of plates sold,
F is a fixed cost, in euros, for the manufacturing process
and **E** is the exchange rate for the number of euros obtained for each pound.

When the company sells 900 plates, its profit is £1050.
Given that the exchange rate is £1 = 1.2 euros, calculate the fixed cost **F**.

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[3]

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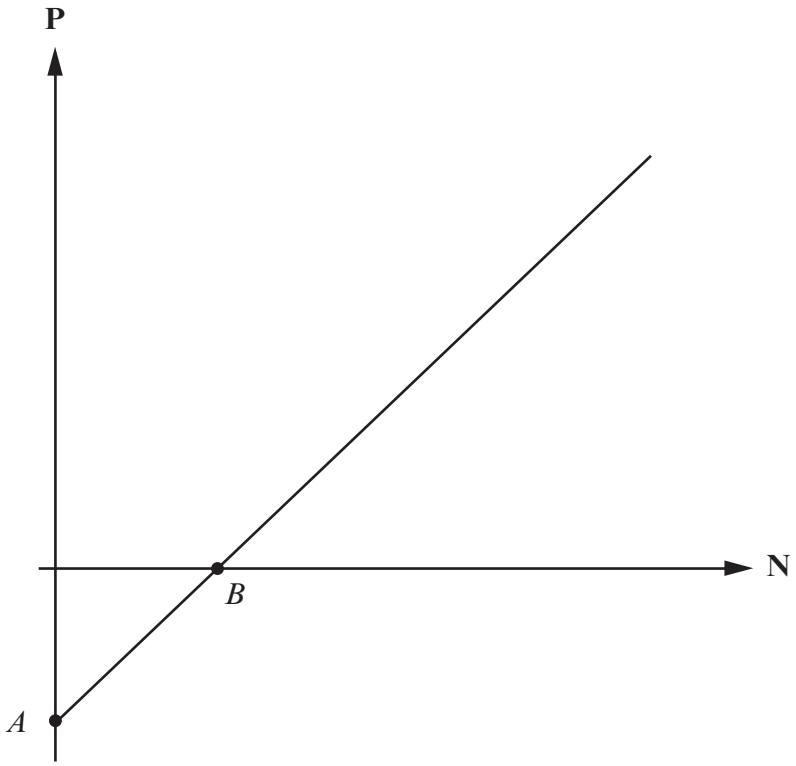
(b) A similar company is based in Britain.

The profit (**P**) it makes, in pounds, is calculated using the formula

$$\mathbf{P = 1{\cdot}5N - F}$$

where **N** is the number of plates sold
and **F** is a fixed cost, in pounds, for the manufacturing process.

The following graph is drawn using this formula.
What information is given by the points *A* and *B* on the graph?



Point *A* .....

.....

Point *B* .....

.....

[2]

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8. A jug has a capacity of 600 ml measured correct to the nearest 10 ml.

(a) Write down the least and greatest possible values of the capacity of the jug.

Least possible capacity = ... ml. Greatest possible capacity = ... ml.
[2]

(b) A tank has a capacity of 73 litres measured correct to the nearest litre.

Explain, showing all your calculations, why it is not always possible for the tank to hold water poured from 120 full jugs without overflowing.

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[4]

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9. A building firm used 3 machines to concrete an area of 600 m^2, to a fixed depth, in 5 hours.

The following day they need to concrete a further area of 1120 m^2, to the same depth, with the work being completed in 4 hours.

Given that all conditions are similar, what is the least number of machines the firm should use on the second day?

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[3]

10. This year a conservation group counted the number of trees in a park and recorded a total of 1144 trees.

They claim that there has been a reduction of 35% in the number since they last counted the trees in 2006.

How many trees were there in the park in 2006?

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[3]

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11. A company logo is in the shape of a sector of a circle as shown below.

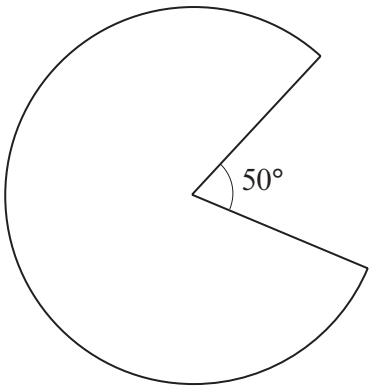


Diagram not drawn to scale

(a) The logo on the side of their headquarters uses a sector of a circle, whose radius is 3 metres.
Calculate the length of the perimeter of this logo.

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[3]

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(b) A solid metal block is made as part of a machine that prints the logo onto the company's products.
The part is made from a solid metal cylinder of radius 2 cm and height 6 cm, as shown below.

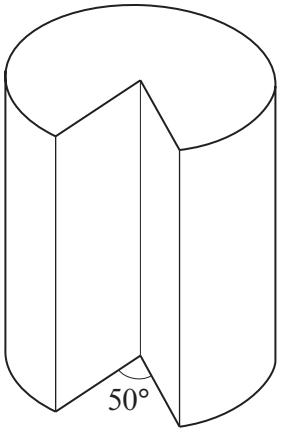


Diagram not drawn to scale

Calculate the volume of metal that has been **cut out** of the cylinder.

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[4]

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12. Two cars each travel 120 miles.
One of the cars travels the whole distance at an average speed of 50 mph.
The second car travels half the distance at an average speed of 40 mph and half the distance at an average speed of 60 mph.

What is the difference in the times taken by the two cars, in minutes, to complete the journey?

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[5]

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13. A frustum is the shape remaining when the top of a cone has been removed.

(a) Find the volume of the solid metal frustum shown below.

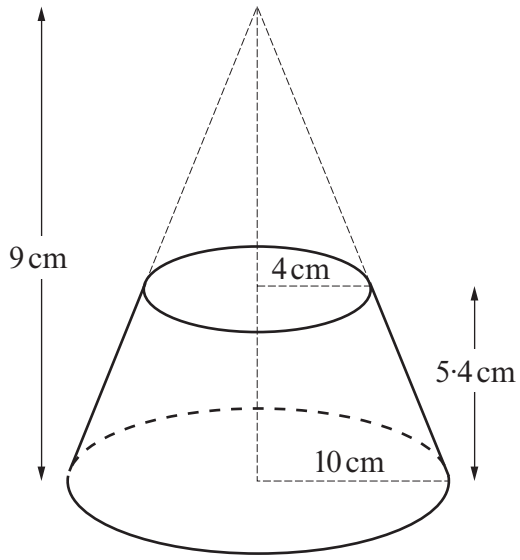


Diagram not drawn to scale

[4]

(b) The metal frustum shown above is melted down and is re-shaped into a sphere. Assuming there is no waste, what is the radius of this sphere in centimetres? Give your answer correct to two decimal places.

[3]

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

NOVEMBER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2012 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 1 - FOUNDATION TIER

UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
1. (a) Wednesday (b) 6 (hours) (c) (£)0.8(0) + (£)1.45 OR 80(p) + 145(p) = (£)2.25 or 225(p)	B1 B1 M1 A1 4	
2. (a) 24 (m^3) (b) 12 (m^2) (c) 14 m or metres	B1 B1 B1 U1 4	
3. (Cost =) 5 × (£)60 + (£)120 = (£) 420 (Each pays) (£)420 ÷ 4 (£)105	M1 A1 M1 A1 4	For intent to multiply£60 by 5 and then add £120. F.T. 'their total cost' ÷ 4.
4. Correct circle. Straight line 11cm long. Mid-point of line identified. Angle of 60° drawn (as per sketch)	 B2 B1 B1 B1 5	*Allow lengths to be ±2mm and angle ±2°.* B1 if a circle drawn but radius ≠ 3cm. 'Free-hand circle' is B0 unless within overlay tolerance. Allow this B1 even if line does not start at centre of circle BUT see below. F.T. their line length. Does not need to be at mid-point for this B1, BUT Penalise −1 once only if one end of the rod is not at centre of circle OR handle is not at mid-point.
5. (Profit week 1 =) (£)1800 (Profit week 2 =) 3 × (£)2500 − 2 × (£)700 = (£)6100 6100 ÷ 1800 OR 1800 × 3 OR 6100 ÷ 3 (3·3(....)) (5400) (2033(.33..)) A statement 'Profit has more than trebled'. Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', '£', × being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	B1 M1 A1 M1 A1 QWC2 7	For any correct method that enables a conclusion. F.T. their 'profits'. Statement alone gains M1A1 only if there are stated profits to compare. QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.

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UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments
6. (a) −7 −10 (b) 787 (c) 25	B2 B1 B1 4	B1 for each. F.T. their table. B0 for −25.
7. 24000 × 0·02 = (£)480 Janet should choose the £500 option.	M1 A1 A1 3	For any correct method of finding 2% of 24000. *<u>Alternative method</u>* *500 / 24000 × 100 M1* *= 2·08(....%) A1* A statement must be made. F.T. their '£480'. Ignore any further statements.
8. 3 or 4 angles correct and correctly labelled. 3 or 4 angles correct, labels not fully correct. 2 angles correct and correctly labelled. 2 angles correct, labels not fully correct. 1 angle correct and correctly labelled. OR <u>If 0 OR 1 for their diagram or no diagram,</u> 360/120 Angles are 54°, 72°, 105° and 129°	 B4 OR (B3) (B3) (B2) (B1) (M1) (A1) 4	Use overlay Allow ±2° Correct labels (Words NOT the frequency OR angle). 3 correct labels is enough. If only B1 is scored for the diagram, and all the angles given correctly, then cancel the B1 and award M1, A1 for 2 marks. If B0 scored for the diagram, check the angles and the method to see if the M1 and the A1 can be awarded. (1 is) 3° gets the M1. OR SC1 for all correct percentages: 15, 20, 29·2 or 29, 35·8 or 36.
9 . (a) (Time taken =) 7(hours) OR 420(min) Use of 'Distance' ÷ 'Time' = 39 (mph) OR 62·4(kph) OR equivalent. (b) $\frac{273}{40}$ × (£)6.3(0) (£)43	B1 M1 A1 M1 A1 5	 F.T. 'their time'. Any other unit of speed must be stated. *Also allow 280/40 × 6·3 OR 273/40 taken as 7gallons for M1 leading to (£)44 for A1.* (£)42.99(..) is A0. SC1 for evidence of 273/40 (=6·825) taken as 6 ×£6.30 = £38 to nearest '£'
10. (a) (i) 53 (cm) (ii) (3/9/) 2006 and (3/9/) 2007 (iii) 103 (cm) (iv) 16 (b) Comment on misleading visual appearance. e.g. 'looks as if many more boys'. Comment on 'Number' scale not starting at zero. e.g. 'only starts at 80'.	B1 B1 B1 B1 B1 B1 6	 Ignore fractions of a year e.g. 16yrs 4m or 16·3yrs Do not accept 'there are more boys'. Accept the (distinct) comments in either order.

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UNIT 1 Foundation Tier	Mark	FINAL MARK SCHEME Comments	
11. (Area =) 2×35 $= 70(m^2)$	M1 A1		
(Litres required =) $70 \div 6$ $= 11{\cdot}6(.....)$ or 12.	M1 A1	An area must be indicated for a F.T. F.T. 'their area'. A0 for 11 remainder 4 unless 12 used later.	OR <u>if area of wall found</u> Using 5×6 AND 2×6 M1 $= 30(m^2)$ AND $12(m^2)$ A1
(Need to buy) Two '5l tins' and One '2l tin'.	M1	F.T. 'their required litres'. Must be for cheapest combination possible.	F.T. their area.
(Cost =) (£)30	A1 6		
12. (a) 10×30 300 (km)	M1 A1	Accept $(10 \pm 0{\cdot}2) \times 30$. Answers in the range 294 to 306 (km) gain M1A1	
(b) Bearing of 070° from Valencia.	M1	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered.	
Bearing of 200° from Barcelona.	M1		
Position marked OR two lines intersecting.	A1 5	F.T. if at least M1 and two intersecting lines.	
13. (a) Q1. A statement regarding e.g. 'not relevant', 'confidentiality', 'too personal'	B1	For any equivalent statement. Ignore extra comments.	
Q2. 'times not exclusive' 'over what period of time?'	B1	For any **one** of these, or equivalent statement. Ignore extra comments. *SC1 if <u>both</u> correct but in reverse order.*	
(b) A criticism regarding location (biased at library) OR poor distribution method. OR does not target teenagers.	B1 3	For any **one** of these, or equivalent statement. Ignore extra comments.	
14. Showing strategy of two sets of 3 books + 1 book. 'Best' combination found. (£7.99 and £7.50 free)	S1 B1	Adding five of the prices implies this S1. Implied by sight of (£)41.48	
$\frac{25}{100} \times$ (£)56.97 $=$ (£)14.24(..)	M1 A1	Allow $0{\cdot}25 \times$ 'attempted sum of the **<u>seven</u>** prices' C.A.O.	
'Buy 3 get cheapest free' a better offer than 25% off.	B1 5	F.T. their derived amounts (must have considered at least one free book to derive one amount and must have used 25% to derive other amount). *<u>Alternative methods for M1, A1.</u>* *$\frac{(7.99 + 7.50)}{56.97} \times 100$ F.T..their 'saving'. M1* *$= 27(\cdot 18.)(\%)$ A1* *OR Comparing prices M1* *(£)41.48 (F.T..their 'saving') AND (£)42.73 or (£)42 72(....) A1*	

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UNIT 1 - HIGHER TIER

UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments	
1. Bearing of 070° from Valencia. Bearing of 200° from Barcelona. Position marked OR two lines intersecting.	M1 M1 A1 3	± 2° (use overlay). Allow the M marks for dots, crosses or any unambiguous indication that the correct bearings have been offered. F.T. if at least M1 and two intersecting lines.	
2. (a)(i) French AND reference to greater spread. (ii)Geography AND reference to 'more high marks'. (b) Comment on misleading visual appearance. e.g. 'looks as if many more boys'. Comment on 'Number' scale not starting at zero. e.g. 'only starts at 80'.	B1 B1 B1 B1 4	Mark allowed for understanding of spread. Ignore extra comments. Do not accept any explanation if based on a calculation. Do not accept e.g. 'Geography because most scored 7 (whilst in French most scored 4)' unless further understanding is shown. Ignore extra comments. Do not accept 'there are more boys'. Accept the (distinct) comments in either order.	
3. (Area =) 2×35 $= 70(m^2)$ (Litres required =) $70 \div 6$ $= 11{\cdot}6(.....)$ or 12. (Need to buy) Two '5l tins' and One '2l tin'. (Cost =) (£)30	M1 A1 M1 A1 M1 A1 6	An area must be indicated for a F.T. F.T. 'their area'. A0 for 11 remainder 4 unless 12 used later. F.T. 'their required litres'. Must be for cheapest combination possible.	OR <u>if area of wall found</u> Using 5×6 AND 2×6 M1 $= 30(m^2)$ AND $12(m^2)$ A1 F.T. their area.
4. (a) (i) $2 \times (100)^3$ $= 2000000$ (ii) 2000 (b) ½ x 4.5 x 6 $= 13.5\ (cm^2)$	M1 A1 B1 M1 A1 5	OR F.T. 'their (i)' / 1000.	

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UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
5. Showing strategy of two sets of 3 books + 1 book. 'Best' combination found. (£7.99 and £7.50 free) $\frac{25}{100}$ × (£)56.97 = (£)14.24(..) 'Buy 3 get cheapest free' a better offer than 25% off. Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ and % being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	S1 B1 M1 A1 B1 QWC2 <

UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
7. (a) $1050 = \frac{1{\cdot}8 \times 900 - F}{1{\cdot}2}$	B1	For correct substitution.
$(F =) \ 1{\cdot}8 \times 900 - 1050 \times 1{\cdot}2$	M1	Accept $1050 \times 1{\cdot}2 - 1{\cdot}8 \times 900 \ (= -F)$
$(F =)$ 360 (euros)	A1	A0 for –360
(b) Indicates that point A is linked to the fixed cost or that no plates were sold.	B1	Accept any unambiguous equivalent statements. B0 for e.g. 'making a loss' unless there is some reference to the fixed cost or that no plates were sold.
Indicates that point B shows number of plates that must be sold in order to break even.	B1 5	Accept e.g. 'minimum sold in order to start making a profit'.
8. (a) Least capacity = 595 Greatest capacity = 605	B1 B1	Accept 604·999...recurring.
(b) Greatest volume = 120 × 605	M1	F.T. 'their greatest capacity' only if > 600. Ignore other multiplications seen
= 72600(ml) OR 72·6(litres)	A1	
Indicates that 'smallest tank' holds 72500(ml) OR 72·5(litres)	B1	
A statement that there is a possibility of overflowing.	E1 6	F.T. logical statement. Numerical errors are allowed but must remain consistent with the possibility of overflowing. *Note also the correct division arguments* *'72·5 /0·605 = 119·3(...) which is less than 120' OR* *'72·5 /120 = 0·604(1..) which is less than 0·605'.*
9. *Area* *Time* *Machines* *600* *5* *3*		
....	M1	For correctly arriving at a row with (area)1120 OR (time) 4.
....	M1	F.T. above row to 'correctly' arrive at a row with (area)1120 AND (time) 4.
1120 *4* **7** (Watch out for compensating errors)	A1 3	C.A.O. with the answer evaluated. If no marks gained allow SC1 for sight of '40m^2 per machine per hour' or equivalent OR sight of 7/3 or equivalent. *Alternative method* $3 \times \frac{1120}{600}$ *M1* $\times \frac{5}{4}$ *M1* *= 7 (machines)* *A1*
10. 65% ≡ 1144 (Original number) $\frac{1144}{65} \times 100$ = 1760	B1 M1 A1 3	Accept any indication. C.A.O.

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UNIT 1 Higher Tier	Mark	FINAL MARK SCHEME Comments
11. (a) $\frac{310}{360} \times 2 \times \pi \times 3$	M1	
$= 16{\cdot}2(...)$	A1	
(Perimeter =) $22{\cdot}2(..)$(m)	A1	F.T. 'their 16·2' + 6. SC1 for 2·6(....) (*using 50° instead of 310°.)* SC2 for 8·6(....) *In part (b) treat finding the volume of the 'metal left' as a misread and mark accordingly.*
(b) (Area of cross section) $\frac{50}{360} \times \pi \times 2^2$	M1	
$= 1{\cdot}74(5....)(cm^2)$ or $5\pi/9$ or equivalent	A1	
(Volume) $1{\cdot}74(5..) \times 6$	M1	F.T. their derived <u>area.</u>
$= 10{\cdot}4(7...)(cm^3)$ or $10{\cdot}5(cm^3)$ or $10\pi/3$ or equivalent.	A1	*<u>Alternative method</u>* (Volume of cylinder) $\pi \times 2^2 \times 6$ M1 $= 75{\cdot}4...(cm^3)$ or 24π A1 F.T their derived <u>volume</u>. (Volume removed) $\frac{50}{360} \times 75{\cdot}4$ M1 $= 10{\cdot}4(7...)(cm^3)$ or $10{\cdot}5(cm^3)$ or $10\pi/3$ or equivalent. A1
	7	
12. Use of 'Distance' / 'Speed'	M1	Ignore units used
<u>First car</u> (120 / 50) = 2·4 (hrs) or 2(hrs) 24(min) or equivalent.	A1	
<u>Second car</u> $\frac{60}{40} + \frac{60}{60}$	m1	Must show intent to add.
= 2·5 (hrs) or 2(hrs) 30(min) or equivalent.	A1	
Time difference = 6 (min)	A1	F.T. 'their two times'.
	5	
13. (a) Sight of $\frac{1}{3} \times \pi \times 10^2 \times 9$ OR $\frac{1}{3} \times \pi \times 4^2 \times 3{\cdot}6$	M1	For correct substitution(either cone)
300π or $942{\cdot}(47..)(cm^3)$	A1	Accept 942 to 943 inclusive.
$19{\cdot}2\pi$ or $60{\cdot}3(1..)(cm^3)$	A1	Accept 60·2 to 60·4 inclusive.
(Volume of frustum =) $280{\cdot}2\pi$ or $882{\cdot}1(...)(cm^3)$	A1	F.T. 'their two derived volumes'.
(b) $\frac{4}{3} \times \pi \times (\text{radius})^3 = 882{\cdot}1$	M1	F.T. 'their frustum volume'
$(\text{radius})^3 = \frac{882{\cdot}1 \times 3}{4 \times \pi}$ (210·6)	A1	
Radius = 5·9(5..)(cm)	A1	F.T. 'their $(\text{radius})^3$'. Accept an answer of 6 if previous M1, A1 awarded.
	7	

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: MATHEMATICS IN EVERYDAY LIFE

HIGHER TIER

P.M. MONDAY, 11 June 2012

$1\frac{1}{4}$ hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **2**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**4**	
2	**8**	
3	**5**	
4	**3**	
5	**2**	
6	**4**	
7	**3**	
8	**4**	
9	**5**	
10	**6**	
11	**3**	
12	**4**	
13	**7**	
14	**7**	
TOTAL MARK		

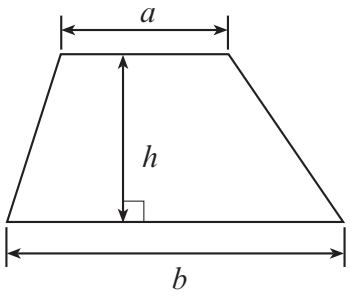
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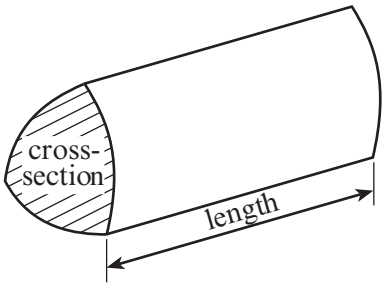
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

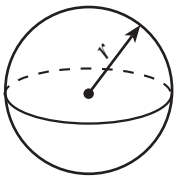


Volume of prism = area of cross-section × length



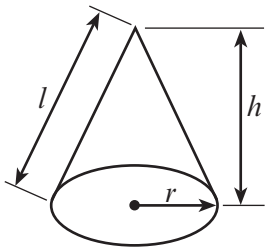
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi r l$

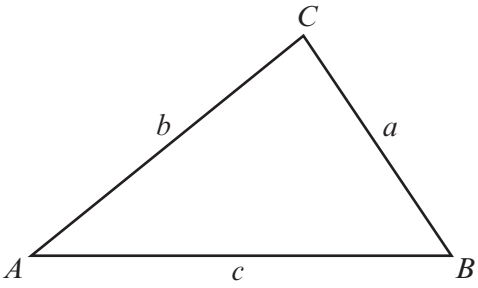


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. A town's drama club carried out a survey by asking people questions as they left the local theatre on a Saturday night.
Part of the survey questionnaire is shown below.

1. Are you interested in drama? Tick (✓) one box only.

No interest ☐ Some interest ☐ Very interested ☐

2. How old are you?

Under 12 ☐ 12 to 20 ☐ 21 to 50 ☐ 50 to 75 ☐

3. Why would you not come to see another production?
What puts you off coming again?

.....

.....

(a) Explain why this is a biased survey.

.....

.....

[1]

(b) State **two** criticisms about the design of **question 2** in the survey.

(i) .....

.....

[1]

(ii) .....

.....

[1]

(c) What is the problem with the design of **question 3** in the survey?

.....

.....

[1]

4351 020003

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2. *You will be assessed on the quality of your written communication in this question.*

Ellen has received her gas bill for the period January to April.
The details of the bill are as follows.

- Number of units of gas used is 9745.
- The cost of one unit of gas is 2.12 pence.
- The number of days in this period is 90.
- The Standing Charge is 12.4p per day.
- VAT at 5% is charged on the total gas bill.

Find, showing all your calculations, the cost of Ellen's gas bill including VAT.

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[8]

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3. A French bus company runs a service from Cherbourg to Rennes, a distance of 172 kilometres. Thierry catches the 13:45 bus at Cherbourg and arrives in Rennes at 16:15.

What was the average speed of the bus in **miles per hour**?

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[5]

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Turn over.

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4. The table below shows the number of different priced season tickets that a football club sold last season.

Cost of ticket (£)	Number sold
250	6000
300	8000
350	8000
500	3000

Calculate the mean cost of the season tickets sold last season.

.....

.....

.....

.....

.....

.....

[3]

5. Find $\sqrt{6{\cdot}8^3}$ to 3 significant figures.

.....

.....

[2]

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6. Arnold went to buy some golf balls.
They were priced at £2 each, but a box of 15 balls could be bought at a discount price of £24.

What was the percentage discount being offered when buying a box of 15 balls?

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[4]

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7. The following is a formula that is used by engineers to measure how far an object travels in a straight line under certain conditions.

$$s = ut + \frac{1}{2}at^2$$

- s is the distance travelled
- u is the object's initial velocity
- a is the acceleration of the object
- t is the time taken

The initial velocity of an object is 20 metres per second.
It travels a distance of 100 metres in 4 seconds.
Find the acceleration of the object.

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[3]

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8. A 1200-litre tank initially contains 200 litres of water.
A valve is then opened, which allows 150 litres of water to flow into the tank every hour.

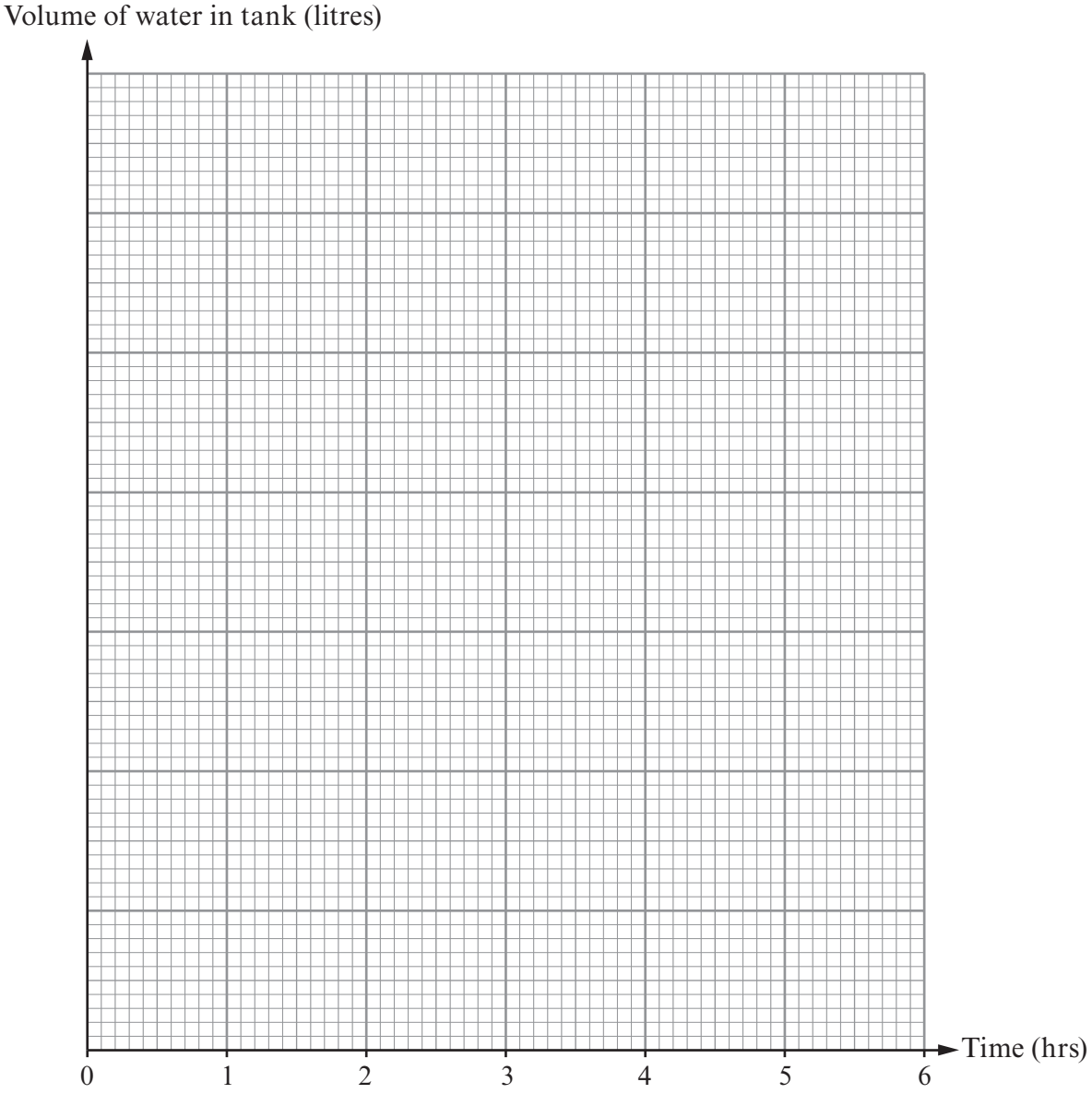
(a) On the graph paper below draw a line that will show the amount of water in the tank at any time up to 6 hours after the valve was opened.

.....

.....

.....

[3]



(b) How much water was in the tank after 2 hours and 48 minutes?

.....

[1]

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9. A company orders a metal machinery part that is a cube with a cylindrical hole drilled through it.
The metal cube has sides of length 17 cm and the cylindrical hole has a radius of 4 cm.

Calculate the volume of metal in the machinery part ordered.

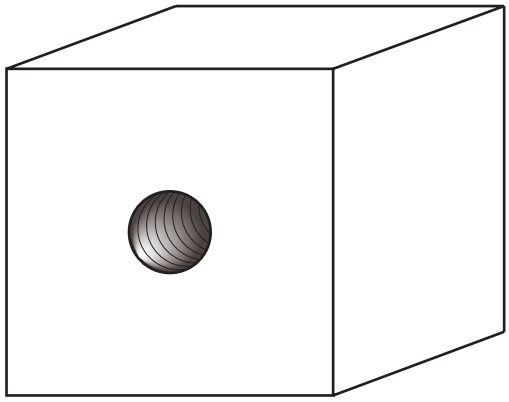


Diagram not drawn to scale

[5]

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10. The length of the edge of a wooden cube is 4·5 cm, measured correct to the nearest mm.

(a) Write down the least and greatest possible length of the edge of the cube.

Least length ..... cm Greatest length ..... cm
[2]

(b) The length of a shelf is 190 cm, measured correct to the nearest 10 cm.

Explain, showing all your calculations, why it is not certain that you can place 41 of the cubes, side by side, along the shelf.

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[4]

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11. Carys invested some money in a new bank account that paid interest at 4% per annum.
No further deposits or withdrawals were made.
At the end of one year she had £884 in this account.

How much money did Carys originally invest?

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[3]

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12. Machine A is three times as quick as Machine B in assembling identical circuit boards. Machine A is allocated two and a half times as many of these circuit boards to assemble than is allocated to Machine B.

Machine B took 4 hours to assemble all of its allocation.

How long did it take for Machine A to complete its allocation? Give your answer in hours and minutes.

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[4]

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13. A plot of land $ABCDE$ is shown below where $AB = 15\,\text{m}$, $BC = 10\,\text{m}$, $CD = 15\,\text{m}$, $A\hat{B}C = 90°$, $B\hat{C}D = 90°$ and $B\hat{A}E = 160°$.
DE is an arc of a circle with centre at A.

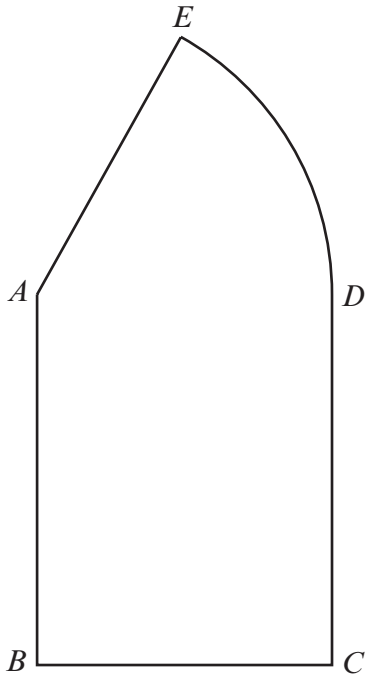


Diagram not drawn to scale

(a) Calculate the perimeter of the plot of land.

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[4]

(b) Calculate the area of the plot of land.

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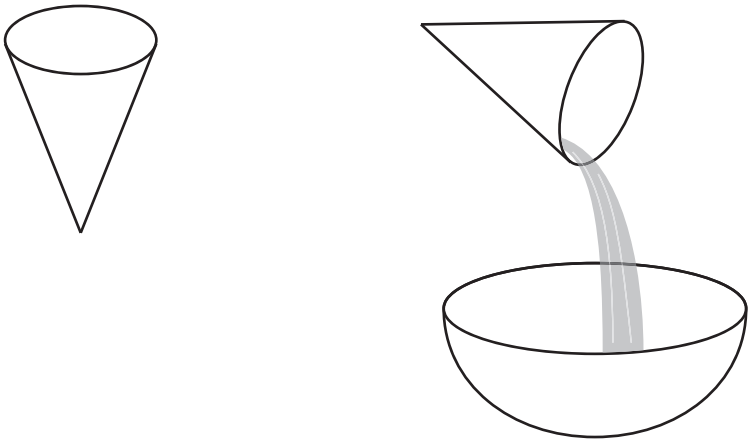
[3]

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14. A water feature consists of a cone-shaped container filling up with water which, when full, tips its contents into a hemispherical bowl.



Mr Davies buys a cone-shaped container, which has a radius of 19·8 cm and a height of 15 cm.

The hemispherical-shaped containers are produced in various sizes.
Each hemispherical container holds a **whole** number of litres, ranging from 2 litres to 10 litres.

What is the diameter, correct to the nearest mm, of the smallest possible hemispherical bowl that Mr Davies should buy in order to collect all the water from his cone-shaped container?

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[7]

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Question number	Additional page, if required. Write the question numbers in the left-hand margin

Examiner only

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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UNIT 1 (FOUNDATION TIER)

JUNE 2012 UNIT 1 Foundation	Mark	FINAL MARK SCHEME Comments
1. (a) (i) Twenty thousand six hundred and eight. 13 079. (ii) 33 700	B1 B1 B2	Ignore incorrect spelling. F.T. their votes in figures for F. Dodd. B1 for sight of 33687 (or an accurate F.T. total)
1. (b) (Football pitch) metre (Thickness of letter) millimetre	 B1 B1	Accept any unambiguous indication of correct choice.
2. (a) 72 90 (b) Laura's by 18(cm)	B1 B1 B1	 F.T. their measurements.
3. Indicates that 3 games are won. (2 × 0 +) 5 × ½ + 3 × 1 = 5½ ISW	B1 M1 A1	This may be implied. Two out of 0, 2½ and 3 AND added gains an M1. F.T. their number of winning games if > 0.
4. (a) Tue Sat – 2(°C) – 5(°C) (b) 7(°C)	B2 B1	B1 for each. F.T. from their table. Do not accept –7(°C).
5. 55 × (£)1.24 OR 55 × 124(p) (£)68.2(0) OR 6820(p) 181 × (£)0.08 OR 181 × 8(p) (£)14.48 OR 1448(p) (Water Charge =) (£)82.68 OR 8268(p)	M1 A1 M1 A1 A1	 F.T. their amounts only if using consistent units.

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JUNE 2012 UNIT 1 Foundation	Mark	FINAL MARK SCHEME Comments
6. (Hire of hall) $4 \times$ (£)20 = (£)80 (Total cost =) (£)230 128 × (£)5 (Income =) (£)640 (Profit =) (£)640 – (£)230 = Profit of (£)410 Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 A1 M1 A1 M1 A1 QWC 2	F.T. 150 + 'their 80'. F.T. their values. Must indicate 'Profit' (or 'Loss' if so on F.T.). QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar
7. (a) Plotting all three points correctly. Line drawn through their points. (b) 32. (c) 18(°C) AND a clear reason given.	P2 L1 B1 B1	P1 for 2 correct plots. A correct line implies P2. F.T. their **three** plots. Allow curve or 'dog leg' only if P2 not gained. F.T. their line. Allow ± ½ 'small square'. Some **correct** use of their graph required. For an accurate graph (or no graph) 18°C needs to be equated to 64°F to 65°F OR 60°F needs to be equated to 15°C to 16°C. Do not accept 'its higher on the line' unless their line has been clearly marked at 60°F and 18°C.
8. (a) (Area =) 1·4 × 0·8 = 1·12 (km^2)	M1 A1	
8. (b) Position of point B due east of point A. AB = 10cm, AC = 6cm and BC = 7·5 cm.	 B1 B3	***Use overlay***. *Do not penalise those who use their own point A.* Allow ± 2°. B1 for each correct length. Allow ± 2mm. There is no requirement to join the points together. *Treat a consistent use of a different scale as a misread.*
9. (a) 800 × 1·57 = ($)1256	M1 A1	
9. (b) (Cost of coat =) 199 ÷ 1·57 = (£)126.7(5...) (To nearest pound =) (£)127	M1 A1 A1	 F.T. their amount.

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JUNE 2012 UNIT 1 Foundation	Mark	FINAL MARK SCHEME Comments
10. (a) (Mode =) 1 (day absent)	B1	Allow B1 for 1 day and 4 workers. B0 for 4 workers.
(b) (0 × 3) + 1 × 4 + 2 × 2 + 20 × 1 (28)	M1	For the intent to multiply values by their frequencies and then add.
÷ 10	m1	
= 2·8	A1	
(c) A valid reason given e.g. 'Only one worker was absent for more than 2·8 days'. 'Most workers were absent for 0,1 or 2 days'. 'Applies to the majority'. 'Most common one'.	M1	Do not accept e.g. '2·8 is not a full day' or 'It is simpler' or 'It is more accurate' or 'It is clearer', unless accompanied by a valid and acceptable response.
(The) Mode	A1	'The Mode' chosen with no valid reason is M0A0. If 'Mean' chosen then M0A0 whatever reason given.
11. Sight (time taken) 2hrs 30min or 2·5(hrs)	B1	Allow 2:30, 2.30, 2 30 and 2·3(0). Also allow 150(min).
(Speed km.ph) 172 / 2·5	M1	F.T. 'their time taken' in hours. Use of 2·3 is M1A0 (but does imply previous B1).
= 68·8 (k.p.h)	A1	Ignore incorrect units at this stage.
68·8 × 5/8	M1	F.T. their speed in km.ph. Allow M3 for 172 / 2·5 × 5/8.
= 43 (mph)	A1	F.T. answers should be accurate to at least 1d.p. *Alternative method.* Sight (time taken) 2hrs 30min. B1 172 × 5/8 M1 =107·5 A1 107·5 / 2·5 M1 F.T. 'their 107·5' = 43(mph) A1 and 'their time'.
12. Three different valid comments. e.g. 'Not representative of population'	B3	*Ignore irrelevant statements.* B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by age, gender or interest group). Do not give more than one mark for similar criticism(s).Reference to location should only be credited once.
'A leading question', 'What is meant by too much?' 'Not relevant to the hypothesis being tested' 'Asking an opinion (not fact)'		(criticisms of question (i))
'Does not specify over what period of time', 'Does not specify at what time (night or day)' 'Better with tick boxes'.		'is it per night or per week?' (a criticism of question (ii))
'Might get a poor response'		'people will forget or not bother (to post or complete them)'
13. 17·7	B2	B1 for 17·73(22.....) B1 for 17·70
14. Sight of (£)30 (15 individual balls) OR Sight of (£)1.60 (single ball in the box)	B1	
(Difference in price =) (£)6 OR 40(p)	B1	F.T. their amounts.
Use of 6/30 × 100 OR 40/200 × 100	M1	F.T. their price difference.
= 20(%)	A1	

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UNIT 1 (HIGHER TIER)

JUNE 2012 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments
1. (a) Valid reason, e.g. 'only those interested in drama will be leaving the theatre', 'Q3 assumes you won't return'.	B1	Accept reference to location or to Q3 *Ignore additional information given by candidates once a correct response has been given credit.*
1. (b) (i) / (ii) Any reference to two of the following. '50 appears in two boxes' 'no over 75 box' 'people might object to giving their age', 'too personal'.	B1 B1	*Ignore additional information given by candidates once a correct response has been given credit.* Do not accept 'not relevant' or 'different age gaps'.
1.(c) Valid reason, e.g. 'asks the same thing twice', 'vague', 'difficult to collect responses', 'people have to write answer', 'better to have tick boxes', 'biased', 'negative', 'leading question', 'taken for granted you won't return	B1	*Ignore additional information given by candidates once a correct response has been given credit.*
2. Sight of 9745 × 2·12 OR 90 × 12·4 (£)206.59(4) or 20659(.4)(p) (£)11.16 or 1116(p) (Cost without VAT) (£)217.75(4) or 21775·4(p) (Bill =) 217.75 × 1·05 or equivalent = (£)228.64 or 22864(p) Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £, % being appropriate) • final answer in £ QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 A1 A1 M1 A1 QWC 2	Accept (£)206.60 or 20660(p) . Do not accept incorrect units but do allow £206.59p and £11.16p. F.T. 'their two amounts'. F.T. 'their cost' in £s or in pence. Allow ± 1p but answer must be a whole number of pence. QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar
3. Sight (time taken) 2hrs 30min or 2·5(hrs) (Speed km.ph) 172 / 2·5 = 68·8 (k.p.h) $68·8 \times \frac{5}{8}$ = 43 (mph)	B1 M1 A1 M1 A1	Allow 2:30, 2.30, 2 30 and 2·3(0). Also allow 150(min). F.T. 'their time taken' in hours. Use of 2·3 is M1A0 (but does imply previous B1). Ignore incorrect units at this stage. F.T. their speed in km.ph. Allow M3 for 172 / 2·5 × 5/8. F.T. answers should be accurate to at least 1d.p. *Alternative method.* Sight (time taken) 2hrs 30min. B1 172 × 5/8 M1 =107·5 A1 107·5 / 2·5 M1 F.T. 'their 107·5' = 43(mph) A1 and 'their time'.

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JUNE 2012 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments
4. Attempt at $\sum f \times x$ (8200000) Division by $\sum f$ (25000) (Mean cost =) (£)328	M1 m1 A1	 C.A.O.
5. 17·7	B2	B1 for 17·73(22.....) B1 for 17·70
6. Sight of (£)30 (15 individual balls) OR Sight of (£)1.60 (single ball in the box) (Difference in price =) £6 OR 40(p) Use of $\frac{6}{30} \times 100$ OR $\frac{40}{200} \times 100$ = 20(%)	B1 B1 M1 A1	 F.T. their amounts. F.T. their price difference.
7. $100 = 20 \times 4 + ½ \times a \times 4^2$. $a = \frac{100 - 20 \times 4}{4^2} \times 2$ $= 2{\cdot}5\ (ms^{-2})$	B1 B1 B1	For correct substitution. Allow for correct intent. C.A.O. Accept an embedded answer.
8. (a) Appropriate uniform scale on vertical axis. Line starts at (0, 200). Straight line with correct gradient (150 *l*/h). (b) 620(litres)	B1 B1 B1 B1	Must allow for all plots up to 6 hours. Need not start at 0. Accept plot at (0,200) if no line drawn. F.T. their graph ± ½ 'small square'.
9. Sight of 4913. (Volume of metal removed) $\pi \times 4^2 \times 17$ $= 854(\cdot5..)(cm^3)$ (volume of part =) $4913 - 854{\cdot}5$ $= 4058(\cdot5)$	B1 M1 A1 M1 A1	 Accept 853 to 856 inclusive OR 272π. F.T. 'their two derived volumes'.
10. (a) Least length = 4·45 Greatest length = 4·55 (b) Greatest length = $41 \times 4{\cdot}55$ = 186·55(cm) Indicates that 'smallest shelf' is 185(cm) A statement that the cubes will not fit	B1 B1 M1 A1 B1 E1	 Accept 4·54999...recurring. F.T. 'their greatest cube' only if > 4·5. Ignore other multiplications seen. This mark is dependent on M1 gained. F.T. logical statement. *Look out for logical thinking when working with values other than 4·55 and/or 185. Some, or possibly all, of the marks available in part (b) may be gained.* Values must remain consistent with the shelf not always being long enough for the award of the E1 mark. *Alternative method* *'Smallest shelf' = 185(cm)* *B1* *185 / 4·55* *M1* *= 40·6(....)* *A1* *Clear explanation that 40·6 < 41and so cubes are not certain to fit* *E1* *Alternative method* *'Smallest shelf' = 185(cm)* *B1* *185 / 41* *M1* *= 4·51(....)* *A1* *Clear explanation that 4·51 < 4.55and so cubes are not certain to fit* *E1*

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JUNE 2012 UNIT 1 Higher	Mark	FINAL MARK SCHEME Comments
11 104% ≡ (£)884 (Original investment) $\frac{884}{104} \times 100$ = (£)850	B1 M1 A1	Accept any indication.
12. $4 \div 3$ OR $4 \times \frac{1}{3}$ $\times 2\frac{1}{2}$ OR equivalent = 20/6(hrs) or equivalent OR 3·33(...)(hrs) OR 200(min) 3hrs 20min	M1 M1 A1 A1	Do not accept 20÷6 until it is evaluated. F.T. if at least one M1 and of equivalent difficulty. *If question is misread as 'It took Machine **A** 4 hours ....How long did it take Machine **B**.....?' award* *SC1 for (4 × 3) / 2½ or 4·8 hours and a further* *SC1 for 4hrs 48min.*
13 (a) Sight of (angle DAE =) 70°. (length of arc DE =) $70/360 \times 2 \times \pi \times 10$ 12·2(....) Perimeter = 62·2(.....)(m) (b) (area of rectangle =) 150(m^2) (area of sector =) $70/360 \times \pi \times 10^2$ (61·08..) Area of land = 211(·08..)(m^2)	B1 M1 A1 A1 B1 M1 A1	Seen or implied in calculations or on the diagram. F.T. 'their 70°' Their 12.2 + 50 F.T. 'their 70°' BUT must be the same as for (a).
14. (Volume of cone) $\frac{1}{3} \times \pi \times 19{\cdot}8^2 \times 15$ = 6158(·14..)(cm^3) '7 litre' or 7000(cm^3) (hemisphere required) $2/3 \times \pi \times r^3 = 7000$ $r^3 = \frac{7000 \times 3}{2 \times \pi}$ (3342) r = 14·95(..)(cm) (Diameter =) 29·9	M1 A1 B1 M1 m1 A1 A1	 Accept answers between 6155 and 6161. F.T. their volume in cm^3. F.T. their volume in cm^3 if not whole litre. Accept to 1dp but may lose final A1. F.T. 2 × 'their radius' to nearest mm. Pre approximation of their radius may result in A0. *If $4/3\pi r^3$ used allow* *SC1 for r = 11·86(..) and a further* *SC1 for d = 23·7*

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Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)
UNIT 1: MATHEMATICS IN EVERYDAY LIFE
HIGHER TIER

A.M. WEDNESDAY, 11 January 2012

$1\frac{1}{4}$ hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

Take π as 3⋅14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **7**.

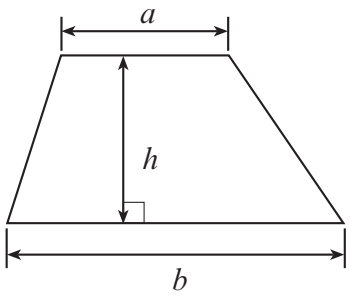
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**4**	
2	**5**	
3	**3**	
4	**3**	
5	**4**	
6	**4**	
7	**7**	
8	**3**	
9	**3**	
10	**4**	
11	**4**	
12	**4**	
13	**6**	
14	**5**	
15	**6**	
TOTAL MARK		

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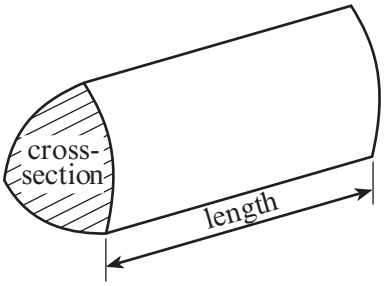
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Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

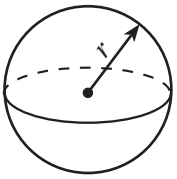


Volume of prism = area of cross-section × length



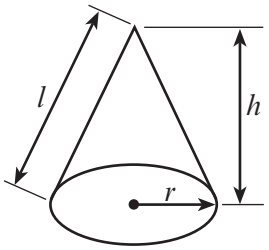
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

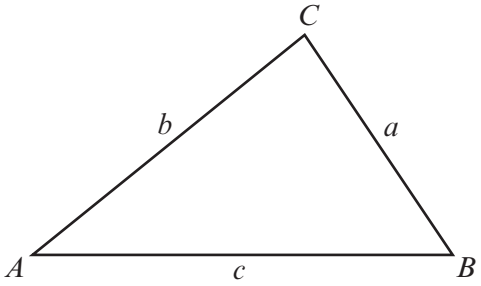


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. An agricultural college tested the fruit yield from two different varieties of trees. They conducted the test for 3 years.

Tree A produced 225 kg of fruit in its first year but the weight was reduced by $\frac{1}{3}$ of the previous yield for each of the next two years.

Tree B produced 200 kg of fruit in its first year but the weight was reduced by 20% of the previous yield for each of the next two years.

Showing all of your calculations, find which tree produced the most fruit in the third year, and by how many kilograms.

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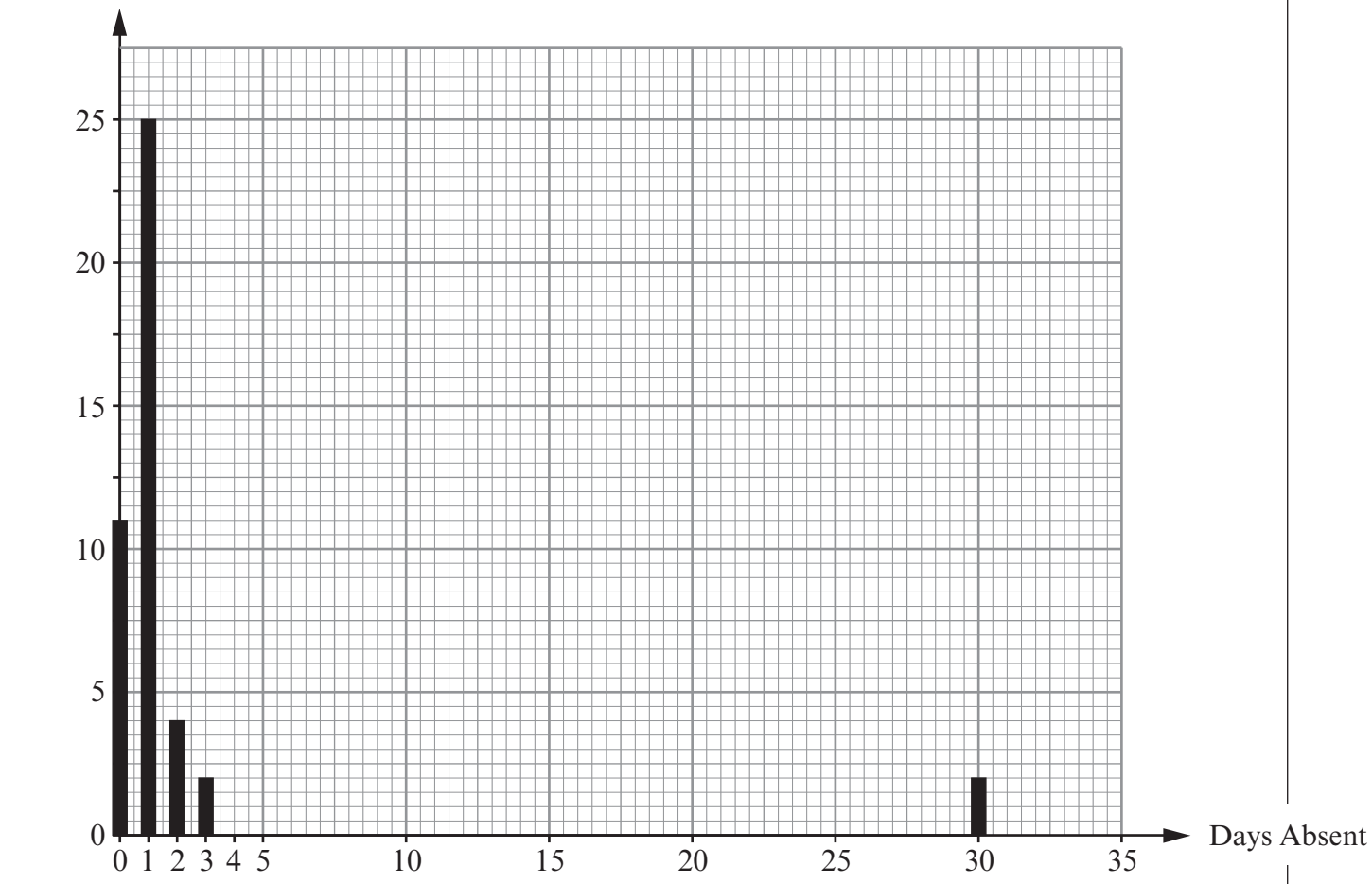
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2. *(a)* A factory employs 44 people.
The diagram below shows the distribution of the number of days' absence for each of these workers during the last three months.



(i) Calculate the mean number of days' absence of the workers.

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[3]

(ii) Why do you think this mean is a poor indicator for the average number of days' absence for these workers?

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[1]

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(b) Why would it not be helpful, when calculating the mean, to show the information as a table with equal group intervals of 5 days starting with 0 to 4 days?

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[1]

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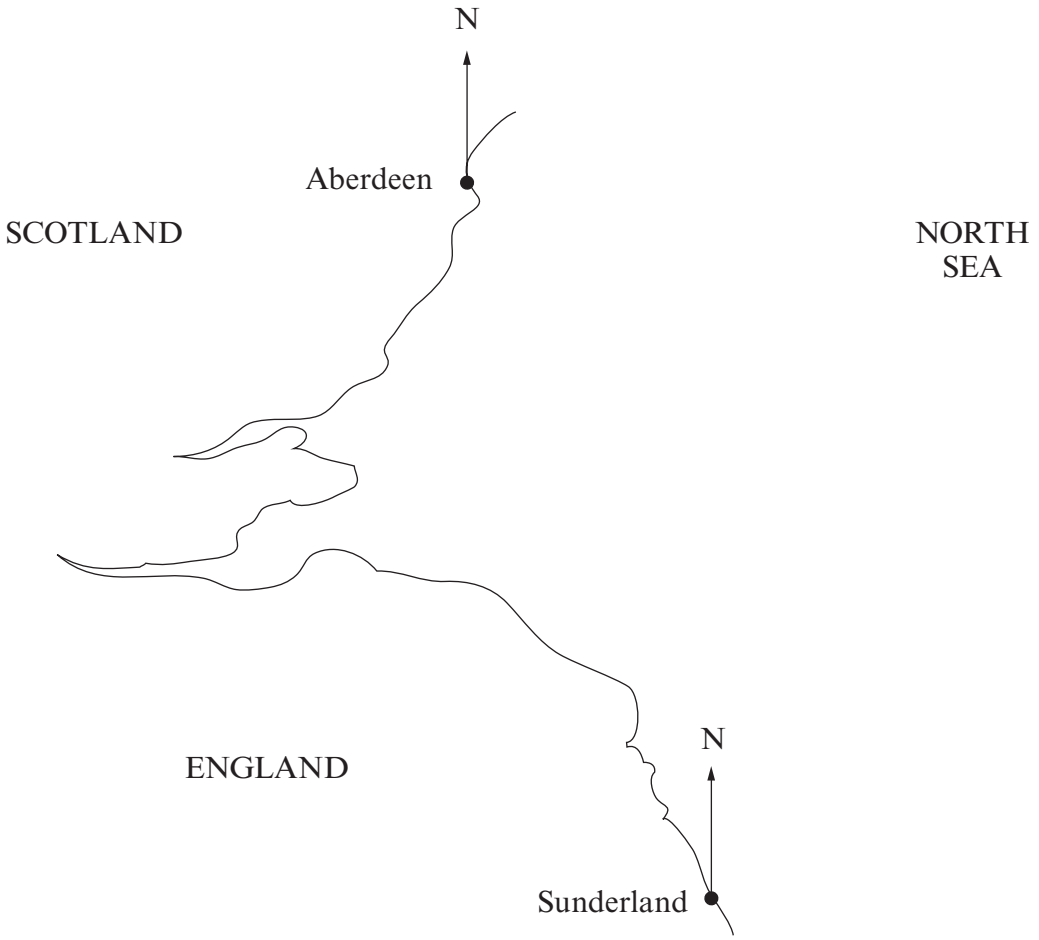
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3. An oil ship is sailing in the North Sea.
It is 150 km from Sunderland on a bearing of 065°.

Plot its position on the diagram below and give its bearing from Aberdeen.

Scale : 1 cm represents 25 km



The bearing of the ship from Aberdeen is .....

[3]

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4. Sian is driving along a road in Germany, which has a speed limit of 80 km per hour. She is driving at 55 mph.

By how much is her speed above or below the speed limit?

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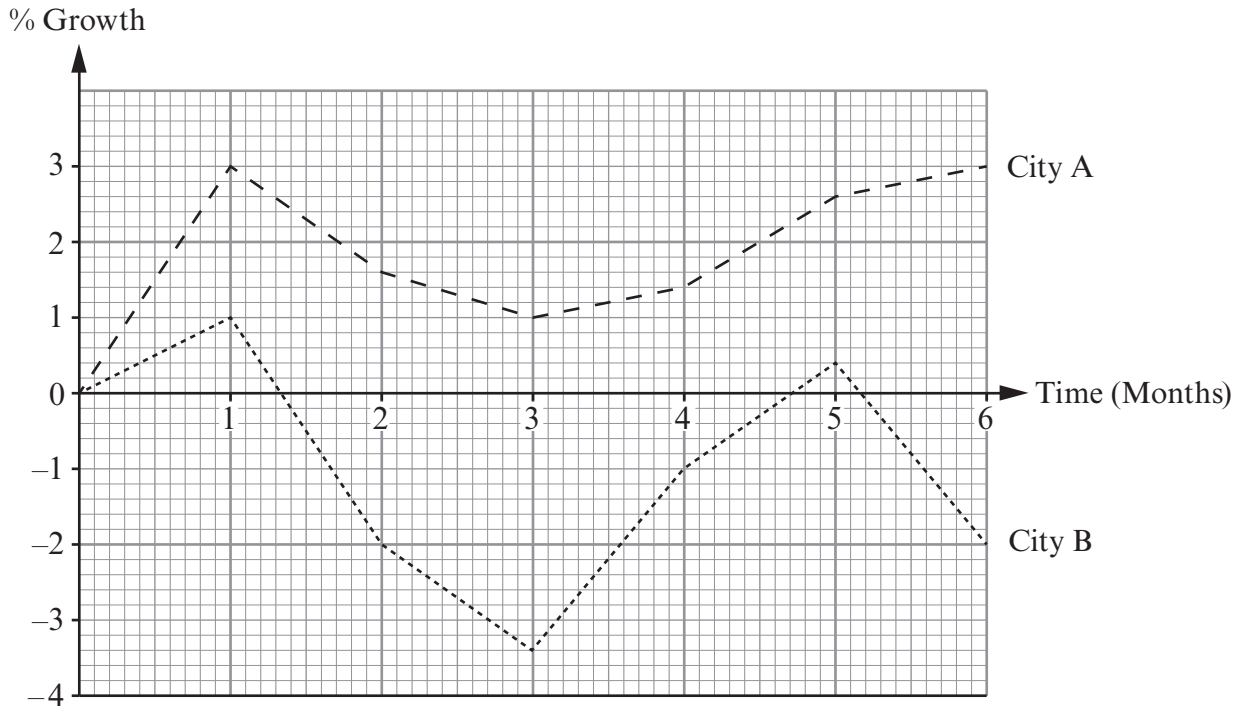
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5. *(a)* A newspaper displayed a graphical representation to compare the percentage growth in reported crimes in two cities (A and B) over a period of six months.

REPORTED CRIME: % Growth in City A and City B



(i) What is the difference in the percentage growth in reported crime between the two cities at the end of the six months?

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[1]

(ii) Can we say from the graph that there is more reported crime in city A than in city B? You must give an explanation for your answer.

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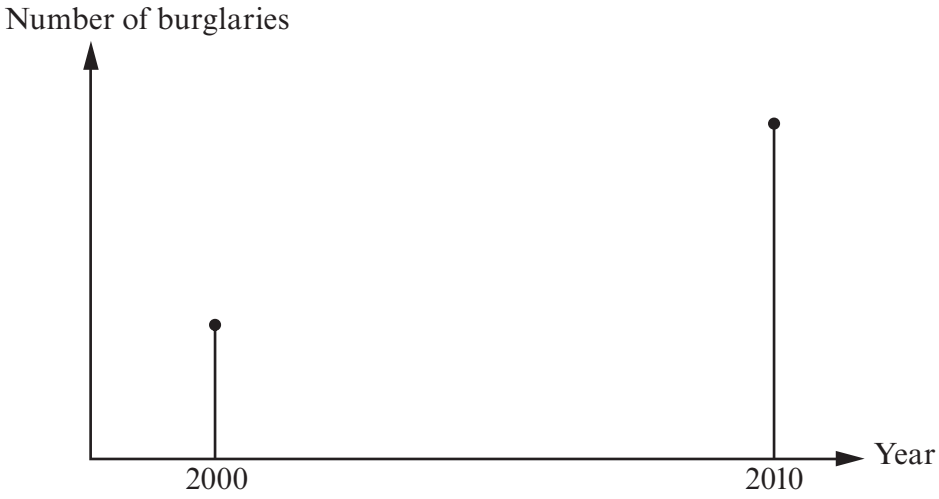
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[1]

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(b) A newspaper printed the diagram shown below with the headline

'Huge and steady increase in burglary over the last ten years'



Give **two** reasons why the diagram and headline might be misleading.

(i) .....

.....

(ii) .....

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[2]

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6. Helen and James are travelling by plane from London to Los Angeles.

They see the following information when they arrive at the airport on Tuesday.

Current Day and Time	
LONDON	LOS ANGELES
Tuesday 15:40	Tuesday 07:40

Their flight leaves in two and a half hours' time.
The flight time between London and Los Angeles is 11 hours and 20 minutes.

Give the time and the day in Los Angeles when they land.

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[4]

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7. *You will be assessed on the quality of your written communication in this question.*

A person's Taxable Income is calculated as follows.

Taxable Income = Gross Income – Pension Contribution – Other Allowances

Rafael has a Gross Income of £57 500 and pays a Pension Contribution of £5175.
His Other Allowances total £7475.

Rafael pays tax at the rate of 20% on the first £35 000 of his Taxable Income, and at a rate of 40% on the rest of his Taxable Income.

Calculate the total amount of tax that Rafael pays.

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[7]

Turn over.

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8. The following two scales are given on a scale drawing of a house.



Represents 1 metre



Represents 1 yard

Use the above scales to convert 1 metre into yards. Give your answer correct to one decimal place.

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[3]

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Examiner only

9. A shop has reduced the price of a bicycle by 40% of its original price.

The sale price of the bicycle is £192.

Calculate the original price of the bicycle.

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[3]

Turn over.

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Examiner only

10. An electricity company uses the following formula to calculate how much to charge its customers.

$$\textbf{Charge} = (\textbf{FR} - \textbf{IR}) \times 11{\cdot}29\text{p} + \textbf{D} \times 13{\cdot}35\text{p} - \tfrac{1}{4}\textbf{AB}$$

A customer was charged £174.16.

Calculate, to the nearest penny, the **Annual Bonus (AB)** for this customer when the

- **Initial meter reading (IR)** was 45238
- **Final meter reading (FR)** was 46740
- **Days at standard charge (D)** was 91

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[4]

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11. A company had intended to send representatives to business conferences in the Far East. An amount of pounds (£) was exchanged for Hong Kong dollars (HK$) for one employee. An equal amount of pounds was exchanged for Japanese yen (yen) for another employee.

Both conferences were cancelled and the money had to be exchanged back into £s. Data on the exchange values at that time is shown below.

	Hong Kong Dollars (HK$)	Japanese yen (yen)
Conversion from pounds	£1 = 11.60$	£1 = 127.2 yen
Conversion back to pounds	£1 = 12.20$	£1 = 135.9 yen

Calculate on which of the two currency exchanges the company lost most money.

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[4]

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12. It takes 4 hours to empty 6 identical tanks of oil using 15 identical pumps.

How long would it take to empty 2 of these tanks using 3 of these pumps?
Give your answer in hours and minutes.

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[4]

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13. The length of a corridor wall is 68 metres, correct to the nearest metre.

Decorative wall tiles each have a length of 36 cm, correct to the nearest cm.

A decorator is given the job of fitting one single row of these tiles, lengthwise, side by side, along the top of one wall of the whole corridor.

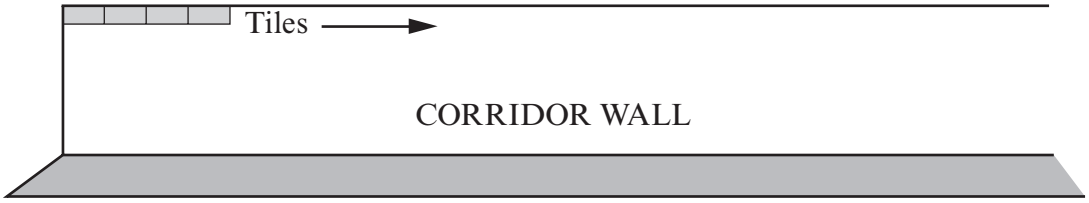


Diagram not drawn to scale

Showing all your calculations, find the least possible number of tiles and the greatest possible number of tiles required.

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[6]

Turn over.

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14. A sector of a circular metal plate centre O, with radius 18 cm, is removed to leave the following shape.

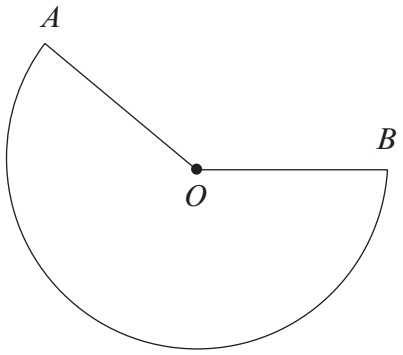


Diagram not drawn to scale

The length of the arc AB of the shape is 66 cm.

(a) Calculate the size of the reflex angle AOB correct to the nearest degree.

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[3]

(b) What was the area of the piece of metal that was removed?

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[2]

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15. A thin hollow container is in the shape of a cylindrical upper part and a conical lower part as shown below.

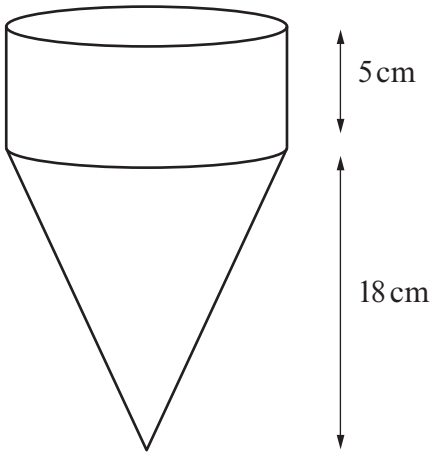


Diagram not drawn to scale

The total capacity of the container is 1244 cubic centimetres.

Calculate the diameter of the cylinder.

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[6]

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Question number	Additional page, if required. Write the question number(s) in the left-hand margin

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WJEC
CBAC

GCSE MARKING SCHEME

MATHEMATICS - UNITISED

JANUARY 2012

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2012 examination in GCSE MATHEMATICS – UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Unit 1 – Foundation Tier	1
Unit 1 – Higher Tier	4
Unit 2 – Foundation Tier	7
Unit 2 – Higher Tier	12

Unit 1 – Foundation Tier

UNIT 1 Foundation Tier	✓	Mark	Comments
1. (a) (£76.99) (£)31.75 (£)36(.00) (Total) (£)144.74 (b) 14 (points)		 B1 B1 B1 B1	 Accept 3175p. Accept 3600p F.T. their amounts. F.T. their total bill.
2(a) $35^{(\circ)}$ 2(b) Sight of 8·3(cm) 8·3 × 20 = 166m		B1 B1 M1 A1	Allow ± 2°. Allow ±2mm. F.T. their '8·3'. For stated intent to multiply a length by 20. Must show correct units. Unsupported answer in the region 162 to 170 implies B1, M1. Also A1 if units given.
2(c) **Use overlay.** A line from end of path B to mid point of path AC.		 B1	Allow ±2mm for mid point. **Use overlay.** Do not penalise poorly drawn lines.
3. (70 to 89) (90 to 109) **110 to 129** (130 to 149) Using a tally convention. (4) 9 7 2		B1 B1 B2	Accept any unambiguous indication e.g. 110 – 129. Need not be accurate. Must show a total of at least 13 additional tallies. B2 for all three correct. B1 for 1 or 2 correct.
4(a) (i) Jan(uary).		B1	
4(a) (ii) May.		B1	
4(b) (Hire Cost =) 50 × 5 + 85 = 335 ISW		M1 A1	For correct substitution BUT M0 if e.g. 50×90 used or implied.
4(c) Correct strategy (£)30		M1 A1	E.g. Using '10 × 6TND' or '6 × 10TND' etc.

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UNIT 1 Foundation Tier	✓	Mark	Comments
5. (Perimeter or fence =) 20(m) (Cost of fence =) (£)140 (Area or concrete =) 6 × 4 = 24(m^2) (Cost of concrete =) (£)216 (Total cost =) (£)356 Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', '£', m and m^2 being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓	B1 B1 M1 A1 A1 B1 QWC 2	F.T. 7 × their 'perimeter'. F.T. 9 × their 'area'. F.T their stated costs for the fence and the concrete. QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.
6.(a) (i) A correct equation formed. (ii) A correct equation formed. (iii) A correct equation formed.		 B1 B1 B1	Must use given numbers once only in each case.
6(b) – ÷		B1	
7(a) (i) 'More girls than boys' or equivalent.		B1	Accept 'Twice as many girls as boys'. Do not accept 'more females passed'.
7(a) (ii) 25(%)		B1	¼ is B0.
7(b) Indication that the range of the marks in History is 6 and in Geography is 9		B2	Allow 'range in Geography is greater' or equivalent. B1 for ranges of 6 and 9 only, with no indication of which is which. OR B1 for 'History 2 to 8 and Geography 1 to 10' OR B1 for one correct range clearly attributed.
7(c) It might appear that the % increase is much greater for one period than the other because of the different scale used.		B2	B1 for comment on misleading visual appearance. B1 for comment on different scale used. Credit similar statements once only. *(Mark comments wherever they appear. Ignore other irrelevant comments.)*
8. 0·15 × (£)1240 + 36 × (£)42 = (£)186 (+) (£)1512 = (£)1698 ISW	✓ ✓ ✓ ✓	M1 B1 B1 A1	For complete method. For sight of 186 or implied in further calculation. For sight of 1512 or implied in further calculation. F.T. addition of their amounts. Correct answer gains all 4 marks.

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UNIT 1 Foundation Tier	✓	Mark	Comments
9. 91.36 – (total cost of three other items) = (£)84.54 or 8454p (Diesel bought =) (£)84.54 ÷ 1.409 = 60(litres) ISW	✓ ✓ ✓ ✓	M1 A1 M1 A1	M1 for attempt so do not penalise incorrect total cost OR use of 48 instead of 0·48. C.A.O. F.T. 'their £84.54' (this may be £91.36) Accept answers from a F.T. being rounded or truncated . SC1 for attempting to divide by 140·9. M1A0 for dividing by 1·41 or 1·4(0). M0A0 for dividing by 1·49
10. Repeated attempt to find 1/3 <u>and subtract</u> or 2/3 of two different amounts. (End of 2nd year) 150(kg) (End of 3rd year) 100(kg)		M1 B1 A1	M1 awarded for intent. Penalise use of decimal approximations to 1/3 or 2/3 once only. Penalise extra work –1*(unsupported 66.6.. implies this).*
11(a) Q1. A statement regarding e.g. 'not relevant', 'confidentiality', 'too personal' Q2. 'times not exclusive' 'over what period of time?'		 B1 B1	*Only mark answer given in relevant answer space* *Ignore other statements if B1 awarded.* For any equivalent statement. For any **one** of these, or equivalent statement.
11(b) A criticism regarding location or time.		B1	
12. 55 × 1·6 or equivalent. = 88 (km.p.h.) 8 (km.p.h.) (above)		M1 A1 A1	*Alternate method.* 80 × 0·625 M1 = 50(m.p.h.) A1 F.T. 'their 88'. 5(m.p.h.)(above) A1 ('*above' not required, but 'under' is A0.)* *An unsupported final answer requires units.* *Unsupported 5(m.p.h.) <u>under</u> is M0A0A0*
13. **Use overlay** Position of ship 065° from Sunderland. Position of ship 6cm from Sunderland. Correct three-figure bearing given		 B1 B1 B1	 Allow ± 2°. Allow ± 2mm. (*Ship must be at sea for this B1)* F.T. their ship's position. Allow ± 2°. **Use tools.**
14. Use of Volume = $\pi \times 12^2 \times$ height. Height = Volume / $\pi \times 12^2$ (Height of water =) 19·88 to 19·91 inclusive. 20(cm)	✓ ✓ ✓ ✓	M1 m1 A1 A1	Allow 900, 90 or 9 as intent to use volume. C.A.O. F.T. 'their height' if of equivalent difficulty and gives an answer that is > 0.
15. 4000 <u>120</u> 4120 <u>123.6(0)</u> 4243.6(0) <u>127.30(8)</u> 4370.90(8) (£) 4370.91 ISW		B1 M1 A1 A1	For the evaluation of a correct 3% OR Sight of 1·03 (360 and 4360 imply use of 3× 120 and gain B1) For attempting to find 3 different 3%. OR $4000 \times 1{\cdot}03^3$. F.T. one error if of equivalent difficulty. Treat 2 years as a misread.

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Unit 1 – Higher Tier

UNIT 1 Higher Tier	✓	Mark	Comments
1. Repeated attempt to find 1/3 and subtract ,or 2/3 of two different amounts. OR Repeated attempt to find 20% and subtract , or 80% of two different amounts. (Tree A =) 100(kg) (Tree B =) 128(kg) Tree B by 28(kg)		 M1 A1 A1 A1	*Treat going on for an extra year as a misread.* *Treat consistent increase as a misread.* M1 awarded for intent. C.A.O. C.A.O. F.T. their amounts. SC1 for Tree B by 45(kg) [(200–40–40) –(225–75–75)]
2(a) (i) Intent to multiply values by frequencies and add up $(0 \times 11 + 1 \times 25 + 2 \times 4 + 3 \times 2 + 30 \times 2)$ their $\sum fx \div 44$ $= 2{\cdot}25$		M1 m1 A1	 CAO (but ignore if 2·25 seen and then rounded to 2)
2(a) (ii) Some indication that this is not typical for the majority of the workforce.		B1	E.g. 'Most are absent fewer than 2 days', '30 days skew things'.
2(b) Some reference to most being in the first group or that most of the group intervals would be empty. OR Some reference to loss of raw data or that the answer will be an estimate		B1	Do not accept that '4 is not a factor of 30' for a B1.
3. **Use overlay** Position of ship 065° from Sunderland. Position of ship 6cm from Sunderland. Correct three-figure bearing given		 B1 B1 B1	 Allow ± 2°. Allow ± 2mm. (*Ship must be at sea for this B1)* F.T. their ship's position. Allow ± 2°. **Use tools.**
4. $55 \times 1{\cdot}6$ or equivalent. = 88 (km.p.h.) 8 (km.p.h.) (above)		M1 A1 A1	*Alternate method.* $80 \times 0{\cdot}625$ M1 = 50(m.p.h.) A1 F.T. 'their 88'. 5(m.p.h.)(above) A1 (*'above' not required, but 'under' is A0.)* *An unsupported final answer requires units.* *Unsupported 5(m.p.h.) under is M0A0A0*
5(a) (i) 5(%)		B1	
5(a) (ii) No because the graph show (%) growth not actual numbers.		B1	Accept equivalent valid statements.
5(b) E.g. 'No scale (so might not be 'huge'). 'Only two plots (so might not be 'steady'). 'Not clear how 'burglaries' are defined'.		B2	B1 for each valid reason. Credit similar reasons once only.
6 Sight of 8 hours difference in time. Sight of take off time as 18:10 (London) Correct addition of 11hrs 20 min. (Time in Los Angeles) 21:30 Tuesday		B1 B1 B1 B1	 May be given as 10:10 (Los Angeles) F.T. their 'initial' time. (Accept e.g. 05:30 but not 29:30) Must give both time and day. *These marks may be implied in their answer(s).* *E.g. (2h30min + 11h20min) '+' 07:40 =) 21:30 gains B3. 'Tuesday 21:30' on its own gains B4*

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UNIT 1 Higher Tier	✓	Mark	Comments
7. (Taxable Income =) (£)44,850	✓	B1	For sight of 44850.
(Tax on first £35000 =) (£)7000	✓	B1	For sight of 7000.
(Additional Tax =) 0·4 × (£)9850 = (£)3940	✓ ✓	M1 A1	F.T. 0·4 × ('their 44850' − 35000).
(Total Tax =) (£)10,940	✓	A1	F.T. 'their 7000' + 'their 3940'.
Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of '=', £ , % being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	✓ ✓	QWC 2 7	QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.
8. Sight of 1m (being represented by) 10cm AND of 1yd (being represented by) 9cm 1/10 metre = 1/9 yard or equivalent e.g. '1yd = 0·9m' (1 metre =) 1·1(yards)		B1 M1 A1	Allow '1m = 10cm ' or '1yd = 9cm' etc. Allow ± 0·1cm in measurement of 10cm and 9cm. F.T. their line measurements.
9. 60% ≡ (£)192 (Original price) $\frac{192}{60} \times 100$ = (£)320		B1 M1 A1	Accept any indication. Or equivalent e.g. 192 / 0·6.
10. Correct substitution into formula. Making 'Annual Bonus' subject of formula. Using consistent units of '£' or 'pence'. (Annual Bonus =) (£)30.26 or 3026 (p)	✓ ✓ ✓ ✓	M1 m1 m1 A1	Do not penalise 'mixing' units at this stage. Allow missing brackets but not incorrect use of + and −. Allow also (£)30.24 or 3024(p) and (£)30.25 or 3025(p) Allow also (£)30.27 or 3027(p) and (£)30.28 or 3028(p)
11. Strategy to find (Fractional or % or actual) return for either currency. (HK$) 0·95(08..) or 95(·08..%) (Return) (Yen) 0·93(60..) or 93(·60..%) (Return) More is lost on the Yen		M1 A1 A1 A1	E.g. $\frac{11.6}{12.2}$ (×100) or $\frac{127.2}{135.9}$ (×100) OR using £x £x × $\frac{11.6}{12.2}$ or £x × $\frac{127.2}{135.9}$ If x = £100 return = £95(.08) If x = £100 return = £93(.60) F.T. their calculated amounts.

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UNIT 1 Higher Tier	✓	Mark	Comments
12. $4 \times \frac{2}{6}$	✓	M1	Or equivalent e.g. × 1/3 or ÷ 3.
$\times \frac{15}{3}$	✓	M1	Or equivalent e.g. × 5 or ÷ 0·2.
= 20/3 (hrs)	✓	A1	C.A.O. or equivalent e.g. 6·66...(hrs). *Alternate presentation.* *Tanks* *Pumps* *Hours* *6* *15* *4* .... M1 for 'two' steps. .... M1 for next 'two' steps. .... *2* *3* ***20/3*** A1 C.A.O.
= 6hrs 40min	✓	A1	(Watch out for compensating errors) F.T. conversion from 'their 20/3' only if an M1 gained and is of equivalent difficulty.
13. Sight of 67·5(m) AND 68·5(m)	✓	B1	Allow B1 for sight of 6750 AND 6850.
Sight of 35·5(cm) AND 36·5(cm)	✓	B1	Allow B1 for sight of 0·355 AND 0·365.
(Least number required) $\frac{6750}{36{\cdot}5}$ or equivalent	✓	M1	F.T. 'their least corridor' / 'their biggest tile'. (*with consistent units used)*
185	✓	A1	Must be a whole number of tiles. Unsupported 184 gains M1A0
(Greatest number required) $\frac{6850}{35{\cdot}5}$ or equivalent	✓	M1	F.T. 'their biggest corridor' / 'their smallest tile'. (*with consistent units used)*
193	✓	A1	Must be a whole number of tiles BUT do not penalise again if already penalised once before. Unsupported 192 gains M1A0 If no M marks gained, allow SC1 once for a 'correct' method but using 'mixed' units, e.g. 67·5/36·5.
Both parts, (a) and (b) marked together			
14 (a) $\frac{\text{Angle AOB}}{360} \times 2 \times \pi \times 18 = 66$		M1	For correct substitution.
$A\hat{O}B = \frac{66 \times 360}{2 \times \pi \times 18}$ or equivalent		A1	
$210^{(°)}$		A1	For an answer that rounds or truncates to 210.
(b) (Area =) $\frac{150}{360} \times \pi \times 18^2$		M1	F.T. 'their 210'.
$= 424(\cdot 11..)(cm^2)$		A1	Accept values that are correct to 3 sig.fig. SC1 for 593(.76) or 594.
15. Sight of $\pi \times r^2 \times 5$ AND $\frac{1}{3} \times \pi \times r^2 \times 18$	✓	B1	
$\pi \times r^2 \times 5 + \frac{1}{3} \times \pi \times r^2 \times 18$	✓	M1	Allow only if equivalent to kr^2.
$(11\pi r^2) = 1244$	✓	m1	
$r = \sqrt{(1244 / 11\pi}$	✓	A1	Incorrect manipulation of equation is A0,A0,A0.
$r = 6$(cm)	✓	A1	
(Diameter =) 12(cm)	✓	A1	F.T. their radius.

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Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

New GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)
UNIT 1: MATHEMATICS IN EVERYDAY LIFE
HIGHER TIER

A.M. MONDAY, 14 November 2011

$1\frac{1}{4}$ hours

ADDITIONAL MATERIAL

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **4**.

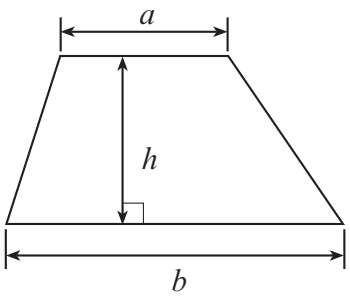
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**4**	
2	**4**	
3	**3**	
4	**7**	
5	**3**	
6	**6**	
7	**3**	
8	**4**	
9	**4**	
10	**6**	
11	**3**	
12	**5**	
13	**3**	
14	**10**	
TOTAL MARK		

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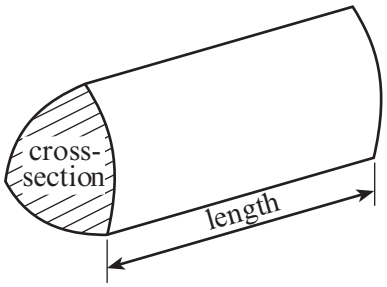
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Formula List

Area of trapezium $= \frac{1}{2}(a + b)h$

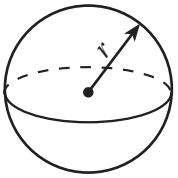


Volume of prism = area of cross-section × length



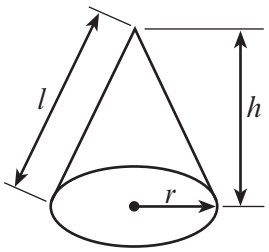
Volume of sphere $= \frac{4}{3}\pi r^3$

Surface area of sphere $= 4\pi r^2$



Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$

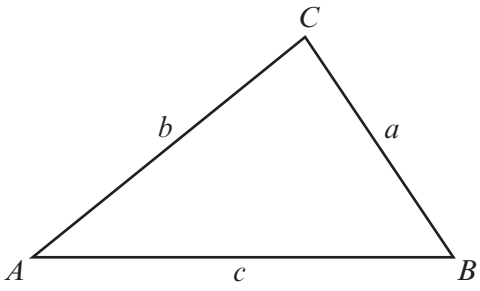


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle $= \frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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Examiner only

1. Before a sale, a store sells a shirt for £24 plus VAT at 20%.
During the sale the store reduces the price you have to pay for the shirt by one quarter.

How much will you have to pay for the shirt in the sale?

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[4]

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020003

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Examiner only

2. The number of seats won by the political parties in the May 2010 general election is shown in the table below.

Political Party	Number of seats
Conservative	306
Labour	258
Liberal Democrats	57
Others	29

Draw a pie chart, as accurately as possible, to show this information.
Show how you calculate the angles of your pie chart.

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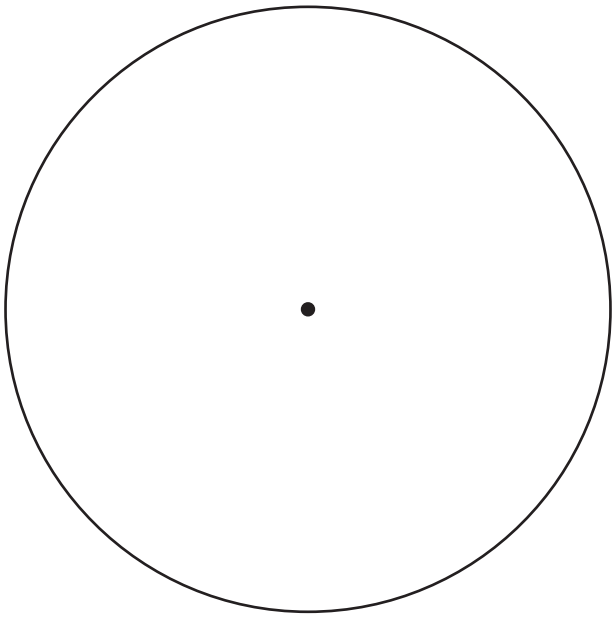
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[4]

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Examiner only

3. The Headteacher of a school wants to test the following hypothesis.

'Most pupils spend less than one hour per night doing their homework.'

She plans to

- hand out a short questionnaire to a Year 10 Geography class,
- ask the following questions,
  - (i) What is your name and your tutor group?
  - (ii) How much time do you spend on your homework?
- collect the replies in two weeks' time.

Write down **three** unfavourable comments about this plan.

1. .....

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2. .....

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3. .....

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[3]

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Examiner only

4. *You will be assessed on the quality of your written communication in this question.*

Marlon went to New Zealand on holiday.

After he arrived he exchanged £800 for New Zealand dollars.

He spent 1391 dollars in New Zealand.

At the end of his visit he changed the dollars he had left over into as many 10 dollar notes as possible.
He kept these 10 dollar notes.
He placed the rest of the money in a charity box at the airport.

On his return to the U.K. he changed the 10 dollar notes into pounds (£).

The exchange rate for buying dollars when he arrived in New Zealand was £1 = 2.08 dollars.

The exchange rate for selling dollars when he returned to the U.K. was £1 = 2.25 dollars.

How many pounds did he receive on his return?

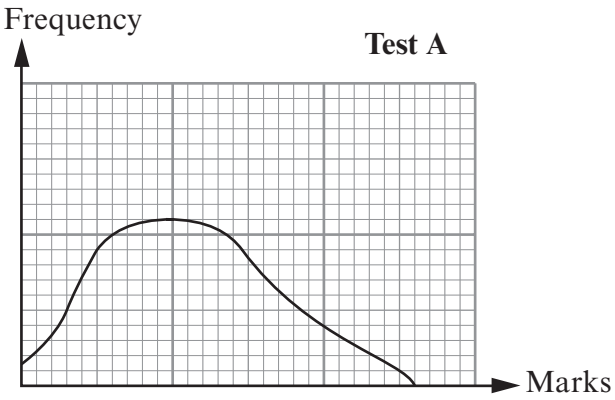
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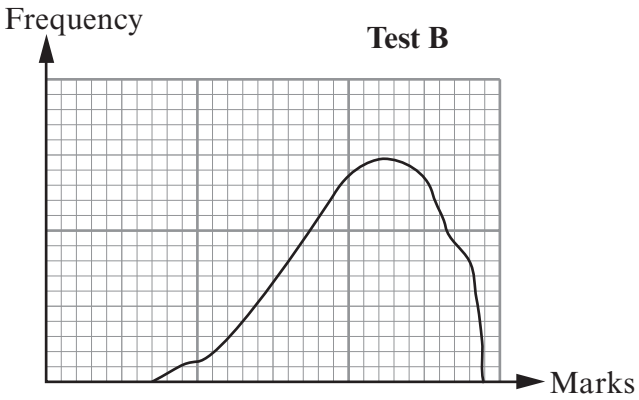
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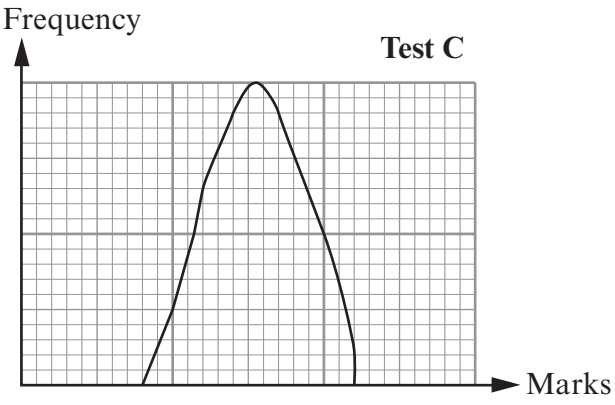
Examiner only

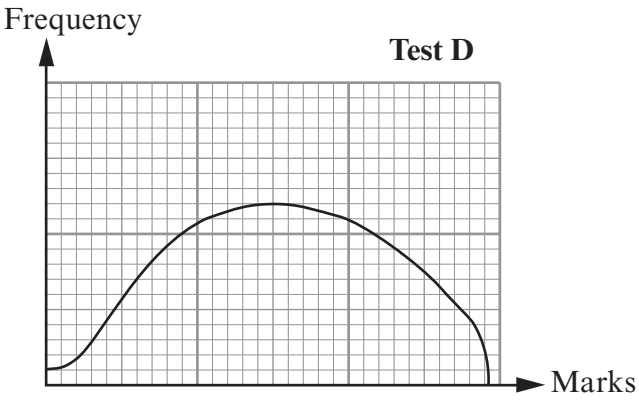
5. A group of students sat four separate tests, Test A, Test B, Test C and Test D, as part of their course.

Using the data from the marks scored in each of these tests the following sketch graphs were drawn. The same scales are used in each graph.









Complete the following statements.

"Most of the students gained high marks in Test ..... ."

"The range of students' marks was smallest in Test ..... ."

"Most of the marks were low in Test ..... ."

[3]

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Turn over.

4351 020007

Examiner only

6. As part of her training, an athlete runs for 5 minutes and then walks for 1 minute. She repeats this without stopping for a period of one hour.

Her average running speed is 18 km per hour.
Her average walking speed is 6 km per hour.

Calculate how many kilometres she will complete during the hour.

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[6]

7. Idris has been awarded a salary increase from £23 500 per annum to £23 970 per annum.

By what percentage has his salary increased?

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[3]

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Examiner only

8. Points A and B in a park are connected by a straight path and also a semicircular path as shown below.

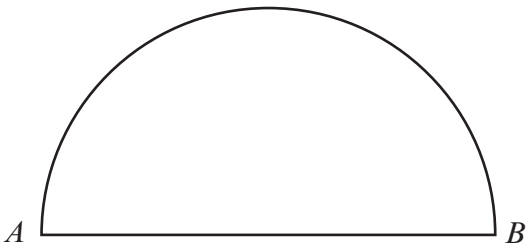


Diagram not drawn to scale

The radius of the semicircular path is 50 metres.

Clive walks from point A to point B along the semicircular path and then returns to point A along the straight path.

Calculate the total distance that Clive walked, giving your answer to the nearest 10 metres.

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[4]

Turn over.

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Examiner only

9. A workforce of 15 people produces, on average, 800 hand-made scarves in 6 days.

(a) How many people, working at the same rate, would be required to produce 1200 of these hand-made scarves in 5 days?

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[3]

(b) Each worker is expected to produce 10 of these scarves each day.
Showing your calculations, decide whether or not each person, on average, makes more than 10 scarves per day.

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[1]

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Examiner only

10. A motorist is told that his car has been recorded travelling 60 metres in 4 seconds.

The speed limit for the road he was travelling on is 50 km per hour.

(a) At what average speed was he travelling, measured in kilometres per hour?

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[3]

(b) The distance he travelled was recorded accurately but the time was only recorded correct to the nearest second.

Show how the motorist could argue that he was travelling at a speed below the speed limit.

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[3]

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Examiner only

11. The weight of fruit collected from an orchard decreases by 8% each year.

This year, 2116 kg of fruit was collected.

What weight of fruit was collected one year ago?

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[3]

12. Twenty five rectangular cards, each measuring 10 cm by 5 cm, are laid on a table in a straight line as shown below.



Diagram not drawn to scale

They are laid in such a way that the 2nd card overlaps the 1st, the 3rd overlaps the 2nd and so on, with the 25th card overlapping the 24th card.

Each card overlaps the previous one by 2 cm ± 0·1 cm.

Calculate the least length and the greatest length of the line of cards.

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[5]

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Examiner only

13. Calculate the area of the shaded part of the circle, centre O, shown below.

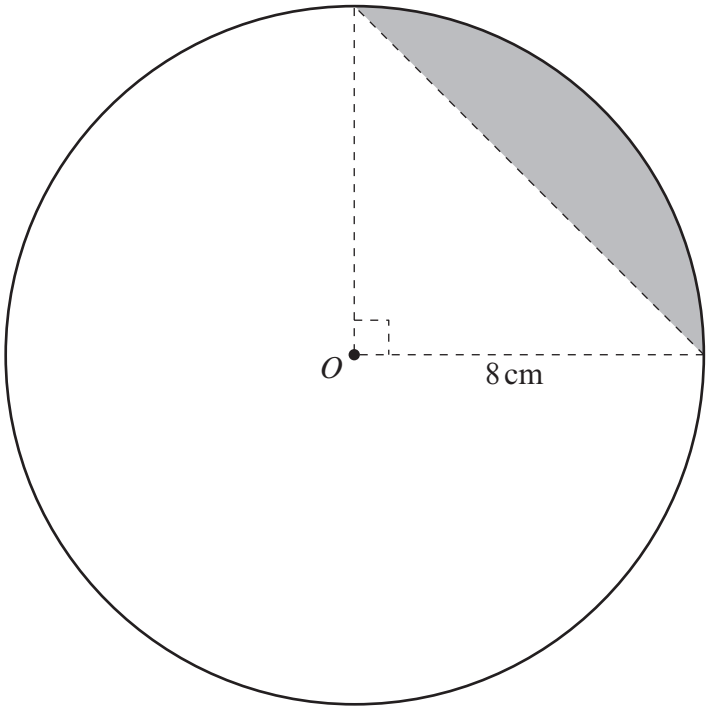


Diagram not drawn to scale

[3]

Turn over.

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Examiner only

14. A metalwork factory has been given an order to produce 50 000 solid metal units of the shape and size shown below.

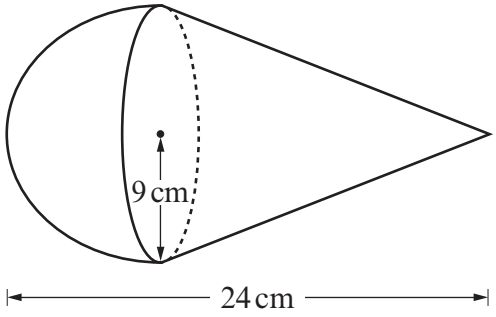


Diagram not drawn to scale

In order to obtain enough metal for the order, the factory melts down a number of other solid metal units to recycle them.
These units are all identical and their shape and size are shown below.

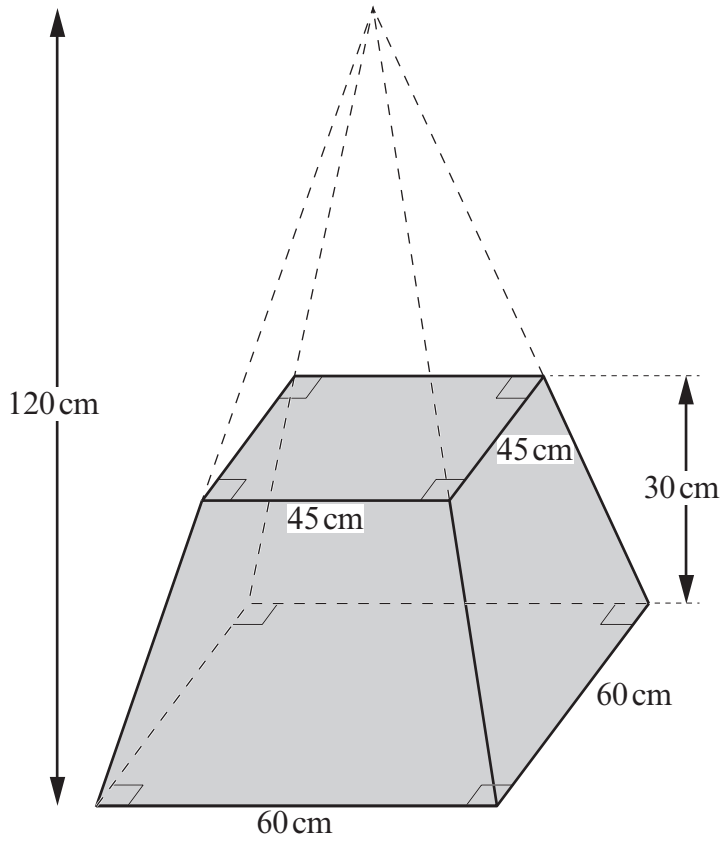


Diagram not drawn to scale

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What is the minimum number of these units that must be melted down to provide enough metal to produce the 50 000 units on order?

[10]

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GCSE MARKING SCHEME

MATHEMATICS - UNITISED

NOVEMBER 2011

INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2011 examination in GCSE MATHEMATICS - UNITISED. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
Mathematics Unit 1 - Foundation Tier	1
Mathematics Unit 2 - Foundation Tier	4
Mathematics Unit 1 - Higher Tier	7
Mathematics Unit 2 - Higher Tier	10

UNIT 1 - FOUNDATION TIER

NOVEMBER 2011 UNIT 1 Foundation	Mark	FINAL MARK SCHEME (19/11/11) Comments (Page 1)
1. Sight of 2·5(kg) OR 2½(kg) 2·5 × (£)1.3(0) = (£)3.25	B1 M1 A1 3	F.T. 'their scale reading' × (£)1.3(0)
2. (a) Blue 12 Cream 18 Yellow 10	B2	For all three correct. B1 for one (or two) correct. Allow unambiguous indication in either 'Tally' or 'Frequency' column (Frequency column takes precedence).
(b) Blue, Cream and Yellow along one axis.	B1	**Or** indicated on the bars themselves. Accept B,C and Y. Ignore widths of bars.
Uniform scale starting at 0.	B1	B0 for ambiguous placing of numbers between grid lines.
Three bars at correct heights	B2 6	B1 for two correct heights. **F.T.** their frequencies. If no scale assume one square to represent a frequency of 1. Mark heights on uniform scale that does not start at 0 (e.g. starts at 1) accordingly.
3. (a) Moscow, Berlin, Cardiff, Athens, Dublin. (b) 7(°C) (c) 8(°C)	B1 B1 B1 3	Accept unambiguous correct order e.g. –7,–3, 0, 2, 3. Accept –7. B0 for -8
4. 22:05 OR 10.05(p.m.)	B1	Accept any unambiguous indication that the correct time has been chosen.
15(min) or ¼ (hour)	B1 2	Accept 45(min) or ¾ (hour) if 2235 or 10.35p.m. given in first part.
5. 5 ÷ 0·34 or 500 ÷ 34 (= 14·7....) = 14 (peaches)	M1 A1	Accept any attempt to find how many 34s in 500.
(change =) (£)5 – 14×0·34	M1	F.T. their number of peaches only if greater than 1 and less than 14.
= (£) 0.24	A1 4	Accept 24(p). Allow £0.24p but <u>not</u> 0.24p.
6. (Time =) (2 +) 9 × 30(min)	M1 M1	Sight of 9 × 30 gains M1 BUT make sure that it is 'Time' that is being found. So, for example, 9 × £30 or 25 + 270 will be M0 as 'Money' is implied.
= (2 +) 9 × ½ (hr)	A1	Sight of 4½(hrs) or 4hr 30min. gains both M marks. May be implied in work that shows understanding of correct relationship between hours and minutes.
= 6½(hrs) OR 6hrs 30min		Accept rounding up to nearest whole hour above.
(Charge=) (£)25 + 6½ × (£)30	M1	F.T. 'their time <u>given in hours</u>' OR 'their time rounded to the nearest whole hour above'.
= (£)220	A1 5	SC1 for (£)195 (call-out charge not included)

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NOVEMBER 2011 UNIT 1 Foundation	Mark	FINAL MARK SCHEME (19/11/11) Comments (Page 2)
7. (a) 18 + 1·2 OR 18000 + 1200 (Total weight =) 19·2(kg) OR 19200(g) 0·8(kg) (under) OR 800(g) (under) Look for • spelling • clarity of text explanations and correct units shown • the use of notation (watch for the use of '=', '+' being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer (b) 50 ÷ 2·2 OR 20(kg) = 20 × 2·2 (lbs) = 22(·727...) or 23 = 44(lbs) Luggage is over weight limit.	M1 A1 A1 QWC2 <

NOVEMBER 2011 UNIT 1 Foundation	Mark	FINAL MARK SCHEME (19/11/11) Comments (Page 3)
11. Labelling litres and uniform scale on vertical axis Uniform scale on horizontal axis Plotting at least two correct points. Correct line drawn Any correct strategy, e.g 10 times value at 35 litres. A correct answer <u>for their line.</u>	B1 B1 P1 L1 M1 A1 6	 *P0,L0 if no attempt at uniform scaling.* <u>+</u> '½ small square'. The origin may be one of the points. Correct line implies P1L1. M0 if inappropriate scale used. E.g. 350 litres on scale. F.T. their line. Allow M1,A1 for unsupported answers between 76 and 78 inclusive or if graph not used.
12. B C A	B1 B1 B1 3	
13. Showing a strategy to find total 'running time' and total 'walking time' OR use of km/min. Runs for 50min AND Walks for 10min. Use of Distance = Time × Speed Runs 18 × 50/60 (= 15km) Walks 6 × 10/60 (= 1km) (Distance =) 16 (km)	S1 B1 M1 m1 m1 A1 6	E.g. 'Running time' + 'walking time' = 60 minutes. OR 'Ten repeats of 5min running and 1min walking' is enough for S1B1 Allow this M1 even if time in minutes and speed per hr. F.T. their 'running time' if less than 60minutes. F.T. their 'walking time' if less than 60minutes and not equal to 'running time'.
14. $\frac{23970 - 23500}{23500} \times 100 = 2(\%)$	M1 m1 A1 3	*Look out for those who incorrectly use 23970 as a denominator (giving an answer of 1·96....%) which is then approximated to 2%. M0m0A0.*
15. Least Value 19·5 745 Greatest Value 20·5 755	 B4 4	B1 for each correct entry. Accept 20·49 recurring but not 20·49. Accept 754·9 recurring but not 754·9.

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UNIT 1 - HIGHER TIER

NOVEMBER 2011 UNIT 1 Higher	Mark	FINAL MARK SCHEME (19/11/11) Comments (Page 1)
1. (£) 24 × 1·2 OR (£)24 + 24 × 0·2 = (£)28.8(0) (£)28.8(0) ×¾ OR (£)28.8(0) – 28.8(0) ×¼ = (£)21.6(0)	M1 A1 M1 A1 4	F.T. their '24 + VAT' (Must be greater than 24). OR (£)24(.00) ×¾ OR (£)24.(00) – 24.(00) ×¼ M1 = (£)18.(00) A1 (£)18 × 1·2 OR (£)18 + 18 × 0·2 M1 F.T. 'their (£)18'. = (£)21.6(0) A1
2. Correctly drawn and labelled.	B4 4	'Correct' angles taken as given below (inclusive). Conservative 167° to 172°, Labour 141° to 145°, Liberal Democrats 29° to 34° and Others 14° to 18°. *(As total not a multiple or factor of 360 allow greater tolerance than the usual ± 2°.)* B3 for 4 correct angles drawn but not labelled correctly. B2 for 2 or 3 correct angles drawn and labelled. B1 for 1 correct angle drawn and labelled. If no B marks gained. M1 for sight of using a correct method to find an angle or percentage.
3. Three different valid comments. e.g. 'Not representative of whole school' 'Small sample' 'Might not get a truthful answer' 'Does not specify over what period of time', 'Might get a poor response' 'Use boxes to show times'.	B3 3	B1 for each different valid comment. Accept equivalent statements e.g. 'biased' (by age, gender or ability). 'not confidential' (a criticism of question (i)) 'is it per night or per week?' (a criticism of question (ii)) 'pupils will forget (to hand them in)' *Do not give more than one mark for similar criticism(s).*
4. (£)800 × 2·08 = 1664 (NZ dollars) 270 (NZ dollars on return) 270 ÷ 2·25 = (£)120 Look for • spelling • clarity of text explanations, • the use of notation (watch for the use of units being appropriate) QWC2: Candidates will be expected to • present work clearly, with words explaining process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer QWC1: Candidates will be expected to • present work clearly, with words explaining process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer	M1 A1 B1 M1 A1 QWC2 7	F.T. 'their 1664' – 1391 AND truncated. F.T. 'their return dollars' even if not multiple of 10. QWC2. Presents relevant material in a coherent and logical manner, using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC1. Presents relevant material in a coherent and logical manner, but with some errors in use of mathematical form, spelling, punctuation or grammar. OR Evident weakness in organisation of material but using acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. QWC0. Evident weakness in organisation of material and errors in use of mathematical form, spelling, punctuation and grammar.

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NOVEMBER 2011 UNIT 1 Higher	Mark	FINAL MARK SCHEME (19/11/11) Comments (Page 2)
5. B C A	B1 B1 B1 3	
6. Showing a strategy to find total 'running time' and total 'walking time' OR use of km/min. Runs for 50min AND Walks for 10min. Use of Distance = Time × Speed Runs 18 × 50/60 (= 15km) Walks 6 × 10/60 (= 1km) (Distance =) 16 (km)	S1 B1 M1 m1 m1 A1 6	E.g. 'Running time' + 'walking time' = 60 minutes. OR 'Ten repeats of 5min running and 1min walking' is enough for S1B1 Allow this M1 even if time in minutes and speed per hr. F.T. their 'running time' if less than 60minutes. F.T. their 'walking time' if less than 60minutes and not equal to 'running time'.
7. $\frac{23970 - 23500}{23500}$ × 100 = 2(%)	M1 m1 A1 3	*Look out for those who incorrectly use 23970 as a denominator (giving an answer of 1·96....%) which is then approximated to 2%. M0m0A0.*
8. π × 50 + 100 = 257(·07...) (nearest 10 metres =) 260	M1 M1 A1 B1 4	*(Note for '+100' and not '100'.)* F.T. for A1 and B1 only if at least one M1gained and lengths are dimensionally correct and π used. F.T. for equivalent work to nearest 10 metres. SC2 for 130. SC1 for 128·5(..0) [Using 50m as diameter]
9. (a) $15 \times \frac{1200}{800}$ $\times \frac{6}{5}$ = 27 (people) (b) 800 ÷ (15 × 6) OR 1200 ÷ (27 × 5) (which is less than 10) so 'NO'. *A correct conclusion must be unambiguously stated or implied.*	M1 M1 A1 B1 4	Or equivalent e.g. × 1·5 or ÷ 0·66(6...). Or equivalent e.g. × 1·2 or ÷ 0·83(3...). C.A.O. *Alternate presentation.* *Scarves* *Time* *People* *800* *6* *15* .... Award M1 for one correct step .... Award M1 for next correct steps .... *1200* *5* ***27*** A1 C.A.O. (Watch out for compensating errors) FT their 27 Also 15 × 6 × 10 (required) (which is more than 800) . OR 27 × 5 × 10 (required) (which is more than 1200).
10. (a) (60/4) × 60 × 60 ÷ 1000 = 54(km/h) (b) Recognising that time could be 4·5(seconds) $\frac{60 \times 3600}{4{\cdot}5 \times 1000}$ = 48(km/h)	M1 M1 A1 B1 M1 A1 6	For converting 'per second' to 'per hour'. For converting metres to kilometres. C.A.O. F.T. their 'time' only if greater than 4(seconds). A0 if greater than 50(km/h) on F.T.

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NOVEMBER 2011 UNIT 1 Higher	Mark	FINAL MARK SCHEME (19/11/11) Comments (Page 3)
11. 2116 equivalent to 92(%) implied. $\frac{2116 \times 100}{92}$ = 2300(kg)	S1 M1 A1 3	Allow 2116 = 92(%) Or equivalent.
12. Realising that 24 cards must be considered in solution. (Expected length =) 24 × 8 + 10 = 202(cm) (Maximum 'error' =) 24 × 0·1 (= 2·4) (Least length =) 199·6 AND (Greatest length =) 204·4	B1 M1 A1 M1 A1 5	Any use of 24 e.g. 24 × 8 or 24 × 0·1 or 24 × 1. C.A.O. Accept 24mm only if units given. C.A.O. *Alternate method* 24 overlaps B1 Least length = 250 – 24 × 2·1 M1 = 199·6(cm) A1 C.A.O. Greatest length = 250 – 24 × 1·9 M1 = 204·4(cm) A1 C.A.O. *If no marks gained, then SC2 for 197·5 and 202·5.* *SC1 for either 197·5 or 202·5.*
13. Sight of ¼ × π × 8^2 OR ½ × 8^2 (Area segment =) ¼ × π × 8^2 – ½ × 8^2 = 18·2(65..)(cm^2)	B1 M1 A1 3	Implied by 50·2.... and 32 or ½ × 8 × 8 × Sin $90^{(°)}$ C.A.O. Accept 18·2 to 18·3 inclusive.
14. (Volume of hemisphere. =) ⅔ × π × 9^3 ('Height' of cone =) 15(cm) (Volume of shape =) ⅔ × π × 9^3 + ⅓ × π × 9^2 × 15 = 2799(·15..) (cm^3) (Volume of pyramid =) ⅓ × 60^2 × 120 (Height of 'small' pyramid =) 90(cm) (Volume of shape =) ⅓ × 60^2 × 120 – ⅓ × 45^2 × 90 = 83250 (cm^3) (Number for re-cycling =) $\frac{50000 \times 2799}{83250}$ = 1682	B1 B1 M1 A1 B1 B1 M1 A1 M1 A1 10	Look for sight of 1526·8(...) for this B1. Both B marks may be implied from volume calculations. F.T. 'their hemisphere volume' and 'their cone height'. *(The formula ⅓ × π × 9^2 × 'their height' must be used for the M1 to be awarded)* Allow 2797 to2801. *(Look out for those who multiply by 50000 at this stage)* Look for sight of 144000 for this B1. Both B marks may be implied from volume calculations. F.T. 'their pyramid volume' and 'their height for the small pyramid'. *(The formula ⅓× 45^2 × 'their height' must be used for the M1 to be awarded)* F.T. their two calculated volumes. *(The 50000 might have already been considered.)* Must be given to the nearest whole number above.

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Candidate Name	Centre Number	Candidate Number
		0

WJEC CBAC

New GCSE

4351/02

MATHEMATICS (UNITISED SCHEME)

UNIT 1: MATHEMATICS IN EVERYDAY LIFE

HIGHER TIER

P.M. MONDAY, 13 June 2011

$1\frac{1}{4}$ hours

ADDITIONAL MATERIALS

A calculator will be required for this paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14 or use the π button on your calculator.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **11***(b)*(ii).

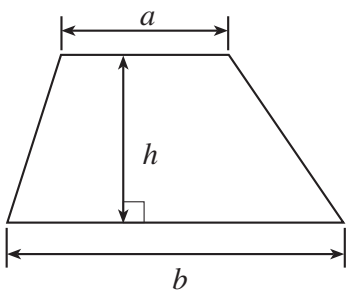
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**4**	
2	**7**	
3	**3**	
4	**3**	
5	**4**	
6	**2**	
7	**4**	
8	**5**	
9	**3**	
10	**3**	
11	**13**	
12	**4**	
13	**10**	
TOTAL MARK		

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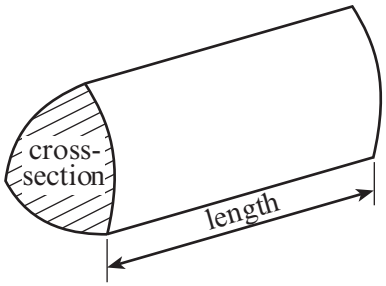
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Formula List

Area of trapezium = $\frac{1}{2}(a + b)h$

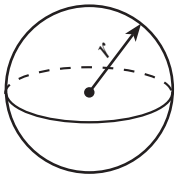


Volume of prism = area of cross-section × length



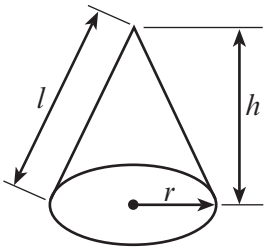
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

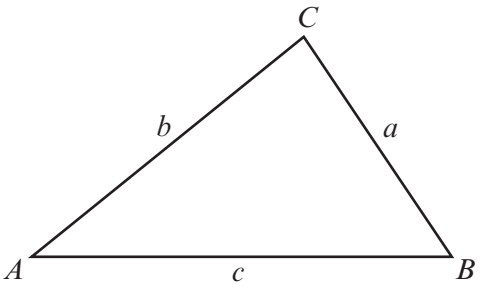


In any triangle ABC

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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1. A survey was carried out. One of the purposes of the survey was to obtain data on how often people aged 60 and over bought pizza.
Only the following two questions were asked.

Q1. *What is your name and your address?*

Q2. *How often do you buy pizzas?*

Never	*1 - 3 times*	*4 - 6 times*	*6 or more times*
☐	☐	☐	☐

(a) For **each** question give **one** reason why it is not suitable.

Q1. .....

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Q2. .....

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[2]

(b) Write down a **different** question which would be necessary and appropriate for this survey.

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[1]

(c) The survey was carried out by questioning people leaving a pizza restaurant on a Saturday night.
Give **one** criticism on how the survey was carried out.

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[1]

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2. Gareth has 10 wooden fence panels that need painting on **both sides**.
Each fence panel is 2 m long and 1·5 m high.

The paint he wants to use is only sold in cans that contain enough paint to cover an area of 25 m^2.
Each can costs £12.99.

(a) How much will Gareth have to pay in order to have enough paint?

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[5]

(b) How many more complete fence panels could he have painted with the paint he has left over?

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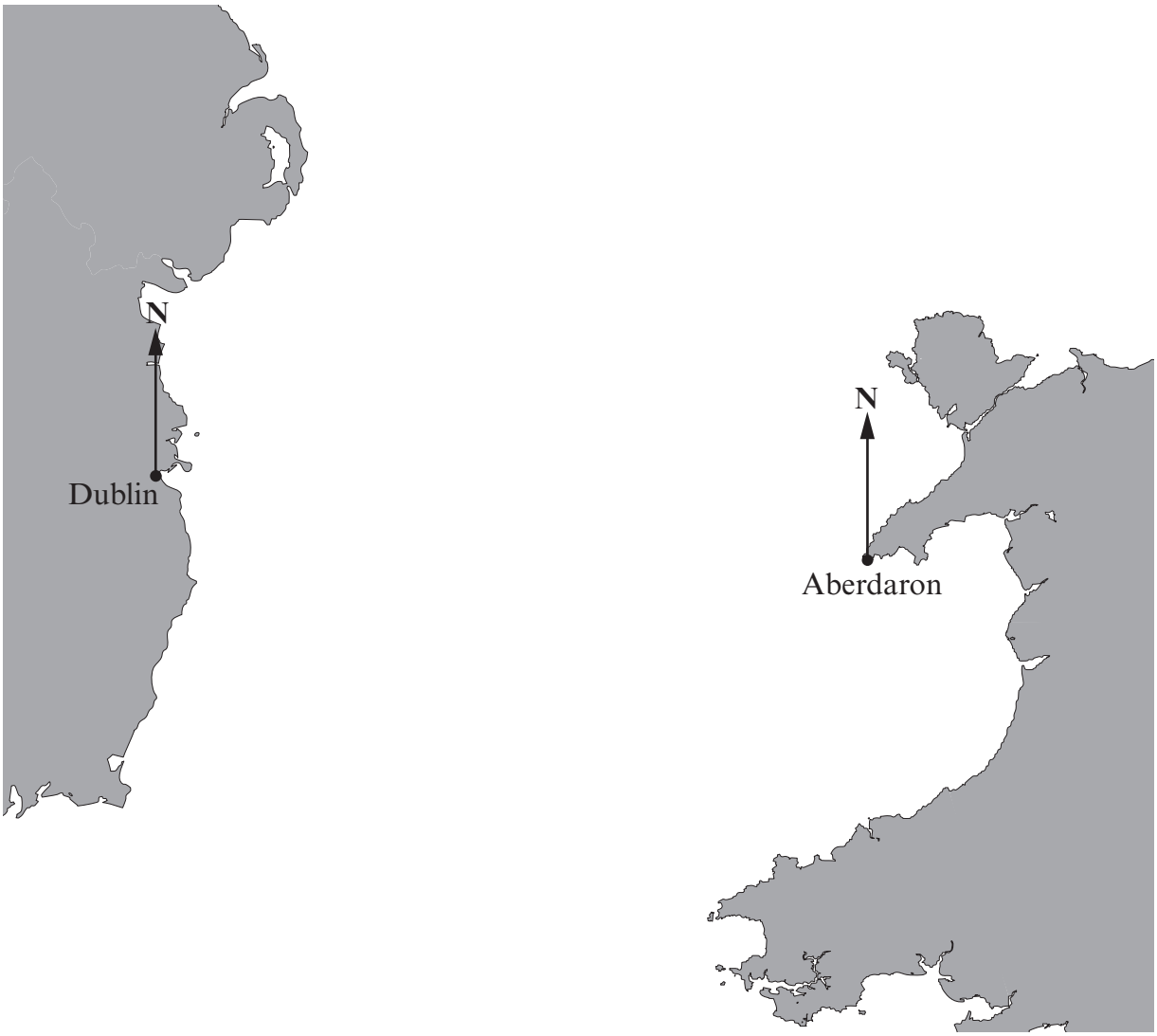
[2]

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3. A ship, *S*, is on a bearing of 075° from Dublin and on a bearing of 330° from Aberdaron. By drawing suitable lines on the diagram below, mark the position of *S*.

[3]



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4. Farah is 26 years older than her son Amir.
Their mean age is 30 years.

How old is Farah?

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[3]

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5. Sian invests £7000 for 3 years at 4% per annum compound interest.
Find the compound interest earned in the 3 years.

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[4]

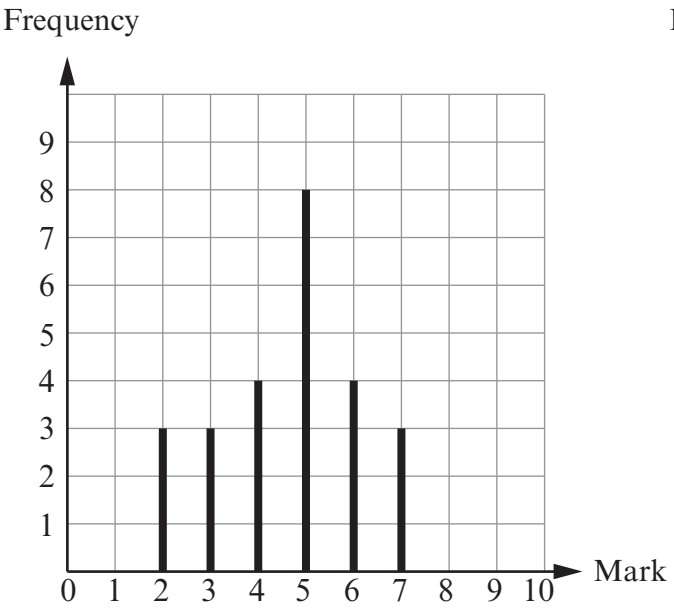
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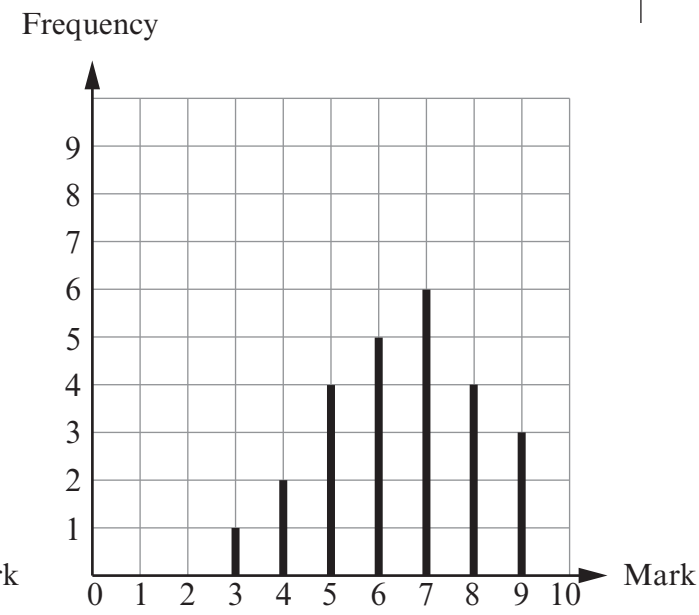
6. Pupils in Class A and Class B of a school were given a Mathematics test.

The school recorded the marks gained as shown below.

Class A



Class B



(a) Which class has the greater range of marks? You must give an explanation for your choice.

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.....

.....

[1]

(b) Without making any calculations, which class has the greater mean mark for the test? You must give an explanation for your choice.

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[1]

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7. *(a)* Find the value of $\sqrt{3{\cdot}27^2 - 2{\cdot}8}$ correct to three significant figures.

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[2]

(b) A family reduced their annual car mileage from 18500 miles to 16280 miles. Calculate the percentage reduction.

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[2]

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8. The formula used for converting temperature measured in degrees Celsius (C) to its value in degrees Fahrenheit (F) is,

$$F = \frac{9C}{5} + 32 \, .$$

(a) What would the temperature be, measured in degrees Celsius, when it is given as 14°F?

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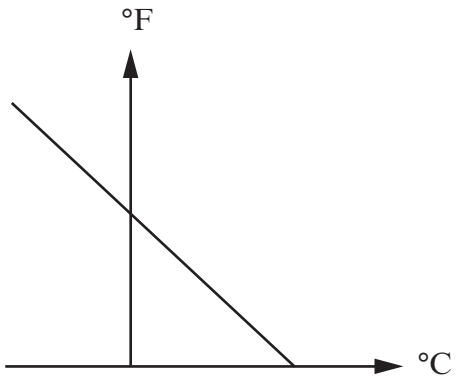
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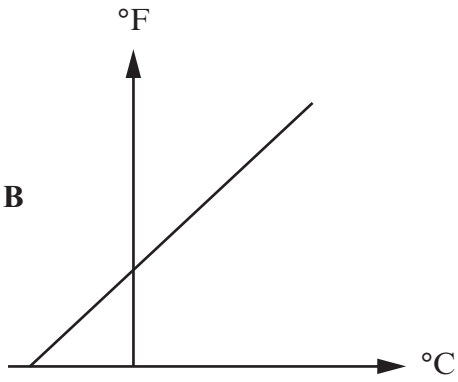
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(b) Which one of the following graphs **A**, **B**, **C** or **D** could represent the conversion between °C and °F? You must give a reason for your choice.

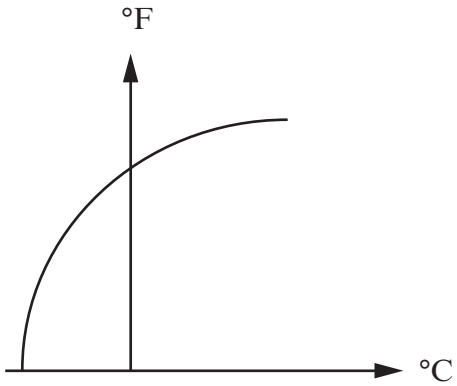
A



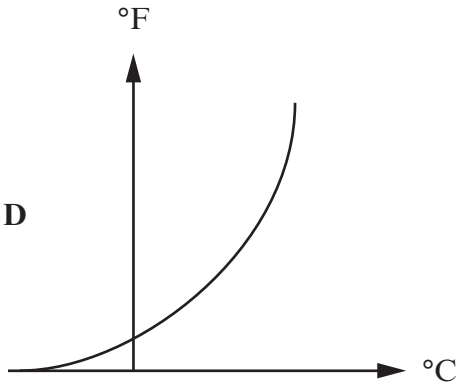
B



C



D



Graph .....

Reason .....

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[2]

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9. It took 5 days for 18 workers to prepare 10 acres of land for planting.

Showing all your calculations, how long would it take to prepare another 8 acres of land using 12 workers given that all conditions are similar?

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[3]

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10. In a sale the price of a shed is reduced by 30% of its original price.

The sale price of the shed is £182.

Calculate the original price of the shed.

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[3]

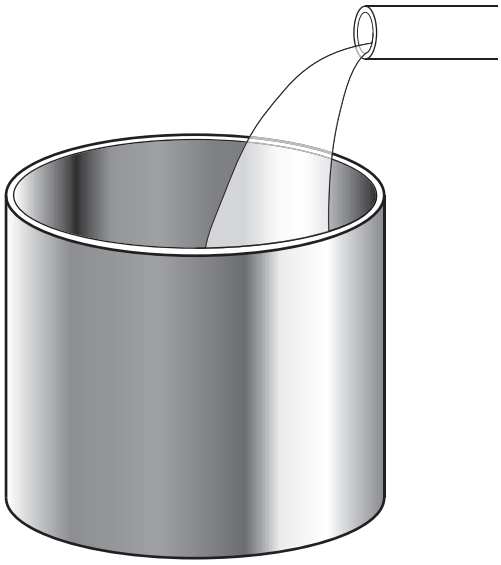
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11. *(a)* A water tank is cylindrical with a base radius of 45 cm.

Water is pumped into this tank at a rate of 1 litre per second.

What is the height of the water in the tank after 3 minutes?



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[5]

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(b) A large container, when full, holds 24 litres of water measured correct to the nearest litre.

(i) Write down the least possible value and the greatest possible value, in litres, of the amount of water in a full container.

Least value ..... litres Greatest value ..... litres. [2]

(ii) *You will be assessed on the quality of your written communication in this question.*

A tank has a capacity of 320 litres measured correct to the nearest 10 litres.

Explain, showing all your calculations, why it is not always possible to empty 13 of the large containers full of water into the tank without the tank overflowing.

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[6]

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12.

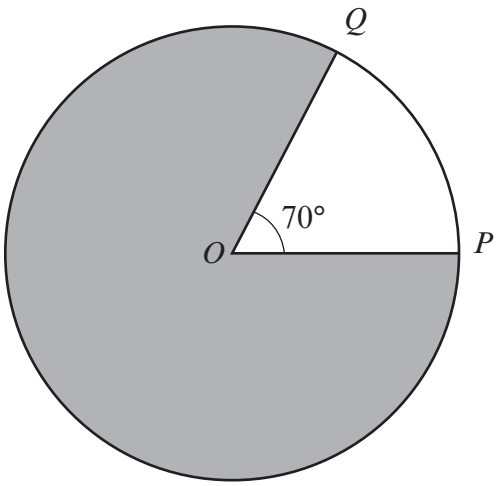


Diagram not drawn to scale

The points P and Q lie on a circle, with centre O and radius 12 cm, and $P\hat{O}Q = 70°$.

(a) Calculate the length of the minor arc PQ.

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[2]

(b) Calculate the area of the shaded part of the circle.

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[2]

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13. A wooden spike consists of a hemisphere, a cylinder and a cone, joined together as shown below.

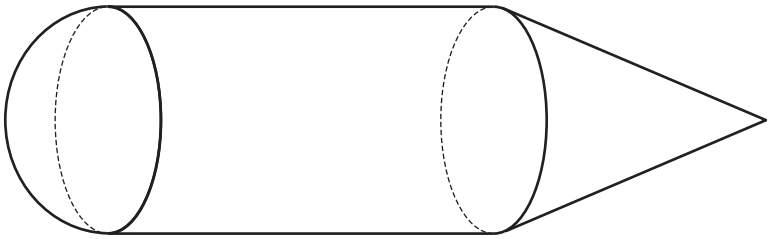


Diagram not drawn to scale

The radius of the cylinder is 5 cm and its length is 22 cm.
The volume of the spike is 2382 cm^3.

Calculate the length of the spike.

[10]

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