WJEC GCSE METHODS IN MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT 2 HIGHER TIER 4364 PAPERS

STEMUP

These questions belong to WJEC, not to us.

The examination questions, mark schemes and examiner reports in this pack were written and published by WJEC. They are past assessment materials, reproduced here so that students can revise from them.

What we do not own

STEMUP is not affiliated with WJEC and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. WJEC has not endorsed, approved or been involved in the production of it. WJEC and the qualification titles used here belong to their respective owners and appear for identification only.

Where to find the originals

WJEC publishes its past papers, mark schemes and examiner reports free of charge. Always check the current specification at wjec.co.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

S16-4364-02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. TUESDAY, 14 June 2016

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**3**	
3.	**11**	
4.	**10**	
5.	**2**	
6.	**5**	
7.	**7**	
8.	**10**	
9.	**6**	
10.	**6**	
11.	**3**	
12.	**3**	
13.	**5**	
14.	**6**	
15.	**5**	
16.	**6**	
17.	**9**	
Total	**100**	

4364 020001

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.

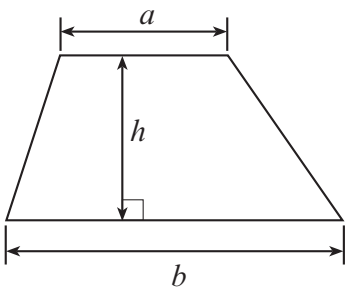
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **8**.

© WJEC CBAC Ltd.

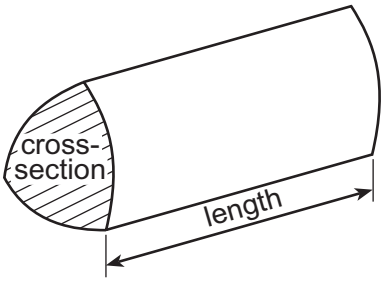
STEMUP.CO.UK

Formula List

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

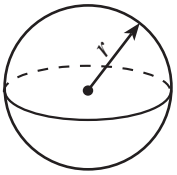


Volume of prism = area of cross-section × length



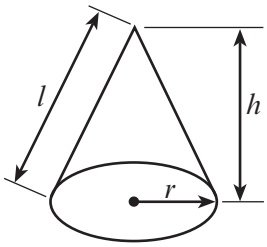
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

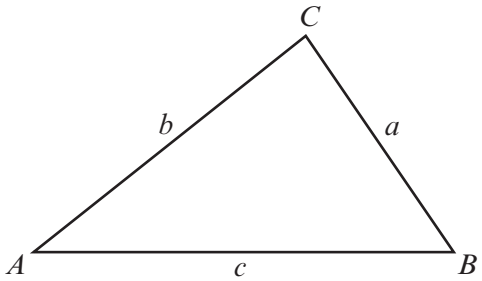


In any triangle ABC

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

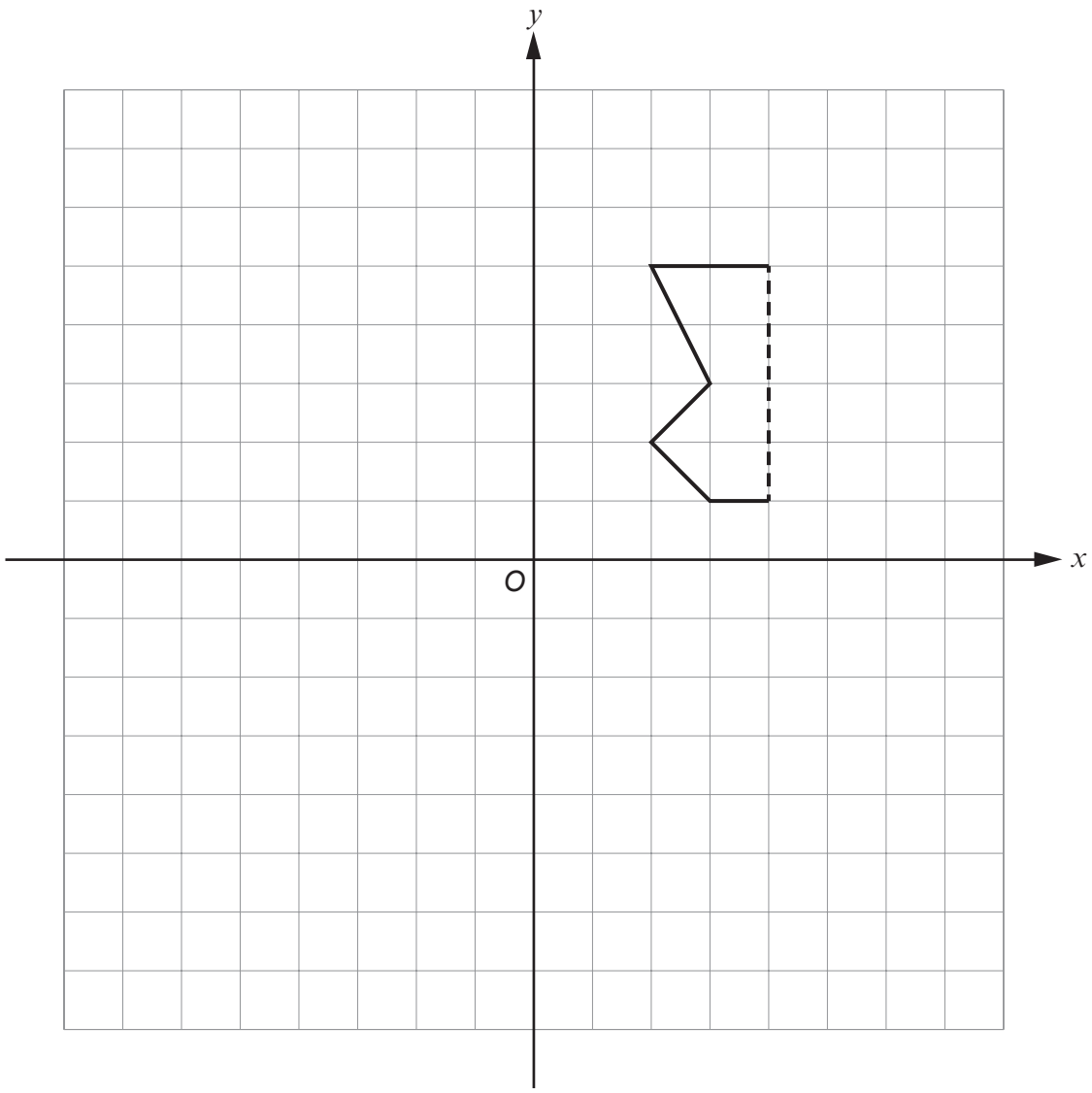
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. Part of a shape is shown on the grid.
The dotted line is the line of symmetry of the shape.
Complete the drawing of the shape and then rotate your complete shape through 180° about the origin. [3]



4364
020003

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

2. The diagram shows a 6-sided shape.

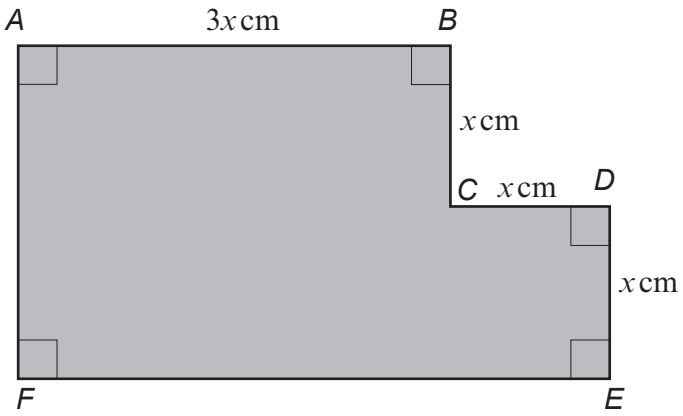


Diagram not drawn to scale

(a) Write down the length of *FE* in terms of x. [1]

.....

.....

(b) The perimeter of the 6-sided shape is 480 cm.
Find the value of x. [2]

.....

.....

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

3. *(a)* What percentage is 45 of 9000? [2]

(b) Increase 4000 by $1\frac{1}{2}$%. [2]

(c) Evaluate the following three lengths, giving your answers correct to two significant figures. Arrange your answers in ascending order.
You must show all your working. [5]

0·28 of 1350 metres

$\frac{5}{8}$ of 580 metres

8·4% of 4450 metres

Answers:

....
Least Greatest

(d) Calculate the difference between $\frac{1}{3}$ of 30 and $\frac{3}{10}$ of 30. [2]

4364 020005

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

4. *(a)* Solve $\frac{3x}{8} = 12$. [2]

(b) Solve $\frac{72}{x} = 9$. [1]

(c) Solve $5(7x - 13) = 40$. [3]

(d) Solve the inequality $6x + 4 < 100$. [2]

(e) Write down the greatest whole number that satisfies the inequality $3x < 81$. [2]

5. The circumference of a circle is 24π cm.
Calculate the radius of the circle. [2]

Radius is ..... cm

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

6.

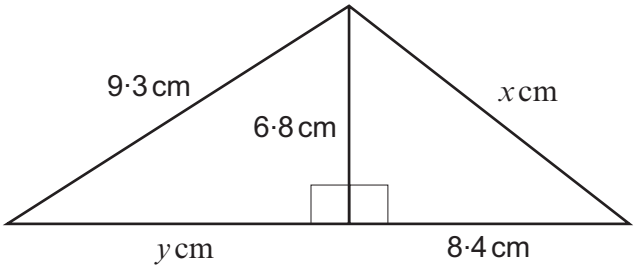


Diagram not drawn to scale

Calculate x and y.
You must show all your working. [5]

x = ... cm y = ... cm

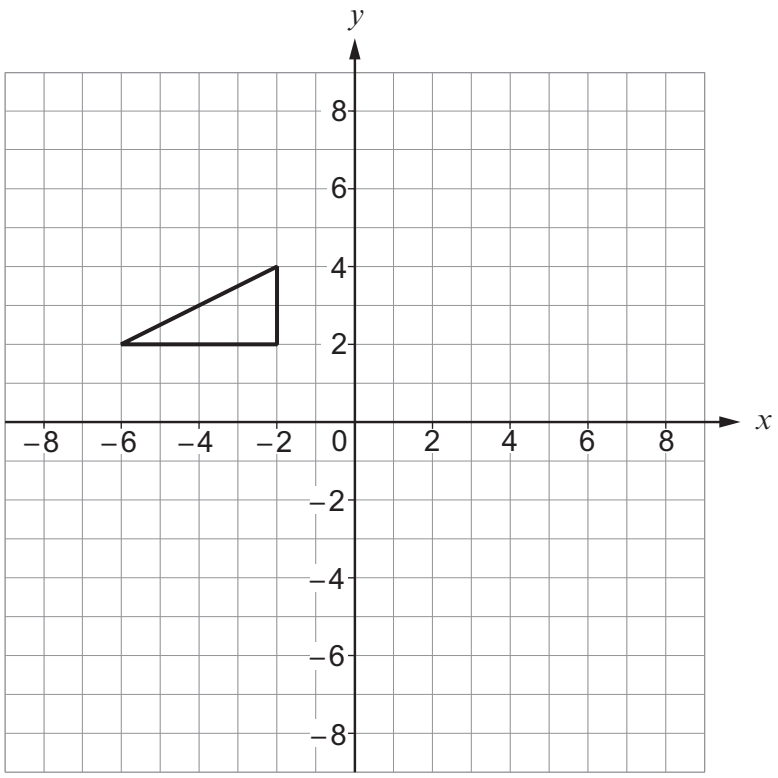
4364 020007

© WJEC CBAC Ltd.

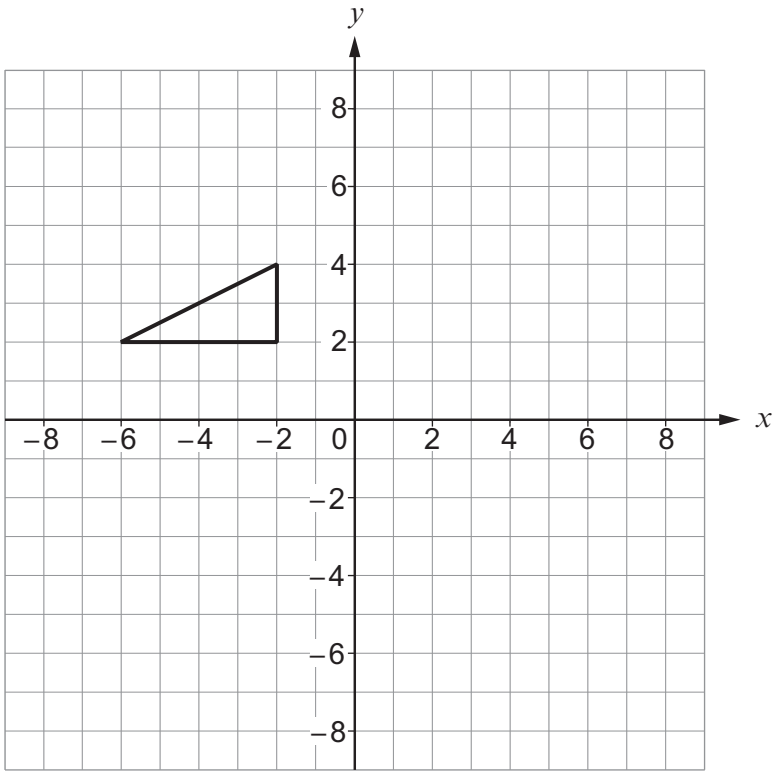
STEMUP.CO.UK

Examiner only

7. *(a)* Rotate the triangle through 90° clockwise using the point (2, 0) as the centre of the rotation. [2]



(b) Reflect the triangle shown in the line $y = x$. [2]

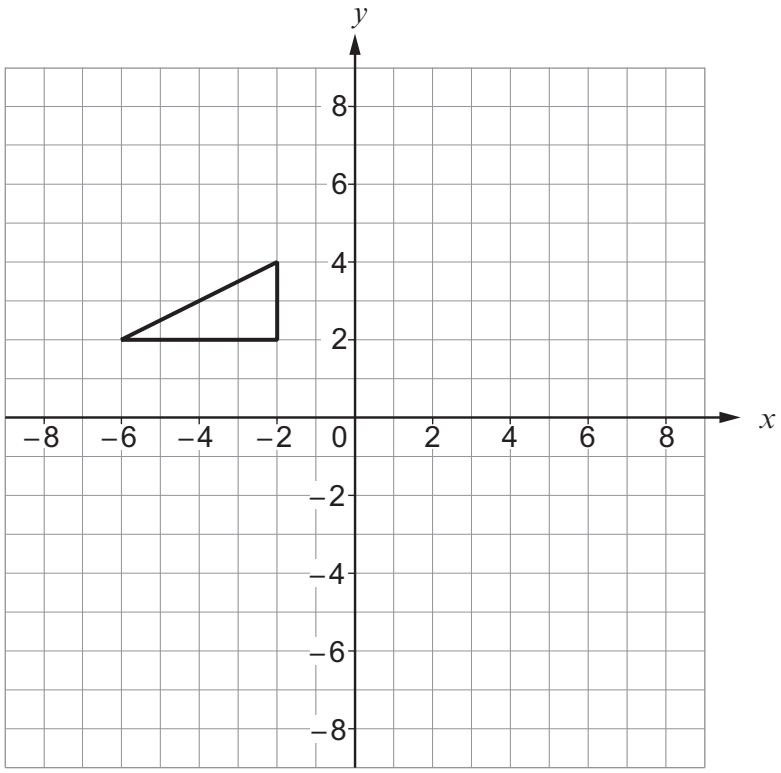


© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(c) Enlarge the triangle shown by a scale factor of $\frac{1}{2}$ using the origin as the centre of the enlargement. [3]



© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

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

A square-based cuboid has a height of 15 cm.
It has a volume of 576·6 cm^3.

Each of the lengths of the **sides of the base** of this cuboid is increased by $\frac{1}{5}$.

Calculate the percentage increase in the volume of the cuboid.
You must show all your working. [10]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

9. *(a)*

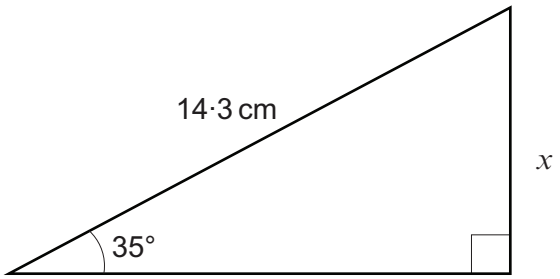


Diagram not drawn to scale

Calculate the length x. [3]

(b)

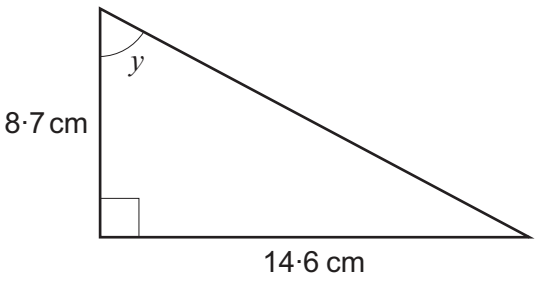


Diagram not drawn to scale

Calculate the size of angle y. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

10. An antique clock is valued every 10 years.
The clock was valued at £800 in 1960.
The owner of the clock keeps a record in a table.
An incomplete section of his table is shown below.

Complete the table in the following order:

- For 1980, calculate the difference and percentage difference.
- Calculate the value of the clock in 2000.
- Complete all the remaining boxes in the table. [6]

Year	Value	Difference in value since previous valuation	Percentage difference in value since previous valuation (correct to 1 decimal place)
1970	£750	–£50	–6·3%
1980	£782	£ …..	….. %
1990	£800	+£18	+2·3%
2000	£ …..	£ …..	….. %
2010	£981	£ …..	+9·0%

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

11. Evaluate the following.
Give your answer in standard form correct to 3 significant figures. [3]

$$\frac{3{\cdot}2\times10^4+7{\cdot}3\times10^5}{6{\cdot}2\times10^3}$$

.....

.....

.....

.....

.....

.....

.....

12.

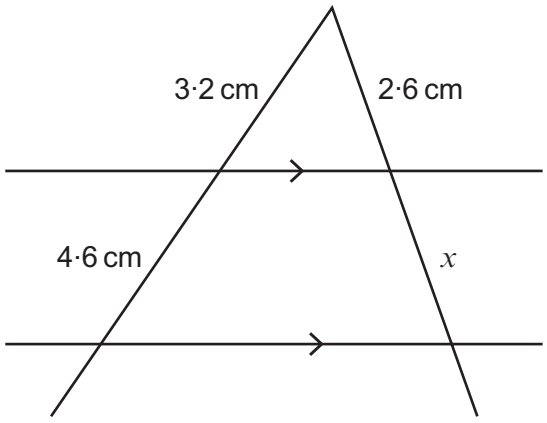


Diagram not drawn to scale

Calculate the length x.
You must show all your working. [3]

.....

.....

.....

.....

.....

.....

.....

.....

x = ... cm

© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

13. The diagram shows two mathematically similar moneyboxes.

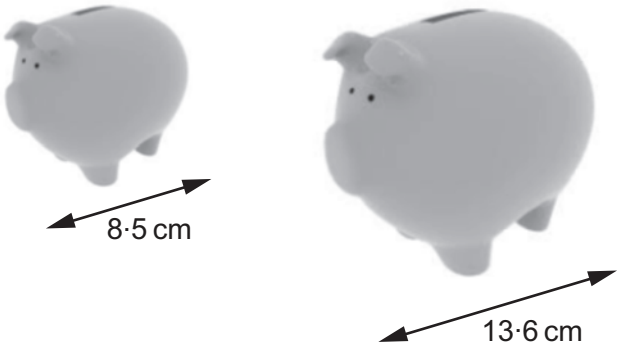


Diagram not drawn to scale

(a) The height of the smaller moneybox is 3 cm.
Calculate the height of the larger moneybox. [2]

Height of the larger moneybox is ..... cm

(b) The volume of the larger moneybox is 102·4 cm^3.
Calculate the volume of the smaller moneybox. [3]

Volume of the smaller moneybox is ..... cm^3

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

14. Solve the following simultaneous equations using an algebraic method. [6]

$$2x^2 + xy + 6 = 0$$
$$x + y = 7$$

© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

15. Given that y is inversely proportional to x^2, and that $y = 10$ when $x = 6$, find the values of x when $y = 4$. [5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

16. The diagram shows two sectors of circles, *BOC* and *AOD*.
The circles have a common centre, *O*.
You are given that $A\hat{O}D$ = 131°, *OB* = *OC* = 8·4cm and *BA*:*AO* is 1:2.

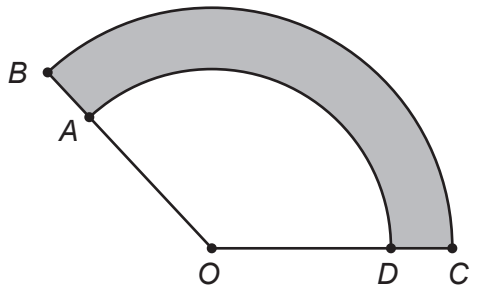


Diagram not drawn to scale

Calculate the perimeter of the shaded region *ABCD*. [6]

Perimeter of *ABCD* is ..... cm

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

17.

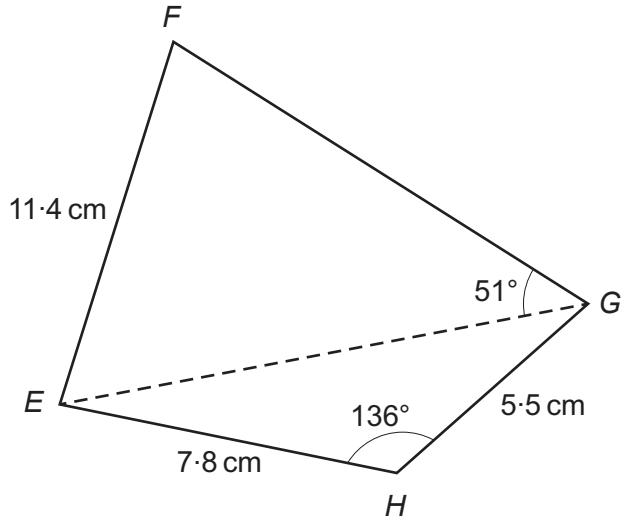


Diagram not drawn to scale

Calculate the area of *EFGH*. [9]

STEMUP.CO.UK

Examiner only

.....

.....

.....

.....

.....

.....

.....

.....

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

GCSE MARKING SCHEME

SUMMER 2016

GCSE MATHEMATICS LINKED PAIR METHODS
UNIT 2 HIGHER
4364-02

© WJEC CBAC Ltd.

STEMUP.CO.UK

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.

© WJEC CBAC Ltd.

METHODS IN MATHEMATICS
UNIT 2 (HIGHER TIER) - SUMMER 2016

Methods in Mathematics Unit 2 Higher Tier		Comments
1. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
2(a) $3x + x$ OR $4x$ (cm) (b) ($x =$) 40	B1 B2 3	Mark final answer FT for $8x$ + 'their FE' = 480 B1 for sight of $12x = 480$ or equivalent informal notation
3(a) $100 \times 45/ 9000$ or $100 \times 45 \div 9000$ 0.5(%) or ½(%) (b) 1.015×4000 or $4000 + 4000 \times 1.5 /100$ or $101.5 \times 4000/100$ 4060 (c) 0.28×1350 or $⅝ \times 580$ or 0.084×4450 or equivalent 378 (m) 362.5 (m) 373.8 (m) 360 370 380 (d) 10 – 9 = 1	M1 A1 M1 A1 M1 A1 A1 A1 B1 M1 A1 11	 CAO Accept 0.5 written as ½ CAO Any one correct calculation shown Accept to 2 sig. figs. 380 Accept 362(.5) or 363 or to 2 sig. figs. 360 Accept 373(.8) or 374 or to 2 sig. figs. 370 Ignore any further working for M and A marks Must all be 2 significant figures, do not accept 360.0 etc. FT provided at least 2 of the A marks awarded *If no marks, award SC1 for sight of 9.999 – 9 = 0.999 or 0.9 recurring*
4. (a) ($x =$) $12 \times 8/3$ $x = 32$ (b) ($x =$) 8 (c) $35x – 65 = 40$ OR $7x – 13 = 40/5$ $35x = 105$ or $x = 105/35$ $7x = 21$ or $x = 21/7$ $x=3$ (d) $6x < 100 – 4$ or $6x < 96$ or $3x < 50 – 2$ or $3x<48$ $x< 16$ (e) $x < 81/3$ or $x< 27$ or $78 < 81$ ($x =$) 26	 M1 A1 B1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) Mark final answer. Do not accept 72/9 FT until 2nd error Accept an embedded answer for B3 No marks for use of "=", unless finally replaced to give $x<16$ then award M1 A1. SC1 for $x<104/6$ ISW Or sight of $3 \times 26 = 78$ with $3 \times 27 = 81$ or equivalent divisions Accept unsupported 26, or a unique answer of 26 from a trial and improvement method, or $3 \times 26 < 81$ Do not accept $x<26$. *Allow sight of $3x = 81$, $x = 27$ followed by selecting $x = 26$*
5. $24\pi = 2\pi r$ or $24\pi = \pi d$ or $d = 24$(cm) $r = 12$ (cm)	M1 A1 2	Do not accept 11.9(9…)
6. ($x^2 =$) $6.8^2 + 8.4^2$ ($y^2 =$) $9.3^2 – 6.8^2$ $x^2 = 116.8$ or ($x =$) $\sqrt{116.8}$ OR $y^2 = 40.25$ or ($y =$)$\sqrt{40.25}$ $x = 10.8(07…)$ $y = 6.3(44…)$	M1 M1 A1 A1 A1 5	 Accept 11 from correct working Accept 6 from correct working

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics Unit 2 Higher Tier		Comments
7.(a) Correct rotation	B2	B1 near miss of grid lines, or for anticlockwise 90° about (2, 0), or for clockwise 90° about (0, 2)
(b) Correct reflection in $y = x$	B2	B1 for sight of the line $y = x$ or correct reflection in $y = -x$
(c) Enlargement scale factor ½ with correct orientation	B2	B1 for any 1 line correct, or consistent incorrect fractional scale <1, or enlargement scale factor ½ with incorrect orientation
Correct position	B1 7	Not FT. Use bottom right hand vertex as a guide
8. (base edge^2) $576.6 \div 15$ (=38.44) (base edge) $\sqrt{(576.6 \div 15)}$ (=6.2 cm) (new base edge) $\sqrt{(576.6 \div 15)} \times 6/5$ or equivalent 7.44(cm)	M1 m1 m1 A1	 FT 'their 6.2' that is 'their base edge' CAO
(New volume) $7.44 \times 7.44 \times 15$ (=830.304 cm^3) (Difference volume) 830.304 – 576.6 (=253.704 cm^3)	B1 B1	FT their 7.44 provided M1, m2 previously awarded FT their new volume provided M1 previously awarded and attempt 'their 7.44' × 'their 7.44' × 'their 15' May be implied in further working
(Percentage increase is) $\frac{253.704}{576.6} \times 100$ or $1 \times 100 - \frac{830.304}{576.6} \times 100$ 44(%)	M1 A1	FT provided their difference in volumes correctly evaluated or implied in an equivalent method ('their 15' as 18 gives an answer of 72.8(%) or 73(%)) *Alternative:* *Linear scale factor 1.2 or equivalent* *M2* *Volume scale factor 1.2^2* *m3* *= 1.44* *A2* *Percentage increase 44(%)* *A1* *Other alternatives are accepted, such as new volume as % original subtract 100, or comparison of base areas*
QWC2: Candidates will be expected to • present work clearly, with words explaining start, process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining start, process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	Q W C 2 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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
9(a) $x = 14.3 \times \sin 35°$ $x = 8.2(02\ldots)$cm)	M2 A1	M1 for $\sin 35° = x/14.3$ Accept 8(cm) from correct working
(b) $\tan y = 14.6/8.7$ $y = \tan^{-1} 14.6/8.7$ or $\tan y = 1.678\ldots$ $y = 59(.2°)$	M1 A1 A1 6	 Allow for sight of $\tan y = 1.67$ or 1.68

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics Unit 2 Higher Tier		Comments
10. (+£) 32 AND (+) 4.3(%) (£) 900 (+£) 100 AND (+) 12.5(%) (£) 81	B2 B2 B1 B1 6	B1 for (32 and) 32/750 or sight of 4.2(666…%) B1 for interpretation '1(.)09 is 981', e.g. 981÷1(.)09 CAO CAO
11. 1.23×10^2	B3 3	B2 for $1.2(29\ldots) \times 10^2$ or 123 B1 for 122.903…
12. $x = 2.6 \times 4.6 \div 3.2$ 3.7(375 cm)	M2 A1 3	M1 for $3.2/4.6 = 2.6/x$ or equivalent *Award M2, A0 for an answer of 3.8(3…cm) from 4.6 ÷ 1.2* Accept 4(cm) from appropriate working. No marks for unsupported 4(cm)
13(a) $3 \times 13.6 \div 8.5$ or 3×1.6 or equivalent 4.8 (cm) (b) Volume scale factor 1.6^3 or 0.625^3 or unsimplified equivalents Volume smaller box 102.4×0.625^3 or $102.4 \div 1.6^3$ 25 (cm^3)	M1 A1 B1 M1 A1 5	 FT 'their derived 1.6^3'
14. $y = 7 - x$ OR $x = 7 - y$ $2x^2 + x(7-x) + 6 \ (= 0)$ $2(7-y)^2 + (7-y)y + 6 \ (= 0)$ $x^2 + 7x + 6 = 0$ $y^2 - 21y + 104 = 0$ $(x + 1)(x+6) \ (= 0)$ $(y - 8)(y - 13) \ (= 0)$ $x = -1, x = -6$ OR $y = 8, y = 13$ $y = 8, y = 13$ $x = -1, x = -6$ 6	M1 M1 A1 M1 A1 A1 *No marks for trial & improvement methods*	OR For sight of $x^2 + xy = 7x$ (2^{nd} eqn multiplied by x) OR Subtraction from 1^{st} equation OR $x^2 + 7x = -6$ or equivalent FT provided quadratic from an appropriate substitution method or subtraction method OR alternative method to solve , e.g. formula with correct substitution and b^2-4ac correctly simplified *If A0, A0 then SC1 for x= -1, y=8* ***OR*** *x= -6, y=13 provided algebraic method shown with appropriate M1, M1, M1 marks*
15. $y \alpha 1/x^2$ OR $y = k/x^2$ $10 = k/6^2$ $y = 360/x^2$ or $k = 360$ $x^2 = 360/4$ or $x = (\pm)\sqrt{90}$ or $x = 9.4868..$ $x = \pm 9.4868\ldots$ or $\pm 3\sqrt{10}$ 5	B1 M1 A1 M1 A1	Ignore use of incorrect symbol 'α' later FT $y \alpha 1/x$ or $y \alpha x^2$ FT 'their k' provided at least 1 mark previously awarded Accept rounded or truncated, but MUST be ±. No FT from 1/x as both solutions required
16. Sight of BA = 2.8(cm) and AO = 5.6(cm) Outer arc $2 \times \pi \times 8.4 \times 131/360$ Inner arc $2 \times \pi \times 5.6 \times 131/360$ Outer arc 19.2(…cm) AND Inner arc 12.8(…cm) Perimeter 2.8+2.8+ outer arc + inner arc 37.6 (cm) 6	B1 M1 M1 A1 M1 A1 	 FT 'their 5.6' provided <8.4, ≠4.2 and >2.8 CAO *If M0, M0, A0 allow:* *SC2 for 9.6(cm) with 6.4(cm), or* *SC1 for sight of $v \times \pi \times 131/360$, where v is a value >0* FT 'their 2.8' provided <4.2. FT their outer and inner arcs provided derived from dimensionally correct formulae CAO *Alternative:* *use of mean arc, using mean radius 7cm twice – must be convincing, then B1 mean radius, M2, A1 for mean arc used twice, then M1, A1 for perimeter*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics Unit 2 Higher Tier		Comments
17. $EG^2 = 7.8^2 + 5.5^2 - 2\times7.8\times5.5\times\cos136°$ $EG = 12.36\ldots$ (cm)	M1 A1	or $EG^2 = 152.809\ldots$ or $EG = \sqrt{152.809\ldots}$
$\sin F = \frac{\sin51°\times 12.36\ldots}{11.4}$	M2	FT 'their derived EG' provided M1 awarded M1 for $\frac{\sin F}{12.36\ldots} = \frac{\sin51°}{11.4}$ or $\frac{12.36\ldots}{\sin F} = \frac{11.4}{\sin51°}$
$F = 57.4\ldots°$ AND sight or use of $E = 180° - 51° - F$ $(=71.57\ldots°)$	A1	*EG=12cm gives 54.88..°* *EG=12.3cm gives 56.98…°* *EG=12.4cm gives 57.7..°*
Area EFG OR Area EHG $= \frac{1}{2}\times11.4\times12.36\times\sin71.6°$ $= \frac{1}{2}\times7.8\times5.5\times\sin136°$	M1	FT 'their EG' provided at least M2 previously awarded FT their correct evaluation of angle E from their angle F provided <90° and at least M2 previously awarded (E = 71.6°)
$= 66.85(\ldots cm^2)$	A1	*(E=72°, EG=12.4cm gives 67(.22..cm^2))*
$= 14.9(..cm^2)$	A1	Accept $15(cm^2)$
Area EFGH 81.7(49… cm^2) or 82(cm^2)	A1	Accept other rounding, unrounded or truncated answers. FT provided at least one of the areas EFG or EHG is correct AND all M marks awarded
	9	

© WJEC CBAC Ltd.

STEMUP.CO.UK

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

W16-4364-02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. MONDAY, 18 January 2016

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**5**	
3.	**7**	
4.	**6**	
5.	**3**	
6.	**7**	
7.	**8**	
8.	**7**	
9.	**2**	
10.	**2**	
11.	**3**	
12.	**2**	
13.	**5**	
14.	**4**	
15.	**1**	
16.	**6**	
17.	**9**	
18.	**1**	
19.	**5**	
20.	**9**	
Total	**100**	

4364 020001

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.

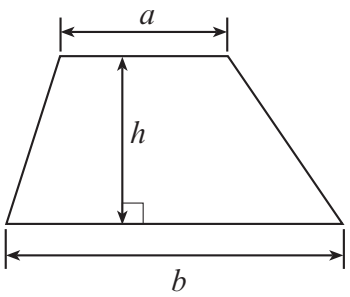
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **8**.

© WJEC CBAC Ltd.

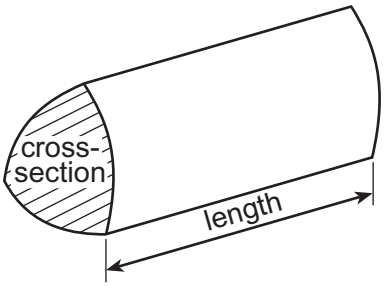
STEMUP.CO.UK

Formula List

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

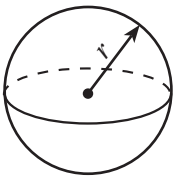


Volume of prism = area of cross-section × length



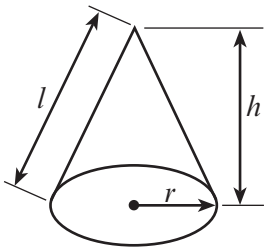
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

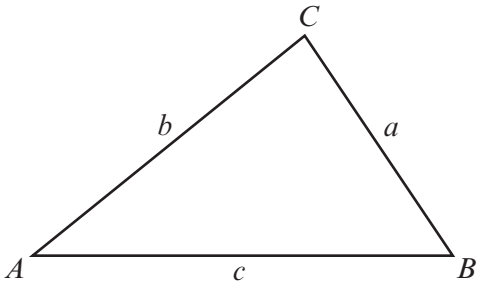


In any triangle ABC

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

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

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. *(a)* Solve $4(3x - 1) = 20$. [3]

(b) Solve $x + 14 = 6 + 3x$. [3]

(c) Express the following inequality in the form $x < n$, where n is a whole number. [2]

$$\frac{x}{3} + 4 < 16$$

4364 020003

© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

2. *(a)* Water flows into a cylindrical tank at a constant rate.

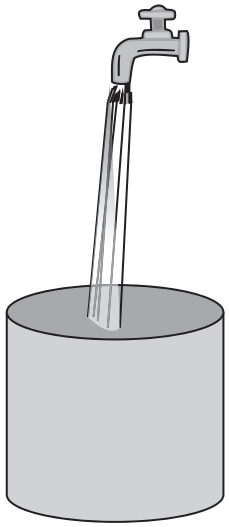


Diagram not drawn to scale

It took 36 minutes to fill the tank to a height of 40 cm.
How long did it take to fill to a height of 5 cm? [2]

.....

.....

.....

.....

(b) The volume of a cuboid is 2400 cm^3.
Its height is 100 cm.
The length of the rectangular base is **2 cm longer** than its width.

Calculate the length and width of the rectangular base of this cuboid. [3]

.....

.....

.....

.....

.....

.....

.....

Length is ..... cm

Width is ..... cm

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

3. *(a)* Write 661·2 as a percentage of 870. [2]

(b) Find the value of $\frac{13{\cdot}4^2 - 2{\cdot}3^5}{7{\cdot}1^2 + \sqrt{5}}$, giving your answer correct to one decimal place. [2]

(c) Find the sum of $1\frac{2}{5}$ of 570 and $2\frac{3}{11}$ of 6204. [3]

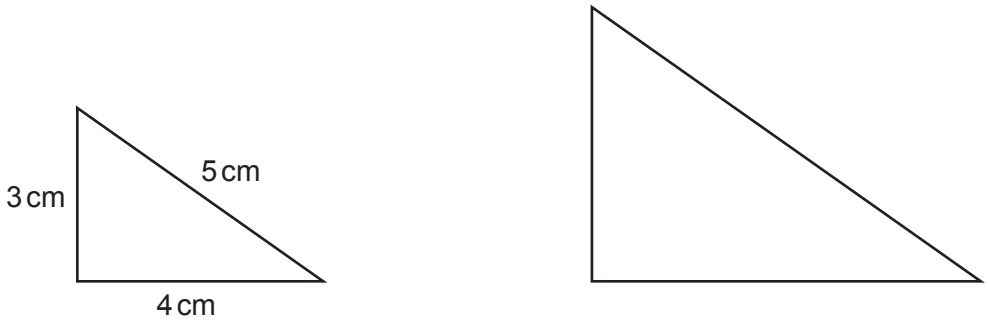
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

4. These two right-angled triangles are similar.



Diagrams not drawn to scale

The lengths of the sides of the larger triangle are all 20% longer than the lengths of the corresponding sides of the smaller triangle.

(a) Calculate the lengths of the sides of the larger triangle. [3]

.....

.....

.....

.....

.....

.....

(b) Calculate the areas of both of these triangles. [3]

.....

.....

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

5. A long roll of wire is to be cut in the ratio 5 : 6 : 7.



Once it has been cut, explain why you cannot have $\frac{4}{9}$ of the roll as a single piece of wire.
You must show all your working. [3]

.....

.....

.....

.....

.....

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

6. *(a)* Seven times a whole number, x, subtract twenty-six is greater than forty-four.
What is the least possible value of this whole number? [3]

(b) The diagram shows a shape formed by joining a triangle to a square.

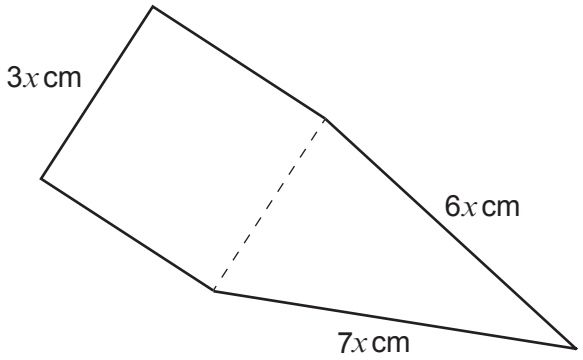


Diagram not drawn to scale

The perimeter of the shape is 1166 cm.

Write down an equation, in terms of x, for the perimeter of the shape.
Solve your equation and write down the length of one of the sides of the square. [4]

Length of a side of the square is ..... cm

© WJEC CBAC Ltd.

STEMUP.CO.UK

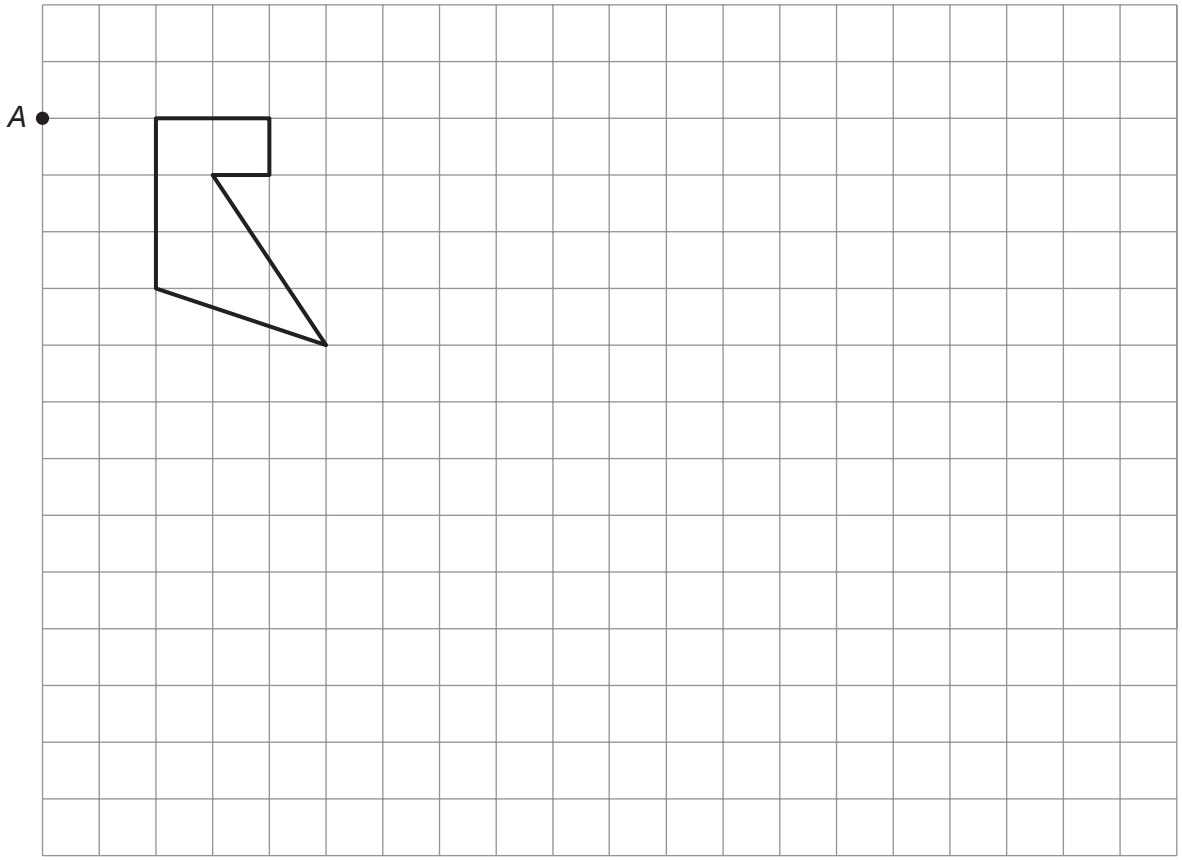
BLANK PAGE

© WJEC CBAC Ltd.

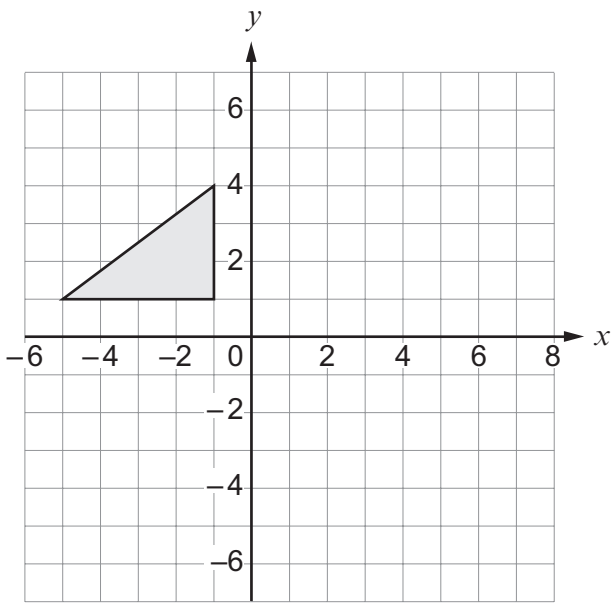
STEMUP.CO.UK

Examiner only

7. *(a)* Enlarge the shape shown on the grid by a scale factor of 2 using *A* as the centre of enlargement. [3]



(b) Reflect the triangle in the line $y = x$. [2]

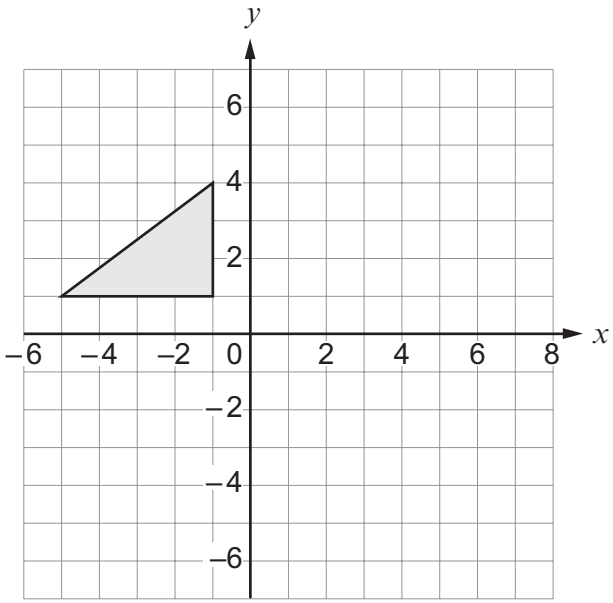


© WJEC CBAC Ltd.

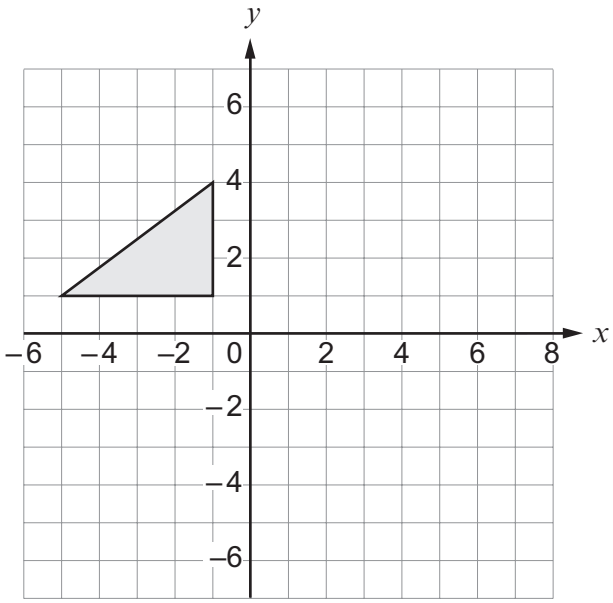
STEMUP.CO.UK

Examiner only

(c) Translate the triangle shown below by $\begin{pmatrix} 2 \\ -1 \end{pmatrix}$. [1]



(d) Rotate the triangle shown on the grid below through 90° clockwise about (0, –1). [2]



© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

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

In May, a bag of potatoes cost £1.40.

From May to June, the price of a bag of potatoes increased by 15%.

From June to July, the price of a bag of potatoes decreased by 18%.

From July to August, the price of a bag of potatoes increased by 2%.

Calculate the price of a bag of potatoes in August.
You must show all your working. [7]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

9.

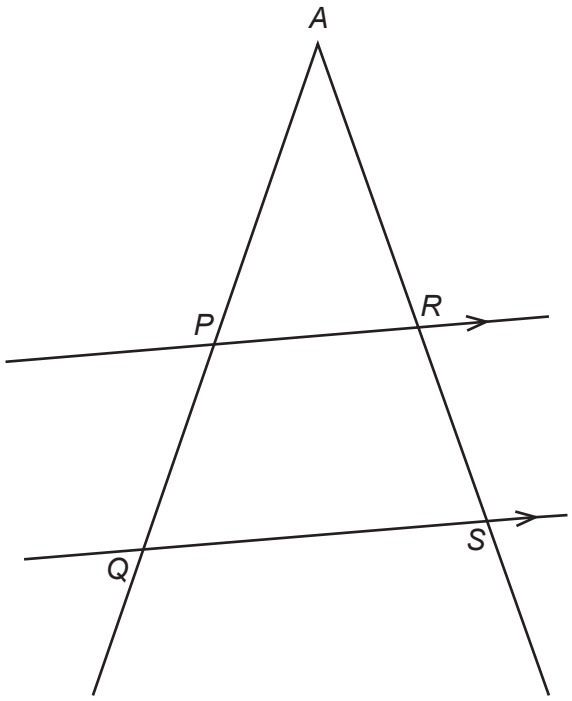


Diagram not drawn to scale

Given that $AP = PQ = 11$ cm and $AR = 14$ cm, calculate AS. [2]

4364 020013

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

10. The area of a circle is $169\pi\,\text{cm}^2$.
Calculate the diameter of the circle. [2]

.....

.....

.....

.....

.....

11. The diagram shows 2 rectangles.

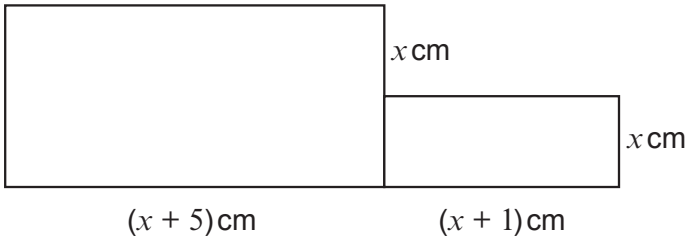


Diagram not drawn to scale

Prove that the total area of the two rectangles, in cm^2, is given by: [3]

$$3x^2 + 11x$$

.....

.....

.....

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

12. Evaluate $\dfrac{5{\cdot}2\times10^{-6}+4{\cdot}5\times10^{-5}}{9{\cdot}4\times10^{-11}}$.

Give your answer, in standard form, correct to 2 significant figures. [2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

13. The tetrahedron shown below has 4 faces.

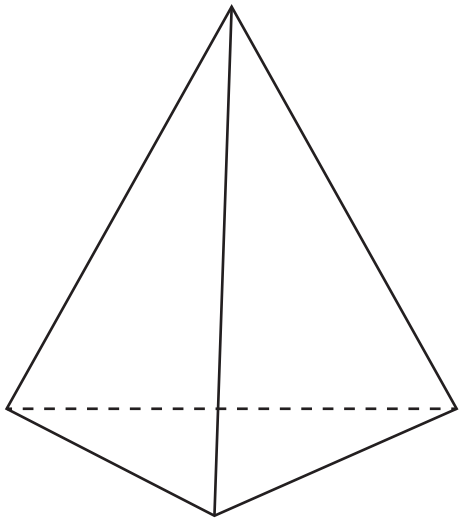


Diagram not drawn to scale

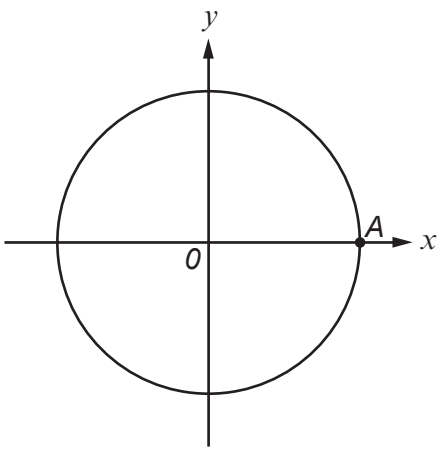
Each edge of this tetrahedron is 46 cm.
Calculate the total area of the 4 faces of the tetrahedron.
Give your answer correct to 4 significant figures. [5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

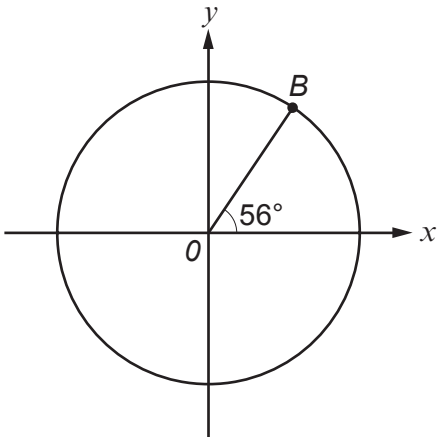
14. *(a)* The equation of the circle shown below is $x^2 + y^2 = 49$.



Write down the coordinates of the point *A*. [1]

(..... , ...)

(b) The radius of the circle shown below is 9 units.



Calculate the x-coordinate of point *B*. [3]

.....

.....

.....

.....

.....

.....

.....

.....

x-coordinate of point *B* is .....

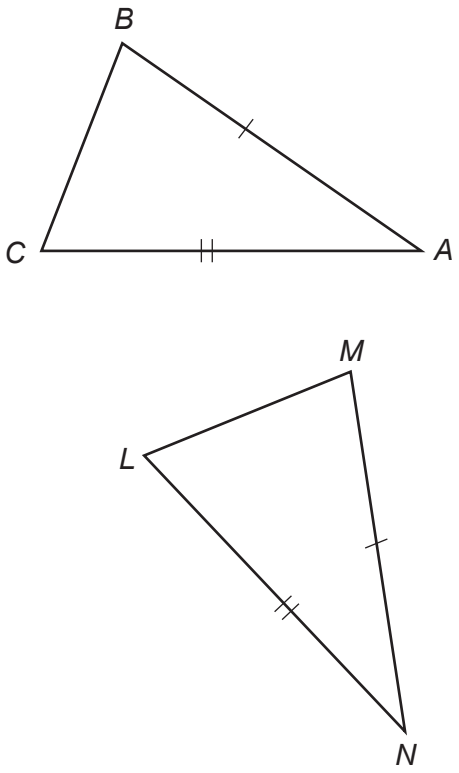
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

15.



Diagrams not drawn to scale

Ben has marked some information on the triangles.
The two triangles are actually congruent.
He now needs to indicate just one other fact on each of the triangles to show this is true.
Write down one possibility for this other fact. [1]

.....

.....

.....

.....

© WJEC CBAC Ltd.

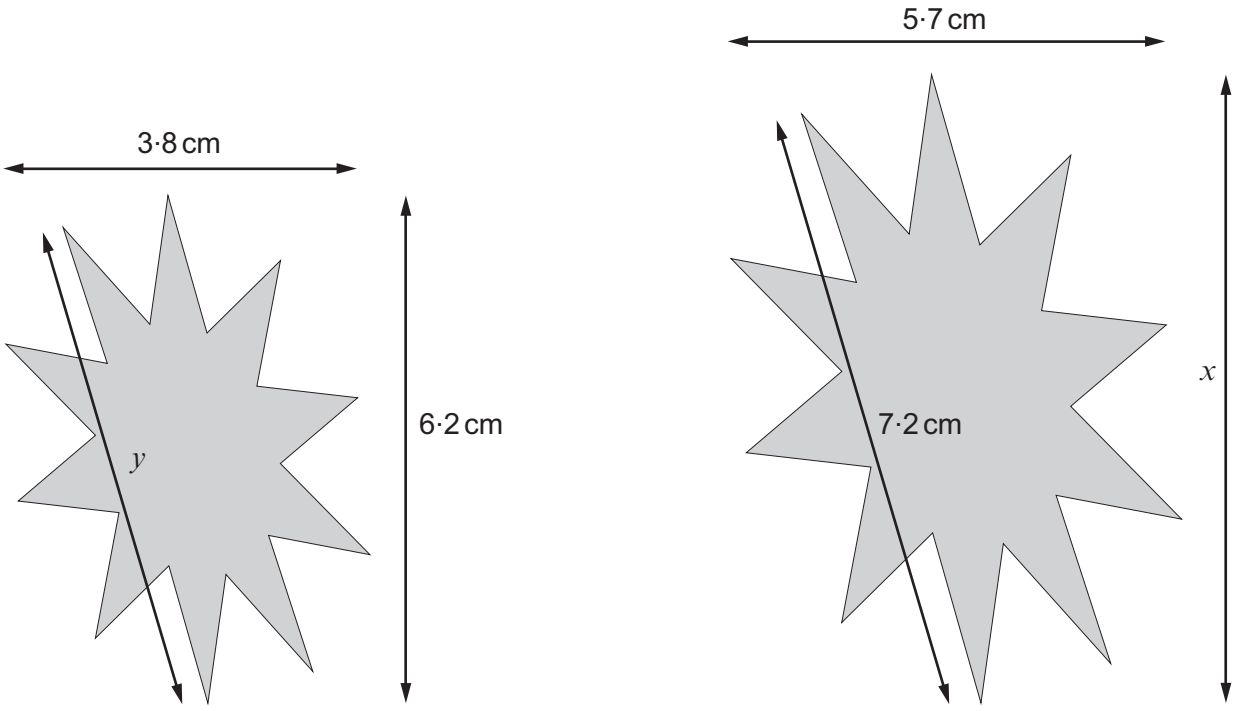
STEMUP.CO.UK

BLANK PAGE

© WJEC CBAC Ltd.

Examiner only

16. The shapes shown below are similar.



Diagrams not drawn to scale

(a) Find the lengths x and y.
Show all of your working. [4]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b) The area of the smaller shape is 22 cm^2.
Calculate the area of the larger shape. [2]

STEMUP.CO.UK

Examiner only

17. *(a)* Use the formula method to solve $2x^2 + 7x - 3 = 0$.
Give your answer correct to 2 decimal places. [3]

(b) Solve the following simultaneous equations using an algebraic method. [6]

$$2x^2 + xy = -3$$
$$x + y = 4$$

© WJEC CBAC Ltd.

STEMUP.CO.UK

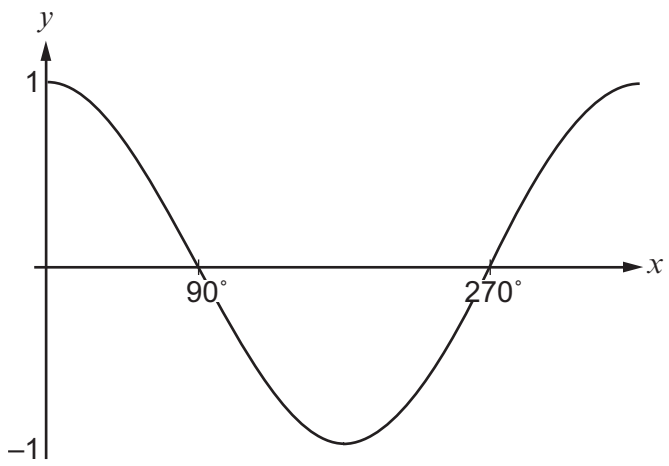
Examiner only

18.

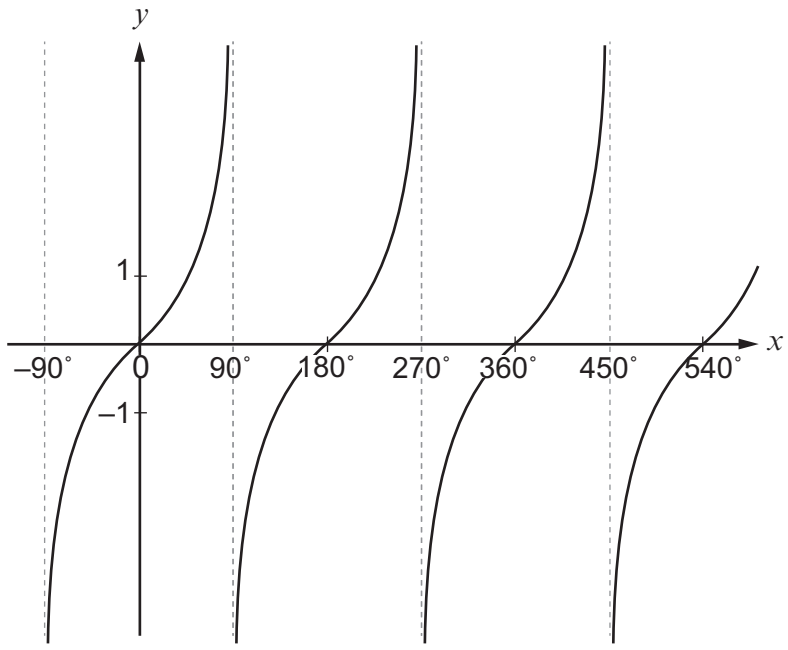
Labels:

$y = \sin x$ $y = -\sin x$ $y = -\cos x$ $y = \cos x$ $y = \tan x$

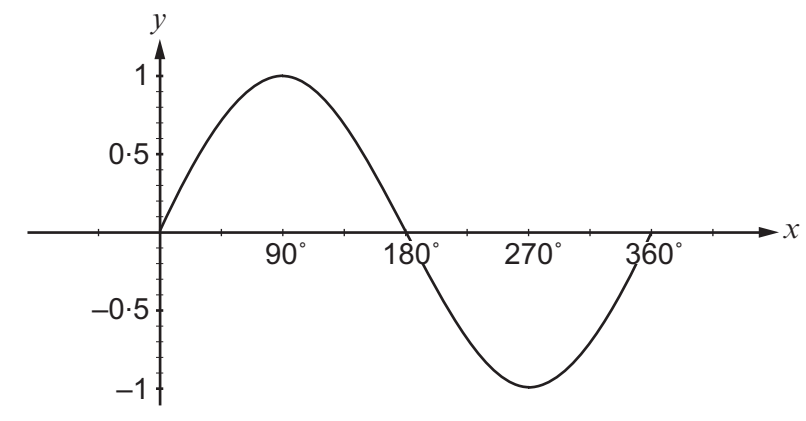
Insert the correct label, from the list given above, alongside each of the graphs below. [1]



$y =$ .....



$y =$ .....



$y =$ .....

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

19. Vectors **OM**, **OL** and **OK** are shown in the diagram below.

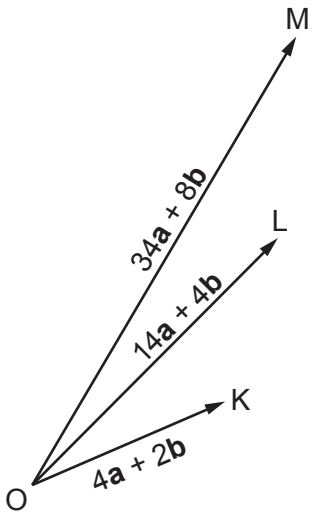


Diagram not drawn to scale

(a) Express **KL** in terms of **a** and **b** in its simplest form. [2]

(b) Show that **KM** = $p \times$ **KL**, where p is a constant value.
Also write down the value of p. [2]

STEMUP.CO.UK

Examiner only

(c) What does your answer to *(b)* tell you about **K**, **L** and **M**? [1]

.....

.....

.....

.....

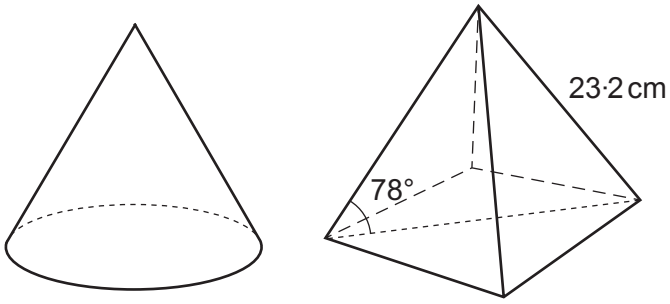
© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

20. The cone and the square-based pyramid shown below have equal heights and equal volumes.



Diagrams not drawn to scale

In the square-based pyramid, the angle between a diagonal of the base and one of the sloping edges is 78°, as shown in the diagram.

Calculate the radius of the cone.

You are given the following facts:

- Volume of a cone = $\frac{1}{3}$ × area of the base × perpendicular height
- Volume of a pyramid = $\frac{1}{3}$ × area of the base × perpendicular height

[9]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

S15-4364-02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. MONDAY, 8 June 2015

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**8**	
3.	**3**	
4.	**6**	
5.	**5**	
6.	**8**	
7.	**9**	
8.	**7**	
9.	**4**	
10.	**2**	
11.	**4**	
12.	**3**	
13.	**3**	
14.	**7**	
15.	**4**	
16.	**9**	
17.	**6**	
18.	**3**	
Total	**100**	

4364 020001

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.

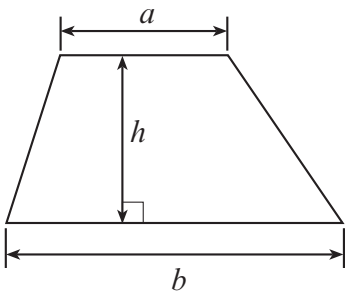
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **5**.

© WJEC CBAC Ltd.

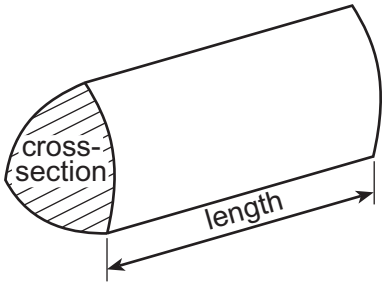
STEMUP.CO.UK

Formula List

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

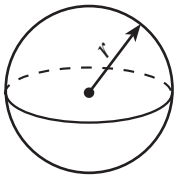


Volume of prism = area of cross-section × length



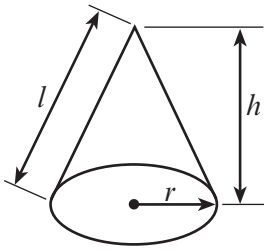
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

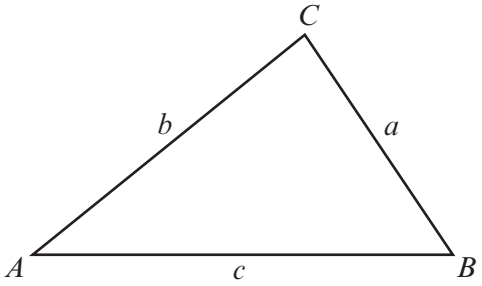


In any triangle ABC

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

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

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. *(a)* Solve $\frac{4x}{5} = 16$. [2]

(b) Solve $\frac{7}{x} = 14$. [1]

(c) Solve $4(7x - 11) = 40$. [3]

(d) (i) Solve the inequality $2x + 3 > 35$. [2]

(ii) Hence, write down the smallest whole number that satisfies the inequality $2x + 3 > 35$. [1]

4364 020003

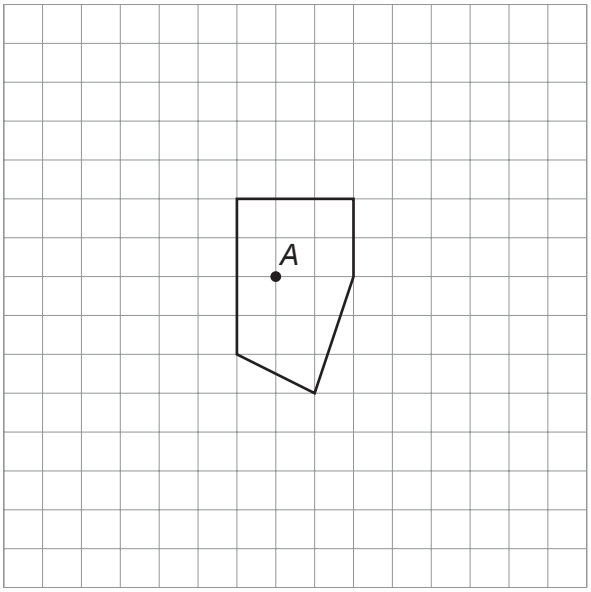
© WJEC CBAC Ltd.

Turn over.

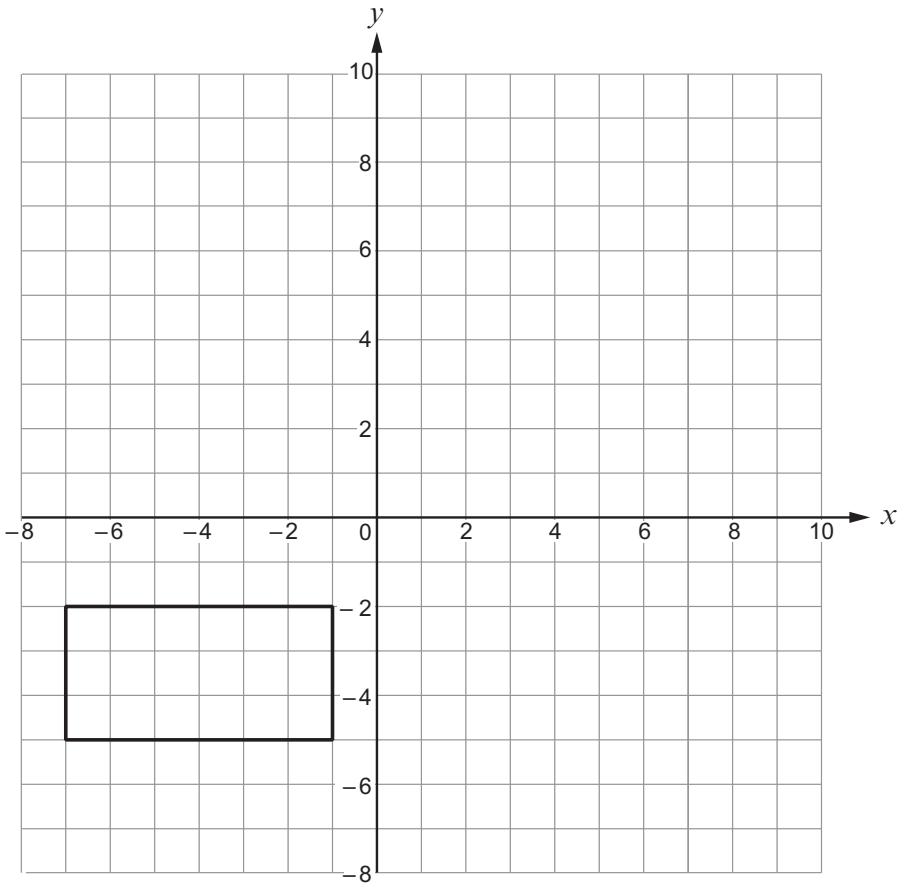
STEMUP.CO.UK

Examiner only

2. *(a)* Enlarge the shape shown by a scale factor of 2 using *A* as the centre of enlargement. [3]



(b) Reflect the rectangle shown below in the line $x = 1$. [2]

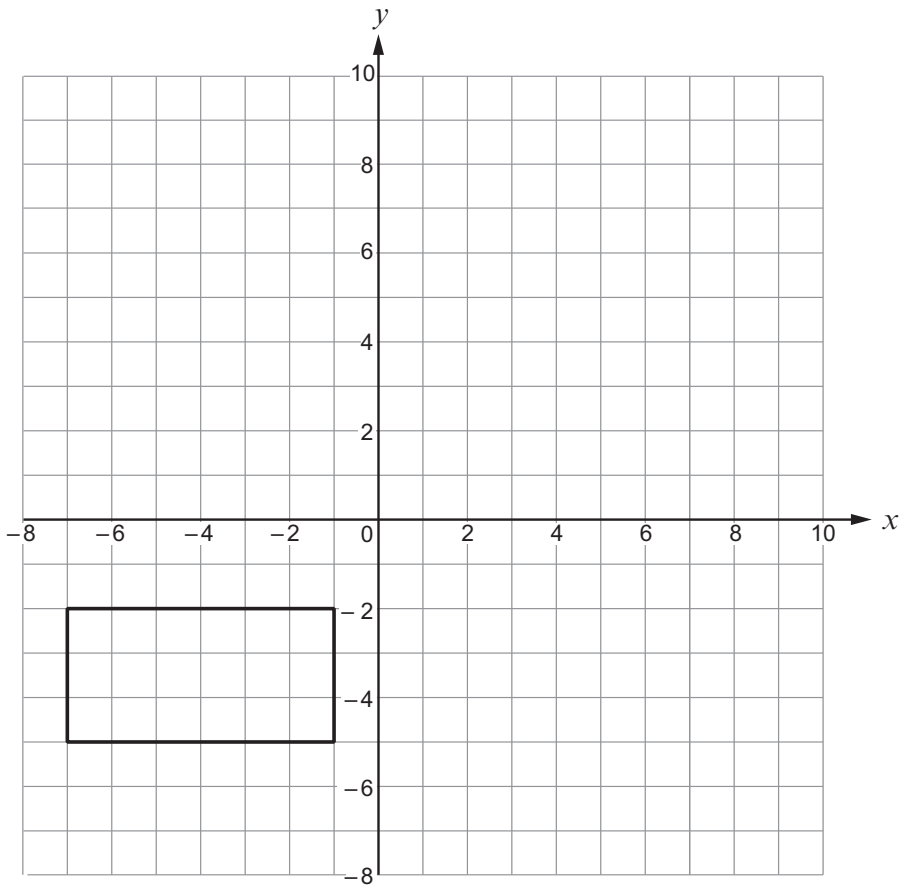


© WJEC CBAC Ltd.

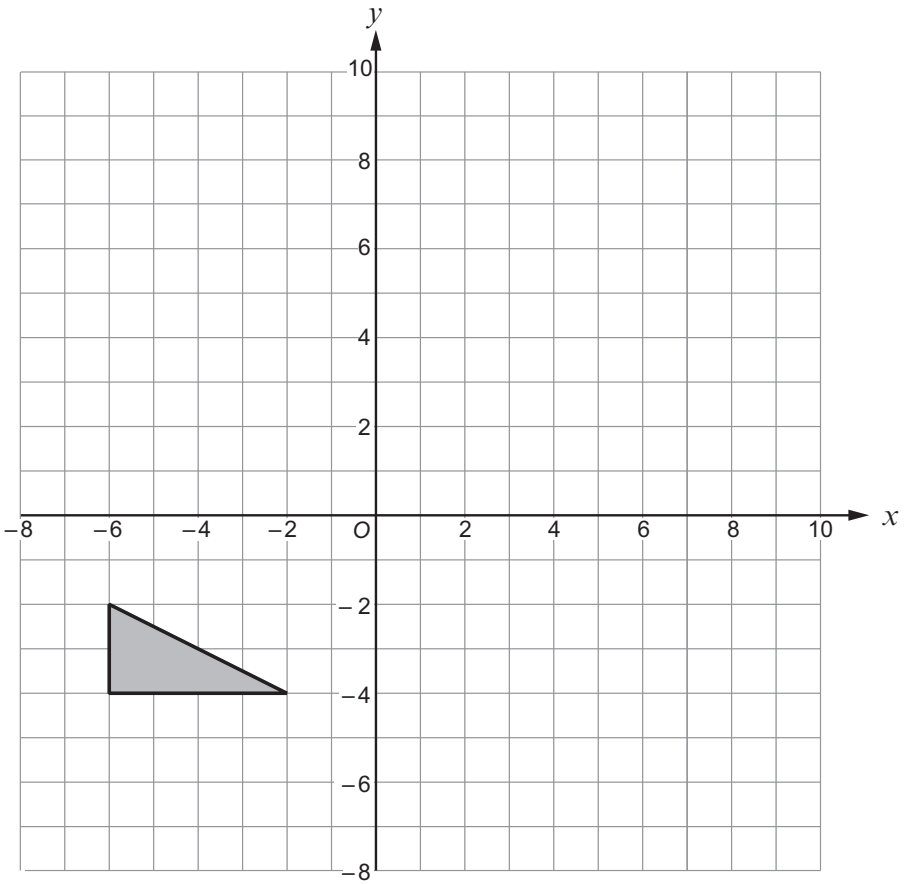
STEMUP.CO.UK

Examiner only

(c) Translate the rectangle shown below by $\begin{pmatrix} 8 \\ 5 \end{pmatrix}$. [1]



(d) Rotate the triangle through 90° anticlockwise about *O*. [2]



© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

3.



A pen costs $4x$ pence.
A pencil costs $2 + 3x$ pence.

The total cost of a pen and a pencil is 65 pence.
Write an equation in x and solve it to find the value of x. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

4. *(a)*

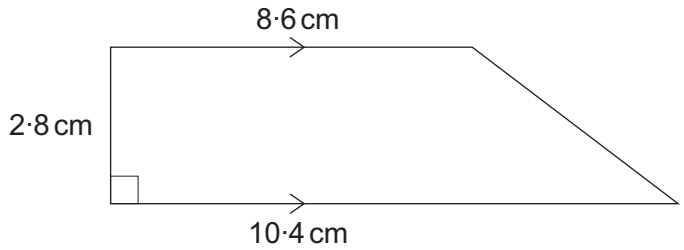


Diagram not drawn to scale

Calculate the area of the trapezium. [2]

(b)

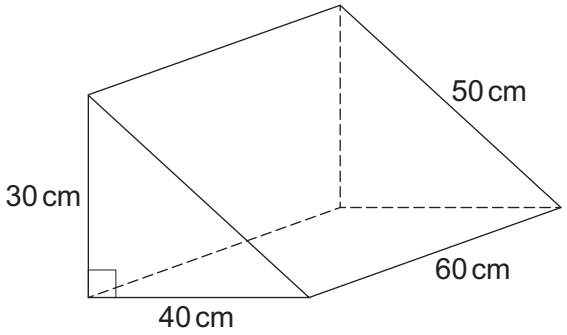


Diagram not drawn to scale

Calculate the volume of the triangular prism.
Give the units of your answer. [4]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

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

Agnes and Bryn both buy identical pizzas to share with friends.



Agnes gives Carwyn $\frac{2}{5}$ of her pizza.
Bryn shares his pizza in the ratio 1 : 2 : 3 : 4 and gives Dafydd the largest piece.

Does Carwyn have:

- the same size piece of pizza as Dafydd, or
- a larger piece of pizza than Dafydd, or
- a smaller piece of pizza than Dafydd?

You must explain your answer and show all your working. [5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

6. *(a)* The shape below shows a semi circle attached to a rectangle.

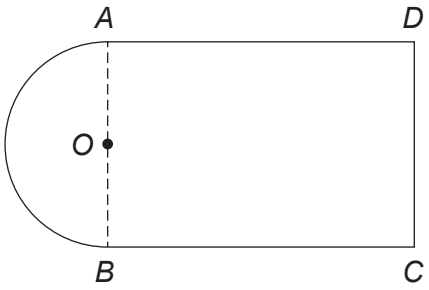


Diagram not drawn to scale

The radius of the semi circle is 6·1 cm and the length BC = 16·7 cm.
Calculate the area of the shape. [6]

(b) A circle has a circumference of 24π cm.
Calculate the radius of the circle. [2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

4364 020009

Examiner only

7. *(a)*

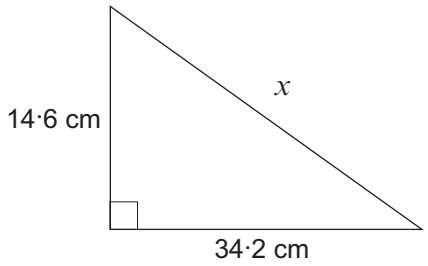


Diagram not drawn to scale

Calculate the length x. [3]

(b)

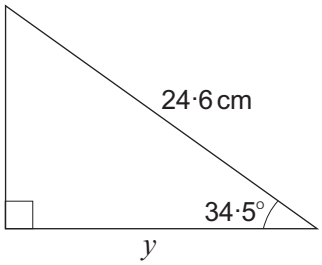


Diagram not drawn to scale

Calculate the length y. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(c)

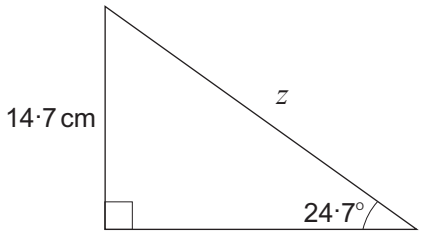


Diagram not drawn to scale

Calculate the length z. [3]

.....

.....

.....

.....

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

8. *(a)* The price of fuel has increased by 20% each year.
The cost of fuel was £1.49 per litre on 1st January 2015.
If the price of fuel continues increasing at the same rate, what would you expect the cost of a litre of fuel to be on 1st January 2020?
Give your answer correct to the nearest penny. [4]

(b) After an increase of 24%, the cost of 1 tonne of coal is £451.36.
Calculate the cost of 1 tonne of coal before the increase in price. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

9.

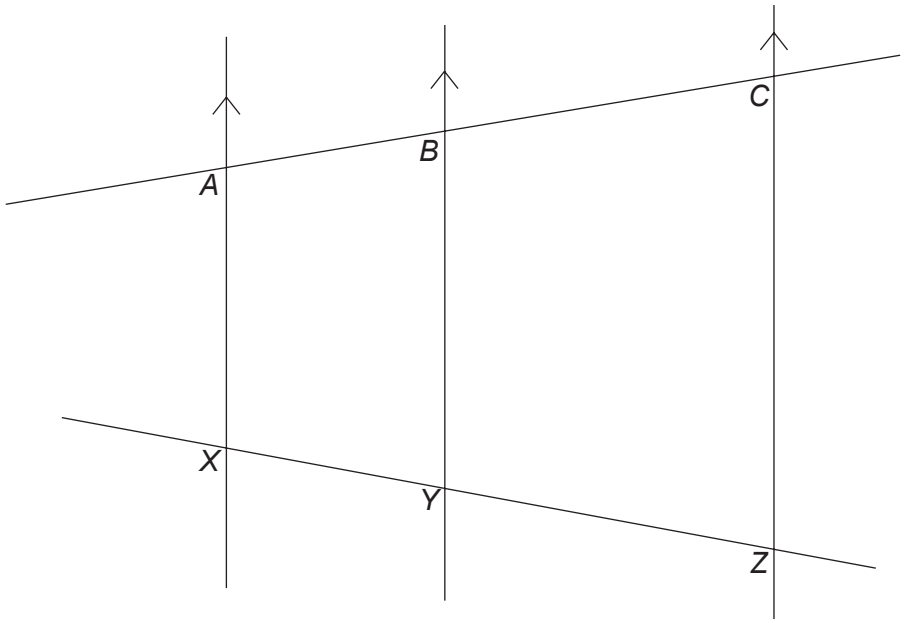


Diagram not drawn to scale

Given that $AB = 30$ cm, $BC = 50$ cm and $XZ = 89{\cdot}6$ cm, calculate the lengths of XY and YZ. You must show all your working. [4]

STEMUP.CO.UK

Examiner only

10. Evaluate $\dfrac{8{\cdot}44 \times 10^{-8} \times 4{\cdot}53 \times 10^{-4}}{2{\cdot}34 \times 10^{16}}$.

Express your answer in standard form **correct to 3 significant figures**. [2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

11. The heart shapes shown below are similar.
A number of corresponding lengths are shown.

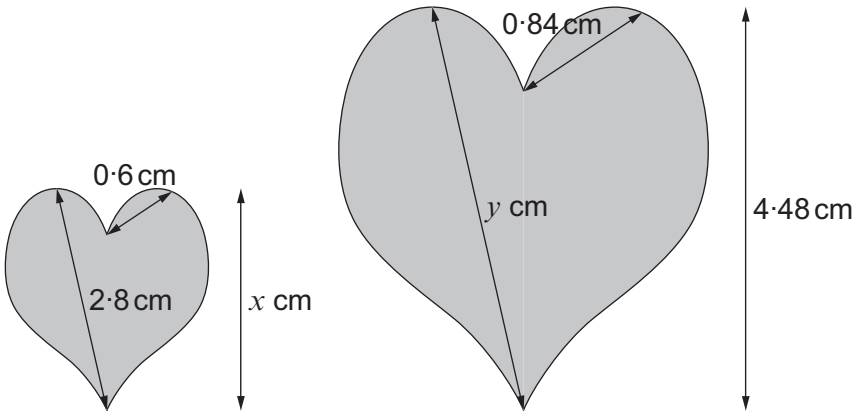


Diagram not drawn to scale

Calculate the lengths x and y.
You must show all your working. [4]

x = ... cm y = ... cm

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

12. There is a relationship between x and y.
The table shows some values of y for a number of values of x.

x	1	2	4
y	200	100	50

(a) Write down a relationship between x and y by completing the following statement. [2]

$$y =$$

(b) Write down the value of y when $x = 25$. [1]

13. Explain, using algebra, why the sum of any 3 consecutive whole numbers is always divisible by 3. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

14. *(a)* Triangle A has sides of length x cm, $(2x + 3)$ cm and $2x$ cm.
The perimeter of triangle A is 123 cm.
Calculate the lengths of **all** the sides of this triangle.
You must show all your working. [4]

(b) Triangle B has sides of length y cm, $(2y + 3)$ cm and $2y$ cm.
Is triangle A similar to triangle B?
You must give a reason for your answer. [1]

(c) Triangle C has sides of length $3g$ cm, $4g$ cm and $6g$ cm.
Triangle D has sides of length $3h$ cm, $4h$ cm and $6h$ cm.

Explain why triangle C is similar to triangle D and state when the two triangles would be congruent. [2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

15. Given that $\mathbf{OA} = 12\mathbf{x} + 8\mathbf{y}$, $\mathbf{OB} = 5\mathbf{x} + 10\mathbf{y}$ and $\mathbf{CO} = -14\mathbf{x} + 11\mathbf{y}$, write down each of the following vectors in its simplest form.

(a) **BA** [2]

.....

.....

.....

.....

(b) **AC** [2]

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

16. *(a)* Solve the following simultaneous equations using an algebraic method. [6]

$$4x^2 + xy - 8 = 0$$
$$x + y = 2$$

(b) Use the formula method to solve $3x^2 + 5x - 4 = 0$, giving your answer correct to 2 decimal places. [3]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

17. The diagram shows a quadrilateral *ABCD*.

Examiner only

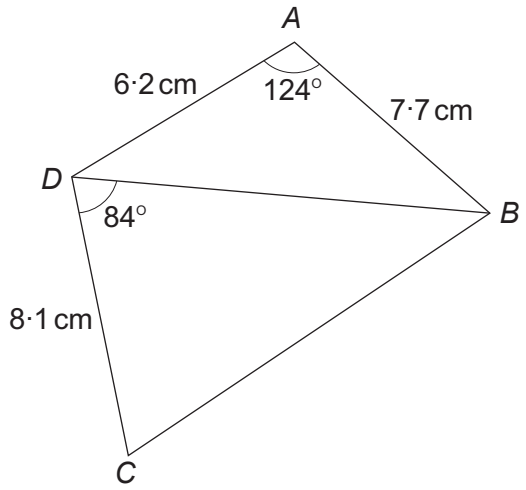


Diagram not drawn to scale

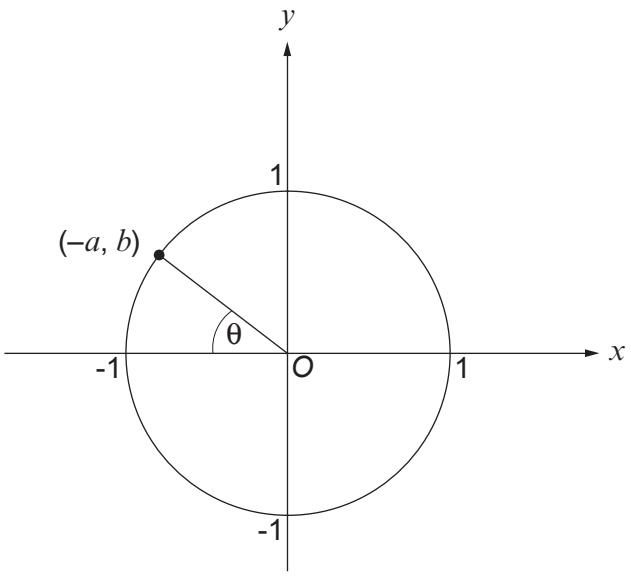
Calculate the area of triangle *BCD*. [6]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

18. The sketch below shows a circle with its centre at the origin and radius 1 unit.
The point $(-a, b)$ is on the circumference of the circle.



The angle θ is shown on the diagram.
Complete the following statements, in terms of a and b. [3]

cos θ =

tan θ =

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

BLANK PAGE

© WJEC CBAC Ltd.

BLANK PAGE

© WJEC CBAC Ltd.

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

W15-4364-02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. MONDAY, 19 January 2015

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**8**	
2.	**3**	
3.	**8**	
4.	**5**	
5.	**6**	
6.	**10**	
7.	**5**	
8.	**7**	
9.	**6**	
10.	**4**	
11.	**3**	
12.	**4**	
13.	**5**	
14.	**5**	
15.	**8**	
16.	**9**	
17.	**4**	
Total	**100**	

4364
020001

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.

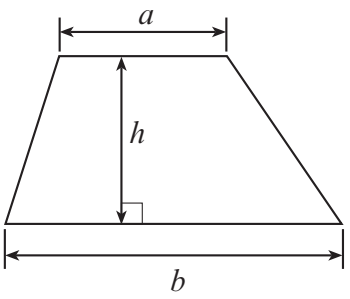
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3***(a)*.

© WJEC CBAC Ltd.

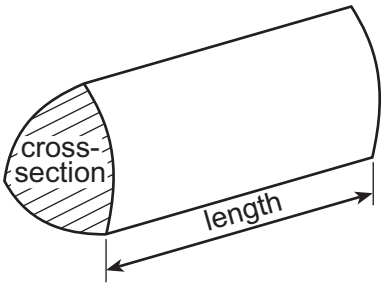
STEMUP.CO.UK

Formula List

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

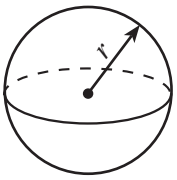


Volume of prism = area of cross-section × length



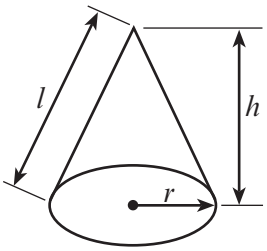
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

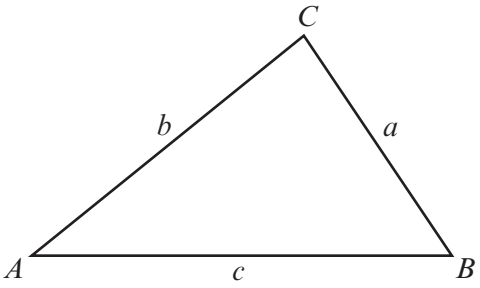


In any triangle ABC

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

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

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. *(a)* Write 249·6 as a percentage of 960. [2]

(b) Write 0·060954 correct to two significant figures. [1]

(c) Find the answer when $\frac{5}{16}$ of 88 is subtracted from 9·6. [2]

(d) Find the value of $\frac{1}{2{\cdot}6^3 + 3 \times \sqrt{4{\cdot}2}}$, giving your answer correct to 3 decimal places. [3]

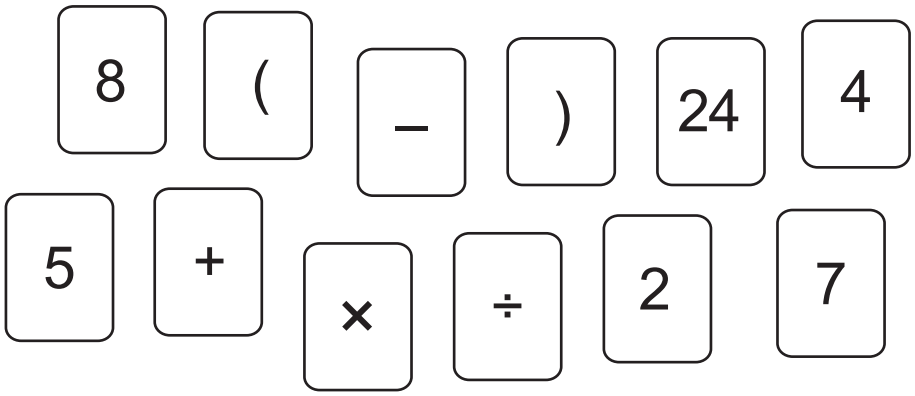
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

2.

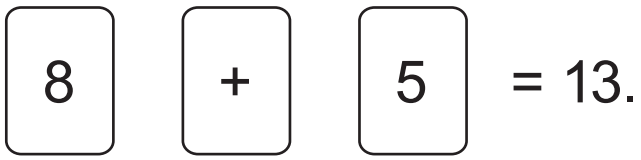


Use only cards from the selection shown above to create calculations with answers of 60, –7 and 21.

Remember:

- there are no other cards available to use
- a card may be used once only in each calculation
- a complete selection of these cards is available for each calculation. [3]

For example, to create a calculation with the answer 13,



(a) = 60

(b) = –7

(c) = 21

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

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

The volume of a cuboid is 385 cm^3.
The height of the cuboid is 11 cm.
The length and the width of the cuboid are both whole numbers of centimetres.
Calculate a possible length and width of this cuboid.
You must show all your working. [5]

(b)

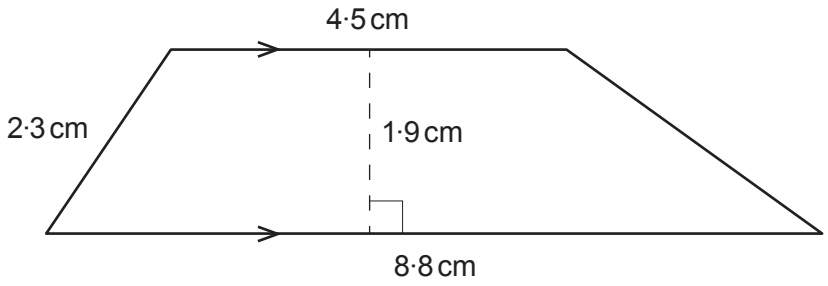


Diagram not drawn to scale

Calculate the area of the trapezium shown above, giving the units for your answer. [3]

STEMUP.CO.UK

Examiner only

4. The diagram shows two circles.

The area of the smaller circle is $\frac{4}{9}$ of the area of the larger circle.

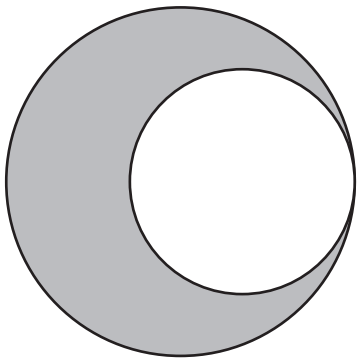


Diagram not drawn to scale

The radius of the smaller circle is 6·2 cm.
Calculate the area of the shaded region, giving your answer correct to 3 significant figures. [5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

5. *(a)* Match a calculation shown below with each of the statements in the table. [3]

Examiner only

A $1\frac{2}{5} \times 700$	**B** $0{\cdot}23 \times 600$	**C** $1{\cdot}23 \times 600$	**D** $\frac{2}{5} \times 500$
E $2{\cdot}3 \times 600$	**F** $\frac{1}{5} \times 400$	**G** $\frac{5}{6} \times 400$	**H** $\frac{2}{5} \times 700$
I $0{\cdot}4 \times 700$	**J** $\frac{3}{5} \div 500$	**K** $\frac{1}{6} \times 400$	**L** $\frac{2}{5} \div 500$

Statement	Calculation
600 metres increased by 23%	
Smaller share of £400 when shared in the ratio 1:5	
Amount of £500 left after $\frac{3}{5}$ of the £500 is given to charity	
700 metres increased by 40%	

4364 020007

(b) Give an example to show that increasing a measurement by 20%, then reducing this increased measurement by 20%, does not take you back to the original measurement. [3]

STEMUP.CO.UK

Examiner only

6. *(a)* Solve $\frac{32}{x} = 8$. [1]

(b) Solve $3(4x - 9) = 33$. [3]

(c) Solve $\frac{x + 17}{3} = 5$. [2]

(d) Write down the greatest whole number that satisfies the inequality $66x < 349$. [2]

(e) Solve the inequality $5x - 22 < 188$. [2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

7. Calculate the lengths p and q in the right-angled triangles shown below. [5]

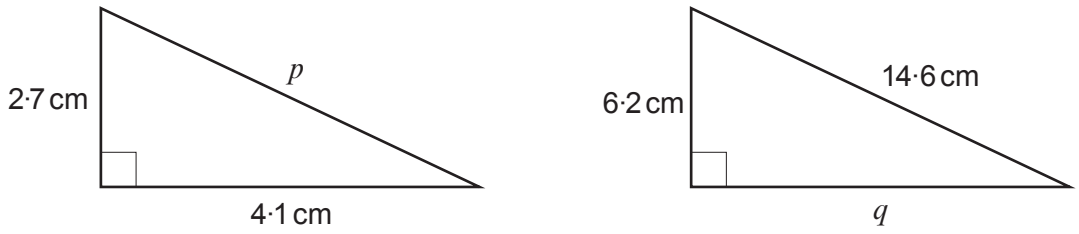


Diagram not drawn to scale

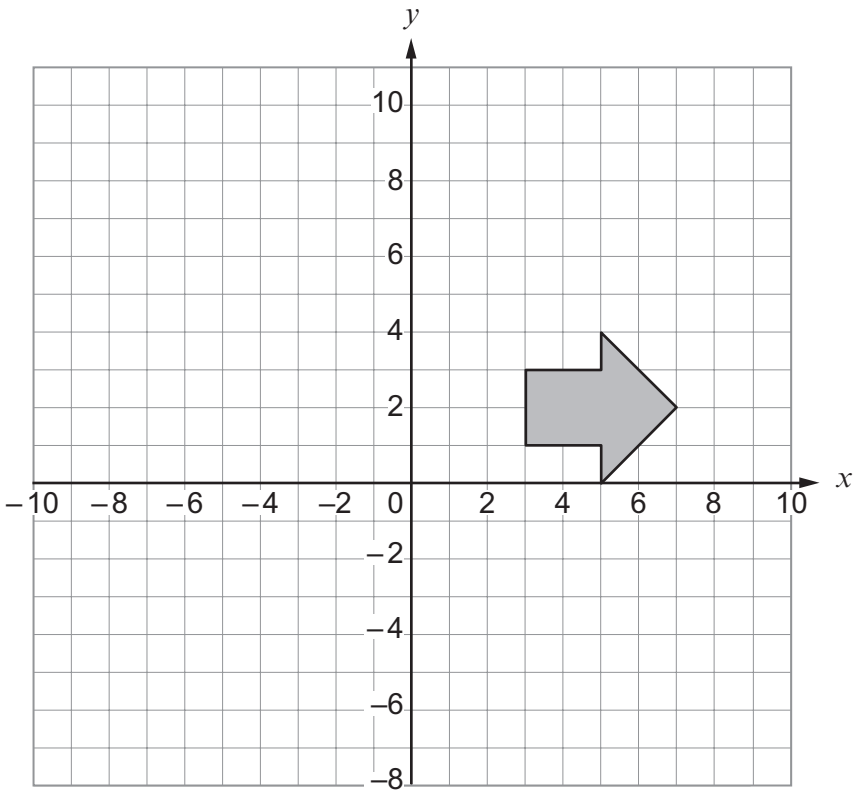
© WJEC CBAC Ltd.

Turn over.

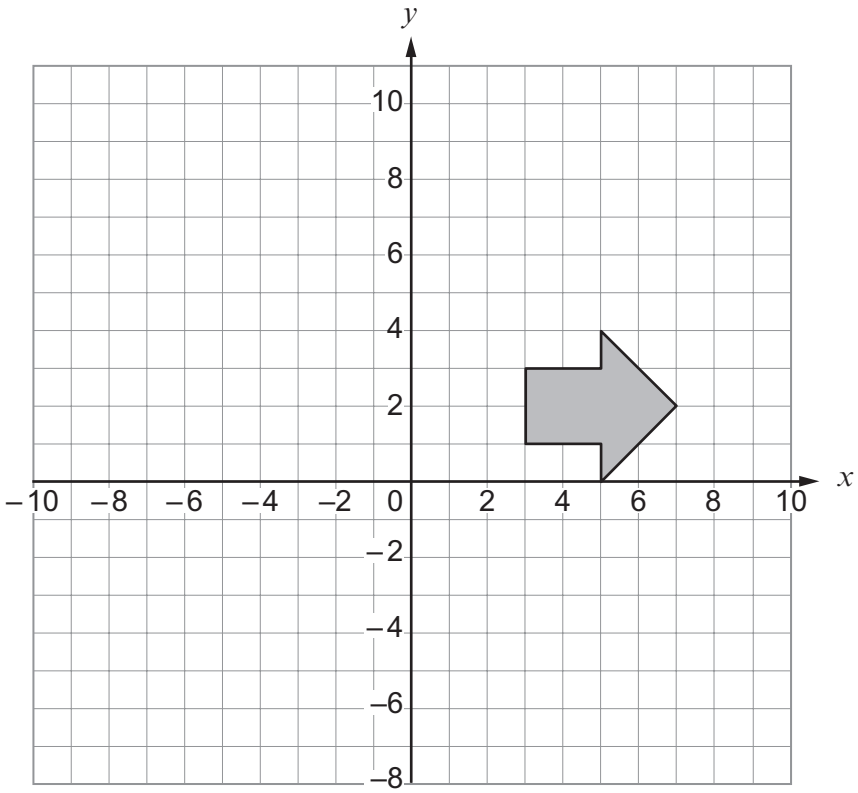
STEMUP.CO.UK

Examiner only

8. *(a)* Reflect the shape in the x-axis. [2]



(b) Rotate the shape through 90° anticlockwise about the point (1, –1). [2]

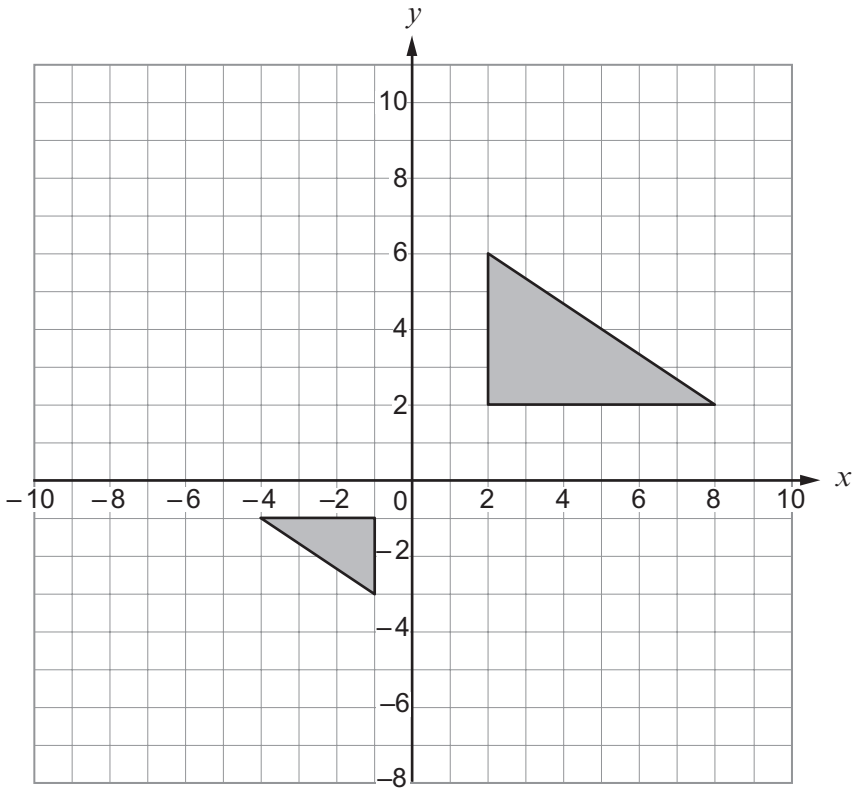


© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(c)



The larger triangle is transformed to the smaller triangle.
Complete the following sentences to describe this transformation.

The coordinates of the centre of the enlargement are (....., ...). [1]

The scale factor of the enlargement of the larger triangle to the smaller triangle is ..... . [2]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

9. *(a)* It is known that $a = \frac{48}{b}$ and that $b = \frac{3}{c}$.

Calculate the value of a when $c = 24$. [3]

(b) It is known that x is proportional to y.
When $x = 4$, $y = 0{\cdot}8$.
Calculate the value of x when $y = 6$. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

10. Evaluate each of the following giving all of your answers in **standard form**.

(a) $4{\cdot}5 \times 10^8 + 9{\cdot}4 \times 10^7$ [1]

Answer in standard form: .....

(b) $\dfrac{6 \times 10^{12}}{3 \times 10^{-6}}$ [1]

Answer in standard form: .....

(c) The product of 1000 and six million. [2]

Answer in standard form: .....

11. Use the quadratic formula to solve $x^2 + 5x + 2 = 0$.
Give your answers correct to 2 decimal places. [3]

STEMUP.CO.UK

Examiner only

12.

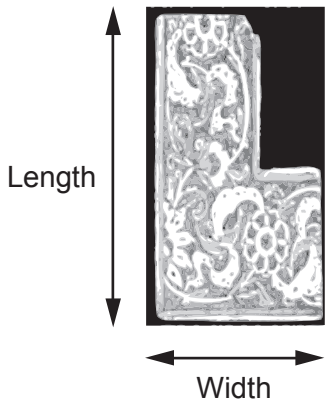


Diagram not drawn to scale

A tile is made so that the sum of its length and width must be 20 cm.
Draw a graph to show possible lengths and widths of this tile. [4]

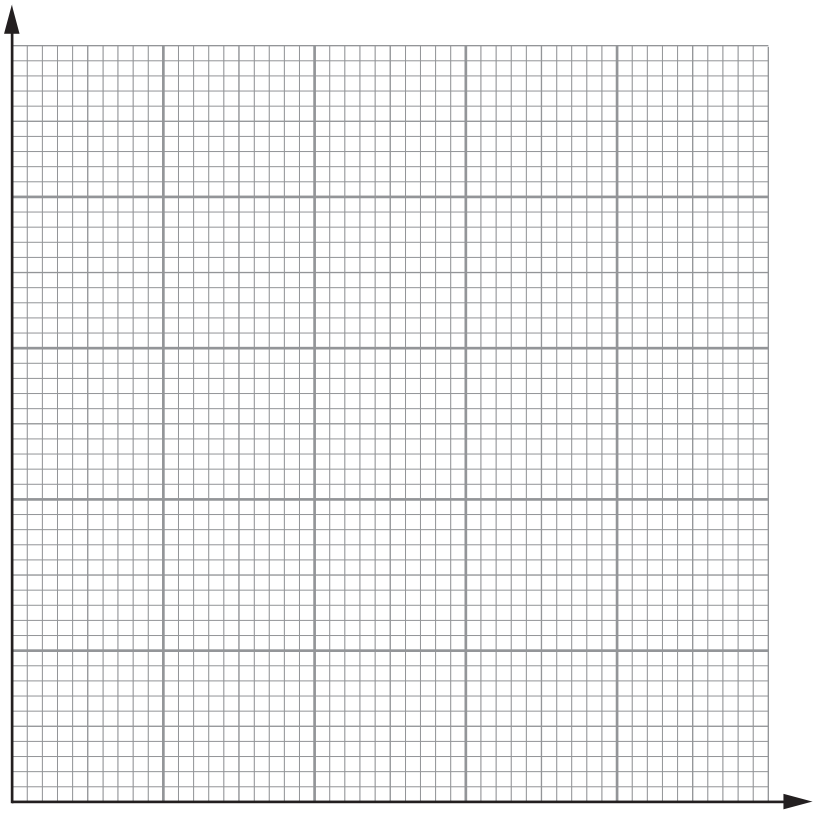
.....

.....

.....

.....

.....



© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

13.

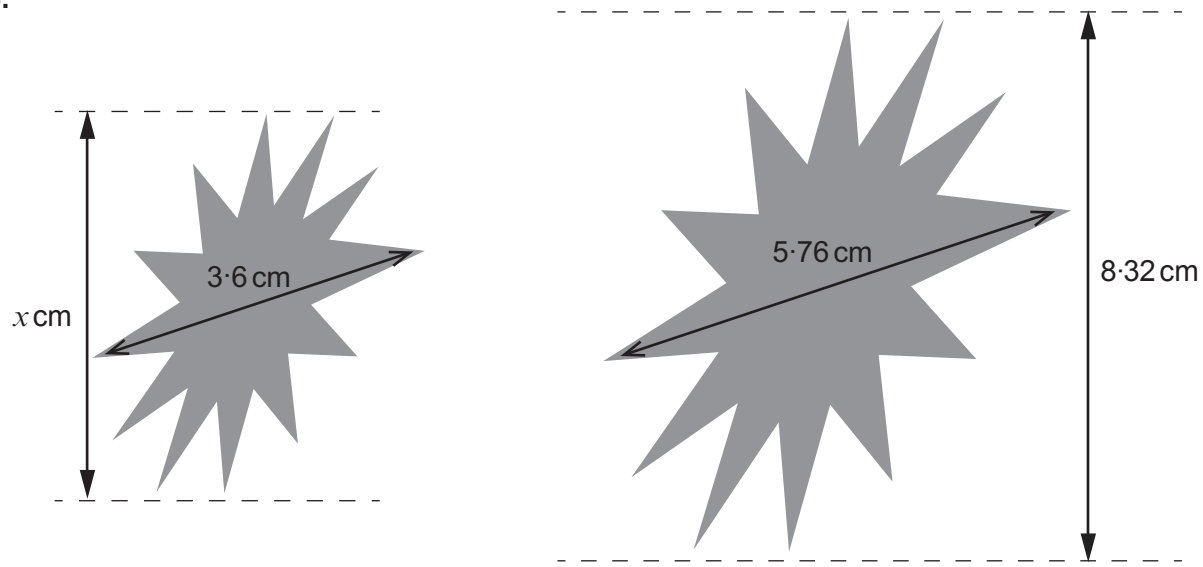


Diagram not drawn to scale

The diagram above shows two similar shapes.

(a) Calculate the length x. [2]

(b) The area of the smaller shape is 13·6 cm^2.
Calculate the area of the larger shape. [3]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

14. The vectors **OM**, **ON** and **OP** are shown in the diagram below.

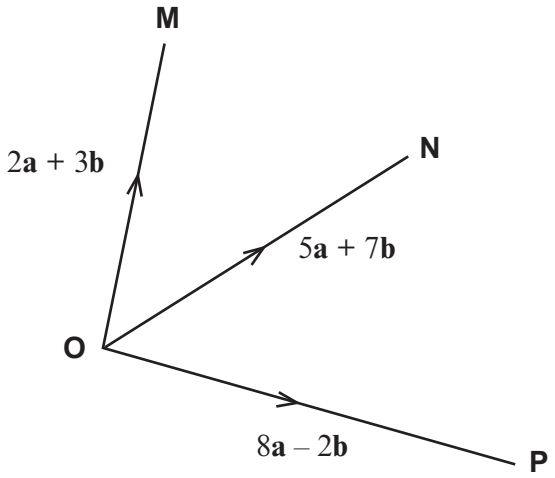


Diagram not drawn to scale

(a) Find **MN** in terms of **a** and **b**.
Give your answer in its simplest form. [2]

(b) The point **R** is the mid-point of **OP**.
Find **RN** in terms of **a** and **b**.
Give your answer in its simplest form. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

15.

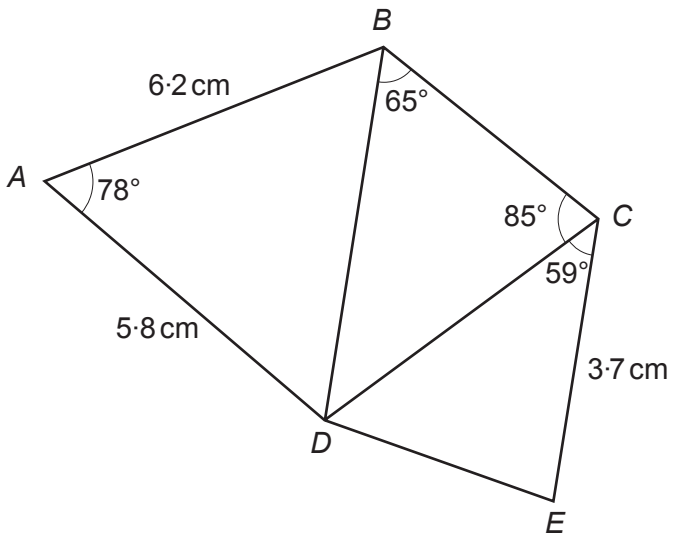


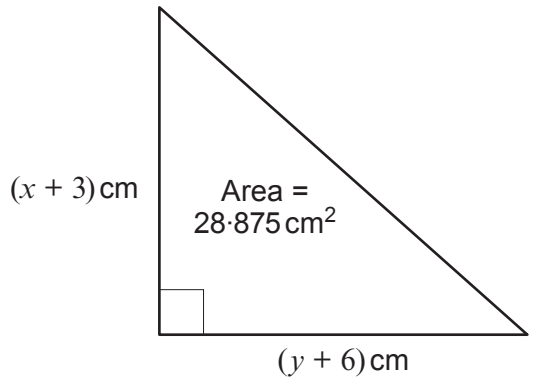
Diagram not drawn to scale

Calculate the area of triangle *DEC*. [8]

STEMUP.CO.UK

Examiner only

16.



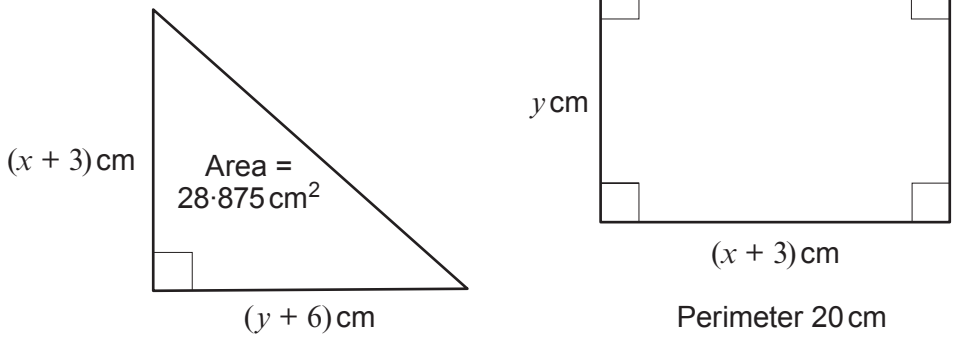
(a) Prove that $xy + 3y + 6x = 39{\cdot}75$.
You must show your working. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b)



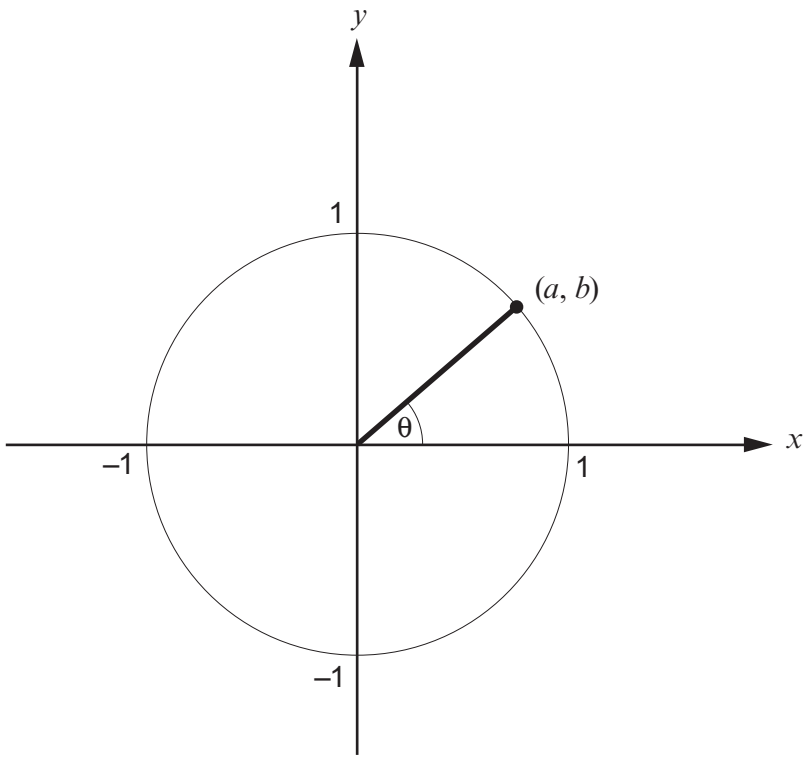
Perimeter 20 cm

Use an algebraic method to calculate the dimensions of the rectangle. [6]

STEMUP.CO.UK

Examiner only

17. The sketch below shows a circle with its centre at the origin and radius 1 unit.
The point (a, b) is a point on the circumference of the circle.



The angle θ is shown on the diagram.
Complete the following statements, in terms of a and b. [4]

(a) cos θ = ...

(b) tan θ = ...

(c) sin θ = ...

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

GCSE MARKING SCHEME

METHODS IN MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2015

© WJEC CBAC Ltd.

STEMUP.CO.UK

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2015 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). 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
Unit 1 Foundation Tier	1
Unit 1 Higher Tier	5
Unit 2 Foundation Tier	10
Unit 2 Higher Tier	14

© WJEC CBAC Ltd.

STEMUP.CO.UK

METHODS UNIT 2
FOUNDATION TIER

Methods Unit 2 Foundation Tier January 2015	Mark	Comment
1. + – ÷ × × + ÷ – **or** – ×	B1 B1 B1 B1 B1 B1 6	
2. (a) (i) 4679 (ii) 9647 (b) 20%, 0.2, 1/5 indicated (c) (i) 400 000 or four hundred thousand (ii) 250 or two hundred and fifty (d) 12 and 24 indicated	B1 B1 B3 B1 B1 B2 9	 B2 for 3 correct and 1 incorrect B2 for 2 correct and no more than 1 incorrect B1 for 1 correct and no more than 2 incorrect B1 for 2 or 3 correct and 2 incorrect B1 for 2 correct and 1 incorrect OR 1 correct and no more than 1 incorrect
3. D and H E and G	B1 B1 2	
4. (a) (£)3.60 ÷ 20 (£)0.18 or 18(p) (£)0.18 × 4 or 18 × 4 (£) 0.72 or 72 (p) (b) 53/100 × 4.2 or equivalent 2.226	M1 A1 m1 A1 M1 A1 6	OR 1 correct step, e.g. 10 pens cost (£)1.80 FT their 0.18 or 18 if M1 awarded Do not accept £72 or 0.72p Award SC1 for sight of (5.5 × 4 =) 22(p) or 5.55… × 4 = 22.22… following 20 ÷ 3.60 *Alternative solution:* *20 ÷ 4 = 5* *M1* *(£)3.60 ÷ 5* *M1* *= (£)0.72 OR 72(p)* *A2* *For incorrect units, award A1 only* *e.g. 0.72p or £72* Accept 2.2 or 2.23 if the correct answer is seen. Otherwise, award SC1 for unsupported an answer of 2.2 or 2.23.
5. (a) 13 × 9 117 (cm^2) (b) Attempting to add two pairs of numbers to make 36 or any two numbers that add to 18 Attempting to add two numbers (or two pairs of numbers) with one being double the other Length = 12, Width = 6	M1 A1 M1 M1 A1 5	 Numbers must be less than 18 Numbers must be less than 18 CAO (Allow Length = 6, Width = 12)

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2015	Mark	Comment
6. (a) Correct Diagram	B2	B1 for lines, B1 for curvature of the curve
(b) 4	B1	
2	B1	
(c) Tangent	B1	
(d) Enlargement of scale factor 2	B2	B1 for any two lines correct or 3 points correct B1 for correct enlargement using different scale factor or B1 for a 'nearly correct' enlargement using scale factor 2
	7	
7. (Total cost =) (12.45 + 3.9(0) + 24.6(0)) ÷ 3	M1	Or dividing each individual price by 3
(Each person pays £) 13.65	A1	Or (£)4.15, (£)1.3(0), (£)8.2(0)
Any one correct first step / strategy	S1	E.g. (Ceri overspent £)24.6(0) – (£)13.65 FT 'their (£)13.65, (£)4.15, (£)1.3(0), (£)8.2(0)'
Any TWO of: Ceri overspent (£)10.95 Alwen underspent (£)1.20 Brian underspent (£)9.75	B1	OR Brian and Ceri owe Alwen (£)4.15 each AND Alwen and Ceri owe Brian (£)1.30 each AND Brian and Alwen owe Ceri (£)8.20 each
Conclusion: Alwen owes Ceri (£)1.20 AND Brian owes Ceri (£)9.75	B2	OR Brian owes Alwen (£)2.85 AND Alwen owes Ceri (£)4.05 AND Brian owes Ceri (£)6.90 Award B1 for either answer correct OR all THREE of: Ceri overspent (£)10.95 Alwen underspent (£)1.20 Brian underspent (£)9.75 ***Awarding last B2 or B1 implies all previous marks*** Award SC2 instead of the last 4 marks for a complete solution with correct values but names reversed and award SC1 for a similar solution with no more than one arithmetical error. Award SC1 instead of the last 4 marks for a correct conclusion with final values given correct to the nearest pound, e.g. Alwen owes Ceri £1 and Brian owes Ceri £10.
Look for: • accuracy of spelling • clarity of labels • correct units (£) • the use of notation (watch for the use of '=', '–' and '÷' being appropriate) QWC2: Candidates will be expected to • present relevant work clearly, with words explaining process or steps AND • make few if any mistakes in spelling, punctuation and grammar QWC1: Candidates will be expected to • present work clearly which is mostly relevant, with words explaining process or steps OR • make few if any mistakes in 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 material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
	8	

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2015	Mark	Comment
8. (a) 49 (b) $5y = 55$ $y = 11$ (c) (i) $x = 5$ $y = -1$ (ii) $(2 \times 5) + (3 \times -1)$ 7	 B1 B1 B1 B1 B1 B1 B1 7	Accept embedded answers in (a), (b) and (c)(i). FT one error ISW FT 'their x', i.e. $y = 4 -$ 'their x' FT 'their x' and 'their y' for B1, and for B2 provided $y < 0$
9. 113.6	B2 2	B1 for 113(.5997747…) OR B1 for 134.2(…) – 20.6(…)
10. 282/3 or 450 × 20/100 94 90 Missing number 92	M1 A1 A1 A1 4	
11. Examples: (a) (8 + 4) × 5 or 7 × 8 + 4 or 5 × 8 + 24 – 4 (= 60) (b) 24 ÷ 4 – (8 + 5) or 2 – (5 + 4) or (5 + 2) ÷ 7 – 8 (= -7) (c) 7 × (5 – 2) or 7 × (8 – 5) or 24 + 2 – 5 (= 21)	 B1 B1 B1 3	**Accept equivalent correct responses using ONLY the cards given, not repeats within a single calculation** Brackets must be used correctly Accept -24 ÷ 2 + 5 or 24 ÷ -2 + 5
12. (a) … × … × 11 = 385 or 385 ÷ 11 Attempt to find two whole numbers to multiply to 35 7(cm) and 5(cm) OR 35(cm) and 1(cm) (b) ½ (4.5 + 8.8) × 1.9 12.6(35) cm^2 (c) $\pi \times 8^2$ 201.(06….cm^2)	S1 M1 A1 M1 A1 U1 M1 A1 8	Idea towards area of the base Correct answers awarded all 3 marks. Independent mark Accept 200.9(6) to 201.143
13. (a) $x + 17 = 5 \times 3$ $x = -2$ (b) $5x < 22 + 188$ $x < 42$	 M1 A1 M1 A1 4	Accept embedded answer in (a) Or $x/3 = 5 - 17/3$ No marks for '=' unless finally replaced to give $x < 42$, then award M1, A1. An answer of $x < 210/5$ gets M1, A0 CAO If no marks, award SC1 for $5x < 166$ ($x < 166/5$) with an answer $x < 33.2$, or for $5x < 200$ with an answer $x < 40$

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2015	Mark	Comment
14.(a) Correct reflection	B2	B1 for reflection in the *y*-axis OR B1 for 4 of the vertices reflected correctly
(b) Correct rotation	B2	B1 for clockwise 90° rotation about (1, -1) OR B1 for anticlockwise 90° rotation about (-1, 1)
	4	
15. $(p^2 =)\ 2.7^2 + 4.1^2$	M1	Correct statement
$p^2 = 24.1$ or $p = \sqrt{24.1}$	A1	Power 2 or intention to take square root must be shown
$(q^2 =)\ 14.6^2 - 6.2^2$ or $14.6^2 = q^2 + 6.2^2$	M1	Correct statement
$q^2 = 174.72$ or $q = \sqrt{174.72}$	A1	Power 2 or intention to take square root must be shown
$(p =)$ 4.9(09175…cm) AND $(q =)$ 13.2(18..cm)	A1	Accept rounded or truncated from correct working *Alternative method using trigonometry:* *M1 complete method to obtain an expression involving p, e.g. angle = $\tan^{-1}(2.7/4.1)$ AND sin(angle) = 2.7/p* *A1 expression with p as subject: e.g. p = 2.7/sin(angle)* *M1 complete method to obtain expression involving q, e.g. angle = $\sin^{-1}(6.2/14.6)$ AND cos(angle) = q/14.6* *A1 expression with q as subject: e.g. q = 14.6cos(angle)*
	5	

© WJEC CBAC Ltd.

STEMUP.CO.UK

METHODS UNIT 2
HIGHER TIER

Methods Unit 2 Higher Tier January 2015	Mark	Comment
1.(a) $100 \times 249.6/960$ 26(%)	M1 A1	
(b) 0.061 or 6.1×10^{-2}	B1	
(c) $9.6 - \frac{5}{16} \times 88$ or $9.6 - 27.5$ - 17.9	M1 A1	Not for reversed unless answer is correct showing intention. *If no marks award SC1 for an answer of 17.9*
(d) 0.042	B3 8	B2 for sight of 0.042151… rounded or truncated, OR B1 for sight of (1/)23.724….
2. Examples: (a) $(8 + 4) \times 5$ or $7 \times 8 + 4$ or $5 \times 8 + 24 - 4$ (=60) (b) $24 \div 4 - (8 + 5)$ or $2 - (5 + 4)$ or $(5 + 2) \div 7 - 8$ (=-7) (c) $7 \times (5 - 2)$ or $7 \times (8 - 5)$ or $24 + 2 - 5$ (= 21)	 B1 B1 B1 3	**Accept equivalent correct responses using ONLY the cards given, not repeats within a single calculation** Brackets must be used correctly *Accept use of brackets for multiplication e.g. 2(24) (=48)* Accept use of the – sign to create negative numbers e.g.-24 ÷ 2 + 5 or 24 ÷ -2 + 5
3.(a) … × … × 11 = 385 or 385 ÷ 11 Attempt to find two whole numbers to multiply to 35 7(cm) and 5(cm) OR 35(cm) and 1(cm) Look for spelling clarity of text explanations, the use of notation and units QWC2: Candidates will be expected to present work clearly, with words explaining start, process or steps AND make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to present work clearly, with words explaining start, process or steps OR make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer (b) ½ (4.5 + 8.8) × 1.9 12.6(35) cm^2	S1 M1 A1 QWC 2 M1 A1 U1 8	Idea towards area of the base Correct answers awarded all 3 marks. 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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. Independent mark
4. Area smaller circle = $\pi \times 6.2^2$ Process to find part shaded, e.g. $\times 5 \div 4$ or $\times 9 \div 4$ to find area of larger circle (and subtract area of the smaller circle) Area shaded = $\pi \times 6.2^2 \times 5 \div 4$ or $\pi \times 6.2^2 \times 9 \div 4 - \pi \times 6.2^2$ Area shaded = 151 (cm^2)	M1 B1 m1 A2 5	 (271.71… - 120.76…) A1 for answers between 150.87… to 151.014… *If M1 only, then also award SC1 for 121*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Higher Tier January 2015	Mark	Comment
5.(a) Indication of: C: 1.23×600 K: $^1/_6 \times 400$ D: $^2/_5 \times 500$ A: $1^2/_5 \times 700$	B3	All 4 correct calculations, or B2 for any 3 correct, or B1 for any 1 or 2 correct
(b) (x) **× 1.2(0)** or equivalent, where $x \neq 0$	M1	Need not be shown as a measure with units, ignore units Accept algebraic working throughout
$(x \times 1.2(0))$ **× 0.8(0)** or equivalent, where $x \neq 0$	M1	FT their value of $(x \times 1.2(0))$ provided $>x$ *Accept sight of ×1.2 for M1 and ×0.8 for M1, or sight of ×0.96 for M2*
$x\times1.2(0)\times0.8(0)$ correctly evaluated	A1	$x \times 0.96$ correctly evaluated Accept a conclusion that less than the original because decrease amount > increase amount, provided both amounts have been correctly evaluated.
	6	
6. (a) $(x =)$ 4	B1	Accept embedded answers in (a) , (b) & (c)
(b) $12x - 27 = 33$ OR $4x - 9 = 33/3$ $12x = 60$ OR $4x = 20$ $x = 5$	B1 B1 B1	FT until 2nd error
(c) $x + 17 = 5 \times 3$ $x = -2$	M1 A1	Or $x/3 = 5 - 17/3$
(d) $x < 349/66$ or $x < 5.2878\ldots$ or $x < 5^{19}/_{66}$ Answer of 5	M1 A1	An answer of 5 implies '<' applied, so M1, A1
(e) $5x < 22 + 188$	M1	No marks for '=' unless final replaced to give $x<42$ then award M1, A1. An answer of $x<210/5$ gets M1, A0
$x< 42$	A1	CAO Mark final answer If no marks award SC1 for $5x<166$ ($x<166/5$) with an answer $x<33.2$, or for $5x < 200$ with an answer $x < 40$
	10	
7. $(p^2 =) 2.7^2 + 4.1^2$ $p^2 = 24.1$ or $p = \sqrt{24.1}$	M1 A1	Correct statement Power 2 or intention to take square root must be shown
$(q^2 =) 14.6^2 - 6.2^2$ or $14.6^2 = q^2 + 6.2^2$ $q^2 = 174.72$ or $q= \sqrt{174.72}$	M1 A1	Correct statement Power 2 or intention to take square root must be shown Accept rounded or truncated from correct working *Alternative method using trigonometry:* *M1 complete method to obtain an expression involving p e.g. angle = $\tan^{-1}(2.7/4.1)$ AND sin(angle) = 2.7/p* *A1 expression with p as subject: e. g. p = 2.7/sin(angle)* *M1 complete method to obtain expression involving q, e.g. angle = sin-1(6.2/14.6) AND cos(angle) = q/14.6* *A1 expression with q as subject: e.g. q = 14.6cos(angle)*
(p =) 4.9(09175…cm) AND (q =) 13.2(18… cm)	A1 5	
8.(a) Correct reflection	B2	B1 for reflection in the y-axis OR B1 for 4 of the vertices reflected correctly
(b) Correct rotation	B2	B1 for clockwise 90° rotation about (1, -1) OR B1 for anticlockwise 90°rotation about (-1, 1)
(c) 0, 0	B1	
-½ or -0.5 or 'negative half' or equivalent	B2 7	B1 for sight of ½ or 0.5 or half (including +½)

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Higher Tier January 2015	Mark	Comment
9.(a) (b =) 3/24 (=1/8) (a =) 48 / $^1/_8$ or (a =) 48 × 8(/1) (a =) 384	M1 M1 A1	(a =) 48 / $^3/_{24}$ gains M2 FT 'their calculated b' CAO
(b) (Scale factor =) 4/0.8 (=5) OR 0.8/4 (= 0.2) OR y = kx with 0.8 = k×4 or x=ky with 4 = k×0.8 OR $\frac{x}{4} = \frac{6}{0.8}$ OR $\frac{x}{6} = \frac{4}{0.8}$	M1	
(x =) 6 × (4/0.8) OR 6 / (0.8÷4) (6 × 5) (6 / 0.2)	M1	Allow M1 for correct substitution for their SF in their proportion equation, or for a reversed substitution in their proportion equation correctly evaluated
= 30	A1 6	CAO A0 if left as 30 proportional to 6
10.(a) 5.4(4) × 10^8	B1	
(b) 2 × 10^{18}	B1	
(c) 1000 × 6 000 000 or 6 000 000 000 or 1000 × 6 × 10^6	M1	
6 × 10^9	A1 4	
11. Correct substitution into the quadratic formula x = (-5 ±√(5^2 - 4×1×2)) / 2×1	M1	Allow 1 slip in substitution
x = (-5±√17)/2	A1	OR sight of 0.43(84…) with -4.5(615...) *Alternative using completing the square:* M1 for $x + \frac{5}{2} = \pm\sqrt{\frac{25}{4} - 2}$ A1 for $x = -\frac{5}{2} \pm \sqrt{\frac{17}{4}}$
x = -0.44 with x = -4.56	A1 3	Must be to 2 decimal places Award all 3 marks for correct unsupported answers.
12. Label axes 'length (of tile in cm)' and 'width (of tile in cm)'	B1	Either order. Accept l and w.
Both scales uniform from 0 to 20 inclusive	B1	
Sight of any two points correct, in list or plotted	M1	Allow (0,20) and (20,0)
Straight line drawn from (0,20) to (20,0) exclusive	A1 4	Accept including (0,20) and (20,0) Allow if the line touches the axes, but intention clear to end at the axes (allow ±2mm). However, A0 if this line extends beyond an axis.
13.(a) x/8.32= 3.6/5.76 or equivalent or sight of scale factor 1.6 or 0.625 if used appropriately	M1	
(x =) 5.2 (cm)	A1	
(b) Sight of 1.6^2 or 0.625^2 or equivalent	B1	
(Area larger shape =) 1.6^2 × 13.6 or 13.6 ÷ 0.625^2	M1	FT their scale factor from (a) provided it was >1 and <2 (or its reciprocal provided >0.5 and <1)
34.8(16) (cm^2)	A1 5	Accept an answer of 35 (cm^2) from correct working only.
14.(a) **MN** = **-OM** + **ON** (= -(2**a**+3**b**) +(5**a** + 7**b**))	M1	Accept intention of brackets
= 3**a** + 4**b**	A1	CAO. Must be simplified form
(b) Sight of -½(8**a**- 2**b**) or ½(8**a**- 2**b**)	B1	May be simplified at a later stage
RN = -½**OP** + **ON** ((= -½(8**a**- 2**b**) +(5**a** + 7**b**))	M1	Intention of brackets Award SC1 for -4**a** - **b** + 5**a** + 7**b** if B1 not previously awarded.
= **a** + 8**b**	A1 5	CAO. Must be simplified form

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Higher Tier January 2015	Mark	Comment
15. Strategy: attempt to calculate BD, then CD and then attempt ½abSinC	S1	
$BD^2 = 6.2^2 + 5.8^2 - 2\times6.2\times5.8\times\cos78(°)$	M1	Correct substitution
$BD^2 = 57.1269912\ldots$ or $BD = \sqrt{57.12\ldots}$ (=7.558..cm)	A1	Accept rounded or truncated
DC = sin65° × BD/sin85(°)	M2	M1 for correct use of sine rule with DC implicit Accept rounded or truncated
DC = 6.876…(cm)	A1	FT correct evaluation with their BD provided all previous M marks awarded
Area DEC = ½ × 3.7 × DC × sin 59(°)	M1	
10.9(…cm^2)	A1	FT correct evaluation with their DC provided all previous M marks awarded and without PA Penalise (PA) premature approximation only by not awarding this final A mark
	8	
16.(a) ½(x + 3)(y +6) (= 28.875)	B1	Intention of brackets must be shown in subsequent working
xy + 3y + 6x + 18 = 2 × 28.875 OR ½xy +1.5y + 3x +9 = 28.875	M1	
xy + 3y + 6x = 39.75	A1	Must be convincing from correct working
(b) y + x+3 + y + x + 3 = 20 or y + x + 3 = 10 or 2y + 2(x+3) = 20 or equivalent	B1	Intention of brackets may be shown in subsequent working
Method to solve, e.g. appropriate substitution of either x = 7 – y or y = 7 – x into xy + 3y + 6x = 39.75	M1	Accept sight of unsimplified substitutions, intention clear. For the intention of substitution not the accuracy of the transformed equation, so FT x = 'their ±7 ± y' or y = 'their ±7 ± x' and other similar substitutions following B0, for M1 and possible final B1 only.
$x^2 - 10x + 18.75 = 0$ or $y^2 - 4y - 2.25 = 0$	A1	OR $-x^2 + 10x - 18.75 = 0$ or $-y^2 + 4y + 2.25 = 0$
(x – 2.5)(x - 7.5) = 0 or (y – 4.5)(y + 0.5) = 0 or (2x –5)(2x - 15) = 0 or (2y – 9)(2y + 1) = 0 or equivalent	A1	OR $x = (10 \pm\sqrt{25})/2$ or $y = (4\pm\sqrt{25})/2$
x = 2.5(cm) AND y = 4.5(cm)	A1	Ignore inclusion of x = 7.5 or y = -0.5 A0 B0 if the **only** solutions given do not satisfy -3 < x < 7 and 0 < y < 10 **Special case:** Area of rectangle = 20 B0 Eliminating y (leading to 6x = 19.75) SC M1 x = 3.2(9166…) AND y = 3.1(788…) truncated or rounded A0 A0 SC A1
Dimensions of the rectangle are (y=) 4.5(cm) AND (x+3 =) 5.5(cm)	B1	Only depends on the award of M1 With no extra spurious dimensions
	9	
17.(a) Idea of right angled triangle shown or used with height b, base a	M1	Any correct answer implies M1
$\cos\theta = a(/1)$	A1	OR $a/\sqrt{(a^2 + b^2)}$
$\tan\theta = b/a$	A1	
$\sin\theta = b(/1)$	A1	OR $b/\sqrt{(a^2 + b^2)}$ Penalise -1 once only for consistent use of values other than a and b providing the hypotenuse is still 1
	4	

© WJEC CBAC Ltd.

STEMUP.CO.UK

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. TUESDAY, 17 June 2014

2 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 **4**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**10**	
3.	**14**	
4.	**9**	
5.	**4**	
6.	**3**	
7.	**2**	
8.	**6**	
9.	**8**	
10.	**6**	
11.	**5**	
12.	**3**	
13.	**6**	
14.	**6**	
15.	**2**	
16.	**5**	
17.	**8**	
Total	**100**	

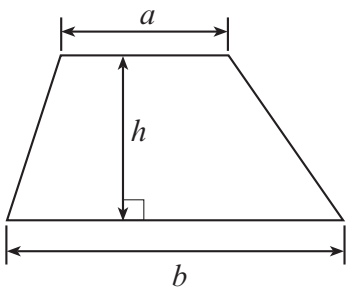
4364 020001

© WJEC CBAC Ltd.

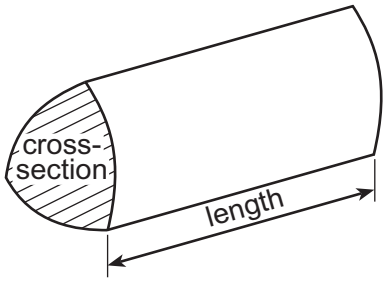
STEMUP.CO.UK

Formula List

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

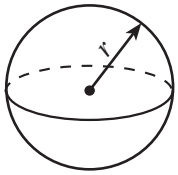


Volume of prism = area of cross-section × length



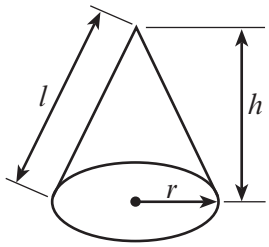
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

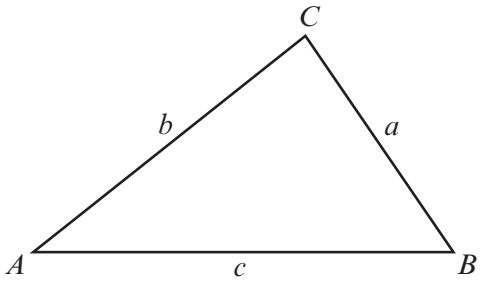


In any triangle ABC

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

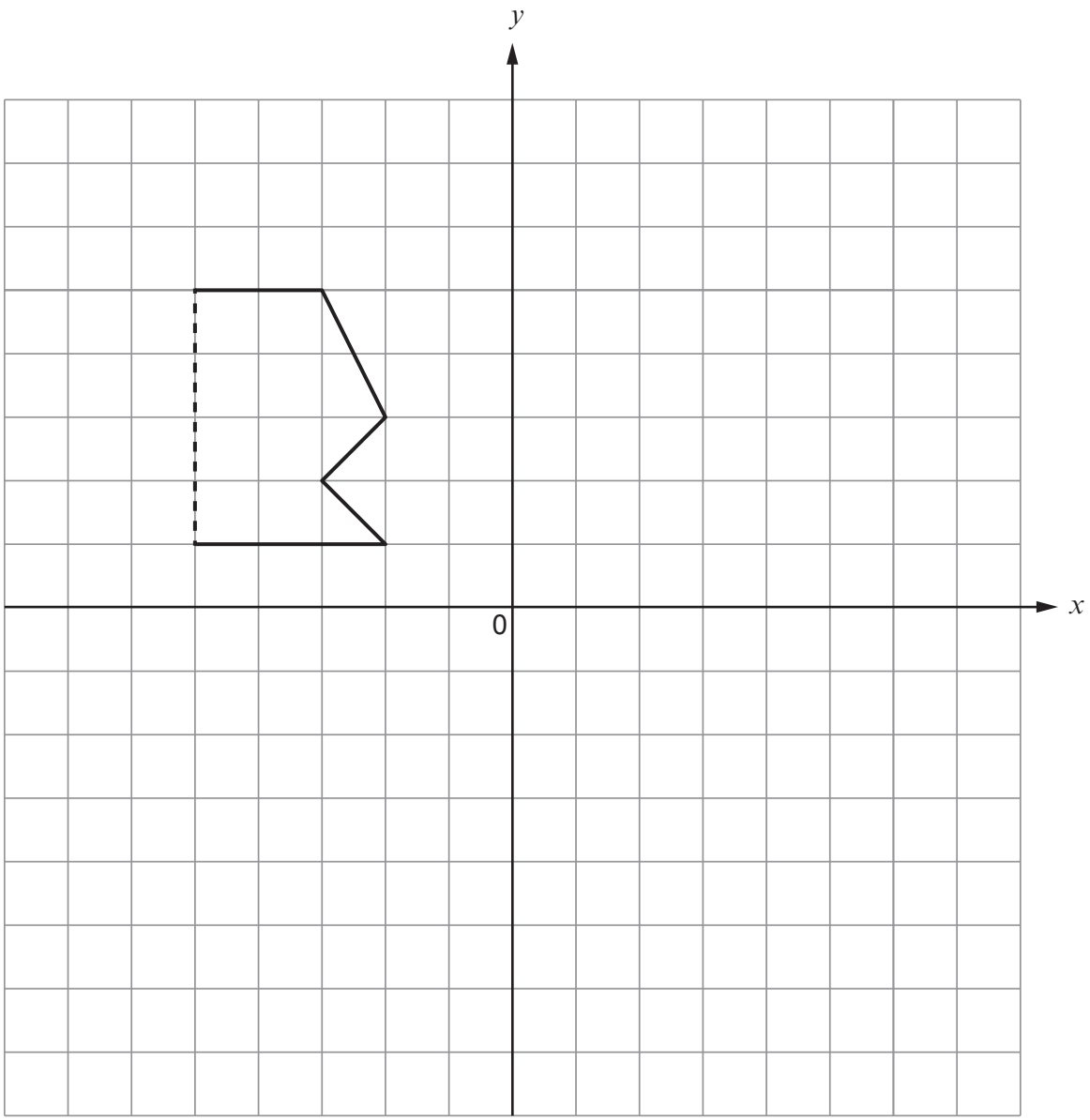
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. Part of a shape is shown on the grid.
The dotted line is the line of symmetry of the shape.
Complete the drawing of the shape and then rotate your complete shape through 180° about the origin. [3]



4364 020003

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

2. *(a)* Solve $\frac{5x}{8} = 10$. [2]

(b) Solve $\frac{28}{x} = 7$. [1]

(c) Solve $6(3x - 17) = 42$. [3]

(d) Solve the inequality $9x + 5 < 77$. [2]

(e) Write down the greatest whole number that satisfies the inequality $5x < 85$. [2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

3. *(a)* What percentage is 34 of 6800? [2]

(b) Increase 34 000 by $2\frac{1}{4}$%. [2]

(c) Evaluate each of the following three lengths **correct to two significant figures**, and then arrange them in ascending order.
You must show all your working. [5]

0·26 of 1345 metres

$\frac{3}{8}$ of 600 metres

4·5% of 3600 metres

....
Smallest Largest

(d) Calculate the difference between

- the smaller share when 450 is shared in the ratio 4:5

and

- $\frac{4}{5}$ of 450. [5]

4364 020005

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

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

The length of a cuboid is $4e$ cm.
The width of the cuboid is $3e$ cm.
The height of the cuboid is $2e$ cm.
The total surface area of the 6 faces of the cuboid is 468 cm^2.

- Write down an equation, in terms of e, for the total surface area of the cuboid.
- Solve the equation and use your answer to find the volume of the cuboid.

You must show all your working. [9]

Volume of the cuboid = ...

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

5. The temperature during Claudia's week on holiday changed every day.
The temperature was 26·5°C on Saturday.

The temperature was 12% lower on Sunday than on Saturday.
The temperature was 8% lower on Monday than on Sunday.

By Friday the temperature was 25·3°C.

What was the difference in temperature between Monday and Friday? [4]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

6. It is known that a is proportional to b.
The table shows some values for a and b.

a	b
7·5	3
30	12
40	16

Use the information given in the table to complete the following equations. [3]

$$a = \ldots\ldots\ldots\ldots \times b$$

$$b = \ldots\ldots\ldots\ldots \times a$$

7. Express each of the following numbers in standard form.

(a) 0·000056 [1]

(b) 2300000000 [1]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

8. The diagram below shows a parallelogram.

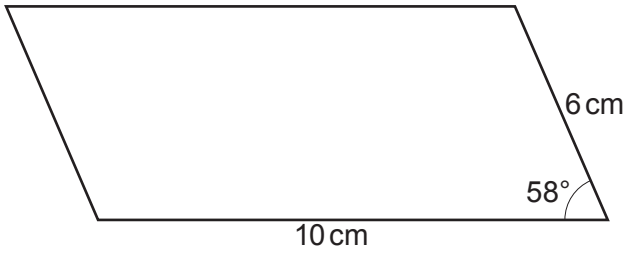


Diagram not drawn to scale

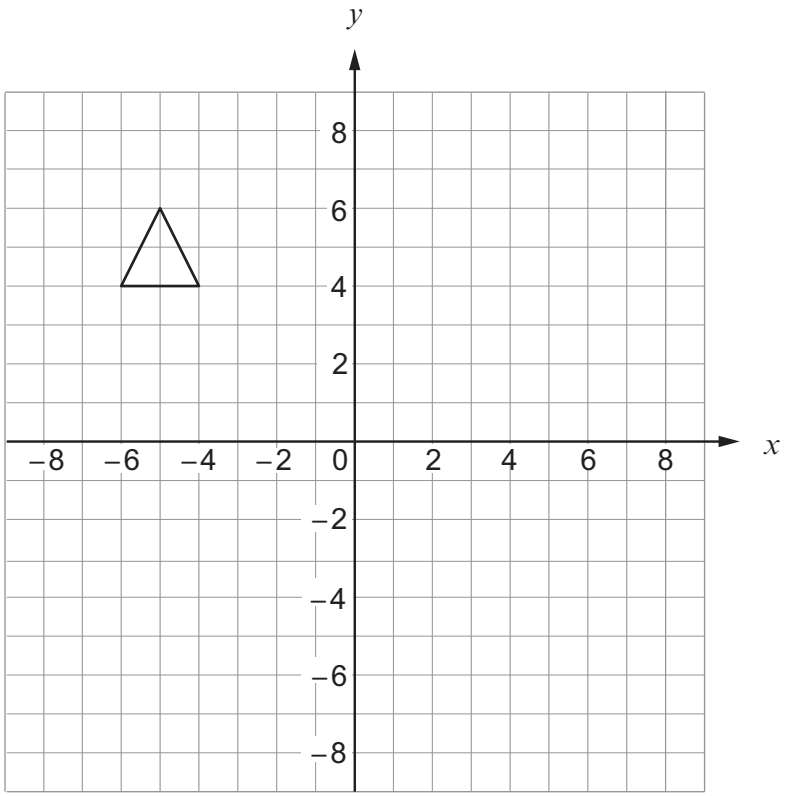
The area of the parallelogram is **not** 60 cm^2.
Calculate the correct area of the parallelogram.
Give your answer to an appropriate degree of accuracy. [6]

© WJEC CBAC Ltd.

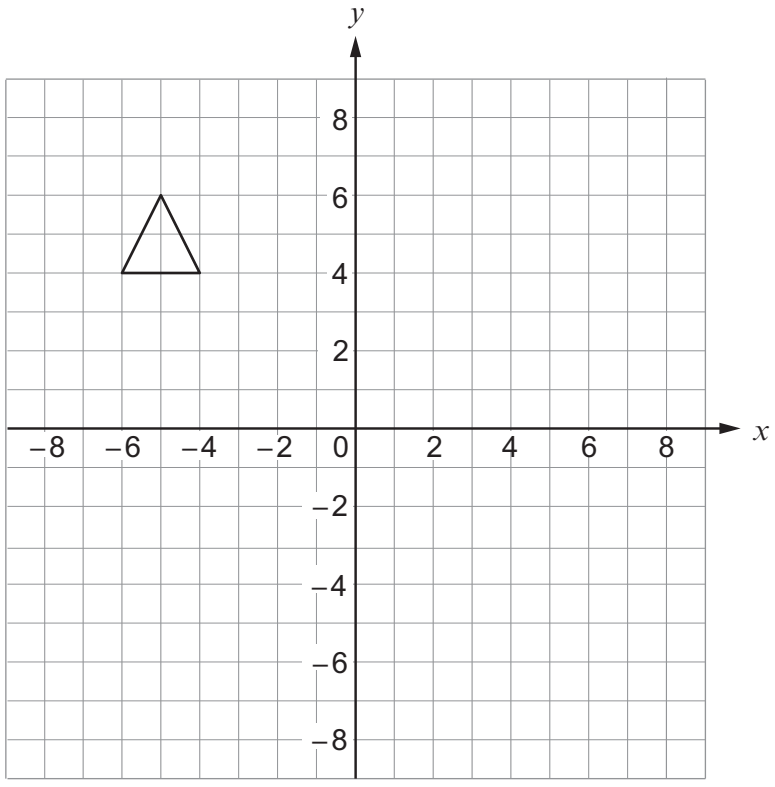
STEMUP.CO.UK

Examiner only

9. *(a)* Translate the triangle shown below by $\begin{pmatrix} 8 \\ -2 \end{pmatrix}$. [1]



(b) Rotate the triangle through 90° anticlockwise using the point (–2, –1) as the centre of the rotation. [2]

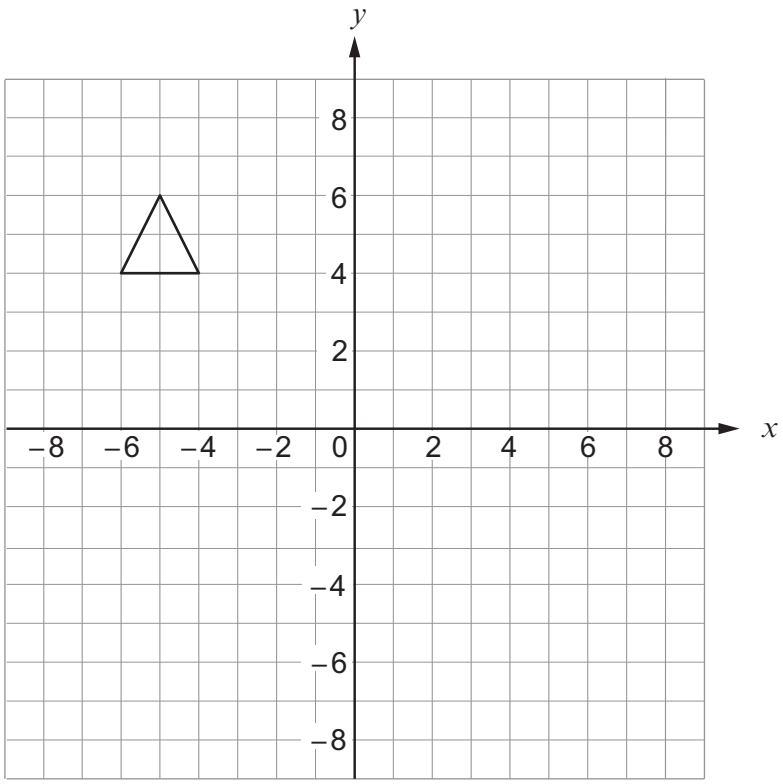


© WJEC CBAC Ltd.

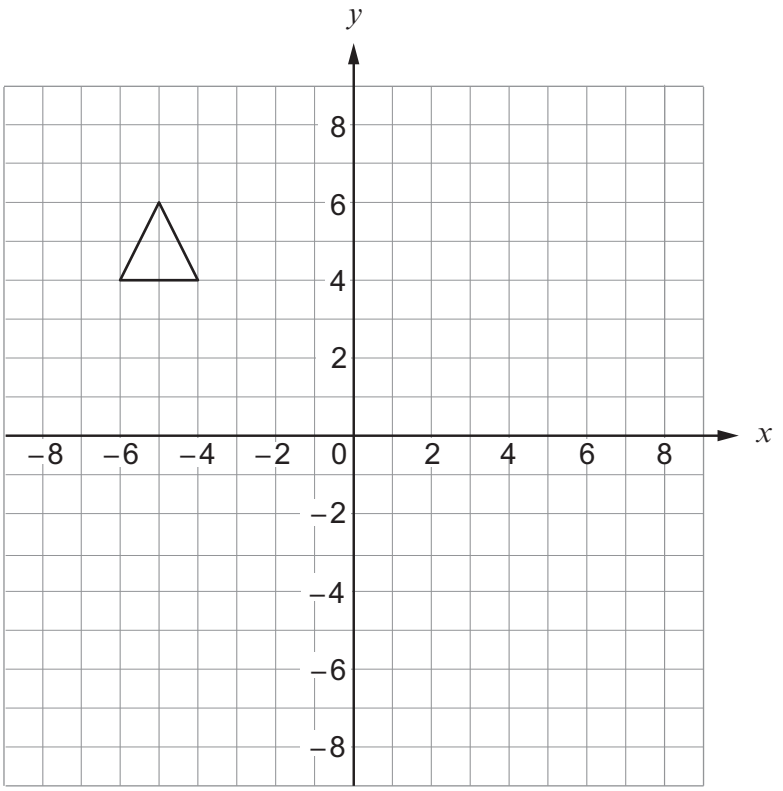
STEMUP.CO.UK

Examiner only

(c) Reflect the triangle shown in the line $y = x$. [2]



(d) Enlarge the triangle shown by a scale factor of $\frac{1}{2}$ using the origin as the centre of the enlargement. [3]



© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

10. The diagram shows a circle with a diameter *PT* and a square with a diagonal *RP*.
RT is a straight line with *RP* = *PT*.

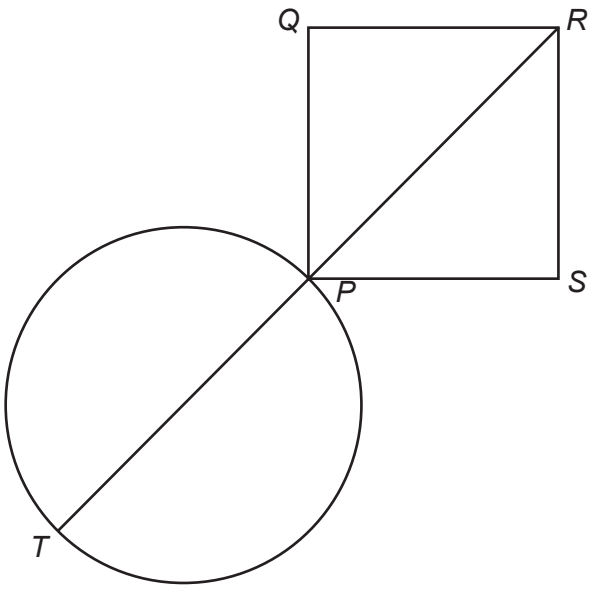


Diagram not drawn to scale

The circumference of the circle is 26·7 cm.
Calculate the perimeter of the square. [6]

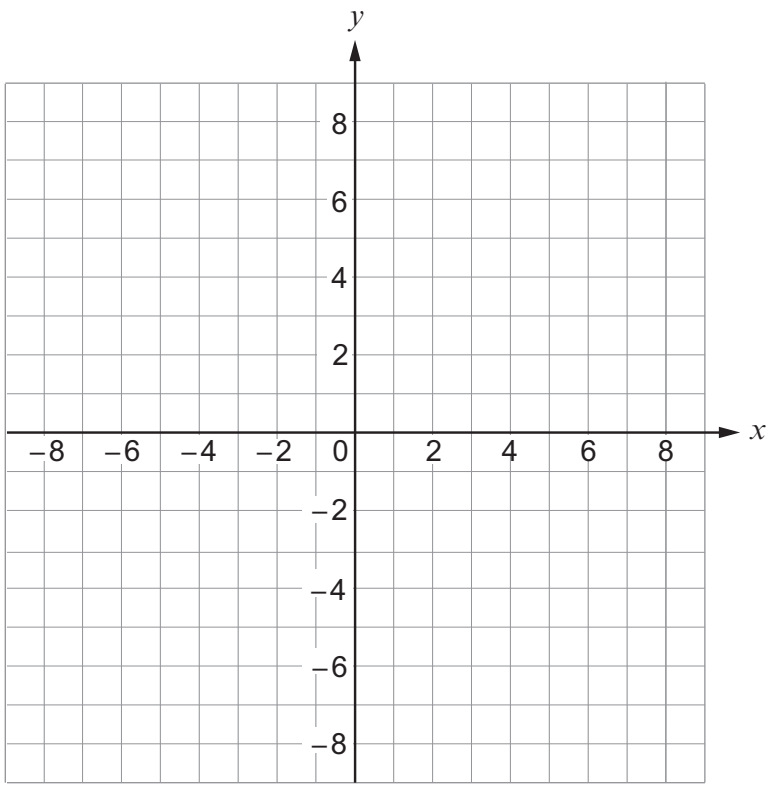
© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

11. *(a)* A point moves such that it is equidistant from the x-axis and the y-axis.

(i) On the grid below, plot the locus of the point. [2]



(ii) Write down the equations that represent the locus of the point. [2]

.....

..... and .....

(b) A point moves such that its distance from the origin is 3 units.
Write down the equation that represents the locus of the point. [1]

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

12.

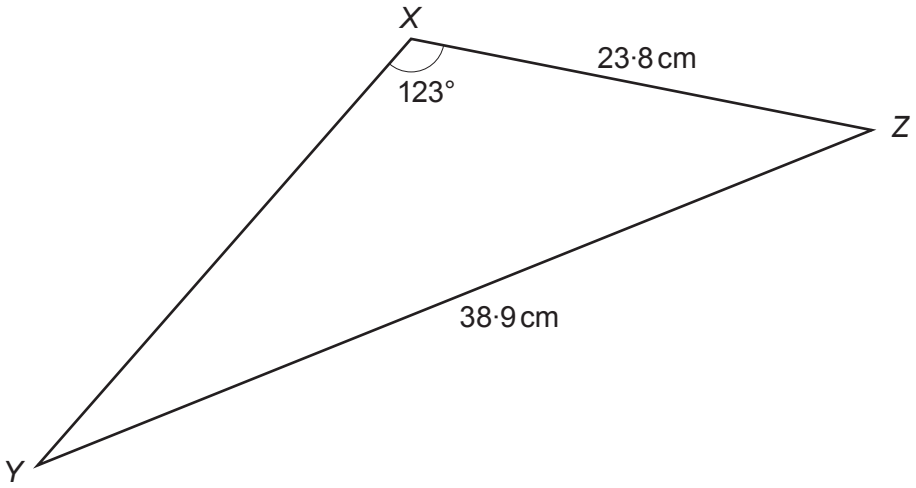


Diagram not drawn to scale

Calculate the size of $X\hat{Y}Z$. [3]

Examiner only

13. Solve the following simultaneous equations using an algebraic method. [6]

$$2x^2 + xy - 5 = 0$$
$$x + y = 4$$

© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

14. *(a)*

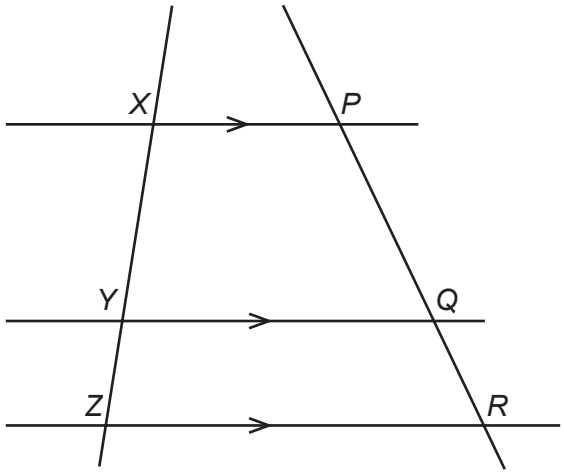


Diagram not drawn to scale

You are given that $XY = 6$ cm, $XZ = 8$ cm and $PQ = 7$ cm.
Calculate the length of QR. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b)

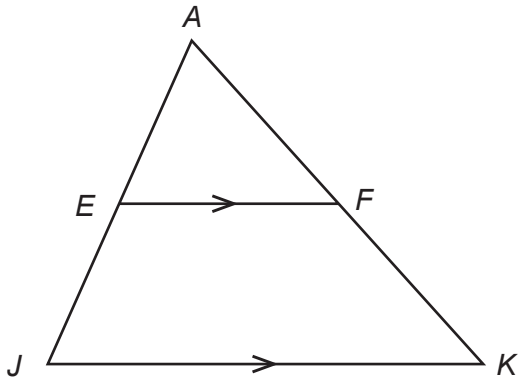
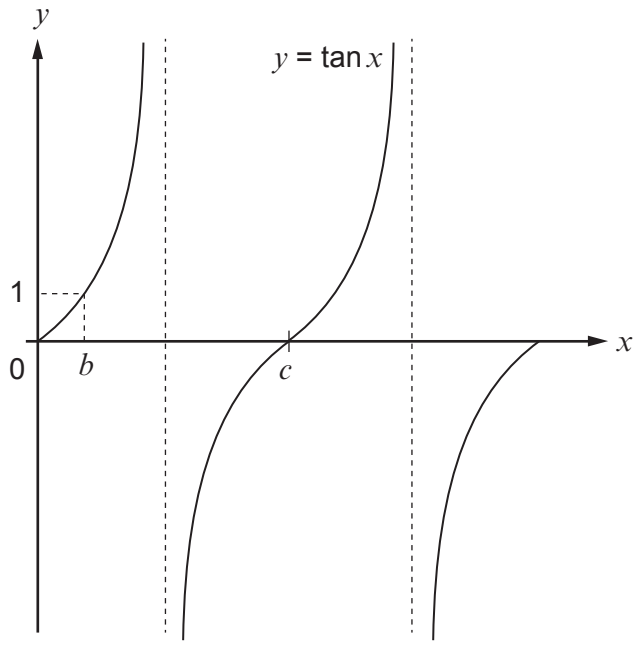


Diagram not drawn to scale

You are given that $AJ = 8x$ cm, $AK = 11y$ cm, $EF = 2x + 3y$ cm and that F is the mid-point of AK.
Find the perimeter of triangle AEF in terms of x and y.
Give your answer in its simplest form. [3]

Examiner only

15.



A sketch of $y = \tan x$ is shown above.

Complete the following statements. [2]

b = ... ° c = ... °

STEMUP.CO.UK

Examiner only

16. You are given that **HL** = $5\mathbf{x} + 6\mathbf{y}$, **LK** = $3\mathbf{x} - 6\mathbf{y}$ and **KN** = $18\mathbf{x} - 36\mathbf{y}$.

(a) Express **HK** in terms of $\mathbf{x}$ and $\mathbf{y}$ in its simplest form. [2]

.....

.....

.....

.....

(b) (i) Show that **LN** = k**LK** where the value of k is to be found. [2]

.....

.....

.....

.....

.....

.....

(ii) What can you say about the points **L**, **K** and **N**? [1]

.....

.....

Turn over for Question 17.

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

17. Here are some facts about two solids, a square-based pyramid and a cone.

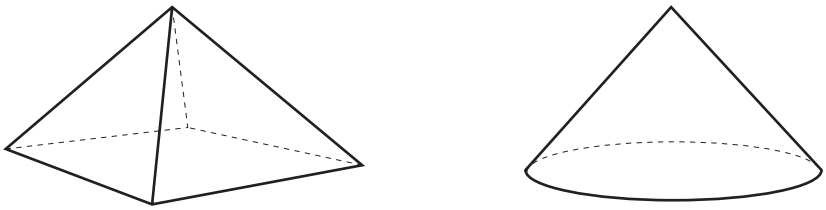


Diagram not drawn to scale

Square-based pyramid	Cone
It is a right pyramid. The total surface area of all 5 faces is 119·8 cm^2. The area of **one** triangular face is 23·6 cm^2. It has a volume of 76·4 cm^3.	It is a right cone. It has a volume of 44·4 cm^3.

The volume of each of these solids is calculated using:

$$\text{volume} = \frac{1}{3} \times \text{area of base} \times \text{perpendicular height.}$$

The square-based pyramid and the cone have equal perpendicular heights.
Calculate the radius of the cone.
Give your answer correct to an appropriate degree of accuracy. [8]

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

GCSE MARKING SCHEME

METHODS IN MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2014

© WJEC CBAC Ltd.

STEMUP.CO.UK

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2014 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). 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.

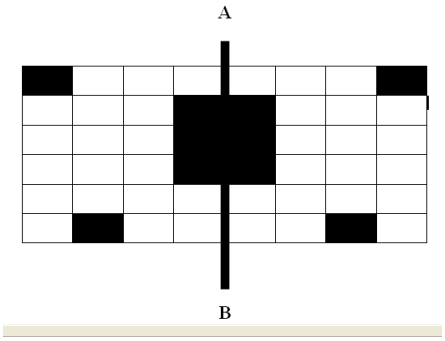
WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

	Page
Unit 1 - Foundation Tier	1
Unit 1 - Higher Tier	5
Unit 2 - Foundation Tier	9
Unit 2 - Higher Tier	13

© WJEC CBAC Ltd.

STEMUP.CO.UK

UNIT 2 (FOUNDATION TIER)

Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
1. 79 28 12 637	B1 B1 B1 B1 4	
2. (a) 8732 (b) 2387 (c) 40% and 2/5 and 0.4 (d) (£)10- (£)1.53 = (£8.47) $\frac{(£)10- (£)1.53}{7}$ OR $\frac{(£)8.47}{7}$ (£)1.21 (e) < > > 10	B1 B1 B3 M1 M1 A1 B2 	 B2 for 3 correct and 1 incorrect B2 for 2 correct and no more than1 incorrect B1 for 1 correct and no more than 1 incorrect B1 for 2 or 3 correct and 2 incorrect CAO B1 for any two correct
3. (a) C and H B and G (b) Radius Chord 4	B1 B1 B1 B1 4	Accept trapezium Accept hexagon
4. (a)  (b) 2 4 (c) Enlargement of scale factor 3	B2 B1 B1 B2 6	B1 for 3 or 4 correct and 1 incorrect OR 3 correct and no incorrect B1 for between 5 and 8 shaded to produce a symmetrical diagram B1 for any two lines correct or 3 points correct B1 for correct enlargement using different scale factor

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
5. Lisa's ingredients × 10 2000(g of flour) OR 2kg 10 (teaspoons of mustard) 500(g of butter) Neil's ingredients × 5 5 (teaspoons of salt) 500(g of cheese) 1250(ml of milk) OR 1.25 l(itres) Look for: Correct use of Units Labels QWC2: Candidates will be expected to • present relevant work clearly, with words explaining process or steps AND • make few if any mistakes in spelling, punctuation and grammar QWC1: Candidates will be expected to • present work clearly which is mostly relevant, with words explaining process or steps OR • make few if any mistakes in spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 A1 QWC 2 6	Or equivalent Attempt at least one of the three ingredients All 3 correct Or equivalent Attempt at least one of the three ingredients All 3 correct 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 material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
6. (a) 67/100 × 234 =(£) 156.78 (b) 2/11 × 242 = 44 (g) (c) For 2 correct in a form which allows comparison For all 3 correct in a form which allows comparison 24%, ¼, 0.3	M1 A1 M1 A1 B1 B1 B1 7	Or equivalent Or equivalent Eg 1\4 = 25% = 0.25 Or equivalent Answer only gets B0, B0, B1

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
7. (a) 20/4 or 5cm 5 × 5 25 cm²	B1 M1 A1 U1	 Independent of other marks
(b) (0.6 × 1.1)/ 2 OR (60 × 110)/ 2 0.33(m²)	M1 A2	 A1 for 3300(cm^2) or 0.66/2 or 0.3×1.1 or 0.6×0.55
(c) 4 × 4 × 4 64 (cm^3) 64 / (8×4) or 32h=64 2 (cm)	M1 A1 M1 A1	*Alternative method:* *4 × 4 M1* *16 (cm^2) A1* *16/8 M1* *2 (cm) A1*
(d) 2π × 20 or π × 40 125.6(637...cm) to 125.7(2…cm)	M1 A1 13	 Accept 126
8. (a) x=23 (b) x=4 (c) y = 72 (d) 4a = 39 - 3 a = 9	B1 B1 B1 B1 B1 5	Allow embedded answers in all parts FT 1 error
9. (a) Listing multiples of 0.3 or 0.4, including at least one between 8 and 9. 8.4 (b) 11.008854….. 11.01 (c) 3000 (d) 0.063	S1 B1 B1 B1 B1 B1 6	OR listing multiples of 3 or 4 including at least one between 80 and 90 with the intention to then insert the decimal point. Award S1B1 for unsupported 8.4
10. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
11 (a) 18x – 102 = 42 OR 3x – 17 = 42/6 18x = 144 3x = 24 x=8 (b) 9x < 77 - 5 x<8 (c) x +2x +3x = 180 x=30 Three angles are 30(˚), 60(˚), 90(˚)	 B1 B1 B1 M1 A1 M1 A1 A1 8	Accept embedded answers in part (a) FT from 1 error FT until 2nd error No marks for use of "=", unless finally replaced to give x<8 then award M1 A1. SC1 for x<82/9 ISW *SC1 for the answers of 30(˚), 60(˚) and 90(˚) without forming an equation* *SC1 for the answers of 60(˚), 120(˚) and 180(˚) from equating to 360*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics June 2014 Unit 2 Foundation Tier	Mark	Comments
12(a) Correct translation	B1	
(b) Correct rotation	B2	B1 near miss of grid lines, or for clockwise 90° about (-2, -1), or for anticlockwise 90° about (-1, -2)
(c) Correct reflection in $y = x$	B2	B1 for a reflection in $y = -x$, OR for sight of the line $y = x$
	5	
13		
$(x^2 =) 20^2-10^2$	M1	
$x^2 = 300$ or $(x =) \sqrt{300}$	A1	x=300 gets M1, A0 unless intention of square rooting is shown
(x=) 17(.32… cm)	A1	
	3	

© WJEC CBAC Ltd.

STEMUP.CO.UK

UNIT 2 HIGHER

Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
1. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
2. (a) (x =) 10×8/5 x = 16 (b) (x =) 4 (c) 18x – 102 = 42 OR 3x – 17 = 42/6 18x = 144 3x = 24 or x = 24/3 x=8 (d) 9x < 77 - 5 x<8 (e) x < 85/5 or x< 17 16	 M1 A1 B1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) Mark final answer. Do not accept 28/7 FT until 2nd error No marks for use of "=", unless finally replaced to give x<8 then award M1 A1. SC1 for x<82/9 ISW Or sight of 5×16 = 80 with 5×17 =85 Accept unsupported 16, or a unique answer of 16 from a trial and improvement method. Do not accept x<16. *SC1 for sight of 5x = 85, x = 17 followed by selecting x =16*
3(a) 100 × 34 / 6800 or 100 × 34 ÷ 6800 0.5(%) or ½(%) (b) 1.0225 × 34000 or 34000 + 34000 × 2.25 /100 or 102.25 × 34000/100 34765 (c) 0.26×1345 or ⅜×600 or 0.045×3600 or equivalent 349.7 (m) 225 (m) 162 (m) 160 230 350 (d) 450 × 4 ÷ 9 = 200 450 × 4 ÷ 5 = 360 Difference 160	M1 A1 M1 A1 M1 A1 A1 A1 B1 M1 A1 M1 A1 A1 14	 Accept 0.25 written as ¼ Any one correct calculation shown Accept 349 or 350 Accept 230 Accept 160 Must all be 2 significant figures FT provided at least 2 of the A marks awarded Complete method CAO Complete method CAO Depend on both M marks

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
4.(Area of faces are) $2e \times 3e$, $2e \times 4e$, $3e \times 4e$, (cm^2) ($2e \times 3e$, $2e \times 4e$, $3e \times 4e$) (cm^2)	M2	M1 for any one of the 3 unique expressions These marks may be implied by correct simplified expressions
(Simplified equation for the total surface area is) $52e^2 = 468$	A2	FT for M2 or M1 as appropriate, provided their simplified sum includes at least two of the expressions $6e^2$, $8e^2$, $12e^2$ and all three terms in the form ae^2. A1 for (2 ×) [$6e^2 + 8e^2 + 12e^2$] OR $52e^2$ (cm^2) A1 for $ae^2 = 468$
$e^2 = 468/52$ (= 9) $e = 3$	B1 B1	FT 'their equation' if in the form $ae^2 = 468$ FT 'their equation' if in the form $ae^2 = 468$
(Volume = 6 × 9 × 12 =) 648 (cm^3)	B1	FT 'their e' within $24 \times e^3$ correctly evaluated
Look for: • if units given, are they correct? • notation • labels and joining text 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	*If no marks, then allow SC2 for $3e \times 4e \times 2e = 468$ leading to an answer of $e = 2.69...$ or 2.7, or SC1 for sight of $3e \times 4e \times 2e = 468$ or equivalent* 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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
5. 26.5 – 26.5 ×0.12 OR 26.5 × 0.88 (=23.3(2) 23.3(2)– 23.3(2) × 0.08 OR 23.3(2)× 0.92 (= 21.4544 or 21.436) 25.3 – 21.4544 (= 3.8456) OR 25.3 – 21.436(=3.864) 3.8(….°C) to 3.9(°C) from correct working	M1 M1 m1 A1 4	OR M2 for $26.5 \times 0.88 \times 0.92$ FT 'their 23.32', but not 26.5 Depends on both previous M marks FT for their 23(.32) and their 21(….) Accept 4(°C) from correct working
6. Sight of any quotient using values from the table for a/b or b/a $a = 2.5 \times b$ $b = 0.4 \times a$	M1 A1 A1 3	Or sight of 1 correct response, or answers reversed Or equivalent Or equivalent FT from $a = 0.4 \times b$ to give $b = 2.5 \times a$
7.(a) 5.6×10^{-5} (b) 2.3×10^{9}	B1 B1 2	

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
8. Idea to show or use the perpendicular height in a right angled triangle	S1	Award for statement such as '6(cm) is not the vertical height'
Height = sin58° × 6	M2	M1 for sin58° = Height/6
= 5(.088…cm)	A1	
Area = 5(.088…)× 10	M1	FT their 5(.088…cm) provided prior M1 awarded or an attempt has been made to use a trig ratio
= 50.9(cm^2) or 51(cm^2)	A1	Must be rounded. Do not accept 50.8 or 50 (from premature approximation). FT from M1
		If S1 only, then use of spurious perpendicular height <6, then also award SC1 for their perpendicular height ×10 correctly evaluated
		Alternative:
		Use of ½ absinC *S1*
		2 × ½ × 6 × 10 × sin 58° *M3*
		or M2 for ½ × 6 × 10 × sin 58°
		50.9(cm^2) or 51(cm^2) *A2*
	6	*or A1 for calculating ½ required area*
9(a) Correct translation	B1	
(b) Correct rotation	B2	B1 near miss of grid lines, or for clockwise 90° about (-2, -1), or for anticlockwise 90° about (-1, -2)
(c) Correct reflection in $y = x$	B2	B1 for a reflection in $y = -x$, OR for sight of the line $y = x$
(d) Enlargement scale factor ½	B2	B1 for any 1 line correct, or consistent incorrect fractional scale
Correct position	B1	
	8	
10. 26.7 = Π× d or 26.7 = 2 × Π× r or r = 26.7/Π	M1	
Diagonal = 8.495… to 8.5(0…) (cm)	A1	Accept rounded or truncated
$diagonal^2 = side^2 + side^2$	M1	FT their diagonal
$side^2 = diagonal^2/2$	A1	
side length = 6(.0096…cm)	A1	Do not FT from inappropriate truncation or incorrect rounding (e.g. from d = 8.4) Answer here for A1 should round to 6.01
Perimeter = 24.(….cm)	B1	FT provided both M marks awarded for 4× 'their side length'
	6	
11.(a)(i) y = x **and** y = - x indicated (2 quadrants for both)	B2	B1 for either indicated in 2 quadrants, or both indicated in 1 quadrant each B1 for indication of appropriate points at least 3 in each of the 4 quadrants *Ignore any circles drawn*
(ii) y = x and y = - x or equivalent	B2	CAO. B1 for either equation
(b) $x^2 + y^2 = 3^2$ or $x^2 + y^2 = 9$	B1	CAO
	5	
12. sin XYZ/23.8 = sin123(°)/38.9	M1	OR 23.8/sin XYZ = 38.9/sin123(°)
sin XYZ = 23.8 × sin123(°)/38.9	M1	OR $\sin^{-1}$ 0.513... *This M1 implies previous M1*
XYZ = 30.871..(°) rounded or truncated correctly	A1	
	3	

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics June 2014 Unit 2 Higher Tier	Mark	Comment
13. $y = 4 - x$ OR $x = 4 - y$ $2x^2 + x(4-x) - 5 = 0$ $2(4-y)^2 + (4-y)y - 5 = 0$ $x^2 + 4x - 5 = 0$ $y^2 - 12y + 27 = 0$ $(x - 1)(x+5) = 0$ $(y - 3)(y - 9) = 0$ $x = 1, x = -5$ OR $y = 3, y = 9$ $y = 3, y = 9$ $x = 1, x = -5$	M1 M1 A1 M1 A1 A1 6	OR For sight of $x^2 + xy = 4x$ OR Subtraction from 1st equation OR $x^2 + 4x = 5$ FT provided quadratic from an appropriate substitution method or subtraction method OR alternative method to solve , e.g. formula with correct substitution and b^2-4ac correctly simplified *If A0, A0 then SC1 for x= 1, y=3* ***OR*** *x= -5, y=9 provided algebraic method shown with appropriate M1, M1, M1 marks* *No marks for trial & improvement methods*
14(a) 6:2 and 7:QR or equivalent, or scale factor 7/6 QR = 2 × 7 ÷ 6 or equivalent QR = 2.3(33…cm) (b) AE = 4x AF = 5.5 y (Perimeter =) 6x + 8.5y or 6x +17y/2 ISW	B1 M1 A1 B1 B1 B1 6	OR 6:8 and 7:**PR** or equivalent OR **PR** = 7 × 8 ÷ 6 (= 9.33…) or equivalent CAO. Must be simplified Accept ½ (12x + 17y) Answers of 4x + 5.5y + 2x + 3y imply B1, B1, B0
15. b = 45(°) c = 180(°)	B1 B1 2	
16(a) **HK** = **HL** + **LK** (= 5**x** + 6**y** + 3**x** – 6**y**) = 8**x** (+0**y**) (b)(i) **LN** = 3**x** – 6**y** + 18**x** – 36**y** (=21**x** – 42**y**) k = 7 (ii) Collinear (or lie along the same straight line)	M1 A1 M1 A1 B1 5	 May be embedded. Award M1, A1 for sight of k=7 Do not accept parallel as a full description
17. Area of the square base = 119.8 – 4 ×23.6 = 25.4(cm^2) (Volume pyramid) 76.4 = ⅓ × 25.4 × height height = 9.02… cm (Volume cone) 44.4 = ⅓ × π × r^2 × height r^2 = 44.4/(⅓ × π × height) r^2 = (44.4 × ⅓ × 25.4) / (76.4 × ⅓ × π) r^2 = 4.69… to 4.701… (radius) 2.17 or 2.2 (cm)	M1 A1 m1 A1* M1* M1 A1 A1 8	 FT their area of square base Note √25.4 = 5.0398…× 5.0398… Depends on all previous method marks, FT their height FT equivalent difficulty, isolating r^2 CAO. OR r^2 = 4.7, or an appropriate unrounded r, r = 2.1681875… to 2.17 CAO. Appropriate degree of accuracy required *Alternative for A1*, M1** *Equating heights,* 76.4 / (⅓ × 25.4) = 44.4 /(⅓ × π × r^2) *For information:* *Common height = 9.02(cm)* *Height of a triangular face = 9.37(cm)*

© WJEC CBAC Ltd.

STEMUP.CO.UK

UNIT 2 (HIGHER TIER)

Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
1. Shape completed accurately with correct rotation seen	B3 3	With no other 90° rotations shown B2 for at least two lines correct in attempting to complete the shape with correct rotation of their shape with no other 90° rotations shown, OR B1 for the shape completed correctly, or a correct rotation of the part of the shape given, ignore other 90° rotations shown
2. (a) (x =) 10×8/5 x = 16 (b) (x =) 4 (c) 18x – 102 = 42 OR 3x – 17 = 42/6 18x = 144 3x = 24 or x = 24/3 x=8 (d) 9x < 77 - 5 x<8 (e) x < 85/5 or x< 17 16	 M1 A1 B1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) Mark final answer. Do not accept 28/7 FT until 2nd error No marks for use of "=", unless finally replaced to give x<8 then award M1 A1. SC1 for x<82/9 ISW Or sight of 5×16 = 80 with 5×17 =85 Accept unsupported 16, or a unique answer of 16 from a trial and improvement method. Do not accept x<16. *SC1 for sight of 5x = 85, x = 17 followed by selecting x =16*
3(a) 100 × 34 / 6800 or 100 × 34 ÷ 6800 0.5(%) or ½(%) (b) 1.0225 × 34000 or 34000 + 34000 × 2.25 /100 or 102.25 × 34000/100 34765 (c) 0.26×1345 or ⅜×600 or 0.045×3600 or equivalent 349.7 (m) 225 (m) 162 (m) 160 230 350 (d) 450 × 4 ÷ 9 = 200 450 × 4 ÷ 5 = 360 Difference 160	M1 A1 M1 A1 M1 A1 A1 A1 B1 M1 A1 M1 A1 A1 14	 Accept 0.25 written as ¼ Any one correct calculation shown Accept 349 or 350 Accept 230 Accept 160 Must all be 2 significant figures FT provided at least 2 of the A marks awarded Complete method CAO Complete method CAO Depend on both M marks

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
4.(Area of faces are) $2e \times 3e$, $2e \times 4e$, $3e \times 4e$, (cm^2) ($2e \times 3e$, $2e \times 4e$, $3e \times 4e$) (cm^2)	M2	M1 for any one of the 3 unique expressions These marks may be implied by correct simplified expressions
(Simplified equation for the total surface area is) $52e^2 = 468$	A2	FT for M2 or M1 as appropriate, provided their simplified sum includes at least two of the expressions $6e^2$, $8e^2$, $12e^2$ and all three terms in the form ae^2. A1 for $(2 \times) [6e^2 + 8e^2 + 12e^2]$ OR $52e^2$ (cm^2) A1 for $ae^2 = 468$
$e^2 = 468/52$ (= 9) $e = 3$	B1 B1	FT 'their equation' if in the form $ae^2 = 468$ FT 'their equation' if in the form $ae^2 = 468$
(Volume = $6 \times 9 \times 12$ =) 648 (cm^3)	B1	FT 'their e' within $24 \times e^3$ correctly evaluated
Look for: • if units given, are they correct? • notation • labels and joining text 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	*If no marks, then allow SC2 for $3e \times 4e \times 2e = 468$ leading to an answer of $e = 2.69...$ or 2.7, or SC1 for sight of $3e \times 4e \times 2e = 468$ or equivalent* 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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
5. 26.5 – 26.5 ×0.12 OR 26.5 × 0.88 (=23.3(2) 23.3(2)– 23.3(2) × 0.08 OR 23.3(2)× 0.92 (= 21.4544 or 21.436) 25.3 – 21.4544 (= 3.8456) OR 25.3 – 21.436(=3.864) 3.8(….°C) to 3.9(°C) from correct working	M1 M1 m1 A1 4	OR M2 for $26.5 \times 0.88 \times 0.92$ FT 'their 23.32', but not 26.5 Depends on both previous M marks FT for their 23(.32) and their 21(….) Accept 4(°C) from correct working
6. Sight of any quotient using values from the table for a/b or b/a $a = 2.5 \times b$ $b = 0.4 \times a$	M1 A1 A1 3	Or sight of 1 correct response, or answers reversed Or equivalent Or equivalent FT from $a = 0.4 \times b$ to give $b = 2.5 \times a$
7.(a) 5.6×10^{-5} (b) 2.3×10^9	B1 B1 2	

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
8. Idea to show or use the perpendicular height in a right angled triangle	S1	Award for statement such as '6(cm) is not the vertical height'
Height = sin58° × 6	M2	M1 for sin58° = Height/6
= 5(.088…cm)	A1	
Area = 5(.088…)× 10	M1	FT their 5(.088…cm) provided prior M1 awarded or an attempt has been made to use a trig ratio
= 50.9(cm^2) or 51(cm^2)	A1	Must be rounded. Do not accept 50.8 or 50 (from premature approximation). FT from M1
		If S1 only, then use of spurious perpendicular height <6, then also award SC1 for their perpendicular height ×10 correctly evaluated
		Alternative:
		Use of ½ absinC *S1*
		2 × ½ × 6 × 10 × sin 58° *M3*
		or M2 for ½ × 6 × 10 × sin 58°
		50.9(cm^2) or 51(cm^2) *A2*
	6	*or A1 for calculating ½ required area*
9(a) Correct translation	B1	
(b) Correct rotation	B2	B1 near miss of grid lines, or for clockwise 90° about (-2, -1), or for anticlockwise 90° about (-1, -2)
(c) Correct reflection in $y = x$	B2	B1 for a reflection in $y = -x$, OR for sight of the line $y = x$
(d) Enlargement scale factor ½	B2	B1 for any 1 line correct, or consistent incorrect fractional scale
Correct position	B1 8	
10. 26.7 = Π× d or 26.7 = 2 × Π× r or r = 26.7/Π	M1	
Diagonal = 8.495… to 8.5(0…) (cm)	A1	Accept rounded or truncated
$diagonal^2 = side^2 + side^2$	M1	FT their diagonal
$side^2 = diagonal^2/2$	A1	
side length = 6(.0096…cm)	A1	Do not FT from inappropriate truncation or incorrect rounding (e.g. from d = 8.4) Answer here for A1 should round to 6.01
Perimeter = 24.(….cm)	B1 6	FT provided both M marks awarded for 4× 'their side length'
11.(a)(i) y = x **and** y = - x indicated (2 quadrants for both)	B2	B1 for either indicated in 2 quadrants, or both indicated in 1 quadrant each B1 for indication of appropriate points at least 3 in each of the 4 quadrants *Ignore any circles drawn*
(ii) y = x and y = - x or equivalent	B2	CAO. B1 for either equation
(b) $x^2 + y^2 = 3^2$ or $x^2 + y^2 = 9$	B1 5	CAO
12. sin XYZ/23.8 = sin123(°)/38.9	M1	OR 23.8/sin XYZ = 38.9/sin123(°)
sin XYZ = 23.8 × sin123(°)/38.9	M1	OR $\sin^{-1}$ 0.513... *This M1 implies previous M1*
XYZ = 30.871..(°) rounded or truncated correctly	A1 3	
13. y = 4 – x OR x = 4 - y	M1	OR For sight of $x^2 + xy = 4x$
$2x^2 + x(4-x) - 5 = 0$ $2(4-y)^2 + (4-y)y - 5 = 0$	M1	OR Subtraction from 1st equation
$x^2 + 4x - 5 = 0$ $y^2 – 12y + 27 = 0$	A1	OR $x^2 + 4x = 5$
(x - 1)(x+5) = 0 (y -3)(y -9) = 0	M1	FT provided quadratic from an appropriate substitution method or subtraction method OR alternative method to solve , e.g. formula with correct substitution and b^2-4ac correctly simplified
x = 1, x = -5 OR y = 3, y =9	A1	
y = 3, y = 9 x = 1, x = -5	A1	
		If A0, A0 then SC1 for x= 1, y=3 ***OR*** *x= -5, y=9 provided algebraic method shown with appropriate M1, M1, M1 marks*
	6	*No marks for trial & improvement methods*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods in Mathematics Unit 2 Higher Tier June 2014	Mark	Comment
14(a) 6:2 and 7:QR or equivalent, or scale factor 7/6 QR = 2 × 7 ÷ 6 or equivalent QR = 2.3(33…cm) (b) AE = 4x AF = 5.5 y (Perimeter =) 6x + 8.5y or 6x +17y/2 ISW	B1 M1 A1 B1 B1 B1 6	OR 6:8 and 7:**PR** or equivalent OR **PR** = 7 × 8 ÷ 6 (= 9.33…) or equivalent CAO. Must be simplified Accept ½ (12x + 17y) Answers of 4x + 5.5y + 2x + 3y imply B1, B1, B0
15. b = 45(°) c = 180(°)	B1 B1 2	
16(a) **HK** = **HL** + **LK** (= 5**x** + 6**y** + 3**x** – 6**y**) = 8**x** (+0**y**) (b)(i) **LN** = 3**x** – 6**y** + 18**x** – 36**y** (=21**x** – 42**y**) k = 7 (ii) Collinear (or lie along the same straight line)	M1 A1 M1 A1 B1 5	 May be embedded. Award M1, A1 for sight of k=7 Do not accept parallel as a full description
17. Area of the square base = 119.8 – 4 ×23.6 = 25.4(cm^2) (Volume pyramid) 76.4 = ⅓ × 25.4 × height height = 9.02… cm (Volume cone) 44.4 = ⅓ × π × r^2 × height r^2 = 44.4/(⅓ × π × height) r^2 = (44.4 × ⅓ × 25.4) / (76.4 × ⅓ × π) r^2 = 4.69… to 4.701… (radius) 2.17 or 2.2 (cm)	M1 A1 m1 A1* M1* M1 A1 A1 8	 FT their area of square base Note √25.4 = 5.0398…× 5.0398… Depends on all previous method marks, FT their height FT equivalent difficulty, isolating r^2 CAO. OR r^2 = 4.7, or an appropriate unrounded r, r = 2.1681875… to 2.17 CAO. Appropriate degree of accuracy required *Alternative for A1*, M1** *Equating heights,* 76.4 / (⅓ × 25.4) = 44.4 /(⅓ × π × r^2) *For information:* *Common height = 9.02(cm)* *Height of a triangular face = 9.37(cm)*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

METHODS OF MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. MONDAY, 20 January 2014

2 hours

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**2**	
3.	**5**	
4.	**3**	
5.	**9**	
6.	**7**	
7.	**4**	
8.	**4**	
9.	**6**	
10.	**5**	
11.	**6**	
12.	**4**	
13.	**3**	
14.	**5**	
15.	**2**	
16.	**7**	
17.	**6**	
18.	**5**	
19.	**4**	
20.	**7**	
Total	**100**	

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 **6**.

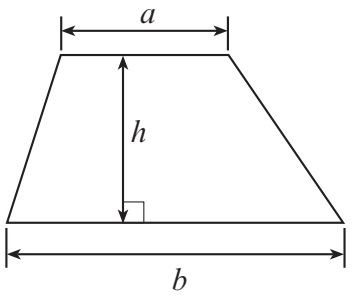
4364
020001

© WJEC CBAC Ltd.

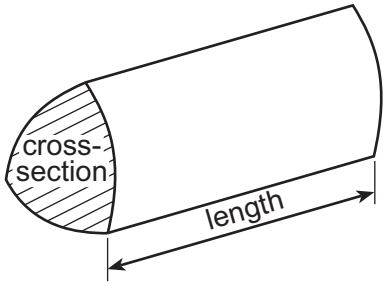
STEMUP.CO.UK

Formula List

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

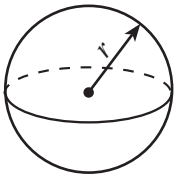


Volume of prism = area of cross-section × length



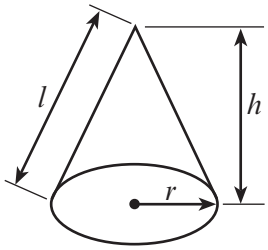
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

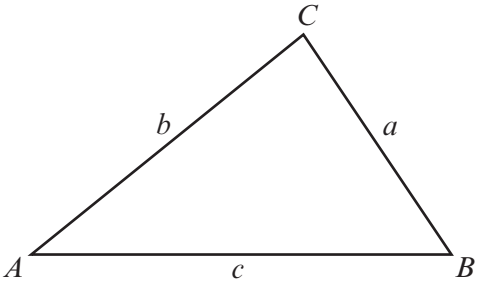


In any triangle ABC

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

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

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. *(a)* Solve $11 = \frac{220}{x}$. [1]

(b) Solve $3(4x - 13) = 45$. [3]

(c) Solve $\frac{x + 4}{12} = 6$. [2]

4364 020003

STEMUP.CO.UK

Examiner only

2. Find the value of $\sqrt{\frac{3}{4 \cdot 2^2 - 3}}$, giving your answer correct to two decimal places. [2]

.....

.....

.....

.....

.....

.....

3. *(a)* Complete the following table. [3]

Quadrilateral	Number of lines of symmetry	Order of rotational symmetry
Kite		
Parallelogram		
Rhombus		

(b) The area of a circle is $36\pi\,\text{cm}^2$.
What is the radius of this circle? [2]

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

4. Abbie, Beatrice, Catrin and Debbie all sat the same test.

Name	Test results
Abbie	23 out of 84 marks awarded
Beatrice	Scored approximately 31%
Catrin	Total given was $\frac{1}{3}$ of marks available
Debbie	$\frac{27}{84}$

Compare their test results and complete the table below.
You must show all your working. [3]

.....

.....

.....

.....

.....

.....

Position	Name
First 	.....
Second 	.....
Third 	.....
Fourth 	.....

4364 020005

STEMUP.CO.UK

Examiner only

5. *(a)* An amount of money is shared by three people in the ratio 2 : 5 : 8.
What fraction of this money is given to the person who receives the smallest share? [2]

.....

.....

.....

(b) Percentage change can be calculated by using multipliers.

A final answer is calculated as follows:

- £400 is increased by 26%
- The increased answer is then decreased by 24%
- This gives the final answer

The calculation to work out the final answer can be expressed, using multipliers, as the **product of three numbers**.
Complete the statement below. [2]

.....

.....

.....

Final answer = £400 × ..... × .....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(c) Water flows from a hose pipe at a steady rate into a water tank.
It takes $1\frac{1}{4}$ hours to fill a cylindrical water tank that is 25 cm tall.

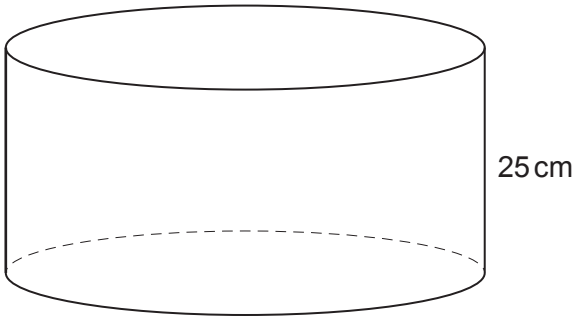


Diagram not drawn to scale

(i) Calculate the time it takes to fill $\frac{2}{5}$ of the tank. [2]

.....

.....

.....

(ii) What depth is the water in the tank after 20 minutes?
Give your answer correct to 3 significant figures. [3]

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

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

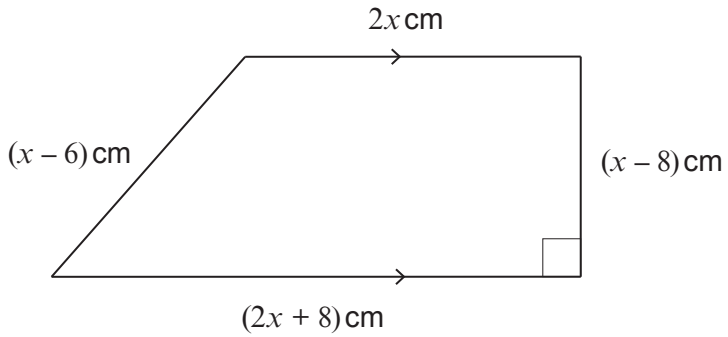


Diagram not drawn to scale

The **perimeter** of the trapezium is 132 cm.

Calculate the height of the trapezium.
You must show all your working. [7]

STEMUP.CO.UK

Examiner only

7. *(a)* The number b is double the number c.
Use this information to write an equation in terms of b and c. [1]

.....

.....

.....

(b) When five times a whole number n is added to seven, the total is less than fifty-two.
Write down an inequality which is satisfied by n and rearrange it in the form $n < a$ where a is a whole number. [3]

.....

.....

.....

.....

.....

.....

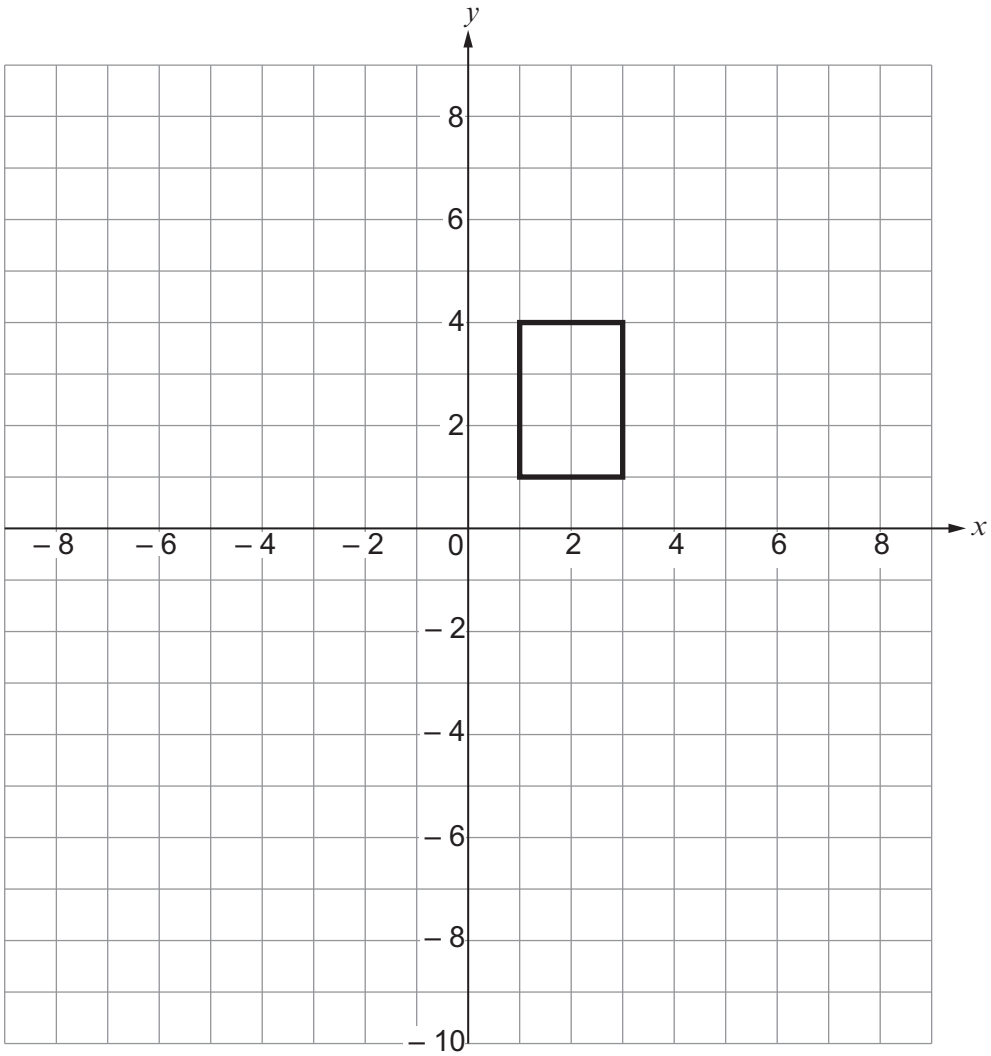
.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

8. *(a)* Rotate the rectangle through 90° clockwise about the origin. [2]

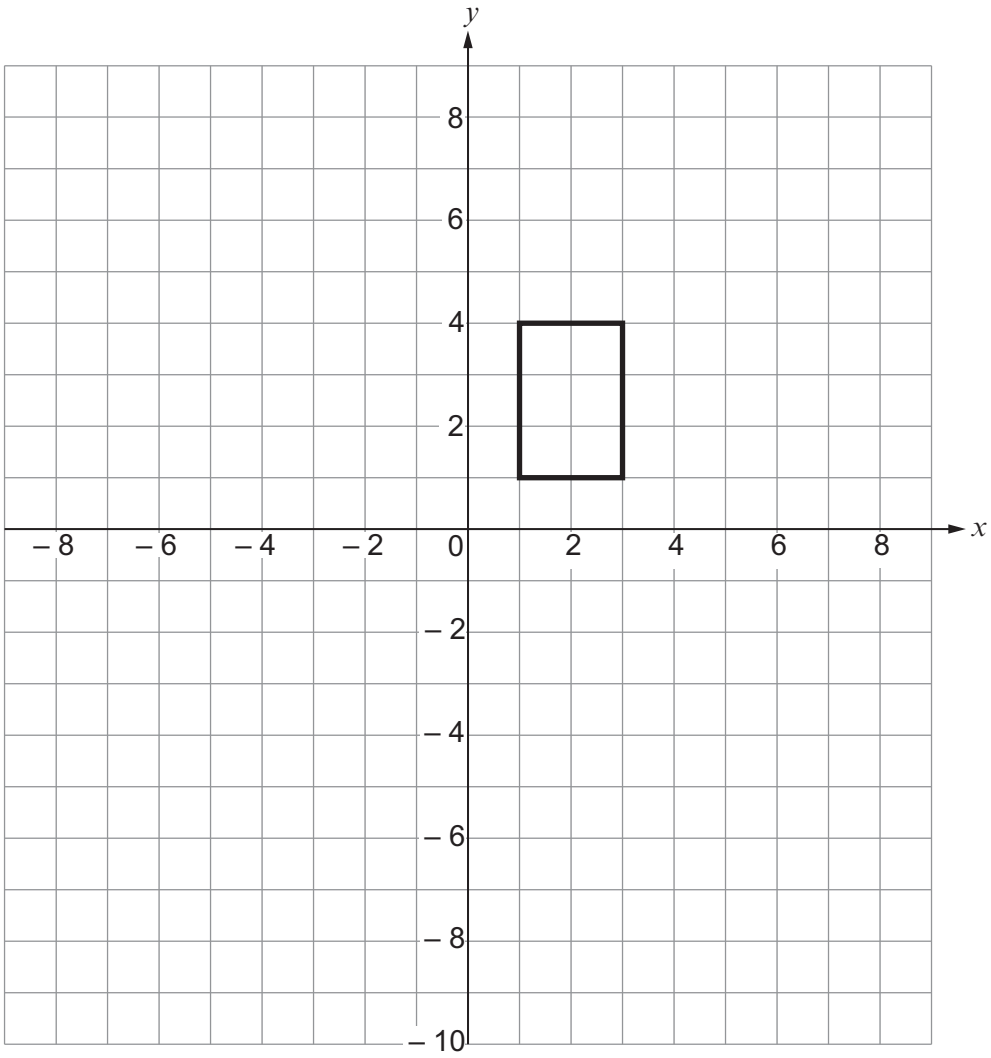


© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b) Enlarge the rectangle by a scale factor of -2 using the origin as the centre of enlargement. [2]



4364
020011

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

9. *(a)* Calculate the perimeter of a semi-circle with a diameter of 6·2 cm. [3]

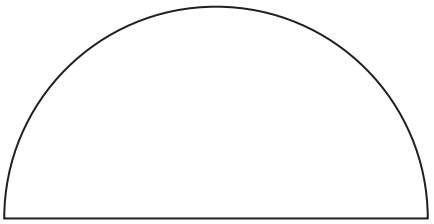


Diagram not drawn to scale

(b) Calculate the volume of a cylinder radius 4·5 cm and height 10·3 cm.
State the units of your answer. [3]

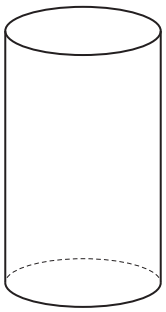


Diagram not drawn to scale

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

10. The diagram shows a right-angled triangle.

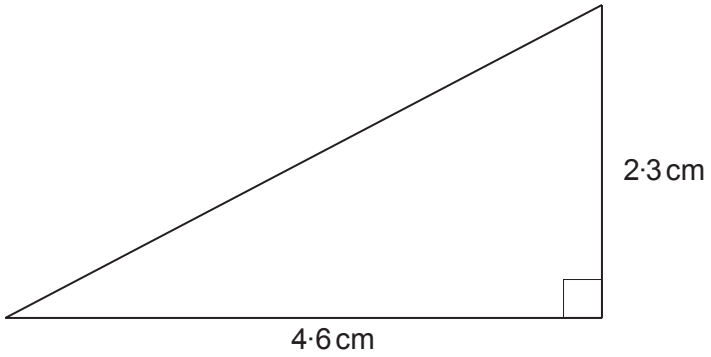


Diagram not drawn to scale

(a) Calculate the area of the right-angled triangle. [2]

(b) Calculate the length of the hypotenuse. [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Turn over.

Examiner only

11. Solve the following equations.
Give **both** your answers in **standard form** correct to **2 significant figures**.

(a) $\dfrac{x}{3{\cdot}4 \times 10^{-2}} = 4{\cdot}5 \times 10^{6}$ [3]

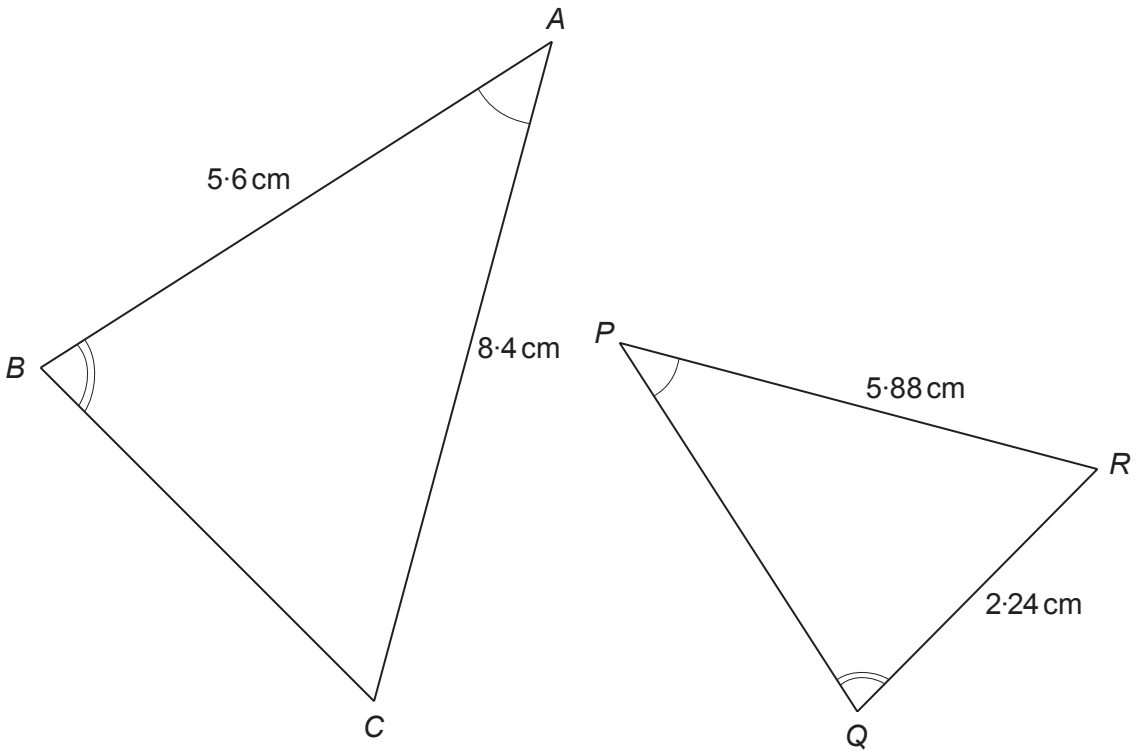
(b) $y + 5{\cdot}5 \times 10^{6} = 1{\cdot}2 \times 10^{8}$ [3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

12. Triangles *ABC* and *PQR* are similar.



Diagrams not drawn to scale

Showing all your working, calculate the length of the following sides.

(a) *PQ* [2]

.....

.....

.....

.....

.....

(b) *BC* [2]

.....

.....

.....

.....

.....

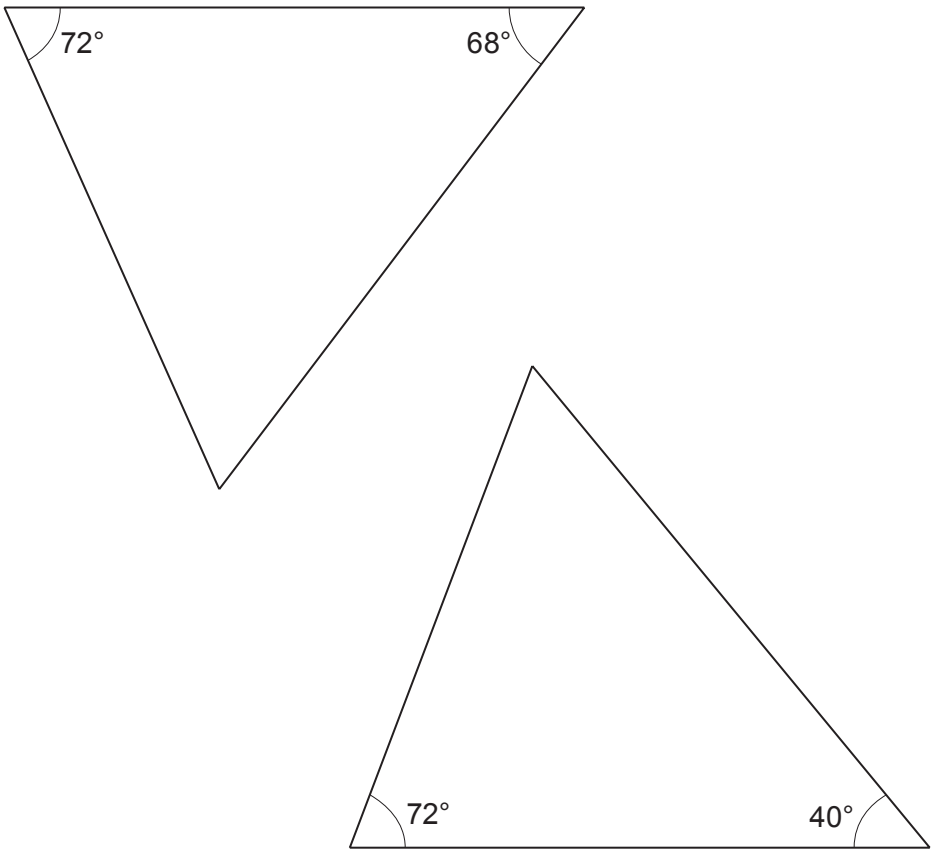
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

13. The two triangles drawn below are not drawn to scale.
Thomas says the triangles are similar but not necessarily congruent.
Is Thomas correct or not?
Explain your answer. [3]



Diagrams not drawn to scale

STEMUP.CO.UK

Examiner only

14. Use an algebraic method to solve the following simultaneous equations. [5]

$$3x + 2y = 1 \quad \text{and} \quad 2x = 5(y - 10)$$

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

15. Vectors **OA** and **OB** are shown in the diagram below.

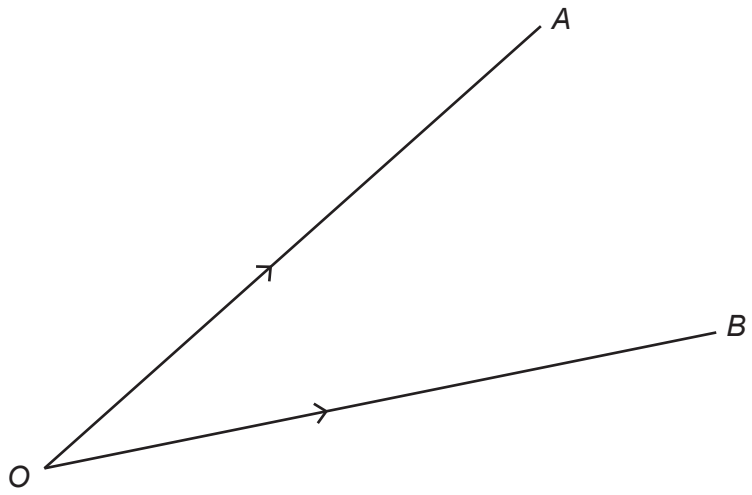


Diagram not drawn to scale

Given that **OA** = $3\mathbf{x} + 7\mathbf{y}$ and **OB** = $4\mathbf{x} + 2\mathbf{y}$, express **AB** in terms of $\mathbf{x}$ and $\mathbf{y}$ in its simplest form. [2]

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

16. Results of an experiment have demonstrated that there is a relationship between two variables, f and g.
It has been shown that f is inversely proportional to the square of g.

(a) Which one of the following statements best describes the results of this experiment? You must explain your answer. [2]

Statement A: 'As g increases f increases at an even faster rate.'
Statement B: 'As g reduces, f also reduces.'
Statement C: 'As g increases, f decreases.'
Statement D: 'Variables f and g both change at the same rate.'

.....

.....

.....

.....

(b) It was found that when $f = 4$, $g = 5$.
Write down an equation, in terms of f and g, expressing the relationship found in the experiment. [3]

.....

.....

.....

.....

.....

.....

(c) Use the equation to complete the following table. [2]

g	$\frac{1}{2}$	5	.....
f	.....	4	0·01

.....

.....

.....

.....

.....

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

17. The diagram below shows a cuboid with $B\hat{C}D = 15°$.

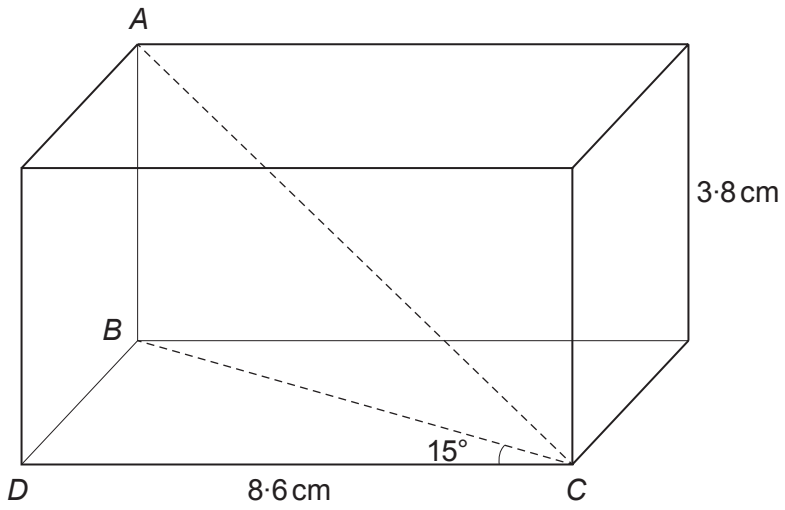


Diagram not drawn to scale

Calculate the size of $A\hat{C}B$. [6]

STEMUP.CO.UK

Examiner only

18.

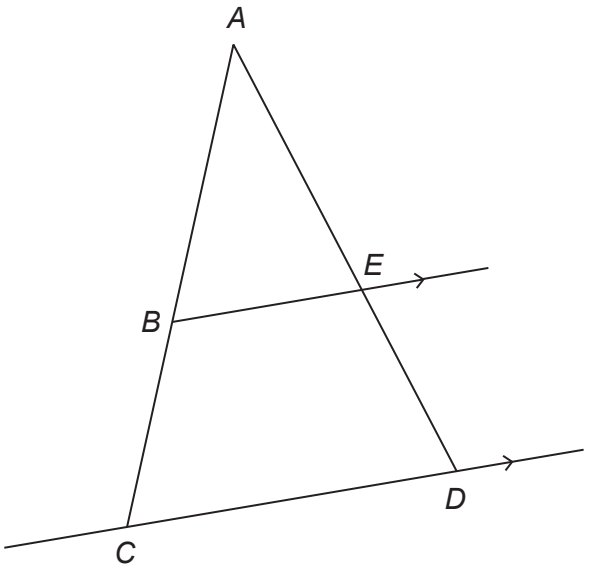


Diagram not drawn to scale

In the diagram above $AE = x$ cm, $ED = y$ cm and $AB = z$ cm.
Starting with the relationship between AB and AC, **prove** that BC can be expressed in terms of x, y and z.
Hence, find an expression for BC in its simplest form. [5]

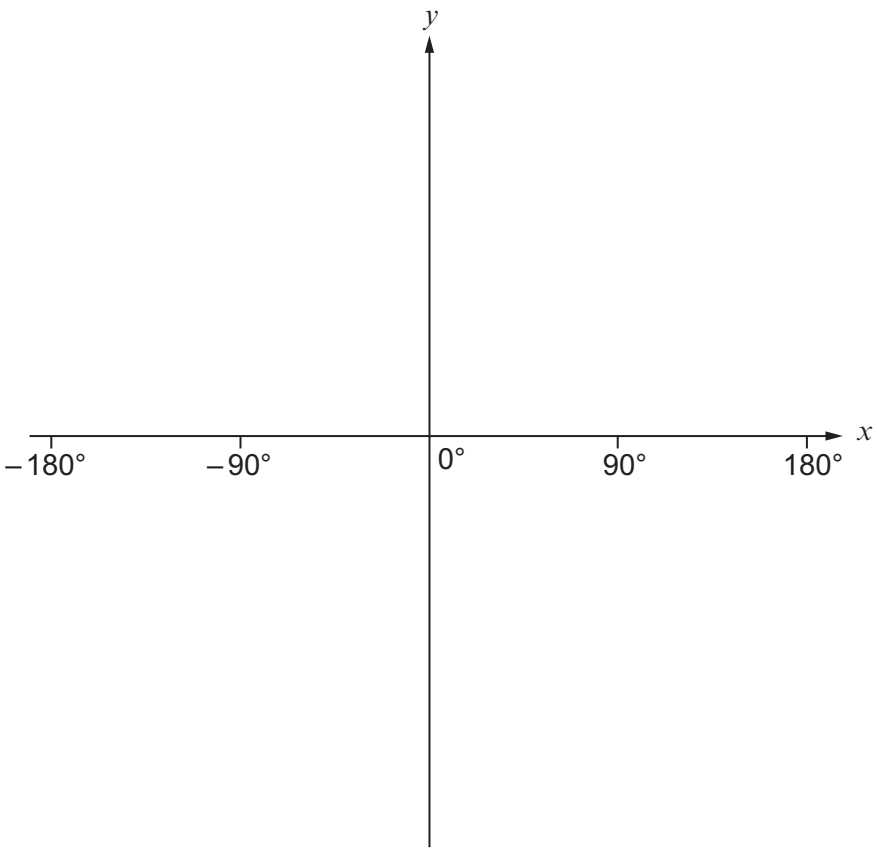
STEMUP.CO.UK

Examiner only

19. Use the axes below to sketch the following graphs.
You must indicate any additional important values on the axes.

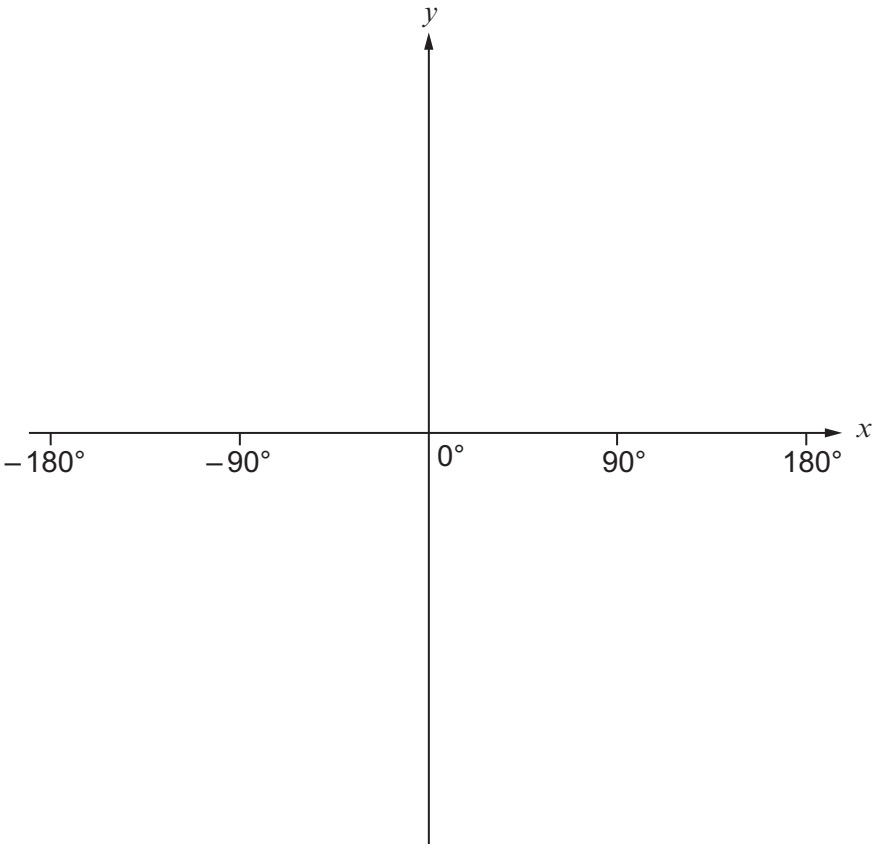
[2]

$y = \cos x$



[2]

$y = \tan x$



© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

20.

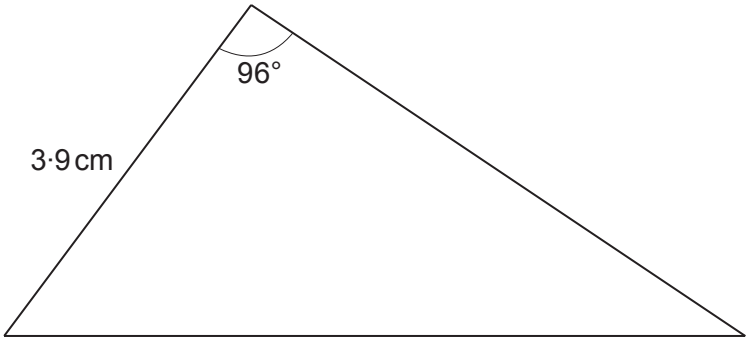


Diagram not drawn to scale

The area of the triangle shown above is $22{\cdot}8\,cm^2$.
Calculate the length of the longest side of the triangle. [7]

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

WJEC
CBAC

GCSE MARKING SCHEME

METHODS IN MATHEMATICS
(LINKED PAIR PILOT)

JANUARY 2014

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2014 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). 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
Unit 1 Foundation Tier	1
Unit 1 Higher Tier	5
Unit 2 Foundation Tier	10
Unit 2 Higher Tier	14

STEMUP.CO.UK

METHODS UNIT 2
FOUNDATION TIER

<table>
<tr><th>Methods Unit 2 Foundation Tier January 2014</th><th>Mark</th><th>Comments</th></tr>
<tr><td>1. (a) 1469
(b) 9614</td><td>B1
B1
2</td><td></td></tr>
<tr><td>2. 25% and 2/8</td><td>B2

2</td><td>B1 for 1 correct and no more than 1 incorrect
OR B1 for 2 correct and 1 incorrect</td></tr>
<tr><td>3. (£) 20 – 4 x (£)4.99
£ 0.04 or 4p</td><td>M1
A2

3</td><td>
Allow £0.04p
A1 for 0.04 or 4 with wrong units or no units</td></tr>
<tr><td>4. (a) D and E
B and H

(b) Diameter
Tangent</td><td>B1
B1

B1
B1
4</td><td>Accept triangle(s)
Accept circle(s)</td></tr>
<tr><td>5. (a)(i) 8
cm³

ii) (Yes and Volume =) 2×2×2 implied or drawn

(b) 5 × 8 × 3
=120 (cm³)</td><td>B1
U1

B1

M1
A1
5</td><td>
Independent of all other marks.</td></tr>
<tr><td>6. (a) Correct diagram

(b) 4</td><td>B2

B1
3</td><td>B1 for straight lines correct or B1 for correct curve</td></tr>
<tr><td>7. (a)
<table>
<tr><th></th><th>8 pancakes</th><th>16 pancakes</th><th>80 pancakes</th></tr>
<tr><td>Flour</td><td>100g</td><td>200(g)</td><td>1000g</td></tr>
<tr><td>Eggs</td><td>1</td><td>2</td><td>10</td></tr>
<tr><td>Milk</td><td>250(ml)</td><td>500(ml)</td><td>2500ml</td></tr>
<tr><td>Melted Butter</td><td>1 tablespoon</td><td>2 tablespoons</td><td>10 tablespoons</td></tr>
<tr><td>Raspberries</td><td>150g</td><td>300g</td><td>1500(g)</td></tr>
</table>
(b) 100 :150 or equivalent

2 : 3 ISW</td><td>B4

M1

A1

6</td><td>B1 for each correct entry

FT ‘their flour’ for 16 pancakes or ‘their raspberries’ for 80 pancakes’
Award SC1 for 3:2</td></tr>
</table>

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2014	Mark	Comments
8. (a) 23/100 x 52 =(£) 11.96 (b) 4/9 x 243 = 108	M1 A1 M1 A1 4	
9. For 2 correct in a form which allows comparison For all 3 correct in a form which allows comparison 76%, ¾ , 0.7	B1 B1 B1 3	
10.(a) a=8 a=1 a=3 (b) Equation with answer x=10 Equation with answer t =-4	B1 B1 B1 B1 B1 5	
11.(Width of rectangle=) 45 / 9 = 5cm (Perimeter=) 9 + 5 + 9 +5 =28cm Look for: Area = length x width Explanation of perimeter Correct use of Units QWC2: Candidates will be expected to • present relevant work clearly, with words explaining process or steps AND • make few if any mistakes in spelling, punctuation and grammar QWC1: Candidates will be expected to • present work clearly which is mostly relevant, with words explaining process or steps OR make few if any mistakes in spelling, punctuation and grammar and include units in their final answer	M1 A1 M1 A1 4 QWC 2 6	FT 'their width' 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 material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar OR evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
12. (a) x=4 (b) y = 20 (c) 5a = 17 +8 a = 5 (d) b = 4 (e) 5d=8 (d=) 8/5 £1.6(0)	 B1 B1 B1 B1 B1 B1 M1 A1 8	Allow embedded answers in all parts FT from 1 error for equation in the form ma=n, m≠1 OR realising 5 drinks cost £8

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2014	Mark	Comments
13. Enlargement scale factor 2	B2 2	B1 for any two lines correct or 3 points correct
14. (a) 5 (b) 2.744 (c) 10 (d) 0.45 (e) 5x>15 x>3	B1 B1 B2 B2 M1 A1 8	 B1 for 10.3(199…) B1 for 0.45267… rounded or truncated CAO
15 (a) ½ × 4.6 × 2.3 5.29 (cm^2) or 5.3(cm^2) (b) (hypotenuse^2 =) $4.6^2 + 2.3^2$ h(ypotenuse)^2 = 26.45 or hypotenuse = √26.45 h(ypotenuse =) 5(.14… cm)	M1 A1 M1 A1 A1 5	 Only accept 5(cm^2) from correct working Allow FT from M1, A0
16.(a) $\pi r^2 = 36\pi$ 6 (cm) (b) (Perimeter) 2x + x – 6 + 2x + 8 + x – 8 = 132 6x - 6 = 132 or 6x = 138 x = 23 (Height of the trapezium (x – 8)cm =) 15 (cm)	M1 A1 M1 M1 A1 A1 B1 7	For equating, or r = √36, or r^2 = 36 *If no marks allow SC1 for 5.9(9..cm) from calculation* Algebraic notation not required for M, A and B marks FT their sum of terms, including x and number terms, equated to 132 FT their collection for equivalent difficulty FT for evaluation, not left as a fraction FT their x-8 provided M2 awarded *Alternative: Trial and improvement* *M1 Trial to sum the correct 4 sides* *M1 Clearly working towards 132, more than 1 trial and moving closer* *A1 Clearly working towards 132, one below and one above* *A1 23* *B1 (Height) 15(cm) FT their x-8provided M2 awarded*
17. Position | Name 1 | Catrin 33(.33...)% 2 | Debbie 32(.144…)% 3 | Beatrice 31% 4 | Abbie 27(.38…)%	B3 3	Names in the correct order **and** all results appropriately and correctly compared (same form) B2 for at least 3 results correctly in a suitable format to compare **and** their comparisons appropriately sorted B1 for at least 2 results correctly in a suitable format to compare **and** their comparisons appropriately sorted, OR B1 for at least 3 results correctly in a suitable format to compare *Remember: format of 1 of the result with 2 others to compare counts as 3 results* *If no other marks, then award SC1 for names in the correct order* If fractions used for comparison they need to be common denominators or awareness of size, e.g. 1/3 =9/27 compared with 9/28 same numerator Fractions: Catrin 28/84, Debbie 27/84 (=9/28), Beatrice ≈26/84, Abbie 23/84 Marks: Catrin 28, Debbie 27, Beatrice ≈26, Abbie 23

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2014	Mark	Comments
18.(a) 2/15 ISW	B2	B1 for sight of 15, e.g. …/15 or $\frac{2}{2+5+8}$
(b) (£400 ×) 1.26 (×) 0.76 or equivalent, in either order	B2	B1 for sight of either 1.26 or 126/100 OR for 0.76 or 76/100 If no marks SC1 for sight of 383.04
	4	

© WJEC CBAC Ltd.

STEMUP.CO.UK

METHODS UNIT 2
HIGHER TIER

Methods Unit 2 Higher Tier January 2014	Mark	Comment
1.(a) 20 (b) $12x - 39 = 45$ OR $4x - 13 = 45/3$ $12x = 84$ OR $4x = 28$ $x = 7$ (c) $x + 4 = 6 \times 12$ $x = 68$	B1 B1 B1 B1 M1 A1 6	FT until 2nd error Or $x/12 = 6 - 4/12$
2. 0.45	B2 2	B1 for 0.45267… rounded or truncated
3.(a) Kite 1 1 Parallelogram 0 2 Rhombus 2 2 (b) $\pi r^2 = 36\pi$ 6 (cm)	B3 M1 A1 5	B2 for any 4 or 5 correct entries, B1 for any 2 or 3 correct entries Allow '0' in top right hand cell For equating, or $r = \sqrt{36}$, or $r^2 = 36$ *If no marks allow SC1 for 5.9(9..cm) from calculation*
4. Position 1: Catrin 33(.33...)% Position 2: Debbie 32(.144…)% Position 3: Beatrice 31% Position 4: Abbie 27(.38…)%	B3 3	Names in the correct order **and** all results appropriately and correctly compared (same form) B2 for at least 3 results correctly in a suitable format to compare **and** their comparisons appropriately sorted B1 for at least 2 results correctly in a suitable format to compare **and** their comparisons appropriately sorted, OR B1 for at least 3 results correctly in a suitable format to compare *Remember: format of 1 of the result with 2 others to compare counts as 3 results* *If no other marks, then award SC1 for names in the correct order* If fractions used for comparison they need to be common denominators or awareness of size, e.g. 1/3 =9/27 compared with 9/28 same numerator Fractions: Catrin 28/84, Debbie 27/84 (=9/28), Beatrice ≈26/84, Abbie 23/84 Marks: Catrin 28, Debbie 27, Beatrice ≈26, Abbie 23
5.(a) 2/15 ISW (b) (£400 ×) 1.26 (×) 0.76 or equivalent, in either order (c)(i) 2/5 × 1 ¼ or 15min per 5cm or 5cm in 15 min or 1cm in 3 min ½ (hour) or 30 (minutes) (ii) 20/75 or 3min per 1cm or 5cm in 15 min or 1cm in 3 min 25 × 20/75 or 0.266... × 25 or 6.66.... or 20/3 or (⅓ or)0.33..cm in 1 min or 3.33.. cm in 10 min 6.67 (cm)	B2 B2 M1 A1 B1 B1 B1 9	B1 for sight of 15, e.g. …/15 or $\frac{2}{2+5+8}$ B1 for sight of either 1.26 or 126/100 OR for 0.76 or 76/100 If no marks SC1 for sight of 383.04 Do not accept 2/5 × 1.15, recording of time must be correct If units are given they must be correct FT from (c)(i) FT their depth corrected to 3 significant figures

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Higher Tier January 2014	Mark	Comment
6. (Perimeter) $2x + x - 6 + 2x + 8 + x - 8$ $= 132$ $6x - 6 = 132$ or $6x = 138$ $x = 23$ (Height of the trapezium $(x - 8)$cm =) 15 (cm) Look for • the use of notation (watch for the use of '=' being appropriate) • steps shown, not $6x = 636/6$ • labels given 'perimeter', 'height' • (*in trial and improvement, the trials and choices need to be clearly explained*) QWC2: Candidates will be expected to • present work clearly, with words explaining start, process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer QWC1: Candidates will be expected to • present work clearly, with words explaining start, process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	 M1 M1 A1 A1 B1 Q W C 2 7	Algebraic notation not required for M, A and B marks FT their sum of terms, including x and number terms, equated to 132 FT their collection for equivalent difficulty FT for evaluation, not left as a fraction FT their x-8 provided M2 awarded *Alternative: Trial and improvement* *M1 Trial to sum the correct 4 sides* *M1 Clearly working towards 132, more than 1 trial and moving closer* *A1 Clearly working towards 132, one below and one above* *A1 23* *B1 (Height) 15(cm) FT their x-8provided M2 awarded* 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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
7.(a) $b = 2c$ OR $c = \frac{1}{2} b$ ISW (b) $5n + 7 < 52$ $5n < 45$ OR $n < 45/5$ $n < 9$	B1 B1 B1 B1 4	 Do not accept use of '=' in (b) FT from 1 error FT only for a whole number answer
8.(a) Correct rotation (b) Correct enlargement (scale factor 2) in lower left quadrant Correct position	B2 B1 B1 4	B1 for a near miss or for 90° anticlockwise rotation appropriate FT to lower left quadrant
9.(a) Semi C = $\frac{1}{2} \times \pi \times 6.2$ $+ 6.2$ 15.9(cm) to 15.94(…cm) (b) Volume = $\pi \times 4.5^2 \times 10.3$ 654.9(...) to 655.5(4…) cm^3	M1 m1 A1 M1 A1 U1 6	 Accept 16(cm) from correct working For answer of 9.7(...) allow M1 and SC1 If no marks SC1 for sight 19.4(7...) to 19.4(8...) or 25.6(7...) to 25.6(8...) Independent mark

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Higher Tier January 2014	Mark	Comment
10(a) ½ × 4.6 × 2.3 5.29 (cm^2) or 5.3(cm^2) (b) (hypotenuse^2 =) $4.6^2 + 2.3^2$ h(ypotenuse)^2 = 26.45 or hypotenuse = √26.45 h(ypotenuse =) 5(.14… cm)	M1 A1 M1 A1 A1 5	 Only accept 5(cm^2) from correct working Allow FT from M1, A0
11.(a) x = $4.5 \times 10^6 \times 3.4 \times 10^{-2}$ $= 1.5 \times 10^5$ (b) y = $1.2 \times 10^8 - 5.5 \times 10^6$ $= 1.1 \times 10^8$	M1 A2 M1 A2 6	Intention to multiply A1 for 15.3×10^4 or 1.53×10^5 or equivalent including to 2 sig. figs. Intention to subtract in the correct order A1 for 1.145×10^8 or 0.11..×10^9 or 11.4…×10^7 (attempt standard form) or equivalent including to 2 sig. figs.
12.(a) PQ = 5.6 × 5.88 / 8.4 or equivalent 3.92(cm) (b) BC = 2.24 ÷ (5.88 / 8.4) or equivalent 3.2(cm)	M1 A1 M1 A1 4	Or equivalent calculation that could lead to correct answer Accept 3.9(cm) FT premature approximation of the scale factor or equivalent premature approximation Or equivalent calculation that could lead to correct answer *(Alternative: scale factors 0.7 or 10/7 may be used)*
13. Third angle 40(°) or 68(°) Statement that this implies similar Statement 'sides could be different' clearly implies not necessarily congruent	B1 E1 E1 3	 Depends on the B1 Accept 'Thomas is correct because sides may be different'. Award this E1 without previous B1 and E1.
14. Rearrange of equation(s) to format that could lead to a solution Method to find first variable, e.g. equal coefficients, equating a variable to give equation in 1 variable First variable Method to find second variable, e.g. substitution shown for first variable Second variable	M1 M1 A1 m1 A1 5	e.g. 3x + 2y = 1 with 2x - 5y = -50, or making either x or y the subject FT from 1 error in rearrangement only Allow 1 error, but not in non equate variable FT their first variable **x = -5 and y = 8**
15. - (3**x** + 7**y**) + 4**x** + 2**y** = **x** – 5**y**	M1 A1 2	Allow for intention of using -**OA** + **OB**, e.g. -3**x**+7**y**+4**x**+2**y** or **x** + 9**y** Accept 1**x** – 5**y**
16.(a) Statement C selected Reason, e.g. 'inverse implies the nature is opposite' (b) f α $1/g^2$ OR f = k/g^2 4 = $k/5^2$ f = $100/g^2$ (c) g: 1/2, 5, **(±)100** f: **400**, 4, 0.01	B1 E1 B1 M1 A1 B2 7	 Accept numerical examples Do not accept a repeat of the statement given FT non linear only Maybe implied in part (b) FT their non linear expression B1 for each value
17. BC = 8.6/cos15 BC = 8.9(03375….) Tan AĈB = 3.8/BC AĈB = $\tan^{-1}$0.4268… 23(.113…°)	M2 A1 M1 M1 A1 6	M1 for cos 15 = 8.6/BC FT their BC provided not 8.6 or 3.8 OR alternative using AC, following evaluation of AC using Pythagoras' Theorem

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Higher Tier January 2014	Mark	Comment
18. $\frac{x}{x+y} = \frac{z}{AC}$ or $\frac{x}{x+y} = \frac{z}{z+BC}$ $AC = \frac{z(x+y)}{x}$ or $x(z+BC) = z(x+y)$ $BC = \frac{z(x+y)}{x} - z$ or $xz + xBC = xz + yz$ $BC = \frac{xz+yz}{x} - z$ or $x\,BC = yz$ $BC = yz/x$	M1 m1 M1 M1 A1 5	Or alternative correct first step Rearranged in form 'AC= …' FT BC = AC – z provided AC in terms of x, y or z Or alternative correct stage of manipulation CAO *If no marks then SC2 for BC=yz/x without working, OR SC1 for BC/y = z/x or BC/z=y/x or equivalent*
19. General cosine curve with appropriate orientation and position 1 and -1 indicated on y-axis, passes through (0°, 1), (90°,0), (-90°,0) and approximately (-180°,-1) and (180°,-1) General tan curves with appropriate orientation and position Correct indication or use of asymptotes	M1 A1 M1 A1 4	 *If no marks, SC1 for slight error in 'tends to infinity' or idea of 'the shape of tanx'*
20. Use of area = ½ absinC and cosine rule $½ \times 3.9 \times x \times \sin 96° = 22.8$ $x = 22.8/(½ \times 3.9 \times \sin 96°)$ x = 11.7567…(cm) rounded or truncated (longest side y) $y^2 = 3.9^2 + x^2 - 2\times3.9\times x\times\cos96°$ y^2 accept values between 163 and 164.1 y = 12.8 (cm)	S1 M1 A1 A1 M1 A1 A1 7	 Correct rearrangement FT their x, not 3.9 or spurious value Accept 13(cm) from correct working, not scale diagram Final A1 depends on previous A1

© WJEC CBAC Ltd.

STEMUP.CO.UK

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. MONDAY, 17 June 2013

2 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 **3**.

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**8**	
3	**8**	
4	**10**	
5	**8**	
6	**5**	
7	**6**	
8	**9**	
9	**4**	
10	**4**	
11	**4**	
12	**4**	
13	**3**	
14	**6**	
15	**5**	
16	**8**	
17	**3**	
TOTAL MARK		

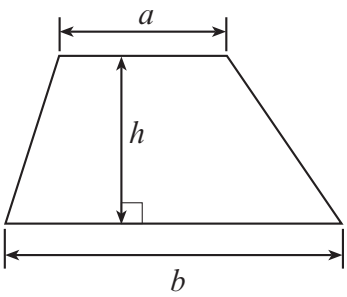
4364 020001

© WJEC CBAC Ltd.

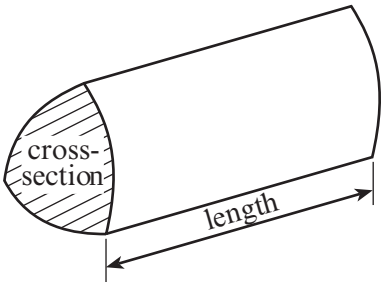
STEMUP.CO.UK

Formula List

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

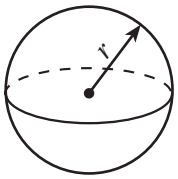


Volume of prism = area of cross-section × length



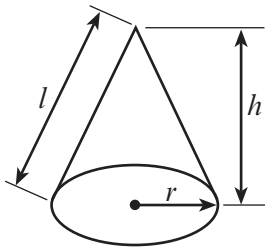
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

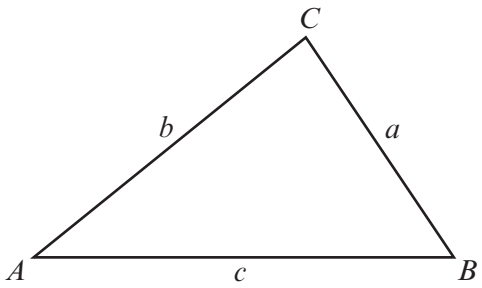


In any triangle ABC

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

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

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. *(a)* In an election, Stella gained 28 416 votes out of a total of 38 400 votes.
Write 28 416 as a percentage of 38 400.

.....

.....

.....

[2]

(b) Jake needs to find a selling price which is 12% more than £766.
Find the selling price.

.....

.....

.....

[2]

(c) Cheryl and her sister share an amount of money in the ratio 2 : 3 respectively.
What fraction of the money will Cheryl receive?

.....

.....

[1]

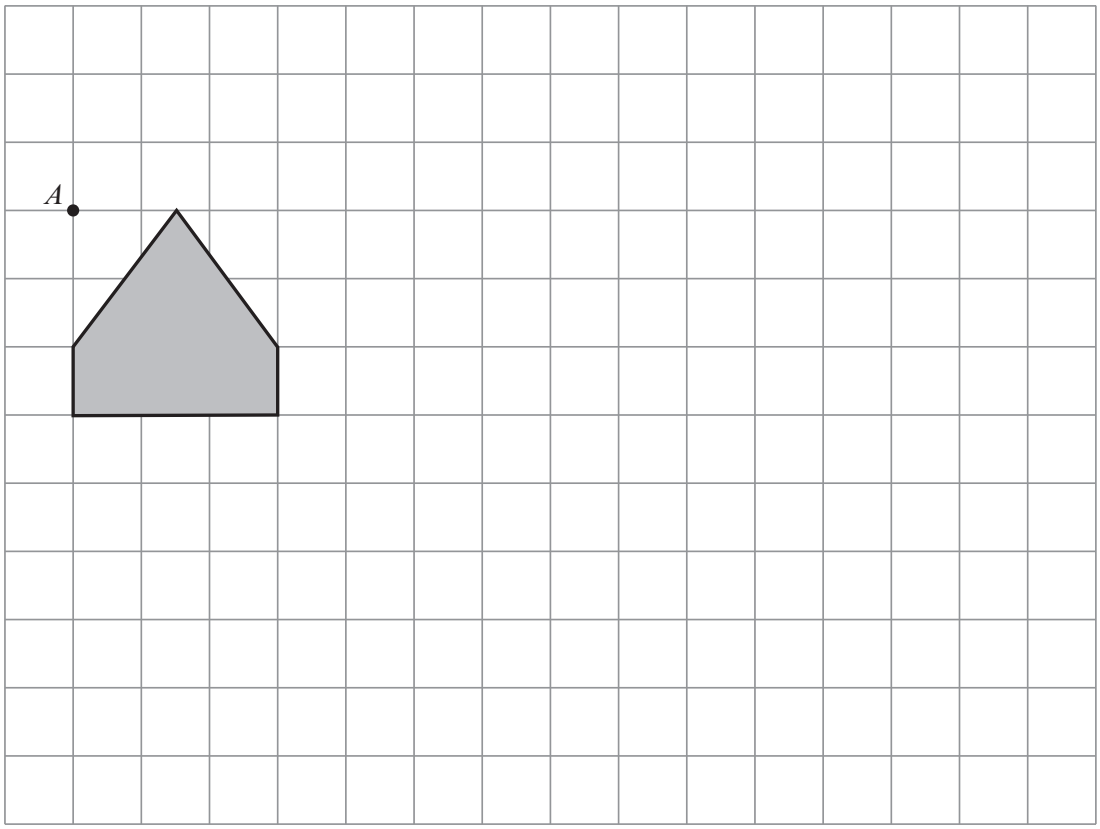
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

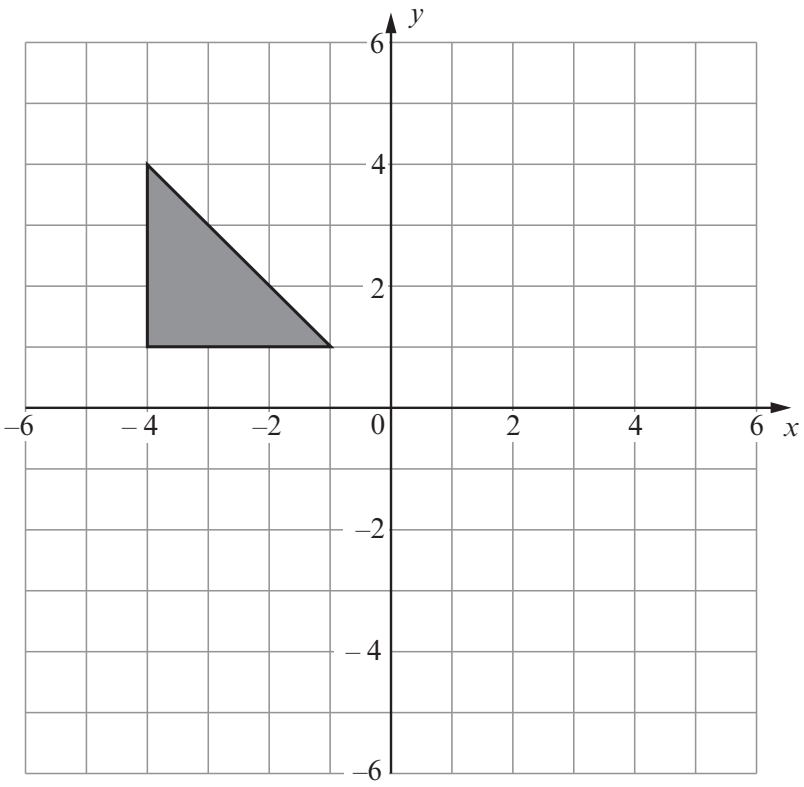
Examiner only

2. *(a)* Enlarge the shape shown on the grid by a scale factor of 2 using A as the centre of the enlargement.



[3]

(b) Reflect the triangle in the line $y = x$.



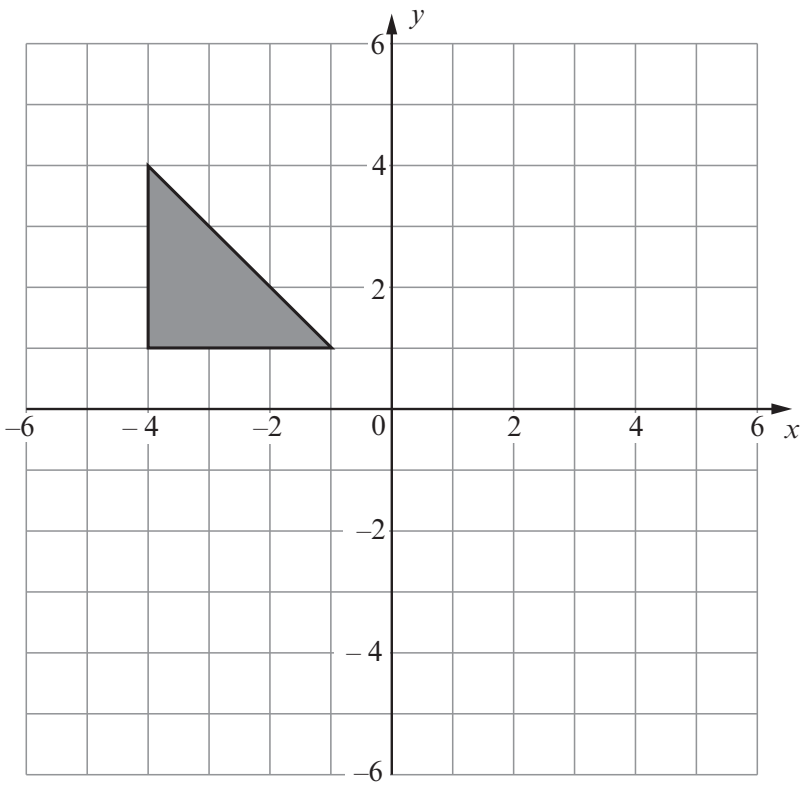
[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

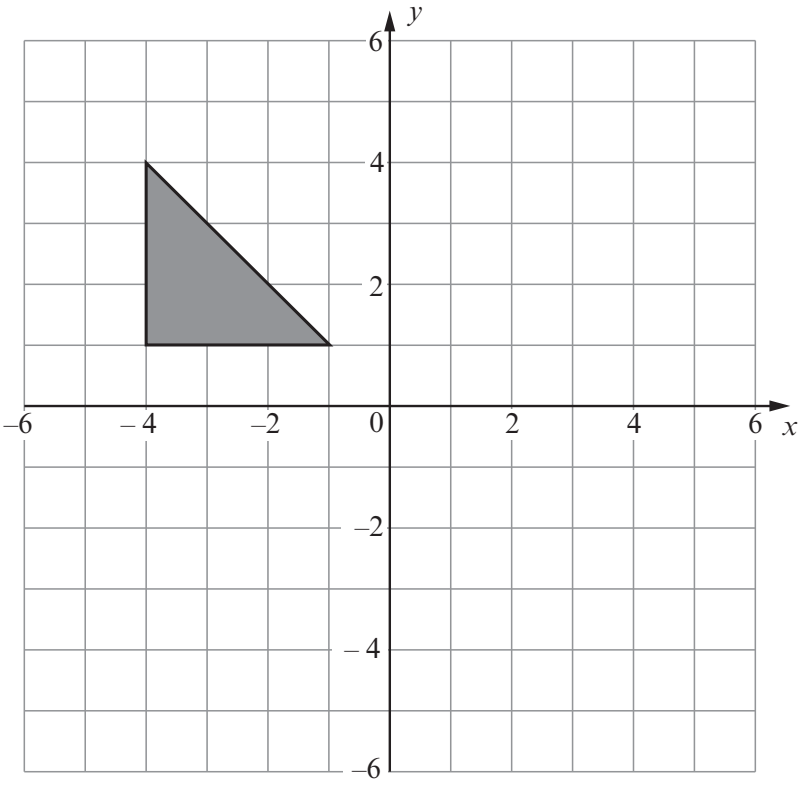
Examiner only

(c) Translate the triangle shown below by $\begin{pmatrix} 5 \\ -3 \end{pmatrix}$.



[1]

(d) Rotate the triangle shown on the grid below through 90° anticlockwise about (2, 1).



[2]

STEMUP.CO.UK

4364 020005

Examiner only

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

A colour of paint called 'ochra' is made using a recipe with white, red, blue and yellow paint. The breakdown of the percentages of the different colours in the 'ochra' paint are shown in the table.

'Ochra' paint recipe	
White	90%
Red	5%
Blue	3%
Yellow	2%

Catrin has already bought 2·5 litres of blue paint.
She decides to buy white, red and yellow paint to use with **all** of her blue paint to make as much 'ochra' paint as she can.

The sizes of tins of paint available are:

- 1 litre,
- 2·5 litres and
- 10 litres.

Only full tins of paint are available to buy.
Catrin has only a small shed to store her paint, so wants as little white, red and yellow paint left over as possible.

Calculate the amount of each of the colours of paint Catrin needs to buy and complete the shopping list for her on the opposite page.
You **must** show all your working.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

.....

.....

.....

.....

.....

.....

Shopping list	
Colour	**Number and sizes of tins to buy**
White	
Red	
Yellow	

[8]

4364 020007

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

4. *(a)* Solve $\frac{8x}{5} = 60$.

.....

.....

[2]

(b) Solve $\frac{3}{x} = 12$.

.....

.....

[1]

(c) Solve $9x - 4 = 7(x + 2)$.

.....

.....

.....

.....

[3]

(d) Solve the inequality $10x + 5 > 45$.

.....

.....

.....

[2]

(e) Write down the smallest whole number that satisfies the inequality $9x > 60$.

.....

.....

.....

.....

[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

5. *(a)*

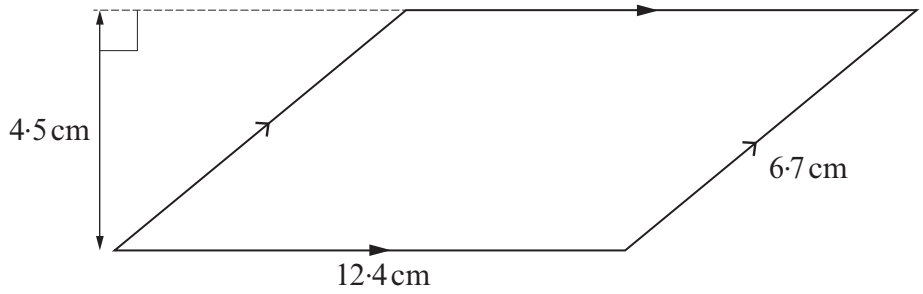


Diagram not drawn to scale

Calculate the area of the parallelogram.

.....

.....

.....

[2]

(b) The area of a circle is $34{\cdot}6\,\text{cm}^2$.
Calculate the radius of the circle.

.....

.....

.....

.....

.....

[3]

(c) The lengths, in centimetres, of the five sides of a pentagon are:

x $\quad$ $x + 2$ $\quad$ $2x$ $\quad$ $3x + 5$ $\quad$ $4x$

The perimeter of the pentagon is 95 centimetres.
Set up an equation in terms of x and solve it to find the value of x.

.....

.....

.....

.....

.....

.....

$x =$ .....

[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

4364 020009

Examiner only

6. *(a)* Find the value of $\dfrac{7{\cdot}77^2 - 6{\cdot}22}{2{\cdot}4^2 + 3 \times 2{\cdot}2}$, giving your answer correct to one decimal place.

[2]

(b) Find the product of the values of $(2\frac{1}{3}$ of 273) and $(4\frac{1}{5}$ of 760).

[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

7. The diagram shows a square and a circle.
The diagonal of the square is equal to the diameter of the circle.

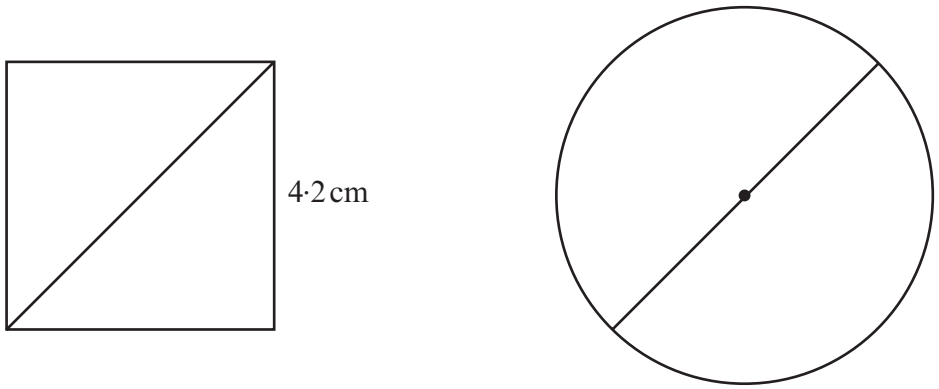


Diagram not drawn to scale

Calculate the circumference of the circle.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6]

4364
020011

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

8. *(a)* Solve the following equation.

$$\frac{3x-1}{4} - \frac{x+6}{3} = \frac{3}{2}$$

[4]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b)

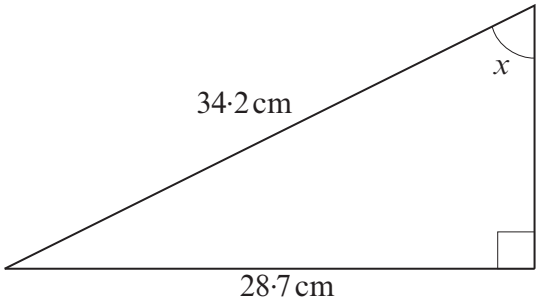


Diagram not drawn to scale

Calculate the size of the angle x.

.....

.....

.....

.....

.....

[3]

(c) Evaluate $\dfrac{(3{\cdot}4 \times 10^5) + (1{\cdot}5 \times 10^4)}{2{\cdot}3 \times 10^{-6}}$.

Give your answer in standard form correct to 2 significant figures.

.....

.....

.....

.....

[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

9. The stars shown below are similar.

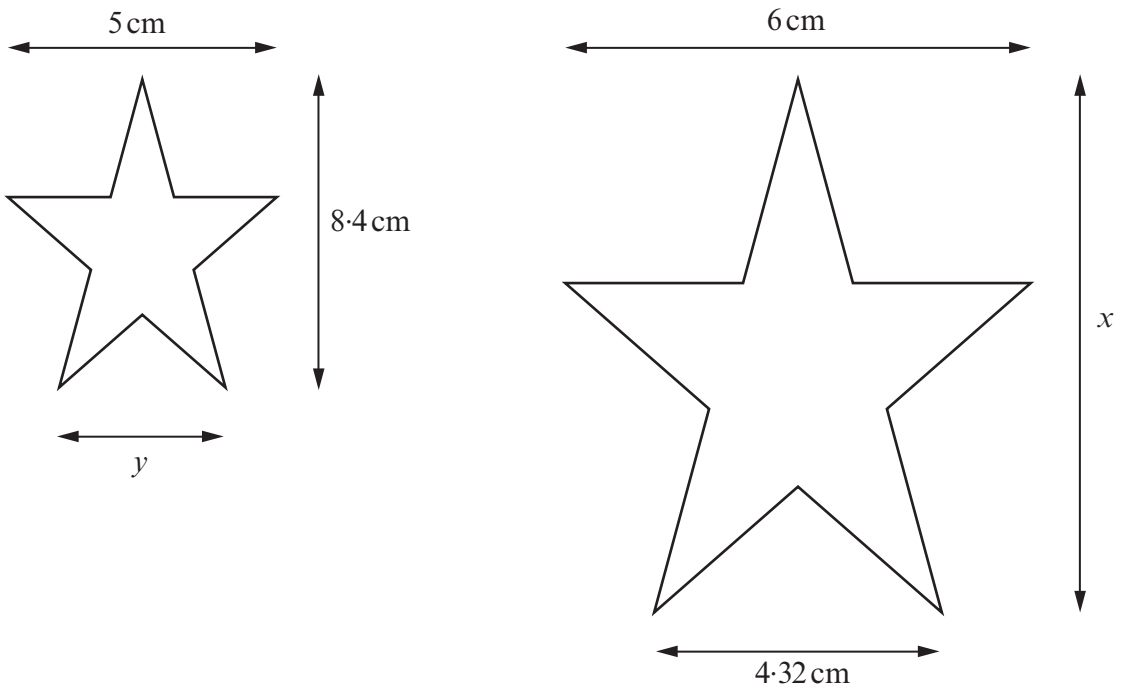


Diagram not drawn to scale

Showing all of your working, find the lengths x and y.

.....

.....

.....

.....

.....

.....

.....

.....

.....

x = ... cm

y = ... cm

[4]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

10. The length of a rectangle is known to be 40 cm or less.
The width of the rectangle is known to be 10 cm shorter than the length of the rectangle.

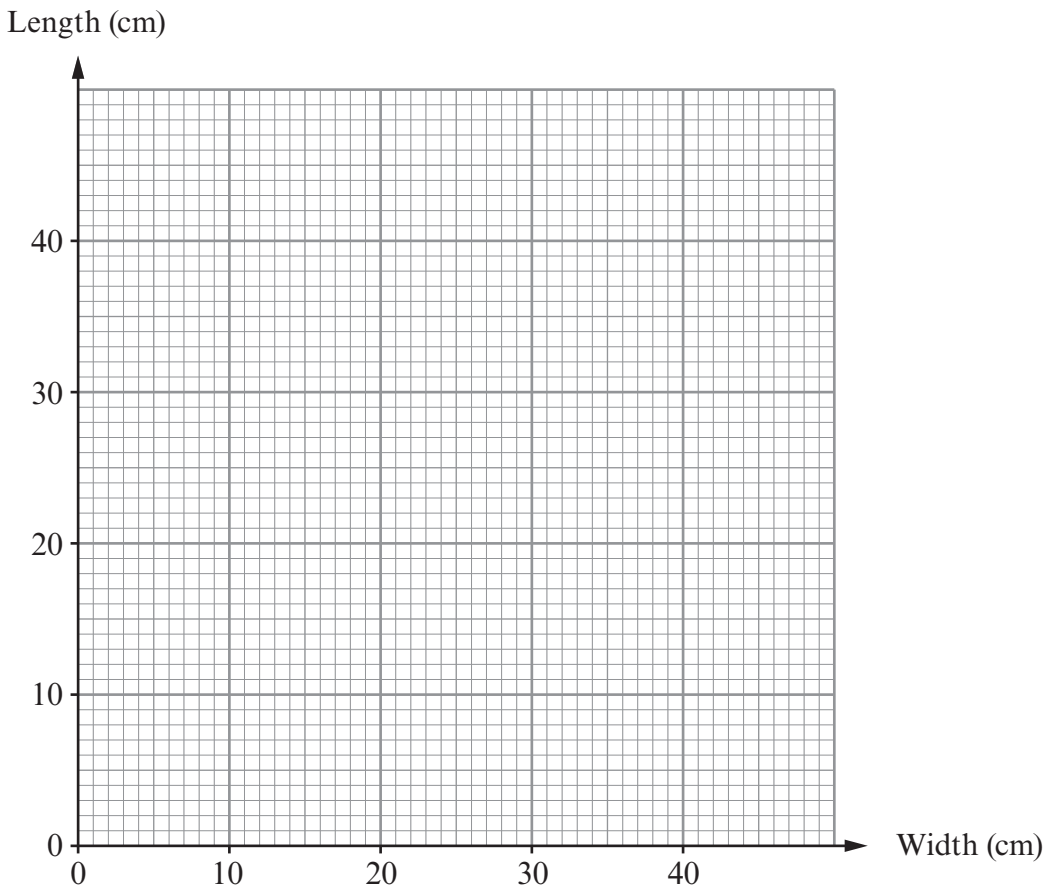
(a) Draw a graph to illustrate this information.

.....

.....

.....

[3]



(b) Should your graph touch either of the axes?
Explain your answer.

.....

.....

.....

.....

[1]

© WJEC CBAC Ltd.

STEMUP.CO.UK

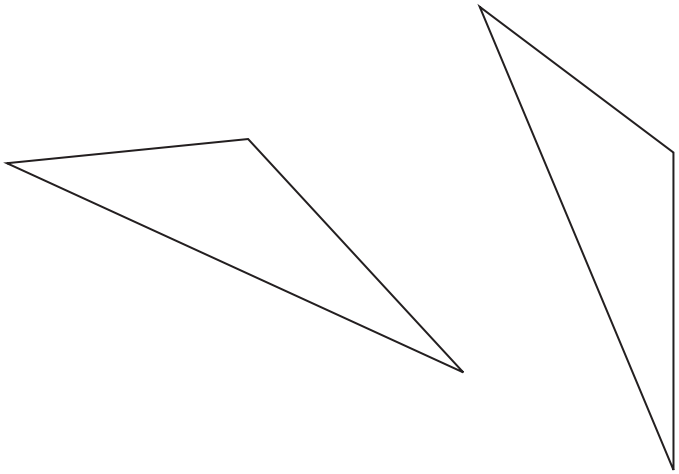
Examiner only

11. The diagrams below show pairs of congruent triangles.
The diagrams are drawn to scale.

Anwen has made a statement about each of the pairs of triangles.

(a) "Look, I have measured two of the sides and one of the angles in each triangle. I have enough information to say that the triangles are congruent."

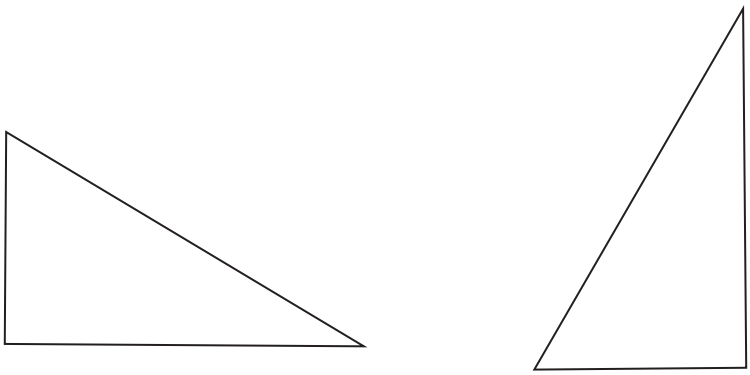
For the statement to be correct, indicate on each triangle the two sides and one angle Anwen could have measured.
Indicate clearly the corresponding sides.
Do not mark any extra detail.



[2]

(b) "Look, I have measured one angle in each triangle and found that they each measured 90°. Then, I measured the hypotenuse of each triangle and found that they were equal."

Indicate on each triangle
- the mathematical information given in Anwen's statement, and
- mark the **minimum** extra detail required to show that the triangles are congruent.



[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

12. Complete the table below.

Original amount	After a decrease of	
	40%	2%
£	£492	£ .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

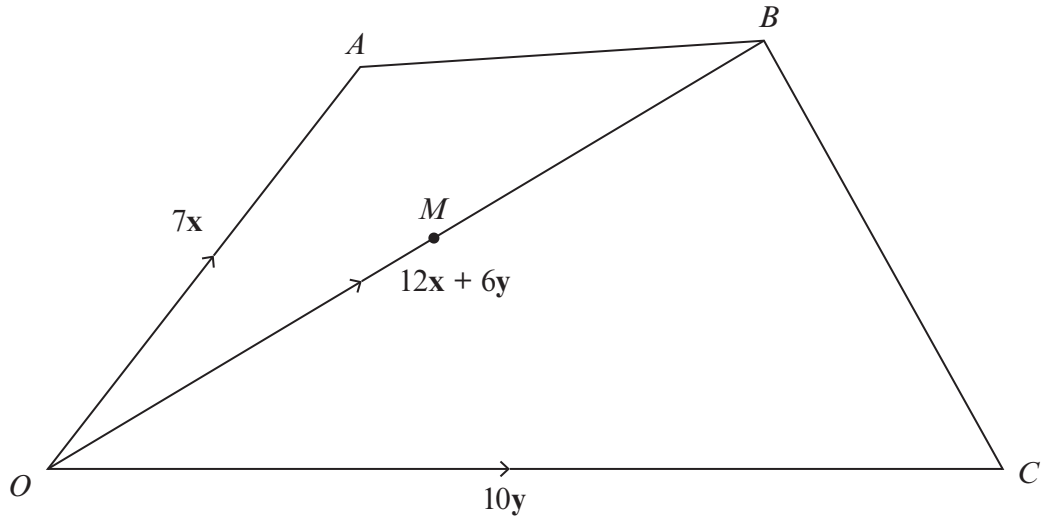
[4]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

13. The diagram shows a quadrilateral *OABC*.



In the quadrilateral *OABC*, the vectors **OA**, **OB** and **OC** are given by **OA** = 7**x**, **OB** = 12**x** + 6**y** and **OC** = 10**y**.

(a) Express **AC** in terms of **x** and **y**.

.....

.....

[1]

(b) **M** is the mid-point of **OB**.
Express each of the following in terms of **x** and **y** in their simplest form.

(i) **MO**

.....

.....

.....

[1]

(ii) **MC**

.....

.....

.....

[1]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

14.

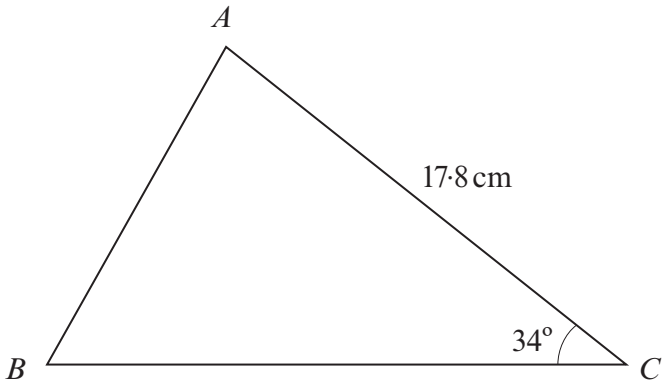


Diagram not drawn to scale

The area of triangle ABC is $42{\cdot}8\,\text{cm}^2$.
Calculate the length of AB.

[6]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

15. The sphere and cone below have equal volumes.



Diagram not drawn to scale

The radius of the sphere is 6·7 cm.
The height of the cone is 10·4 cm.

Calculate the radius of the base of the cone.
Give your answer correct to 1 decimal place.

[5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

16. The diagram below shows a composite shape formed by joining two rectangles.

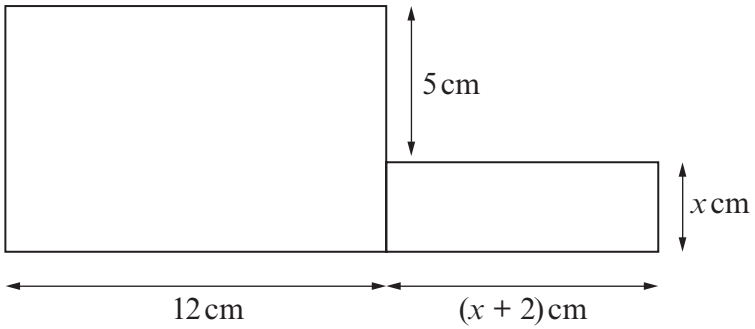


Diagram not drawn to scale

The area of the larger rectangle is $4y$ cm^2.
The area of the smaller rectangle is y cm^2.

Form and solve simultaneous equations to calculate the dimensions of the smaller rectangle.
Give your answers correct to 1 decimal place.

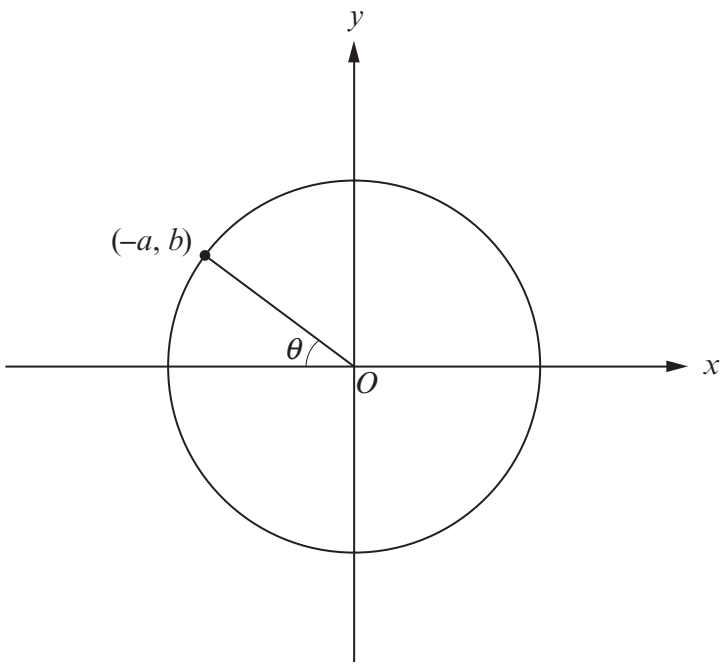
[8]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

17. The sketch below shows a circle with its centre at the origin and radius 1 unit. The point $(-a, b)$ is on the circumference of the circle.



The angle θ is shown on the diagram.

Complete the following statements, in terms of a and b.

$\sin \theta =$ .....

$\cos \theta =$ .....

[3]

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

BLANK PAGE

© WJEC CBAC Ltd.

STEMUP.CO.UK

GCSE MARKING SCHEME

METHODS OF MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2013

© WJEC CBAC Ltd.

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2013 examination in GCSE METHODS OF MATHEMATICS (LINKED PAIR PILOT). 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.

© WJEC CBAC Ltd.

UNIT 2 (FOUNDATION TIER)

<table>
<tr><th>Methods 2 Foundation June 2013</th><th></th><th>Final</th></tr>
<tr><td>1. (a) Correct diagram
(b) 4 lines of symmetry drawn correctly
Only 1 line of symmetry drawn correctly
(c) 4, 3, 2</td><td>B2
B2
B1
B3
8</td><td>-1 for each incorrect vertex
Award B1 for 2 or 3 lines of symmetry correctly drawn
CAO
Award B1 for each correct one</td></tr>
<tr><td>2. (a) A correct congruent shape drawn
(b) A correct similar shape drawn
(c) Radius drawn
Tangent drawn
Arc drawn</td><td>B1
B1
B3

5</td><td>
Do not accept a congruent shape
B1 for each correct. Accept intention of each</td></tr>
<tr><td>3. (a)
<table><tr><td>¾</td><td></td><td>75(%)</td></tr><tr><td></td><td>0.3(0)</td><td>30(%)</td></tr></table>
(b) 42/100 × 630
264.6(0)
(c) 3/7 × 364
156</td><td>B2

B2

M1
A1
M1
A1
8</td><td>Accept equivalent fractions for ¾ . Ignore incorrect simplification of 75/100. Do not accept 7.5/10.

CAO
Or equivalent
CAO</td></tr>
<tr><td>4. (Monday to Friday) 40 × (£)12.85
= (£)514
(Saturday) 8 × (12.85 × 2)
= (£)205.6(0)
(Sunday) 6 × (12.85 × 3)
= (£)231.3(0)
(Total =) (£)950.9(0)

If 0 missing from the final answer, lose at least QWC1

Look for
• spelling
• clarity of labels
• the use of notation (watch for the use ‘=’ “£” 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 in their 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 in their final answer</td><td>M1
A1
M1
A1
M1
A1
B1

Q
W
C
2

9</td><td>

FT if at least M2 awarded AND 3 values added.
If no marks awarded, award SC1 for sight of (£)25.7(0) OR (£)38.55

Alternative method
8×2 AND 6×3 M2. (award M1 for either)
16 AND 18 A1
40 + 18 + 16 M1 (FT provided 3 values added)
74 A1
74 × (£)12.85 M1 (FT their total hours)
(£)950.9(0) A1

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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.

QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.</td></tr>
</table>

© WJEC CBAC Ltd.

STEMUP.CO.UK

5. 5 -3 6 - -6 = 12	B1 B1 B2 4	 Award B1 for 6 OR -6 in the correct place, provided 1st is positive AND 2nd negative, with their correct answer given e.g. 6 - - 1 = 7 or 5 - - 6 = 11
6. (a) $x = 7$ (b) $x = 9$ (c) $5x = 35$ $x = 7$	B1 B1 B1 B1 4	*Accept embedded answers throughout question* FT "their 35" ÷ 5. If this leads to a whole number it must be correctly evaluated. Mark final answer.
7. For a trial that gives an area of 30 cm^2 For a trial that gives an area of 30 cm^2 and the value of the perimeter stated. (Length) 6(cm) and (width) 5(cm) (Perimeter =) 22 (cm)	B1 B1 B1 B1 4	Accept non-whole number trial eg 4 × 7.5 *Maybe seen on a diagram* Accept non-whole numbers with the correct perimeter Accept (width) 6(cm) and (length) 5(cm) 1 by 30 62cm 2 by 15 34cm 3 by 10 26cm 5 by 6 22cm
8. (a) For all 4 correct as fractions that allows comparison 7/12, 2/3, ¾ , 5/6 or equivalent fractions (e.g. 7/12, 8/12, 9/12, 10/12) (b) 390 ÷ 3 .... × 5 650	M2 A1 M1 m1 A1 6	Award M1 for any two correct in a fraction that allows comparison *If no marks awarded, award SC1 for correct order without using equivalent fractions* Accept in either order × 5 ÷ 3. Award M1 for sight of 130 or 1950 CAO
9. (a) 7 AND 5 multiplied by 0.8 5.6 AND 4 (m) 5.6 × 4 = 22.4 m^2 (b) 35 × 45 × 20 31500 31500 ÷ (100 × 15) 21 (cm)	 M1 A1 M1 A1 U1 M1 A1 M1 A1 9	*Accept equivalent in cm* Seen or implied FT their 5.6 AND 4 but not 7 × 5 Independent mark Seen or implied in further calculations FT their 31500
10. (a) (28416/38400) × 100 74(%) (b) 766 + 766×12/100 OR 766 × 1.12 (£)857.92 (c) 2/5 or equivalent fraction	M1 A1 M1 A1 B1 5	Or equivalent full method Or equivalent full method CAO
11. (a) Enlargement scale factor 2 Correct position (b) Correct reflection in $y = x$ (c) Correct translation (d) Correct rotation	B2 B1 B2 B1 B2 8	B1 for any 3 lines correct, or consistent incorrect scale At least 2 points are needed to indicate the correct position B1 for a reflection in $y = -x$, OR for sight of the line $y = x$ B1 near miss, OR 90°clockwise rotation about (2, 1), OR 90° anticlockwise rotation about (1, 2)

© WJEC CBAC Ltd.

STEMUP.CO.UK

12. (a) $9x - 4 = 7x + 14$ $9x - 7x = 14 + 4$ or $2x = 18$ $x = 9$ (b) $10x > 40$ $x > 4$	B1 B1 B1 M1 A1 5	*FT until 2nd error* No marks for use of "=", unless finally replaced to give x>4 then award M1 A1. SC1 for x>5 from 10x>50 OR sight of 9×6=54 AND 9×7=63
13. (a) 4.5×12.4 $55.8\ (cm^2)$ (b) $x + x+2 + 2x + 3x + 5 + 4x\ (= \ldots)$ $11x + 7 = 95$ or $11x = 88$ $x = 8$	M1 A1 M1 m1 A1 5	 Accept $56(cm^2)$ from correct working For the expression with intention to sum the terms given CAO. Unsupported x=8 is awarded no marks

© WJEC CBAC Ltd.

STEMUP.CO.UK

UNIT 2 (HIGHER TIER)

<table>
<tr><th>Methods 2 Higher Summer 2013</th><th></th><th>Final</th></tr>
<tr><td>1(a) (28416/38400) × 100
74(%)
(b) 766 + 766×12/100 OR 766 × 1.12
(£)857.92
(c) 2/5 or equivalent fraction</td><td>M1
A1
M1
A1
B1
5</td><td>Or equivalent full method

Or equivalent full method

CAO</td></tr>
<tr><td>2(a) Enlargement scale factor 2
Correct position

(b) Correct reflection in $y = x$

(c) Correct translation

(d) Correct rotation</td><td>B2
B1

B2

B1

B2
8</td><td>B1 for any 3 lines correct, or consistent incorrect scale
At least 2 points are needed to indicate the correct position

B1 for a reflection in $y = -x$,
OR for sight of the line $y = x$

B1 near miss, OR 90°clockwise rotation about (2, 1),
OR 90° anticlockwise rotation about (1, 2)</td></tr>
<tr><td>3. Method for finding yellow (2.5 × 2÷3 = 1.666…), or
Method for finding red (2.5×5÷3 = 4.166…), or
Method for finding white (2.5×90÷3 = 75)

Red 4.166… (litres)
AND Yellow 1.666.. (litres)
AND White 75 (litres)

<table><tr><th>Colour</th><th>Number and sizes of tins to buy</th></tr><tr><td>White</td><td>7 × 10 litre, 2 × 2.5 litre</td></tr><tr><td>Red</td><td>1 × 2.5 litre, 2 × 1 litre</td></tr><tr><td>Yellow</td><td>2 × 1 litre tins</td></tr></table>
Look for
• spelling
• connection of colour name with calculation
• clarity of text explanations and statements
• the use of notation
• units (litres or l)

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 in their 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 in their final answer</td><td>M1

A2

B1

B1

B1

QWC 2

8</td><td>Or equivalent correct method for one colour

Answers must be from appropriate calculations, correct working with appropriate rounding or truncation
A2 for all three correct, accept suitable rounding or truncation, e.g. do not accept red 4 litres, yellow 1 litre
For example:
Red (accept values 4.1,4.15, 4.16, 4.17,4.2, 4.5litres)
Yellow (accept 1.6, 1.7, 2 litres)
White (accept 74.7, 74.9, 75 litres)

A1 for any two correct

FT for their amount of paint provided M1 awarded and more than 1 tin is needed for the colour
Accept equivalent tin sizes available, e.g. 5 × 1 litre tins

For Red do not accept 2 × 2.5 litre nor 5 × 1 litre

For Yellow do not accept 1 × 2.5 litre tins

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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.

QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.</td></tr>
</table>

© WJEC CBAC Ltd.

STEMUP.CO.UK

4(a) $x = 60 \times 5 / 8$ $x = 37.5$ (b) $x = 1/4$ or 0.25 or equivalent (c) $9x - 4 = 7x + 14$ $9x - 7x = 14 + 4$ or $2x = 18$ $x = 9$ (d) $10x > 40$ $x > 4$ (e) $x > 60/9$ or $x > 6.6(666)$ 7	B1 B1 B1 B1 B1 B1 M1 A1 M1 A1 10	*FT until 2nd error* Accept 300/8 or equivalent. Mark final answer Accept 3/12. Mark final answer *FT until 2nd error* No marks for use of "=", unless finally replaced to give x>4 then award M1 A1. SC1 for x>5 from 10x>50 OR sight of 9×6=54 AND 9×7=63 Do not accept final answer of (x)>7. Do not penalise use of '=' if 7 is given as a final response, award M1, A1
5(a) 4.5×12.4 55.8 (cm^2) (b) $34.6 = \Pi \times r^2$ $r^2 = 34.6/\Pi$ r = 3.3(186… cm) (c) x + x+2 + 2x + 3x + 5 + 4x (= …) 11x + 7 = 95 or 11x = 88 x = 8	M1 A1 M1 A1 A1 M1 m1 A1 8	 Accept 56(cm^2) from correct working Accept 3(cm) or 3.3(cm) from correct rearrangement For the expression with intention to sum the terms given CAO. Unsupported x=8 is awarded no marks
6(a) 4.4 (b) 637 (× …) (… ×) 3192 = 2033304	B2 B1 B1 B1 5	B1 for 4.38(13…) or 4.3 FT correct evaluation of product from 1 correct value *If no marks then SC1 for interpretation of 'product' and 'of' e.g. by sight of 2 1/3 ×273 ×4 1/5 ×760*
7. Strategy: use of Pythagoras' Theorem **and** C=Πd or C=2Πr $h^2 = 4.2^2 + 4.2^2$ $h = \sqrt{35.28}$ diameter = 5.9(39…cm) or radius = 2.9698…(cm) C = Π × 5.939… OR C = 2 ×Π × 2.9698.. . 18.5 (cm) to 18.7(cm)	S1 M1 A1 A1 m1 A1 6	OR alternative full correct strategy OR alternative <u>complete</u> method Accept diameter = 6(cm) or radius = 3(cm), do not accept radius = 2.9. Clarification of diameter or radius may be implied in further work, penalise here with A0, then FT FT their radius or diameter as appropriate provided M1 awarded, including use of r= 5.9(39…) (r = 5.9(39…) leads to 37(. 4..cm)
8(a) Method to clear fractions, all 3 terms $3(3x - 1) - 4(x + 6) = 3 \times 6$ $9x - 3 - 4x - 24 = 18$ OR $5x - 27 = 18$ OR $5x = 45$ $x = 9$ (b) Sin x = 28.7/34.2 57(.0537...°) or 57(.1°) (c) 1.5×10^{11}	M2 A1 A1 M1 A2 B2 9	Intention, i.e. brackets may be missing M1 for clearing fractions 2 terms Fractions must be cleared before M marks can be awarded, not for quotients FT from M1 or M2 FT provided M1 awarded *If no marks SC1 sight of (5x - 27)/12* A1 for x = $\sin^{-1}$ 0.839(181…) B1 for 1.54(347…) × 10^{11}
9. (x =) 8.4 × 6/5 = 10(.08 cm) or 10.1(cm) (y =) 4.32 / 6/5 or (y =) 4.32 × 5/6 = 3.6 (cm)	M1 A1 M1 A1 4	Or equivalent calculation that could lead to correct answer Or equivalent calculation that could lead to correct answer

© WJEC CBAC Ltd.

STEMUP.CO.UK

10.(a) Any two points correct, with no incorrect points Correct straight line drawn from (but not beyond) (30,40) inclusive to (0,10) exclusive (b) Explanation of implied NO, e.g. 'not possible to have a rectangle with zero lengths'	M2 A1 E1 4	Accept (0, 10) as one of the points with 1 other point, provided no other incorrect points plotted M1 any one point correct provided no incorrect points plotted, do not accept (0, 10), OR M1 for any 2 correct points not including (0,10) Accept indication for lots and lots of points between. Accept to (0, 10) but not beyond
11(a) Two **different** corresponding sides and an included angle indicated. (b) Right angle, hypotenuse and a corresponding **different** side indicated OR Right angle, hypotenuse and a corresponding **different** angle indicated	B2 B2 4	B1 Two corresponding sides not marked as different and the included angle indicated B1 Right angle, hypotenuse and a corresponding different length indicated but not marked as different B1 Right angle, hypotenuse and a corresponding angle indicated but angles not marked as different, or Right angle, hypotenuse & the both of 2 corresponding sides marked differently as appropriate *Accept right angles indicated either as 90° or ☐ at vertex*
12. Amount: £**820** After a decrease of: 40% £492; 2% £**803.6(0)**	B4 4	B3 for 820, or B2 for 492 × 100/ 60, or B1 for '60% is 492', or B1 for 0.98× 'their 820' correctly evaluated to nearest penny or unrounded
13. (a) $-7\boldsymbol{x} + 10\boldsymbol{y}$ (b)(i) $-6\boldsymbol{x} - 3\boldsymbol{y}$ or factorised equivalent (ii) $-6\boldsymbol{x} + 7\boldsymbol{y}$	 B1 B1 B1 3	Mark final answer in each part FT (b)(i) + $10\boldsymbol{y}$ simplified correctly If (i) and (ii) both correct but left in unsimplified form allow SC1
14. Strategy: Use of ½ abSinC and cosine rule $42.8 = ½ \times BC \times 17.8 \times \sin 34$ BC = 8.59987… $AB^2 = BC^2 + 17.8^2 - 2 \times BC \times 17.8 \times \cos 34$ $AB^2 = 136.98…$ AB = 11.7(… cm)	S1 M1 A1 M1 A1 A1 6	Or equivalent full strategy FT their BC, but not as 17.8 Accept 12(cm) from correct working. CAO *Alternative:* *S1 complete strategy, e.g. with perpendicular with appropriate trigonometry for both triangles* *M1, A1 for the RHS triangle* *M1, A1, A1 for the LHS triangle*
15.Volume sphere = $4 \times \Pi \times 6.7^3/3$ $(=1259(.833\ cm^3))$ Volume cone = $\Pi \times r^2 \times 10.4 / 3$ $r^2 = \frac{\text{Volume sphere} \times 3}{\Pi \times 10.4}$ $r^2 = 115.678...$ r = 10.8(cm)	B1 B1 M1 A1 A1 5	 FT their volume sphere provided dimensions cm^3 for M1 only Or equivalent rearrangement to isolate r^2 CAO. Must be to 1d.p. Alternatively: $4/3 \times \pi \times R^3 = 1/3 \times \pi \times r^2 \times h$ B1 $4 \times R^3 = r^2 \times h$ B1 $4 \times 6.7^3 = r^2 \times 10.4$ M1 $r^2 = 115.678..$ A1 $r = 10.8(cm)$ A1 CAO

© WJEC CBAC Ltd.

STEMUP.CO.UK

16. $x(x + 2) = y$ (ISW) $12(5 + x) = 4y$ (ISW) $x(x+ 2) = 15 + 3x$ OR $12(5 + x) = 4x(x + 2)$ OR equivalent $x^2 - x - 15 = 0$ OR $4x^2 – 4x – 60 = 0$ $x = \{ 1 \pm \sqrt{(-1^2 - 4\times1\times-15)}\}/ 2$ OR $x = \{ 4 \pm \sqrt{(-4^2 - 4\times4\times-60)}\}/ 2\times4$ $x = (1 \pm \sqrt{61})/2$ OR $x = (4 \pm \sqrt{976})/8$ $(x =) 4.4$ (cm) $(x + 2 =) 6.4$ (cm)	B1 B1 M1 A1 M1 A1 A1 A1 8	The first two B1 marks maybe implied by the correct quadratic, hence if M1 awarded also award BOTH these B1 marks Equating or substituting, allow 1 error, e.g. missing brackets, or from incorrect expansion. FT provided at least B1 and equivalent level of difficulty Must be equate to zero Allow 1 slip in substitution. FT 'their 3 term quadratic' of equivalent level of difficulty for M1 and final A1 only (-3.4 is not required) FT provided M1 awarded
17. Idea of right angled triangle shown or used with height b, base a $\sin\theta = b(/1)$ $\cos\theta = a/(1)$	M1 A1 A1 3	 Accept $b/\sqrt{(a^2 + b^2)}$ Accept $a/\sqrt{(a^2 + b^2)}$ *If A0 due to notation $–a^2$ as $(-a)^2$ but otherwise correct, then allow SC1 as well as M1*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

METHODS IN MATHEMATICS

UNIT 2: Methods (Calculator)
HIGHER TIER

A.M. THURSDAY, 17 January 2013

2 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 **6**.

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

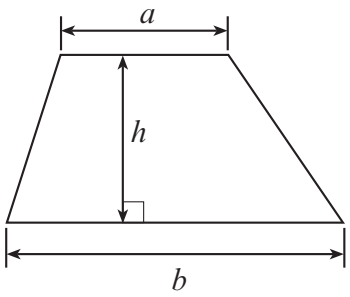
4364 020001

© WJEC CBAC Ltd.

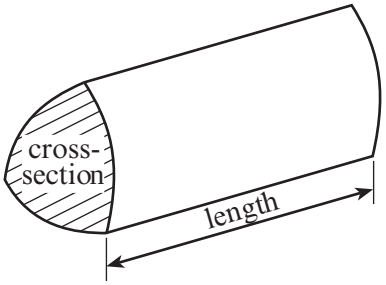
STEMUP.CO.UK

Formula List

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

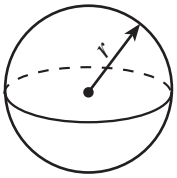


Volume of prism = area of cross-section × length



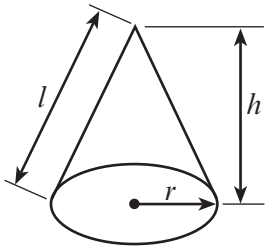
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

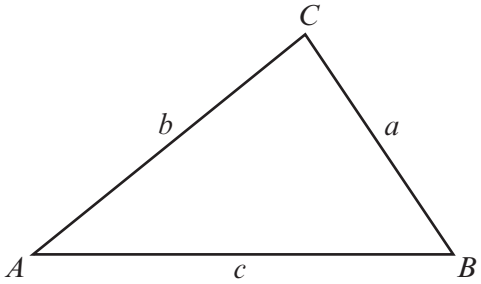


In any triangle ABC

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

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

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. *(a)* Write 281·6 as a percentage of 880.

.....

.....

.....

[2]

(b) Increase 640 by 35%.

.....

.....

.....

[2]

(c) Write 456050·8 correct to two significant figures.

.....

.....

[1]

(d) Find the value of $\sqrt{\frac{1}{3 \cdot 2^2 + 2}}$ giving your answer correct to two decimal places.

.....

.....

.....

.....

[3]

(e) Find the answer when $\frac{3}{8}$ of 40 is subtracted from 12·5.

.....

.....

.....

.....

[2]

4364 020003

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

2. *(a)* Solve $\frac{2}{x} = 8$.

.....

.....

[1]

(b) Solve $2(7x - 13) = 16$.

.....

.....

.....

.....

[3]

(c) Solve $\frac{x + 4}{12} = 6$.

.....

.....

.....

.....

[2]

(d) Write down the greatest whole number that satisfies the inequality $5x < 34$.

.....

.....

.....

.....

[2]

(e) Solve the inequality $3x - 4 < 26$.

.....

.....

.....

[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

3. *(a)*

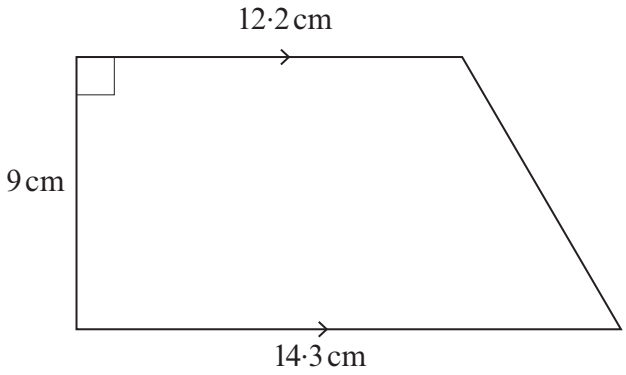


Diagram not drawn to scale

Calculate the area of the trapezium shown above giving the units for your answer.

.....

.....

.....

.....

[3]

(b)

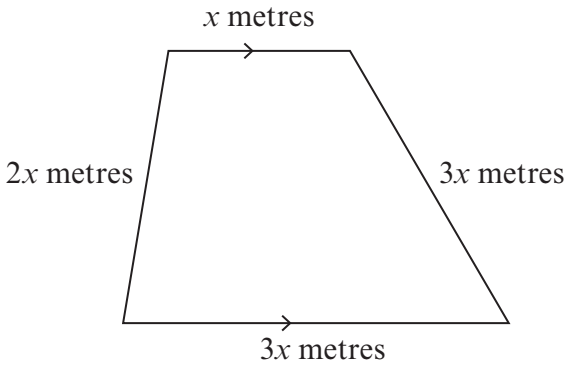


Diagram not drawn to scale

The perimeter of this trapezium is 108 metres.
Find the length of each side of this trapezium.

.....

.....

.....

.....

.....

.....

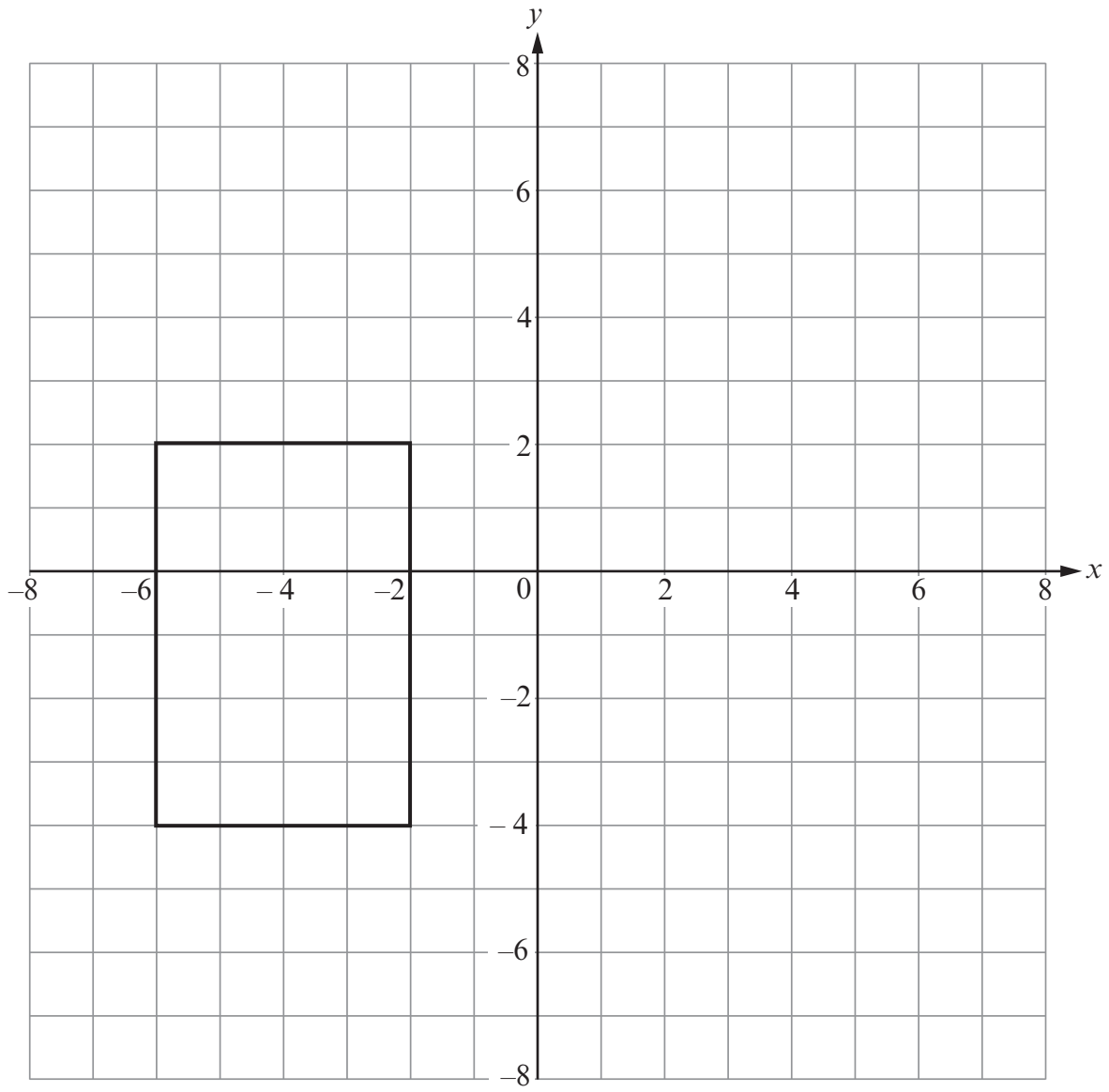
[3]

STEMUP.CO.UK

4364 020005

Examiner only

4. *(a)* Translate the rectangle shown below by $\begin{pmatrix} 2 \\ 4 \end{pmatrix}$.



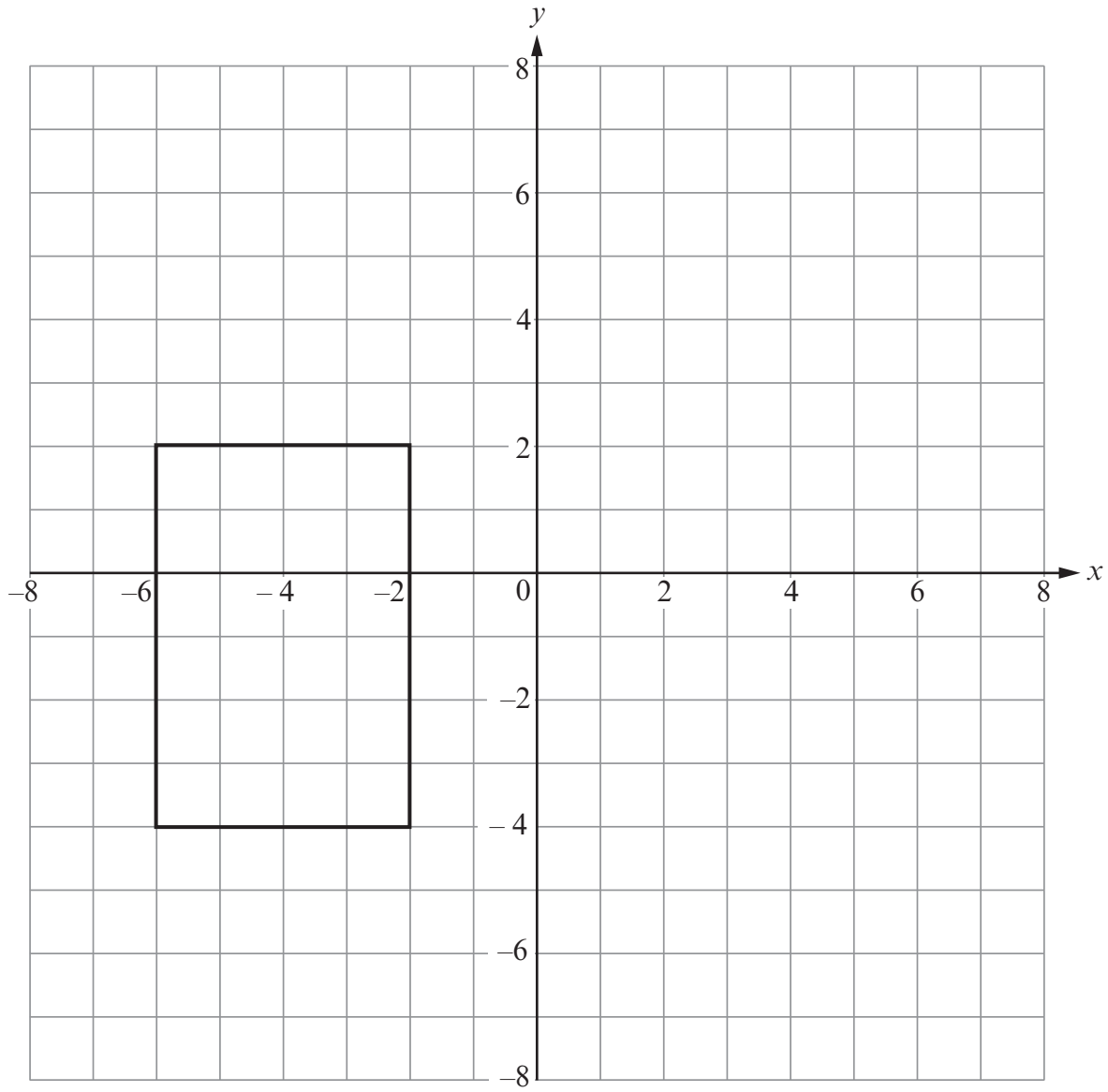
[1]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b) Rotate the rectangle shown on the grid below through 90° clockwise about the origin.



[2]

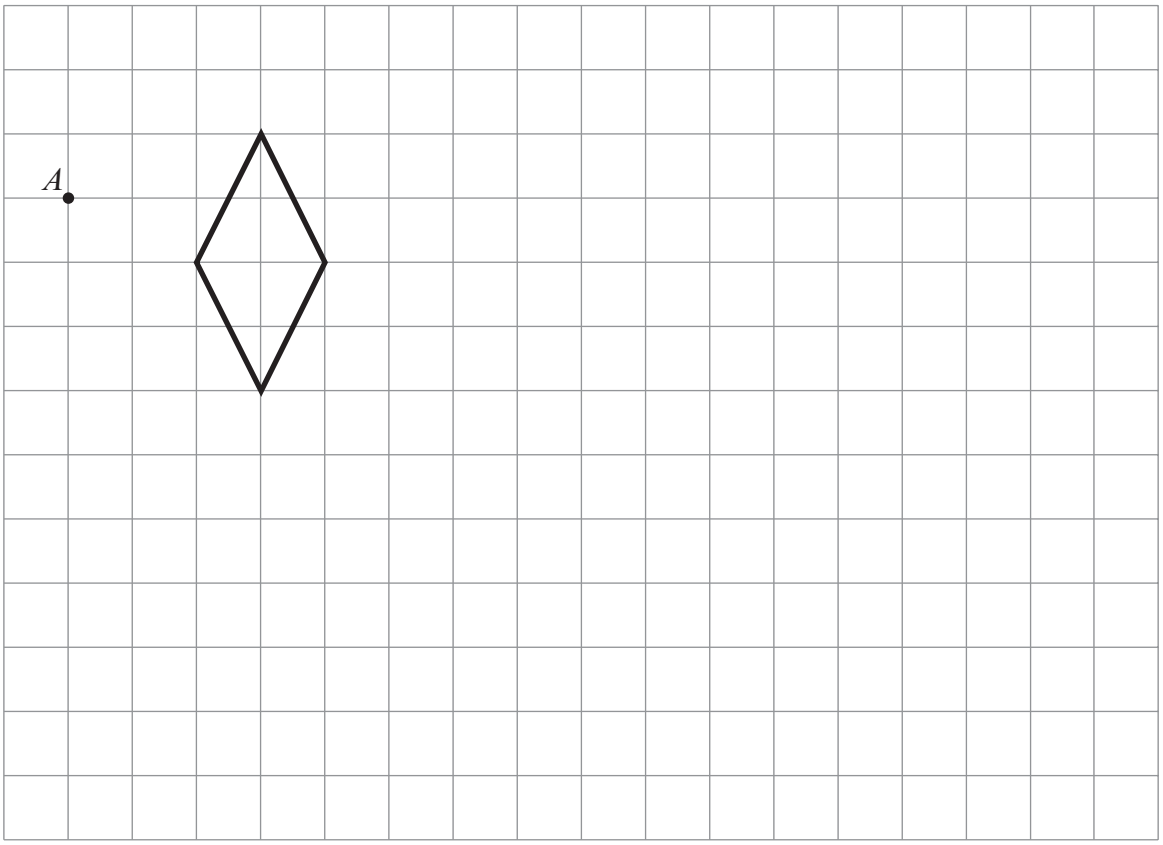
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

(c) Enlarge the shape shown on the grid below by a scale factor of 2 using A as the centre of enlargement.

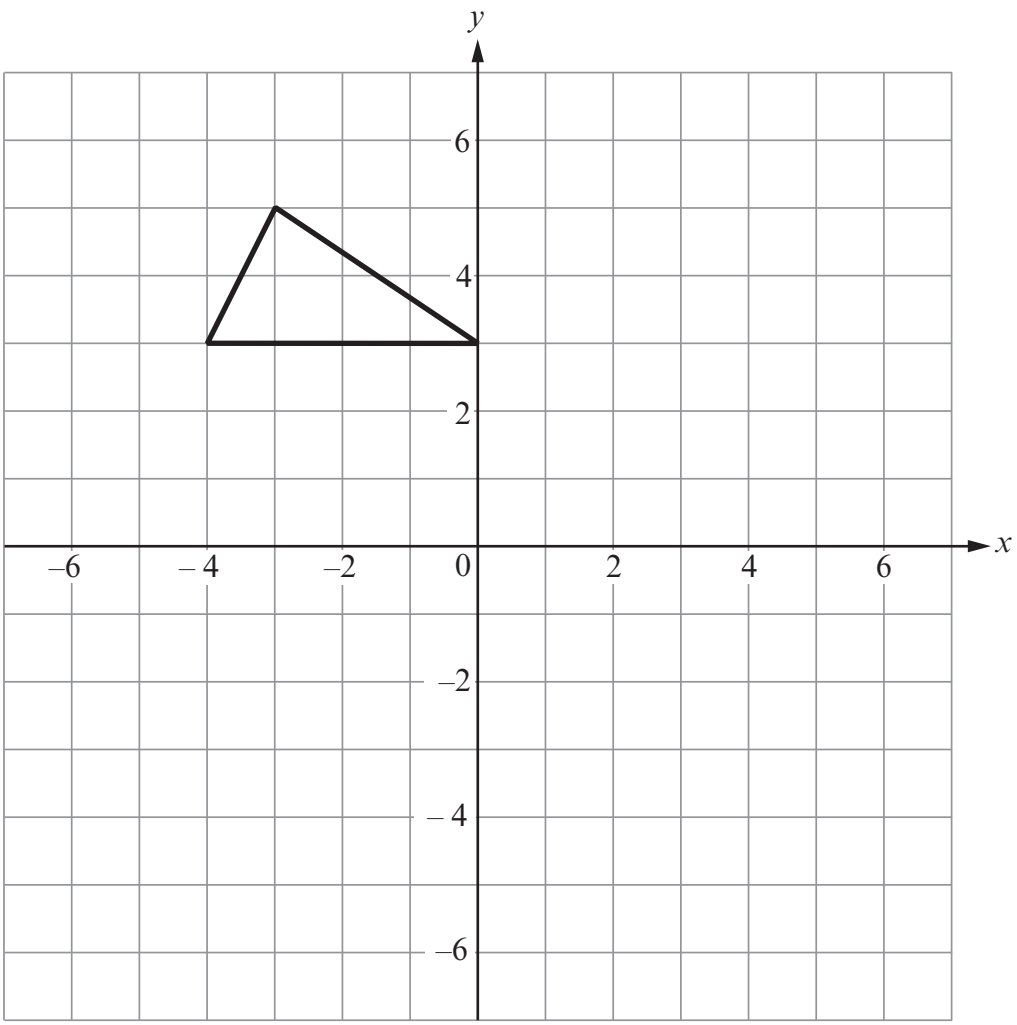


[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

(d) Reflect the triangle in the line $x = 1$.



[2]

4364 020009

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

5. *(a)*

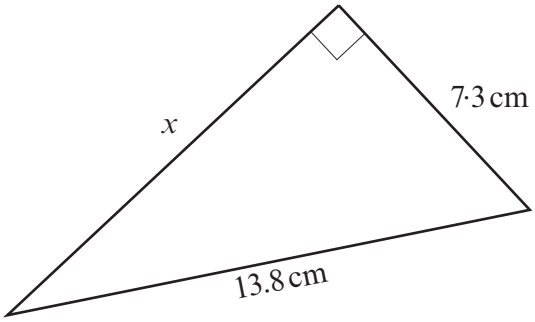


Diagram not drawn to scale

Calculate the length of the side marked x.

.....

.....

.....

.....

..... [3]

(b)

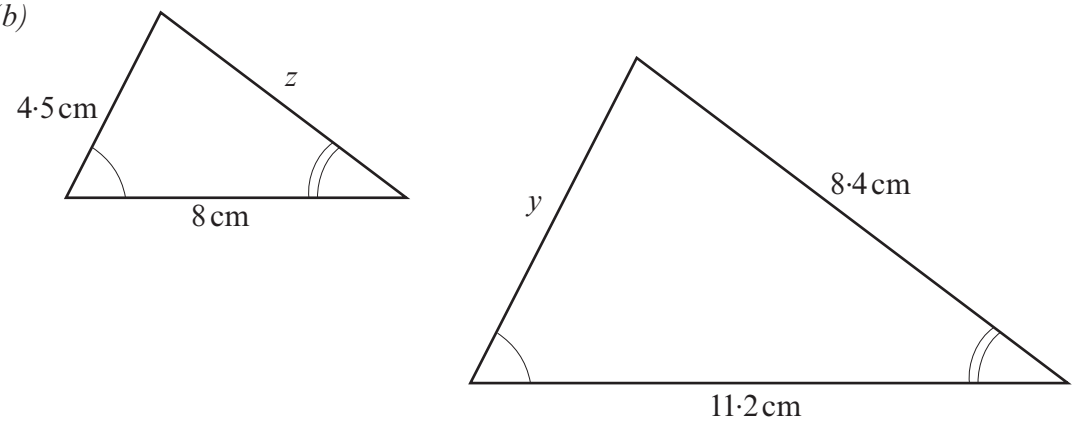


Diagram not drawn to scale

Calculate the lengths of the sides marked y and z.

.....

.....

.....

.....

.....

y = ... cm z = ... cm

[4]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

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

Bradley makes the following statement.

> 'The sum of any three consecutive numbers is always three times the middle number.'

Use algebra to prove Bradley's statement is correct.

.....

.....

.....

.....

.....

.....

.....

[6]

7. On 1st January 2012 Jasmine weighed 84 kg and was overweight for her height.
By eating healthy food and exercising, she lost 6% of her body weight during the first three months of 2012.
Her weight then remained the same for the next two months.
During June, Jasmine cycled every day and, by doing so, she lost 2·8% of her April body weight.

(a) Calculate Jasmine's body weight at the end of June.

.....

.....

.....

.....

.....

.....

[4]

(b) What percentage of her original body weight did Jasmine lose in these six months?

.....

.....

.....

.....

[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

8. A rectangular tile is to be made so that the sum of its length and width must be 8 cm. Draw a graph to show possible dimensions of this tile.

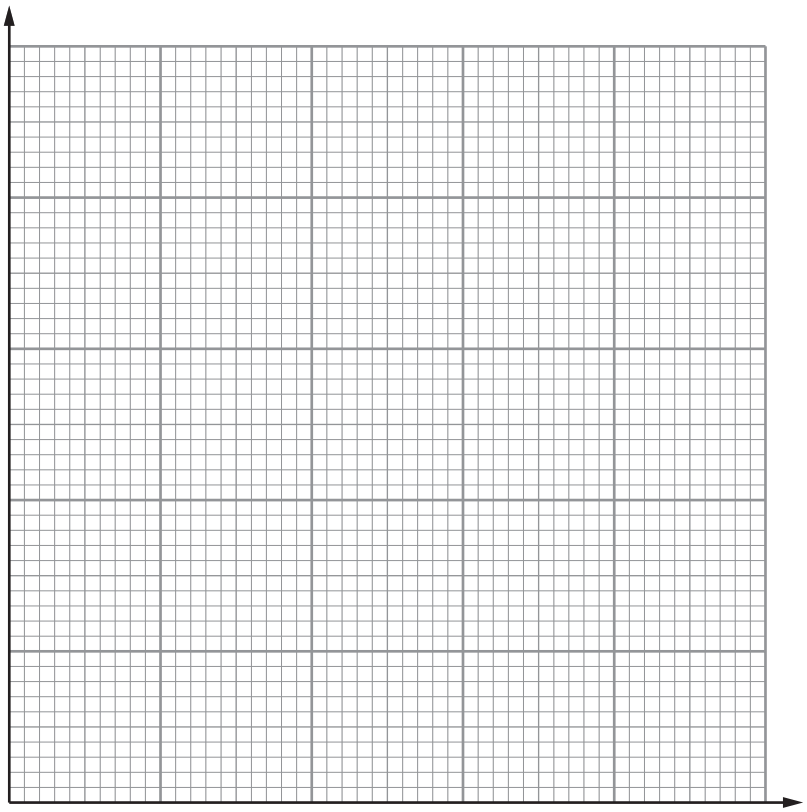
.....

.....

.....

.....

[4]



© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

9. *(a)* A measurement has been increased by 26%.
After the increase the measurement is 57·96 cm.
Calculate the original measurement.

.....

.....

.....

.....

[3]

(b) Calculate the sum of $2{\cdot}31 \times 10^{14}$, $3{\cdot}48 \times 10^{12}$ and $6{\cdot}8 \times 10^{13}$.
Give your answer in standard form correct to 3 significant figures.

.....

.....

.....

.....

[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

10. The diagram below shows a rectangle $ABCD$.

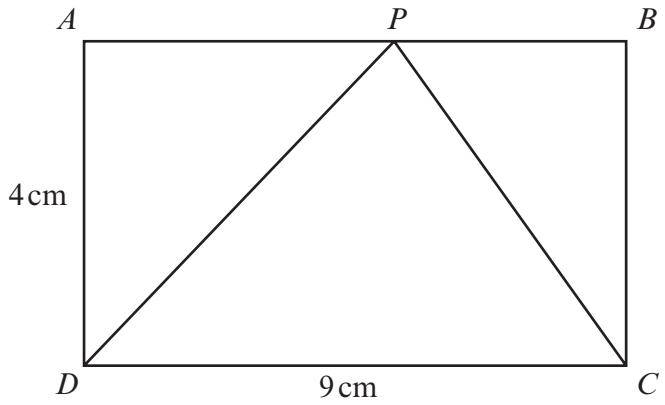


Diagram not drawn to scale

The point P is on the side AB.
The ratio of AP to PB is 3 : 2.

(a) Calculate the area of the triangle DPC.

.....

.....

[2]

(b) Calculate the size of $P\hat{D}C$.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[7]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

11. A 3D shape is made using see-through plastic.
A right circular cone fits exactly into a hemisphere as shown in the diagram.
The gap between the interlocking cone and hemisphere is filled with coloured gel.
The radii of the cone and hemisphere are both 10 cm.

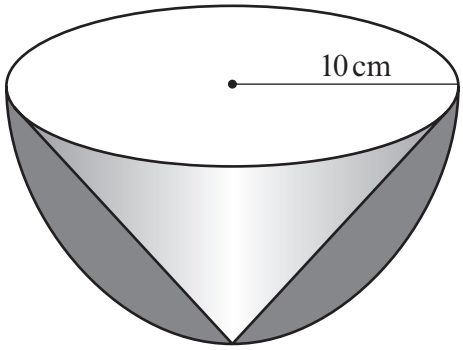


Diagram not drawn to scale

Calculate the volume of the coloured gel.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[5]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

12. *(a)*

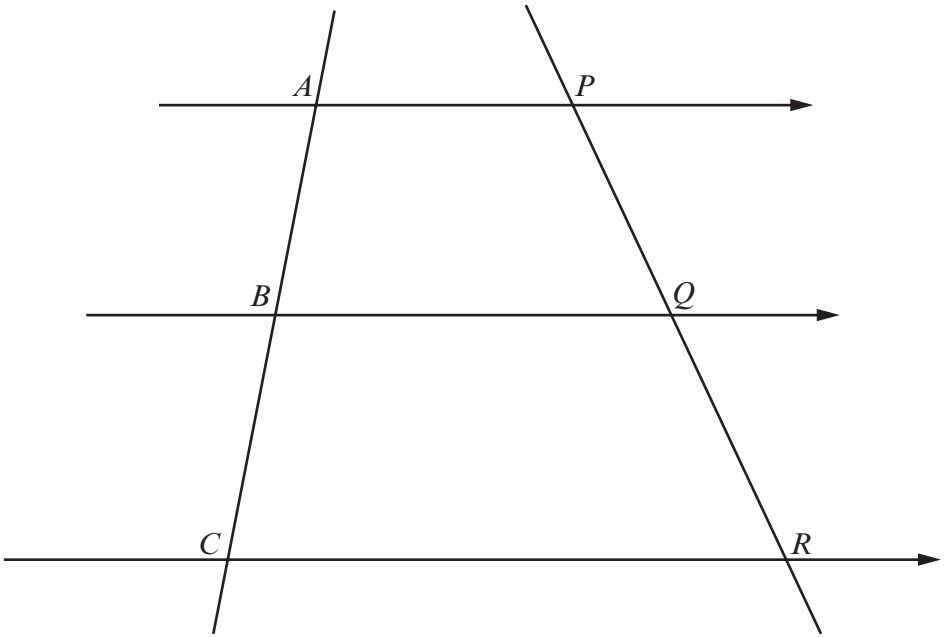


Diagram not drawn to scale

You are given that $AB = 3\,\text{cm}$, $BC = 5\,\text{cm}$ and $PQ = 4{\cdot}5\,\text{cm}$.
Calculate the length of PR.

.....

.....

.....

.....

.....

.....

[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b)

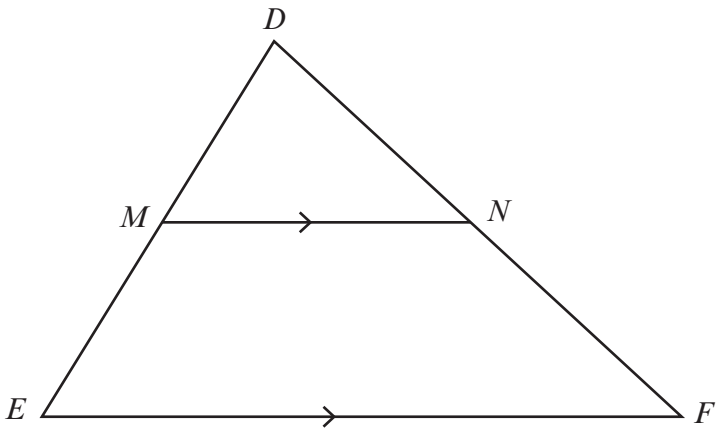


Diagram not drawn to scale

You are given that $DM = 3x$ cm, $DF = 5y$ cm, $EF = 9y$ cm and that M is the mid-point of DE.
Find the perimeter of triangle DMN in terms of x and y.
Give your answer in its simplest form.

.....

.....

.....

.....

.....

.....

[3]

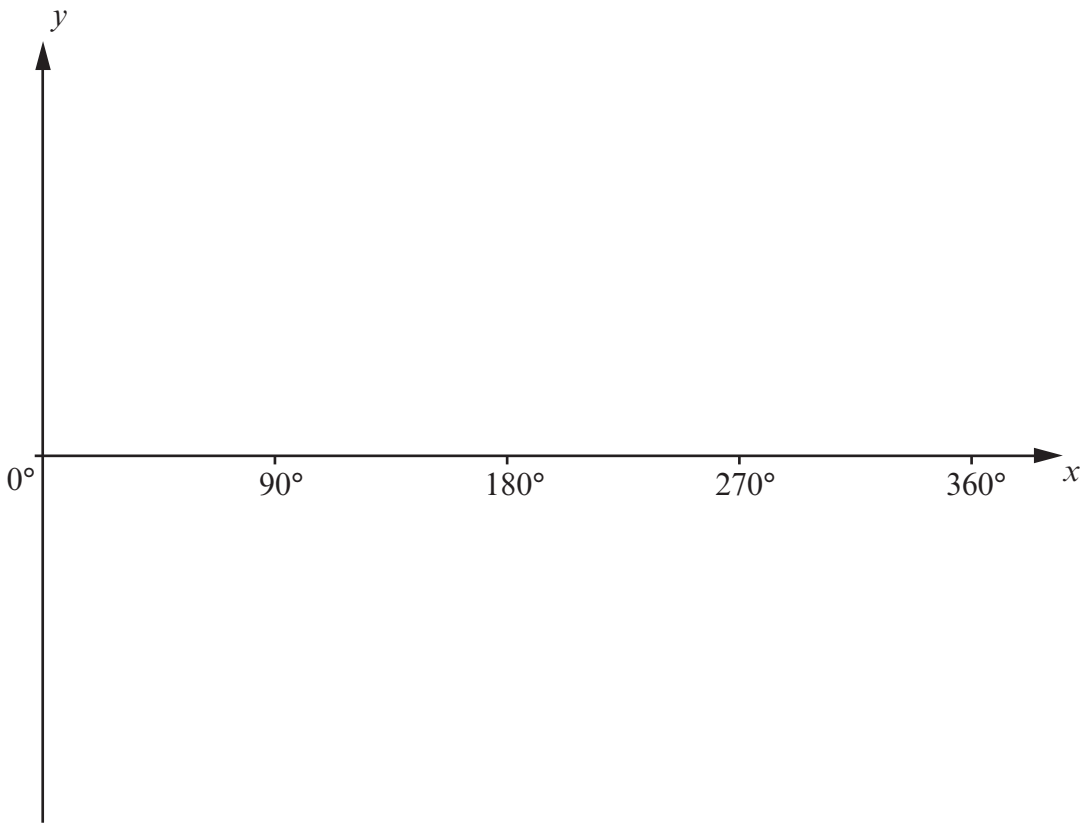
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

13. Use the axes given below to sketch the graph of $y = \tan x$ for values of x from 0^o to 360^o.



[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

14.

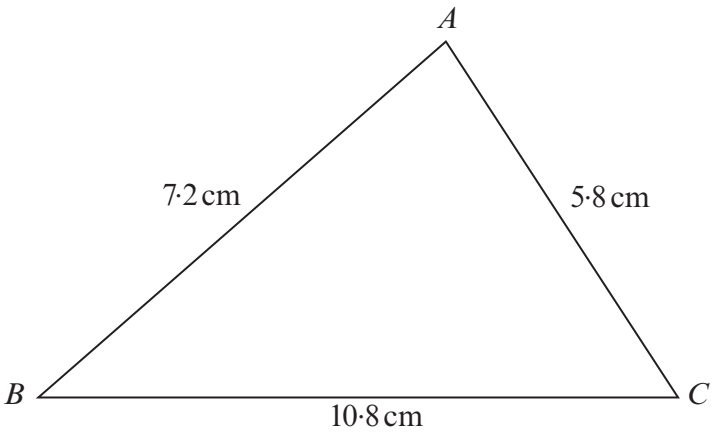


Diagram not drawn to scale

(a) Calculate the size of $B\hat{A}C$.

[4]

(b) Calculate the area of triangle ABC.

[3]

STEMUP.CO.UK

Examiner only

15. A rectangle of length $(x + 8)$ cm and width x cm has an area of y cm^2.
It is known that $y - x = 1284$.
Find the dimensions of the rectangle.
Give your answer correct to 1 decimal place.
You must use an algebraic method.

[8]

END OF PAPER

© WJEC CBAC Ltd.

STEMUP.CO.UK

GCSE MARKING SCHEME

METHODS IN MATHEMATICS (LINKED PAIR PILOT)

JANUARY 2013

© WJEC CBAC Ltd.

STEMUP.CO.UK

INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). 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.

© WJEC CBAC Ltd.

UNIT 2 - FOUNDATION TIER

Methods Unit 2 Foundation Tier January 2013		Final
1. F and J OR J and F B and G OR G and B	B1 B1 2	
2. (a) 27/100 × 830 224.1	M1 A1	Or equivalent. Sight of 224 is evidence of M1 CAO Ignore units. Ignore subsequent rounding if 224.1 is given
(b) (1/3 of 1500 =) (£)500 (1/5 of 1500 =) (£)300 Saved 1500 – 500 - 300 Saved (£)700 (c) 30(%) 34(%) 28%, 0.3, 17/50 or equivalent	B1 B1 M1 A1 B1 B1 B1 9	*1/3 + 1/5 M1* *8/15 spent A1* FT 1500 – 'their 500' - 'their 300' *7/15 saved B1* *(£)700 B1* FT 'their 30%' and 'their 34%'
3. (a) Sector (b) Tangent Chord	B1 B1 B1 3	
4. (a) 4 squares shaded correctly (b) Correct diagram (c) Correct diagram drawn (d) correct shape drawn	B2 B2 B3 B1 8	Award B1 for 3 correct and 1 incorrect OR B1 for between 5 and 8 shaded to produce a symmetrical diagram -1 for each incorrect vertex Award B2 for 2 sections drawn correctly, B1 for 1 section correctly drawn Accept in any orientation
5. (a) 3/4 × 156 117 (b) (i) 40(%) (ii) 60(%) (c) (i) 2/6 and 4/12 (ii) 4 : 16 and 7 : 28	M1 A1 B1 B1 B2 B2 8	Or equivalent FT 100 – 'their 40' correctly evaluated Award B1 for each. If more than 2 answers offered -1 for each incorrect answer in (i) and (ii)
6. (a) (4.76 + 6.59=) 11.35 20 – 11.35 (£)8.65 (b) 50 ÷ 7.89 6	B1 M1 A1 M1 A1 5	Maybe implied FT 20 – 'their 11.35' Alternative method, award M1 for workings that could lead to 6 Answer of 6.3(37135...) is M1 A0
7. a = 4 b = 5 c = 3 d = 2	B1 B1 B1 B1 4	CAO FT 9 – 'their a' FT [13 – 'their a'] ÷ 3 FT 14 – 'their a + b + c'
8. (a) x = 13 (b) x = - 4 (c) x = 4 (d) 2x = 14 x = 7	B1 B1 B1 B1 B1 5	*Accept embedded answers throughout question* FT 'their 14 ÷ 2'. Correctly evaluated if this leads to a whole number.
9. (a) 313.6 (b) 64.36	B1 B2 3	 B1 for sight of 9.6 or 73.96

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2013		Final
10. Strategy for comparing sizes of coffee	S1	Eg. looking at 100 grams of coffee for each size or idea of doubling or halving.
For 200 gram jar, cost for 100 grams is (£)2.8(0) For 400 gram jar, cost for 100 grams is (£)2.95	B2	Award B1 for each. Candidates could compare another size rather than 100 grams. *Eg.* *For 200 gram jar, cost for 400 grams is (£)11.2(0) B1* *For 100 gram jar, cost for 400 grams is (£)12 B1* *Cost per gram. Award B2 for all 3 correct. Award B1 for any 1 correct.* *For 200g jar, cost is 2.8pence* *For 100g jar, cost is 3 pence* *For 400g jar, cost is 2.9(5) pence* *Grams per pound(£). Award B2 for all 3 correct. Award B1 for any 1 correct.* *For 200g jar, weight is 35.71g* *For 100g jar, weight is 33.3...g* *For 400g jar, weight is 33.89...g.* *Allow rounded or truncated answers*
The 200 gram jar AND suitable reason/explanation	E1	E.g. The 200 gram jar is the best buy because it costs less (per 100 grams than the other sizes.) OR the 200g jar because you get more coffee (per £1) OR correct workings but reason given as – The 400g better because of less waste/number of jars etc.
QWC: Look for • Correct units used • Spelling in at least 1 statement/sentence • Clarity of text explanations • Clearly linking working with size of coffee jar • the use of notation (watch for the use '=' "£" being appropriate) • 0 missing from 2.80 Count incorrect use of '=' in situations such as 200g = £5.60 within the few mistakes in mathematical form 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 in their 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 in their answer	Q W C 2 6	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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
11. (a) (i) × 0.25 selected (ii) × 1.4 selected (b) (i) Correct explanation given of either the error in her working OR the correct workings OR both (ii) 12 + 8 × 3 = 36	B1 B1 E1 B1 4	CAO CAO Eg Susan subtracted 6 from 30 to get 24 and then divided by 2 to get 12. OR She should work out 6 ÷ 2 = 3 first and then subtract 3 from 30. OR should have used BIDMAS CAO

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods Unit 2 Foundation Tier January 2013		Final
12.(a) ½ (12.2 + 14.3) ×9 119.25 cm^2 (b) x + 2x + 3x + 3x = 108 x = 108/9 (=12) 12(m), 24(m), 36(m) (and 36(m))	M1 A1 U1 M1 A1 A1 6	 Indept. mark Idea not notation important, Or alternative first step
13.(a) Correct translation (b) Correct rotation (c) Enlargement scale factor 2 Correct position (d) Correct reflection in x = 1	B1 B2 B2 B1 B2 8	 B1 for a near miss (intention), OR anticlockwise rotation through 90°, OR sight of all 4 × 90° rotations B1 for any 2 lines correct, or for consistent incorrect scale factor used B1 for reflection in y = 1 or either axis, OR for the sight of the line x=1 or x = 1 implied, OR reflection in any vertical line indicated
14. 3x < 30 x< 10	M1 A1 2	No marks for '=' unless final replaced to give x<10 then award M1, A1. An answer of x<30/3 gets M1, AO
15. (area of square =) 144 (area of circle =) $\pi \times 6^2$ 113 to 113.1428..... (area of shaded part =) 30.857..... to 31 cm^2	B1 M1 A1 A1 4	 FT 'their area of square' – 'their area of circle' provided M1 awarded
16. (AC^2=) $11^2 + 18^2$ AC^2= 445 or AC = √445 21.(095...) or 21.1 (cm)	M1 A1 A1 3	Showing steps of squaring and adding. Do not penalise notation if steps are clearly intended

© WJEC CBAC Ltd.

STEMUP.CO.UK

UNIT 2 - HIGHER TIER

Methods 2 Higher January 2013		Final
1.(a) $(281.6/880) \times 100$ 32(%) (b) $640 + 0.35 \times 640$ OR 640×1.35 864 (c) 460000 (d) 0.29 (e) $12.5 - \frac{3}{8} \times 40$ -2.5	M1 A1 M1 A1 B1 B3 M1 A1 10	 Allow 460000.0 B2 for 0.2858… rounded or truncated, OR B1 for sight of 0.08(1699…) Not for reversed unless answer is correct showing intention. Award SC1 for an answer of 2.5
2. (a) ¼ or 0.25 (b) $14x - 26 = 16$ OR $7x - 13 = 16/2$ $14x = 42$ OR $7x = 21$ $x = 3$ (c) $x + 4 = 6 \times 12$ $x = 68$ (d) $x < 34/5$ or $x < 6.8$ Answer of 6 (e) $3x < 30$ $x < 10$	 B1 B1 B1 B1 M1 A1 M1 A1 M1 A1 10	Accept embedded answers in (a) , (b) & (c) Accept 2/8 FT until 2nd error Or $x/12 = 6 - 4/12$ An answer of 6 implies '<' applied, so M1, A1 No marks for '=' unless final replaced to give $x<10$ then award M1, A1. An answer of $x<30/3$ gets M1, AO
3.(a) ½ (12.2 + 14.3) ×9 119.25 cm^2 (b) $x + 2x + 3x + 3x = 108$ $x = 108/9$ (=12) 12(m), 24(m), 36(m) (and 36(m))	M1 A1 U1 M1 A1 A1 6	 Independent mark Idea not notation important, Or alternative first step
4.(a) Correct translation (b) Correct rotation (c) Enlargement scale factor 2 Correct position (d) Correct reflection in x = 1	B1 B2 B2 B1 B2 8	 B1 for a near miss (intention), OR anticlockwise rotation through 90°, OR sight of all 4 × 90° rotations B1 for any 2 lines correct, or for consistent incorrect scale factor used B1 for reflection in y = 1 or either axis, OR for the sight of the line x=1 or x = 1 implied, OR reflection in any vertical line indicated
5.(a) $(x^2 =) 13.8^2 - 7.3^2$ $x^2 = 137.15$ or $x = \sqrt{137.15}$ 11.7(….cm) or 12(cm) (b) $y/4.5 = 11.2/8$ $y = 6.3$ (cm) $z/8.4 = 8/11.2$ $z = 6$ (cm)	M1 A1 A1 M1 A1 M1 A1 7	Showing steps of squaring and subtracting Scale factor 11.2/8 (=1.4) used appropriately Scale factor 11.2/8 (=1.4) used appropriately

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods 2 Higher January 2013		Final
6.Shows understanding of summing three consecutive numbers	S1	Understanding of 'sum', 'consecutive' using numerical or algebraic example to show ×3 middle value Accept x+y+z = 3y as an example of ×3 middle value Do not accept x+x+x=3x or 1x+2x+3x=6x
x, x+1, x+2 OR x-1, x, x+1 OR equivalent	M1	Expressing 3 consecutive numbers algebraically
Correct simplified sum of their algebraic terms	A1	Sum using single variable
Convincing conclusion, e.g. 3(x+1)	E1	If their sum is 3x for middle term x, then award E1 due to their effective use of initial choice
Work must be relevant in order to award QWC marks, not engaging with the problem QWC0	Q W C 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.
Look for • clarity of initial text explanation (e.g. writing that 'first number is x'), • the use of notation (watch for the use of '=' being appropriate) • spelling in any initial or final explanation		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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.
QWC2: Candidates will be expected to • present work clearly, with words explaining start, process or steps AND • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer		QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
QWC1: Candidates will be expected to • present work clearly, with words explaining start, process or steps OR • make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer	6	
7.(a) 84 - 0.06 × 84 OR 0.94 × 84 78.96(kg) or 79(kg)	M1 A1	Do not accept premature approximation 78.9, but FT
78.96 × 0.972 OR 78.96 – 0.028 × 78.96	M1	FT their 78.96 or 79 provided the value is <84
76.7(4912 kg) or 76.7(88kg) or 76.8(kg) or 77(kg)	A1	Or 76.75 or 76.74 *If no marks, then SC1 for an answer of 76.6(08) from a reduction of 8.8%. No FT to (b)*
(b) $\frac{(84 - 76.76912)}{84} \times 100$ or equivalent full method	M1	FT their '76.7', provided ≠ 76.6(08) from 8.8%
8.632…% rounded or truncated from correct working	A1 6	Accept an answer of 8.333..% from using 77kg, or 8.69…% from using 76.7, …
8.Label axes 'length (of tile)' and 'width (of tile)'	B1	Either order
Both scales uniform from 0 to 8 inclusive	B1	
Sight of any two points correct, in list or plotted	M1	Only one of these point can be (0,8) or (8,0). If only (0,8) and (8,0), then M0
Straight line drawn from (0,8) to (8,0) exclusive	A1 4	Accept including (0,8) and (8,0). Allow if the line touches the axes, but intention clear to end at the axes ±2mm. However, A0 if this line extends much beyond an axis *Treat line from (0,4) to (4,0) as MR-1, with axes 0 to 4 required*
9.(a) Considering 57.96 as 126%	B1	Or equivalent with 1.26
57.96/1.26	M1	
46 (cm)	A1	
(b) 3.02×10^{14}	B2 5	B1 for 3.0248×10^{14} or 3.025×10^{14} or 302 480 000 000 000 or 302 000 000 000 000 or 302 500 000 000 000

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods 2 Higher January 2013		Final
10.(a) ½ × 9 × 4 = 18 (cm^2) (b) Overall strategy: use of ratio and trigonometry 9 ÷ 5 (= 1.8) (AP =) 5.4 (cm) Using angle APD = angle PDC Tan PDC = 4/5.4 Angle PDC = $\tan^{-1}$ 0.74074074 Angle PDC = 36.5(28855…°)	M1 A1 S1 M1 A1 B1 M1 A1 A1 9	 May include extra, ⅖ × 9 or allow ⅗ × 9 OR using angle PDC = 90 – angle ADP OR using perpendicular from P to DC. *Check diagram* FT their '5.4' provided their value is less than 9 OR Tan ADP = 5.4/4, must be clear that it is this angle OR Angle ADP = 53.(471…°)
11.Volume hemisphere = 2/3 × Π × 10^3 Realising height of the cone = 10 (cm) Volume of cone = 1/3 × Π × 10^2 × 10 Volume gel = 2/3 × Π × 10^3 - 1/3 × Π × 10^3 Answers in the range 1046.6 to 1048(cm^3)	M1 B1 M1 M1 A1 5	(Answers in the range 2093 to 2095(.238...cm^3)) (Answers in the range 1046.6 to 1048(cm^3)) *Needs to be from a difference consideration, not volume of the cone **and** provided at least M1 previously awarded* CAO
12.(a) 3:5 and 4.5:QR or equivalent, or scale factor 1.5 QR = 1.5 × 5 or equivalent PR = 12 (cm) (b) MN = 4.5y DN = 2.5 y (Perimeter =) 3x + 7y	M1 A1 A1 B1 B1 B1 6	OR 3:8 and 4.5:PR or equivalent OR PR = 4.5 × 8 ÷ 3 or equivalent CAO. Must be simplified An answer of ½ (6x + 14y) implies B1, B1, B0
13.General idea of tan curve and crosses axes at 0°, 180° and 360° Correct sketch tending to infinity correctly at 90° and 270° only	B1 B2 3	 B1 for correct sketch with idea of tending to infinity at 90° and 270° only but curving back instead of approaching vertical lines
14.(a) cos A = $\frac{7.2^2 + 5.8^2 - 10.8^2}{2 \times 7.2 \times 5.8}$ cos A = -0.373….. 111.9(059597…°) or 112° (b) Attempt use of ½ absinC ½ × 7.2 × 5.8 × sin 'their A' Answer between 19.35(cm) and 19.4(cm) inclusive	M2 A1 A1 M1 m1 A1 7	M1 for $10.8^2 = 7.2^2 + 5.8^2 - 2 \times 7.2 \times 5.8 \times \cos A$, OR M1 for 1 slip in rearranged form Not for FT of inappropriate rounding or truncation Accept any values for a, b & C, for choice & quote rule 'their A' ≠ 7.2, 5.8 or 10.8 CAO *Candidates choosing to calculate a different angle first, no marks until they reach the '½absinC' stage then FT for their angle with appropriate sides used.*
15. Equation x(x+8) = y Sight of x(x+8)= y AND y =1284 + x, OR x(x + 8) = x + 1284 $x^2 + 7x – 1284 = 0$ $x = \{-7 \pm \sqrt{(7^2 - 4 \times 1 \times -1284)}\}/2$ $x = \{-7 \pm \sqrt{5185}\}/2$ x = 32.5(0347… (and -39.5…) (Dimensions are) 32.5(cm) by 40.5(cm)	B2 B1 B1 M1 A1 A1 A1 8	Allow B1 for sight of x(x + 8) Must be rearranged form y =1284 + x, FT from 1 error Allow 1 slip FT for +ve x and x+8 provided M1 awarded, with answer correct to 1 d.p. *Watch for alternative with elimination of x instead of y, and mark accordingly*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Surname	Centre Number	Candidate Number
Other Names		0

GCSE LINKED PAIR PILOT

4364/02

METHODS IN MATHEMATICS

UNIT 2: METHODS (CALCULATOR)

HIGHER TIER

P.M. TUESDAY, 19 June 2012

2 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 **6**.

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

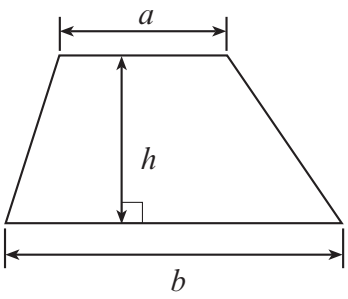
4364 020001

© WJEC CBAC Ltd.

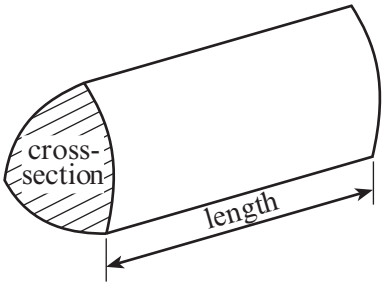
STEMUP.CO.UK

Formula List

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

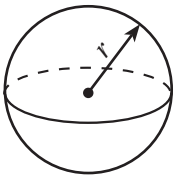


Volume of prism = area of cross-section × length



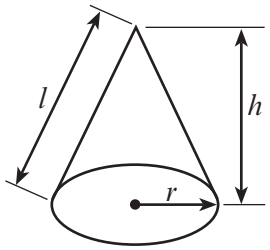
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

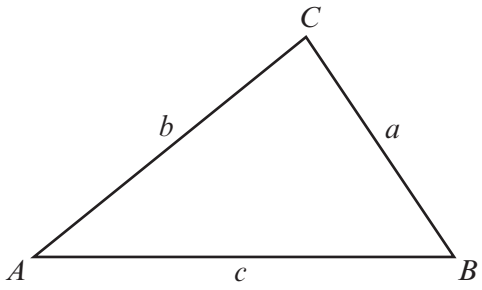


In any triangle ABC

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

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

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

1. *(a)* Solve $\frac{3x}{4} = 24$.

.....

.....

[2]

(b) Solve $\frac{8}{x} = 16$.

.....

.....

[1]

(c) Solve $7(5x - 4) = 77$.

.....

.....

.....

.....

[3]

(d) Solve the inequality $6x + 5 < 47$.

.....

.....

.....

[2]

(e) Write down the smallest whole number that satisfies the inequality $3x > 67$.

.....

.....

.....

.....

[2]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

2. *(a)* The perimeter of a rectangle is P cm and the area is A cm^2.
The width of the rectangle is w cm.
The length of the rectangle is $5w$ cm.

- Write down and simplify an equation for the perimeter P, in terms of w.
- Write down and simplify an equation for the area A, in terms of w.

Perimeter

.....

.....

Area

.....

.....

.....

[3]

(b)

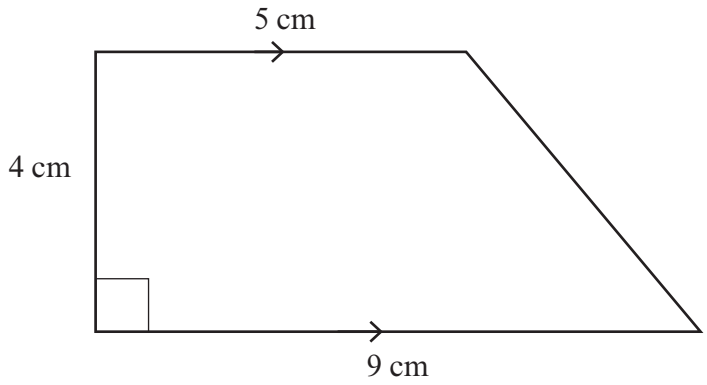


Diagram not drawn to scale

Calculate the area of the trapezium.

.....

.....

.....

.....

.....

.....

[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

3. *(a)* Write 432 as a percentage of 960.

.....

.....

.....

[2]

(b) Decrease 820 by 24%.

.....

.....

.....

[2]

(c) Find the value of $\sqrt{\dfrac{5{\cdot}67^2 + 6{\cdot}72}{2{\cdot}3 + 4{\cdot}56 \times 2{\cdot}4}}$ giving your answer correct to one decimal place.

.....

.....

.....

.....

.....

.....

[3]

(d) Find the sum of $1\frac{2}{3}$ of 381 and $2\frac{3}{7}$ of 4970.

.....

.....

.....

.....

.....

.....

[3]

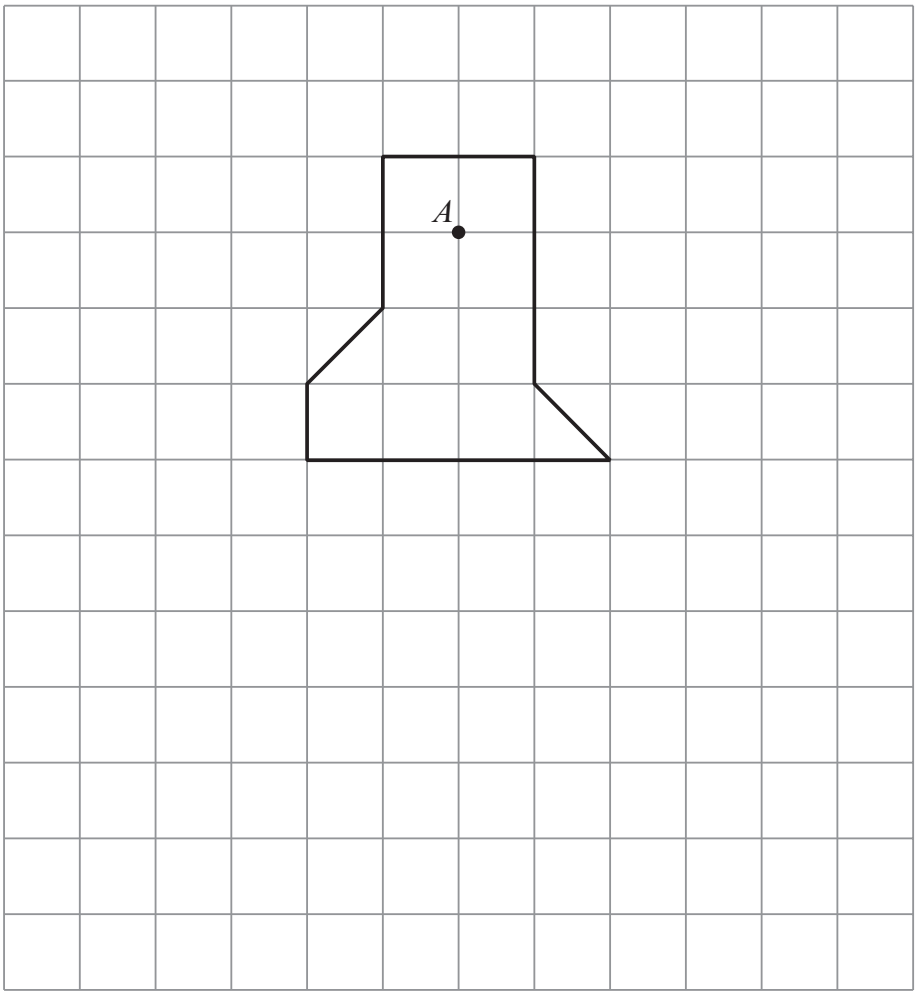
© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

4. *(a)* Enlarge the shape shown on the grid by a scale factor of 2 using A as the centre for the enlargement.

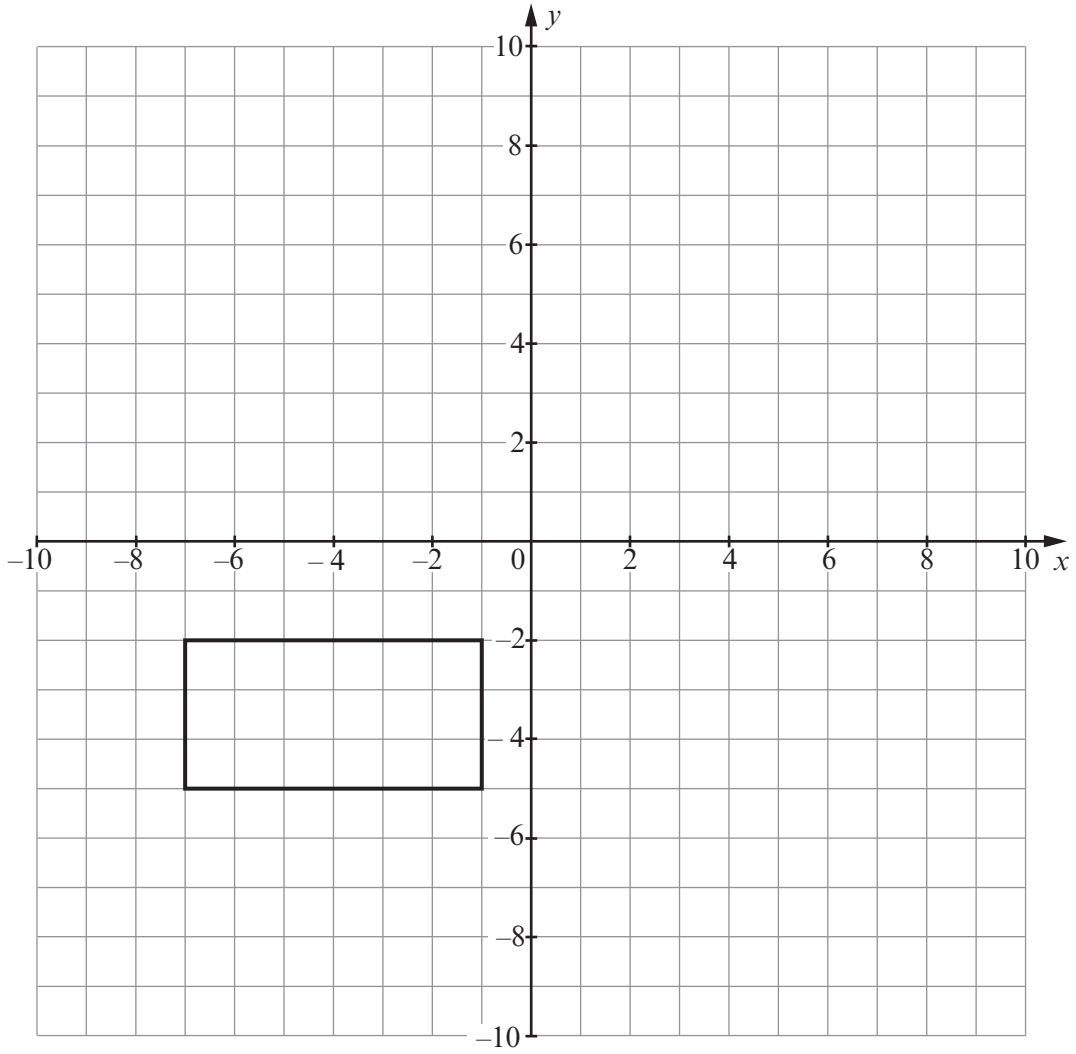


[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

(b) Reflect the rectangle in the line $y = 2$.



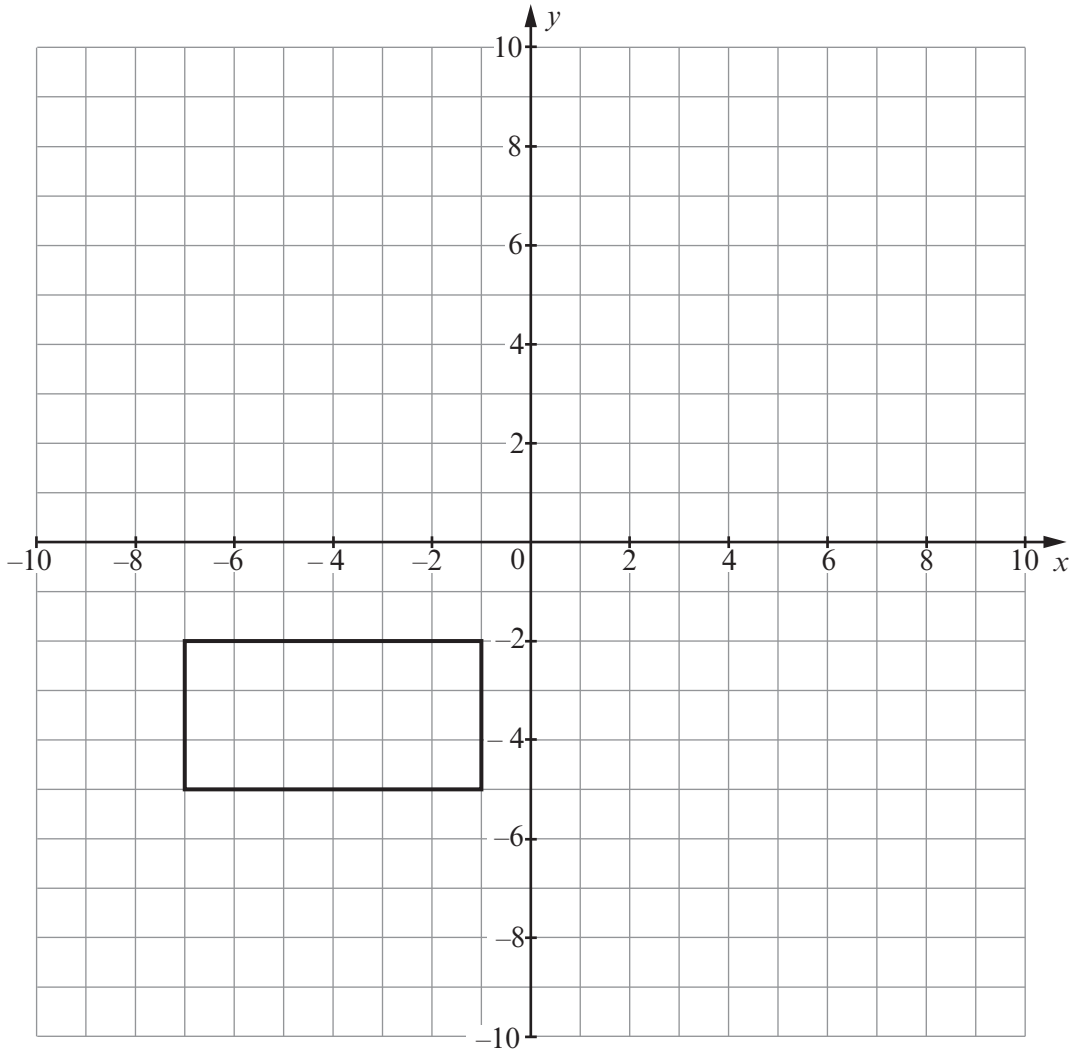
[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(c) Translate the rectangle shown below by $\begin{pmatrix} 4 \\ -2 \end{pmatrix}$.



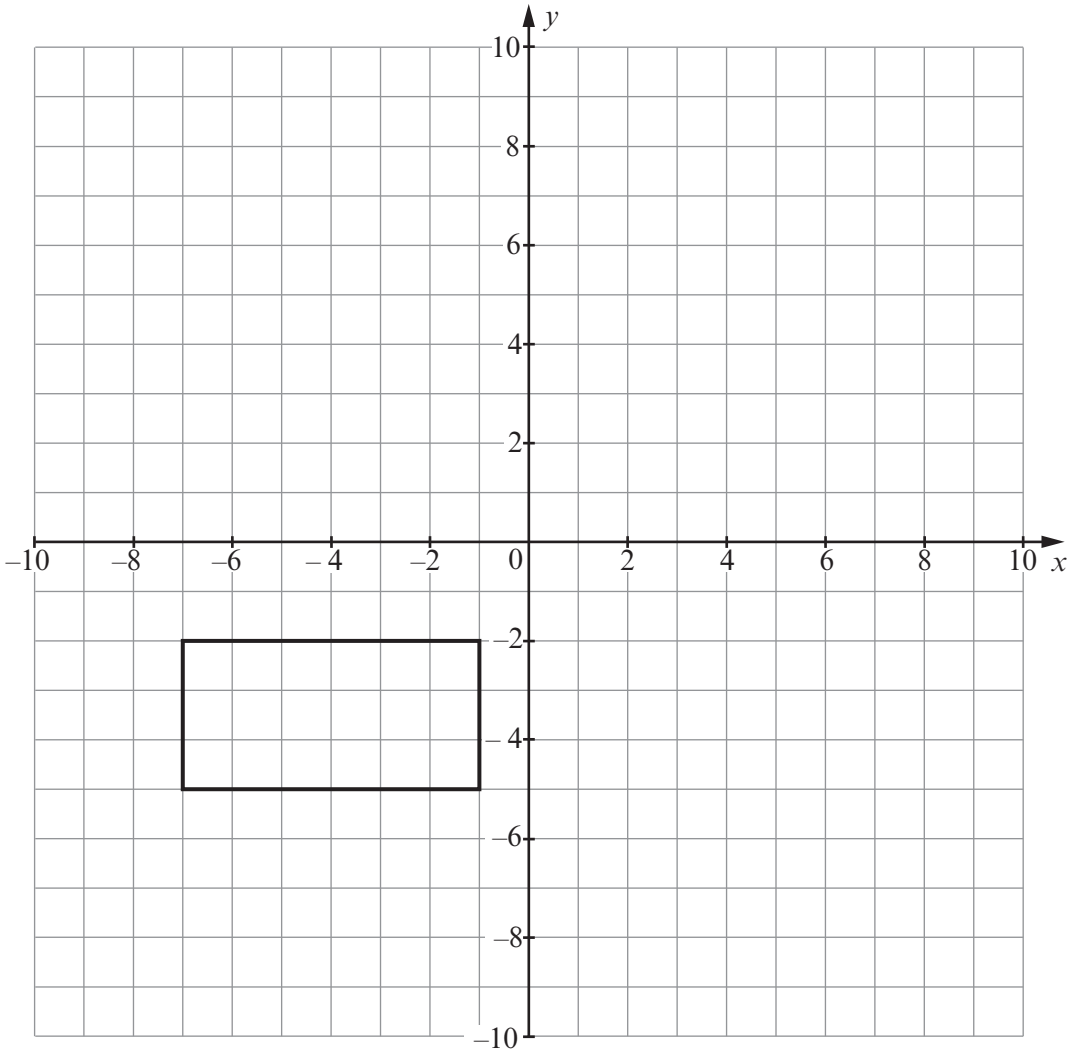
[1]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(d) Rotate the rectangle shown on the grid below through 90° clockwise about the origin.



[2]

4364
020009

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

5. *(a)* The ratio of black beads to yellow beads in a bag is 2 : 3.
Write down the fraction of the beads that are

(i) black,

.....

[1]

(ii) yellow.

.....

[1]

(b) In a class of 49 pupils, there are 21 boys.

(i) Write down the ratio of girls to boys in its simplest form.

.....

.....

[2]

(ii) What percentage of the class are girls? Give your answer correct to 3 significant figures.

.....

.....

.....

[3]

(c) Express, in its simplest form, the ratio 12 : 30 in the form 1 : ..... .

.....

.....

[1]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

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

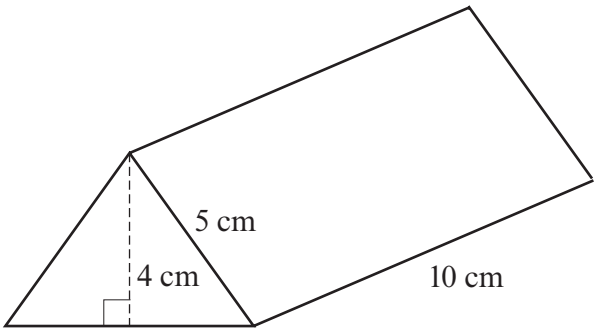


Diagram not drawn to scale

The volume of the triangular prism is $120\,cm^3$.
Explain and show through working how you know that the cross-section of the triangular prism is an isosceles triangle.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[7]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

7. You are given the following clue to find the number x.

Five times the number added to a quarter of the number is 18·9.

Use the clue to find the value of x.

[4]

8. A circle of radius 8·2 cm is cut out of a square piece of card.
The length of the side of the square is 23·4 cm.
What percentage of the card remains after the circle is cut out?

[5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

9. *(a)* Calculate the size of the angle marked x in the diagram.

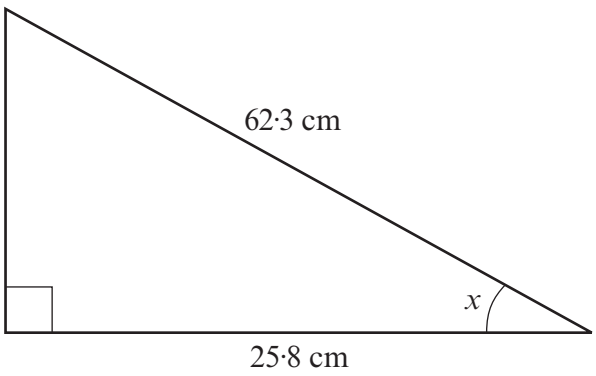


Diagram not drawn to scale

.....

.....

.....

.....

[3]

(b) Sam is working on a different calculation but she has forgotten her calculator.

She has just written "$\tan 34° = \frac{z}{14{\cdot}3}$" in her book.

Complete the calculation to find the value of z for Sam.

$$\tan 34° = \frac{z}{14{\cdot}3}$$

.....

.....

.....

.....

[2]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

10. *(a)* It takes eight workers six days to lay paving slabs to make a 230 metre straight path.

(i) Express the length of the path in millimetres, giving your answer in standard form.

.....

.....

.....

.....

[2]

(ii) How long would it take 3 workers to make the path?
You may assume that all workers work at the same rate.

.....

.....

.....

[2]

(b) It takes x workers d days to lay paving slabs to make a straight path.
Write an equation to give the time T, in days, that it would take w workers, working at the same rate, to make a path of the same length.

.....

.....

.....

.....

.....

.....

.....

[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

11.

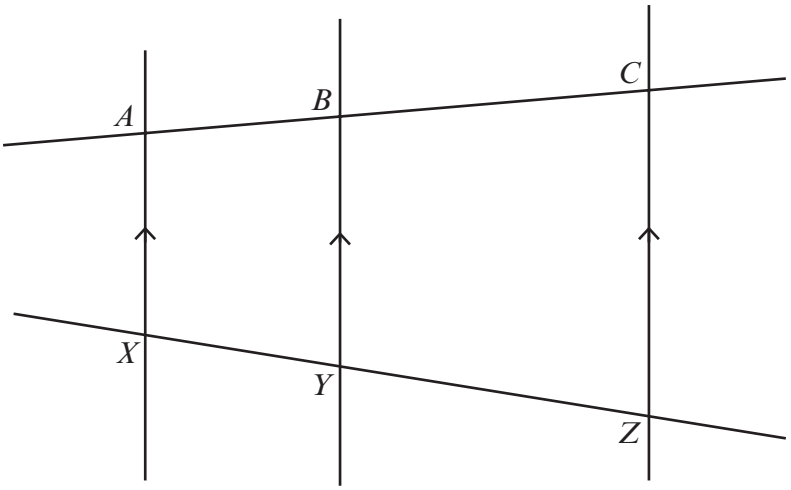


Diagram not drawn to scale

Given that $XY = 3{\cdot}25\,\text{cm}$, $YZ = 4{\cdot}55\,\text{cm}$ and $AC = 9{\cdot}6\,\text{cm}$, calculate the lengths of AB and BC.

.....

.....

.....

.....

.....

.....

.....

.....

[4]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

12. *(a)* Solve the following simultaneous equations using an algebraic method.

$$3x^2 + xy + 6 = 0$$
$$x + y = 8$$

[6]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

(b) Use the formula method to solve $2x^2 + 5x - 4 = 0$, giving your answer correct to 2 decimal places.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[3]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

13. A shopkeeper calculates the selling price of a coat by increasing the manufacturer's price by 18%.
In a sale, the shopkeeper reduced the selling price of the coat by 15%. The sale price of the coat was £90.27.
Calculate the manufacturer's price for the coat.

.....

.....

.....

.....

.....

.....

.....

.....

.....

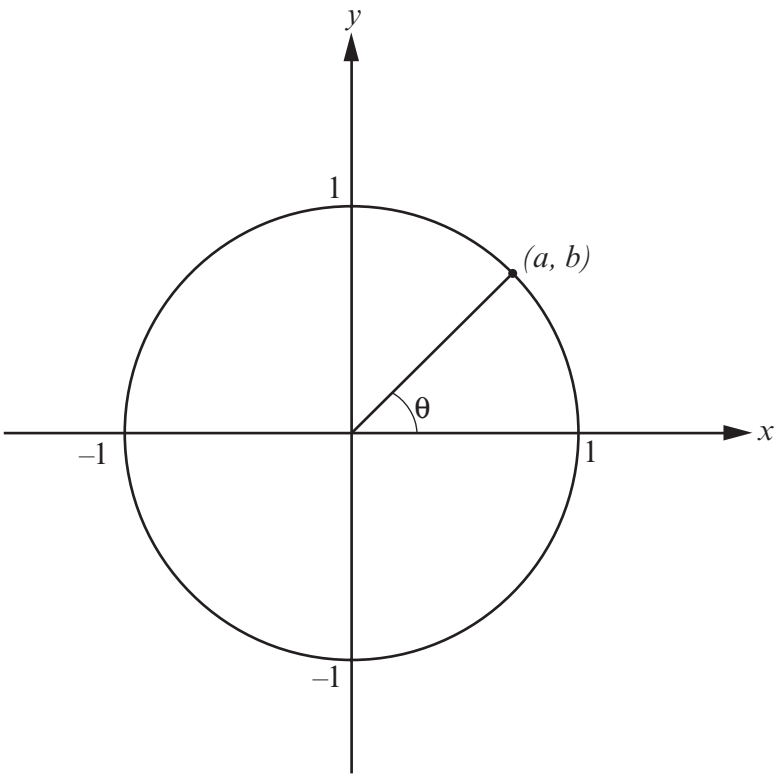
[5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

14. The sketch below shows a circle with its centre at the origin and radius 1 unit. The point (a, b) is a point on the circumference of the circle.



(a) The angle θ is shown on the diagram.
Complete the following statements, in terms of a and b.

(i) $\sin\theta =$

(ii) $\tan\theta =$

[3]

(b) Consider a general point (x, y) on the circumference of the circle to write down an equation of the circle in terms of x and y.

.....

.....

.....

[2]

© WJEC CBAC Ltd.

Turn over.

STEMUP.CO.UK

Examiner only

15.

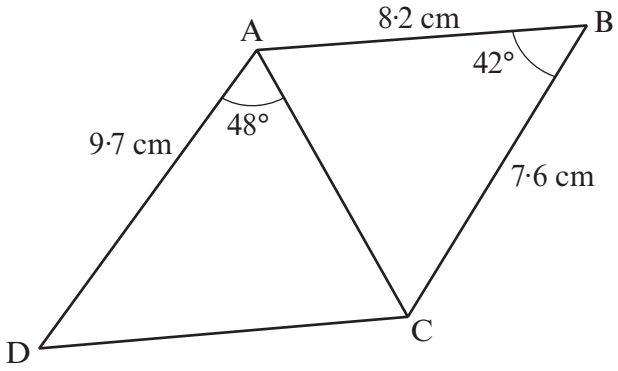


Diagram not drawn to scale

Calculate the area of the quadrilateral *ABCD*.

[5]

© WJEC CBAC Ltd.

STEMUP.CO.UK

Examiner only

16. Given that **OA** = 2**x** + 8**y**, **OB** = 4**x** + 7**y** and **CD** = 4**x** – 2**y**, explain the geometrical relationships between the straight lines AB and CD.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[3]

© WJEC CBAC Ltd.

STEMUP.CO.UK

GCSE MARKING SCHEME

METHODS IN MATHEMATICS (LINKED PAIR PILOT)

SUMMER 2012

© WJEC CBAC Ltd.

INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE METHODS IN MATHEMATICS (LINKED PAIR PILOT). 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.

© WJEC CBAC Ltd.

UNIT 2 (FOUNDATION TIER)

Methods 2 Foundation June 2012		FINAL
1.(a) ¼ | 0.25 | 7/10 | | 70(%) (b) 38/100 × 790 300.2 (c) 4/9 × 117 52 (d) ¼ × 40 (= 10) 30 scarves left 20% of 30 = 6 (30 – 6=) 24 left (e) 1/8	B2 B2 M1 A1 M1 A1 M1 A1 M1 A1 B1 13	Award B1 for each. Accept equivalent fractions for ¼ Award B1 for each. Accept equivalent fractions for 7/10 CAO Or equivalent CAO Or equivalent. Sight of 10 implies M1 FT 'their 30' or 40 Award SC3 for 45% of 40 = 18, 40 – 18 = 22 Award SC2 for 45% of 40 = 18 Award SC1 for 45/100 × 40
2.(a) Correct diagram (b) 4 1 0 4 1 2	B2 B3 5	-1 for each incorrect vertex Award B3 for all correct Award B2 for 4 or 5 correct Award B1 for 2 or 3 correct Accept 1 for shape B 0
3.Correct indication of Diameter Chord Sector	 B1 B1 B1 3	
4.(a) Perimeter = 30 (Area =) 4 × 11 = 44 (b) Showing a strategy of trialling a length & width that multiply to 20 **and** would make a perimeter of 24 (Length =)10(cm) **and** (Width =) 2(cm)	B1 M1 A1 M2 A1 6	 Award M1 for 4 × 11 seen but ward M0 for perimeter = 11 × 4 Award M1 Showing a strategy of trialling a length & width that multiply to 20 **or** would make a perimeter of 24 CAO. Do not penalise if length = 2(cm) and width = 10(cm)
5. Congruent shape drawn Similar shape drawn Correct "Full" explanation given Eg. A congruent shape is exactly the same size and a similar shape is a different size.	B1 B1 E2 4	Do not penalise incorrect labelling for diagrams drawn E1 for each If own shapes correctly drawn for congruent or similar shapes it must have a correct explanation to get B1 E1 for congruent shapes and/or B1 E1 for similar shapes.
6.(a) $x = 16$ (b) $x = 6$ (c) $x = 56$ (d) $3x = 12$ $x = 4$	B1 B1 B1 B1 B1 5	*Accept embedded answers throughout question* FT from one error eg 3x = 22 x = 22/3 award B0 B1

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods 2 Foundation June 2012		FINAL
7. Cost for 15 year olds (5 × 37.20=) (£)186 Cost for under 15s (9 × 25.40=) (£) 228.6(0) Total cost = (£)414.60 Saving = 15/100 × 414.60 Saving of (£)62.19	B1 B1 B1 M1 A1	FT their 5 × 37.20 + 9 × 25.40 Penalise -1 if further workings shown as saving e.g. saving = 414.60 - 62.19 = (£)352.41
<u>Alternative method 3</u> Week prices for 15 year olds = 186 B1 Week prices for under 15s = 228.6(0) B1 Total for week = 414.60 B1 Weekend prices 15 year olds = 37.20 – (15/100 × 37.20) = (£)31.62 Weekend prices for under 15s = 25.40 – (15/100 × 25.40) = 21.59 Total cost of weekend = 5 × 31.62 + 9 × 21.59 M1 (= 158.10 + 194.31) = 352.41 Saved (414.60 – 352.41=) 62.19 A1		<u>Alternative method 1</u> 15/100 × 37.20 = 5.58 15/100 × 25.40 = 3.81 9 × 3.81 + 5 × 5.58 = 62.19 Mark as M1 for 15% of either value, A1 for 5.58, A1 for 3.81, B1, B1 FT 9 × their 3.81 + 5 × 5.58 provided M1 A1 awarded <u>Alternative method 2</u> 15 year olds = 186 B1 Under 15's = 228.6(0) B1 15/100× 186 or 228.6(0) M1 27.90 and 34.29 A1 (£)62.19 A1 FT if M1 awarded and 2 values shown for 27.90 and 34.29 and one B1 awarded.
<u>Notes:</u> QWC2 can only be awarded if the correct unit is shown in the final answer. QWC2 requires words throughout the response not just connected to the final answer.		Watch for misread of 9 × 37.20 + 5 × 25.40 = 334.80 + 127 B1 for 334.80, B1 for 127 = 461.80 B1 15/100 × 461.80 M1 = (£)69.27 A1 MR -1
If 0 missing from both 414.60 and 228.60 will lose at least QWC1 Look for • spelling • clarity of labels • the use of notation (watch for the use of '=', '£' and '0' appropriately used) • 0 missing from both 414.60 and 228.60 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 in their 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 in their final answer	Q W C 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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
	7	

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods 2 Foundation June 2012		FINAL
8. Evidence of trying to count cubes Number of cubes = 48 Strategy to try to find 3 values that multiply to give 48 3 values that multiply to give 48 e.g. $2 \times 6 \times 4$	M1 A1 S1 B1 4	Award M1 if answer 'for 48' in range 44 - 52 inclusive or sight of 24 FT their 48
9. (a) 24.5 (b) 203.593	B1 B2 3	Accept 24.50 B1 for sight of 18.4 or 185.193. If only 201.5 or 203.6 or 203.59 shown award B1.
10. $6x - 2 = 4x + 5$ $2x = 7$ $x = 7/2$ (3.5) Length of side of square = $4 \times 3.5 + 5$ or $6 \times 3.5 - 2$ =19	 B1 B1 B1 M1 A1 5	If trials shown award B marks as: B1: for at least 2 sensible trials each substituted into both $4x + 5$ and $6x - 2$. B1: one trial ≥ 3.5 (that is too big) and one trial ≤ 3.5 (that is too small) B1 for 3.5 Follow through 'their x'
11.(a) 85:75 17:15 (b) 85/160 (c) 3/12 × 100 = 25(%) (d) 45/100 × 160 = 72 (72 + 98 =) 170 170/850 1/5	M1 A1 B1 M1 A1 M1 A1 B1 B1 B1 10	If boys : girls stated, accept 75:85 as M1 and then award A1 for 15:17 Award SC1 for 15:17 ISW FT their 72 provided M1 awarded FT provided their fraction simplifies
12. (a) Full explanation given Correct version = 4/3 or $1\ ^1/_3$ or 1.33(33333...) (b) $35x - 28 = 77$ OR $5x - 4 = 77/7$ $35x = 105$ $5x = 15$ $x=3$ (c) $6x < 42$ $x<7$	E1 B1 B1 B1 B1 M1 A1 7	Eg. Upside down dividing If no marks awarded, award SC1 for $x = 4 \div 3$ or 1.3 as evidence of understanding of error made. FT until 2nd error Accept an embedded answer of 3 No marks for use of "=", unless finally replaced to give $x<7$ then award M1 A1. SC1 for $x<52/6$ ISW
13.(a) Enlargement scale factor 2 Correct position (b) Correct reflection in $y = 2$ (c) Correct translation (d) Correct rotation	B2 B1 B2 B1 B2 8	B1 for any 3 lines correct, or consistent incorrect scale B1 for a reflection in $x=2$ or either axis, OR for sight of the line $y = 2$ B1 near miss, OR anticlockwise rotation

© WJEC CBAC Ltd.

STEMUP.CO.UK

UNIT 2 (HIGHER TIER)

Methods 2 Higher Summer 2012		FINAL
1. (a) x = 24×4/3 x = 32 (b) x = ½ or 0.5 or equivalent (c) 35x – 28 = 77 OR 5x – 4 = 77/7 35x = 105 5x = 15 x=3 (d) 6x < 42 x<7 (e) x > 67/3 or x>22.3… 23	 B1 B1 B1 B1 B1 B1 M1 A1 M1 A1 10	Accept embedded answers in parts (a), (b) & (c) FT from 1 error Mark final answer FT until 2nd error No marks for use of "=", unless finally replaced to give x<7 then award M1 A1. SC1 for x<52/6 ISW Or sight of 3×22 = 66 with 3×23 =69 Accept unsupported 23, or a unique answer of 23 from a trial and improvement method. Do not accept x>23
2.(a) 5w+w+5w+w or 12w $5w^2$ or 5w×w P = 12w AND A = $5w^2$ (b) ½ × 4 × (5 + 9) or equivalent = 28 (cm^2)	B1 B1 B1 M1 A1 5	Expression B0 for 5w + w × 2 or similar Expression Equations, CAO
3.(a) (432/960) × 100 45(%) (b) 820 - 820×24/100 OR 820 × 0.76 623.2 (c) 1.7 (e) 635 + … … + 12070 = 12705	M1 A1 M1 A1 B3 B1 B1 B1 10	Or equivalent full method Or equivalent full method B2 for 1.71(313…), OR B1 for 2.9(3483…) FT from B1, i.e. either 635 or 12070 correct, with sum of their 2 values calculated correctly
4.(a) Enlargement scale factor 2 Correct position (b) Correct reflection in $y = 2$ (c) Correct translation (d) Correct rotation	B2 B1 B2 B1 B2 8	B1 for any 3 lines correct, or consistent incorrect scale B1 for a reflection in $x=2$ or either axis, OR for sight of the line $y = 2$ B1 near miss (±2mm from grid lines), or anticlockwise rotation B0 if rotation shown in all quadrants
5.(a)(i) 2/5 (ii) 3/5 (b)(i) 4:3 (ii) (28/49) × 100 57.1(%) (c) 1: **2.5**	B1 B1 B2 M1 A2 B1 8	 FT 1 – (i) B1 for 28:21 with an attempt to find a common factor, or sight of 1.3•:1 or 1:0.75, or reverse answer 3:4 FT their 28, may be 21 used A1 for 57.142857…. rounded or truncated Accept 2 ½. Do not accept 30/12

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods 2 Higher Summer 2012		FINAL
6. Correct use of area cross section or volume, ½ × base × 4 ×10 (= 120) (Base of the cross section is) 6(cm) Use of Pythagoras' Theorem $5^2 = 4^2 + (\text{RHS base})^2$ RHS base = 3(cm) Conclusion e.g. 'small left hand side triangle is also 3cm, 4cm, 5cm (so cross section has two sides of length 5 cm, so it is isosceles)', 'isosceles as 3 is half of 6' Look for • spelling • clarity of text explanations and statements • the use of notation • units, cm, cm^2 and cm^3 For QWC2 there must be sufficient process steps shown, with text connecting throughout, or in full summary within a conclusion. Also units must be shown. Candidates not showing two stages working with the problem do not have sufficient process steps to be awarded QWC2. 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 in their 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 in their final answer	M1 A1 M1 A1 E1 Q W C 2 7	OR M1 for finding the area of the cross section $12(cm^2)$ Accept as a reverse calculation, i.e. using 6cm to show volume $120(cm^3)$ or area $12(cm^2)$ Accept M1, A1 if $4^2 + 3^2$ used to show side 5cm, or M1, A1 for reference to 3, 4, 5 triple Depends on **all** previous marks **If M1, A1 for base 6(cm), but M0, A0 or M1, A0 for Pythagoras' Theorem & E0 then possible award of: *SC1 for clear conclusion that it is an isosceles and its dimensions are (5cm,) 5cm with base 6cm* *OR* *SC1 for a clear conclusion that it is not isosceles based on incorrect use of, or an error in using Pythagoras' Theorem* 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 weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.
7. $5x + x/4 = 18.9$ $20x + x = 4 \times 18.9$ OR $21x/4 = 189$ $21x = 75.6$ $x = 3.6$	B1 B1 B1 B1 4	FT until 2nd error FT provided similar format, equivalent level of difficulty Accept FT from $5x + ¼ = 18.9$, giving $5x = 18.9 – ¼$ CAO *If B0, and similar level of difficulty but trial and improvement used, check their answer in their equation, if correct then award SC2. If SC2 not awarded, then for 2 correctly evaluated trials, 1 either side of the required value award SC1*

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods 2 Higher Summer 2012		FINAL
8. Area of circle = $\pi \times 8.2^2$ (211.(…)) Area of square = 23.4^2 or 23.4×23.4 (547.56) Area remaining, between 336.3 to 336.5(cm^2) inclusive Percentage = (area remaining/ 23.4^2) × 100 = 61(.4… %)	M1 M1 A1 M1 A1 5	 CAO FT their area remaining provided at least M1 CAO *Alternative:* *M1 Area of circle = $\pi \times 8.2^2$ (=211.(...))* *M1 area of square = 23.4^2 (=547.56)* *A1 $\pi \times 8.2^2$ / 23.4^2 (×100) correctly evaluated, 0.38, 0.385… and 0.386, or 38, 38.5, 38.6 or 39 (or as percentages) CAO* *M1 % remaining = 100×(1 - Area circle / Area square) (FT areas provided at least M1 awarded) or 1 – 38.5 or 38.6 or 39* *A1 61.(4..%) CAO*
9.(a) cos x = 25.8/62.3 65.5(3576…°) rounded or truncated (b) z = 14.3 × tan 34 9.6(454..) or 9.65	M1 A2 M1 A1 5	 A1 for $\cos^{-1}$ 0.4(141…) 65.8 comes from premature rounding, award M1 and A1 implied If 9.6… seen in working, award M1 A1, however if not seen and incorrectly rounded then M1, A0. An answer of 9.64 or 9.8 from correct working is M1, A0 An unsupported answer of 9 gets M0, A0.
10.(a)(i) 230 × 100 × 10 or 230 000 2.3×10^5 (ii) 8 × 6 ÷ 3 16 (days) (b) T = xd/w	B1 B1 M1 A1 B3 7	 FT 'their 230 000', but not 230, **correctly** expressed in standard form B2 for xd/w or T = xd/… or T = xd × … B1 for sight of xd
11. Sight of 9.6÷7.8 or 9.8/(3.25 + 4.55) or 9.6÷2.4 or 9.6×0.416(66..) or equivalent AB = 4(cm) BC = 5.6(cm)	B2 B1 B1 4	May be within a calculation or implied (2.4 = 7.8/3.25 and 0.4166… = 3.25/7.8) B1 for sight of 3.25:4.55 (or 5:7) or 3.25:7.8 or AB/BC = 3.25/4.55 or AB/9.6 = 3.25/(3.25+4.55) or equivalent *Alternative method:* *B1 x/(9.6-x) = 3.55/4.55 or simplified versions* *B1 4.55x = 3.25(9.6 – x) or equivalent rearrangement* *B1 AB = 4(cm)* *B1 BC =5.6(cm)*
12.(a) y = 8 – x OR x = 8 - y $3x^2 + x(8-x) + 6 = 0$ $3(8-y)^2 + (8-y)y + 6 = 0$ $2x^2 + 8x + 6 = 0$ $2y^2 – 40y + 198 = 0$ (x + 1)(x+3) = 0 (y -11)(y -9) = 0 x = -1, x = -3 OR y = 11, y =9 y = 9, y = 11 x = -3, x = -1 (b) $x = \{ -5 \pm \sqrt{(5^2 - 4\times2\times-4)}\} / 2\times2$ $x = \{ -5 \pm \sqrt{57}\} / 4$ 0.64 and -3.14	M1 M1 A1 m1 A1 A1 M1 A1 A1 9	 Allow 1 error in substitution Or by halving $x^2 + 4x + 3 = 0$ OR y^2 -20y +99=0 FT equivalent level of difficulty provided M1 Or alternative method to solve , e.g. formula with correct substitution and b^2-4ac correct simplified OR *SC1* for x= -1, y=9 **OR** x= -3, y=11 Allow 1 slip in substitution. Must be correct formula
13. Idea to work with £90.27 as 85% or considering the 2nd step as 118% of original price 90.27÷0.85 or equivalent 106.2(0) 106.2(0)÷1.18 (£)90	S1 M1 A1 M1 A1 5	 Maybe implied in further working FT their 106.2(0) provided >90.27

© WJEC CBAC Ltd.

STEMUP.CO.UK

Methods 2 Higher Summer 2012		FINAL
14.(a) Idea of right angled triangle shown or used with height b, base a $\sin\theta = b(/1)$ $\tan\theta = b/a$ (b) Use of Pythagoras' Theorem $x^2 + y^2 = 1$ or $x^2 = 1 - y^2$ or $y^2 = 1 - x^2$	M1 A1 A1 M1 A1 5	Either answer correct implies M1 Or $b/\sqrt{(a^2 + b^2)}$ M1 for $a^2 + b^2 = 1$ or $x^2 + y^2 = r^2$ CAO. Correct equation in any form
15. $AC^2 = 8.2^2 + 7.6^2 - 2\times8.2\times7.6\times\cos42$ $AC^2 = 32(.37\ldots)$ AC = 5.689.. or 5.7 (cm) $\frac{1}{2}\times8.2\times7.6\times\sin42 + \frac{1}{2}\times9.7\times AC\times\sin48$ Answers in the range 41.35 (cm^2) to 41.4(cm^2) inclusive	M1 A1 A1 M1 A1 5	 FT their AC, but not 8.2, 7.6 or 9.7 (20.85… + 20.50…)
16. **AB** = 2**x** – **y** Parallel **CD** twice length **AB** OR **AB** is ½ length **CD**	M1 A1 A1 3	

© WJEC CBAC Ltd.

STEMUP.CO.UK