WJEC GCSE METHODS IN MATHEMATICS

# MATHS



## EXAM QUESTION PACK

UNIT 1 HIGHER TIER 4363 PAPERS

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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

S16-4363-02

## METHODS IN MATHEMATICS

### UNIT 1: Methods (Non-Calculator)
### HIGHER TIER

A.M. THURSDAY, 26 May 2016

2 hours

**CALCULATORS ARE NOT TO BE USED FOR THIS PAPER**

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

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**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 $\pi$ as 3·14.

**INFORMATION FOR CANDIDATES**

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

Unless stated, diagrams are not drawn to scale.

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

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

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **7***(b)*.

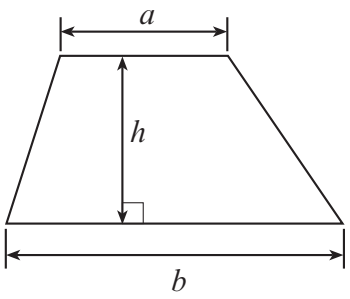
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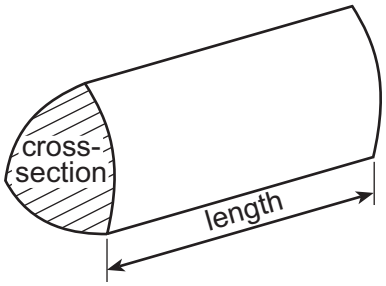
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## Formula List

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

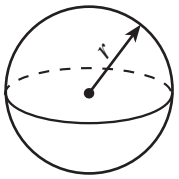



**Volume of prism** = area of cross-section × length



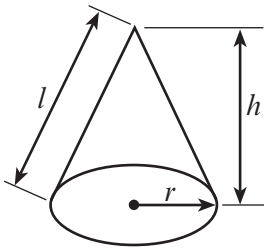

**Volume of sphere** = $\frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** = $\pi rl$

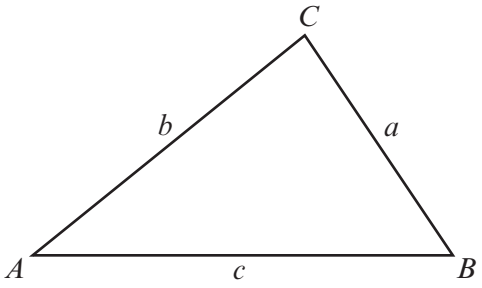



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

where $a \neq 0$ are given by

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

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**1.**

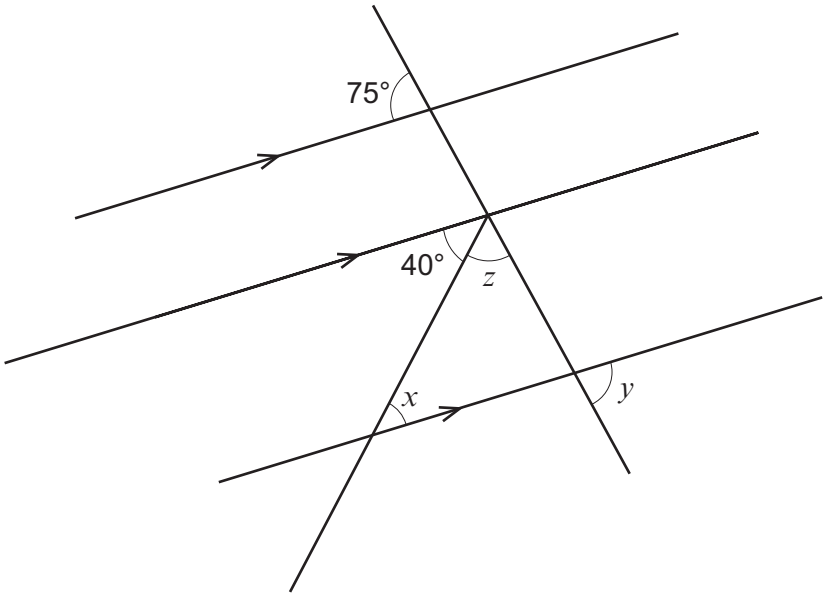



*Diagram not drawn to scale*

Find the sizes of angles $x$, $y$ and $z$. [4]

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$x$ = ..... ° $y$ = ..... ° $z$ = ..... °

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

| Fraction | Decimal | Recurring or terminating? |
|---|---|---|
| $\frac{1}{3}$ | $0\cdot\dot{3}$ | ..... |
| $\frac{5}{8}$ | ..... | ..... |
| $\frac{3}{11}$ | ..... | ..... |

*(b)* Express $\frac{0\cdot3\,\overline{\text{w}}0\cdot9}{5\cdot4}$ as a fraction in its simplest form. [3]

*(c)* A number is multiplied by 12 and then 56 is added before finally dividing by 100. This leads to an answer of 2.
What is the original number? [2]

Original number is .....

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**3.** *(a)* Given that $d = -2$, $e = 3$ and $f = 5$, find the value of each of the following.

(i) $d^3$ [1]

(ii) $e^2 + df$ [1]

(iii) $\frac{1}{f}e - d$ [1]

*(b)* Simplify each of the following.

(i) $6g - 22h - 14g - 7h$ [2]

(ii) $\frac{x+8^{\,5}}{x+8^{\,4}}$ [1]

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**4.** Use the clues to write down the names of each of the following quadrilaterals.

*(a)* This quadrilateral has:

- 4 equal sides,
- diagonals of different lengths. [1]

This quadrilateral is a .....

*(b)* This quadrilateral has:

- diagonals that intersect at right angles,
- only one pair of opposite angles which are equal,
- 2 pairs of adjacent sides equal in length,
- no reflex angles. [1]

This quadrilateral is a .....

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**5.** *(a)* (i) Express 600 as a product of prime factors using index form. [3]

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(ii) What is the least number 600 should be multiplied by to give an answer that is a square number? [1]

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*(b)* Calculate the larger amount when £440 is divided in the ratio 5 : 6. [2]

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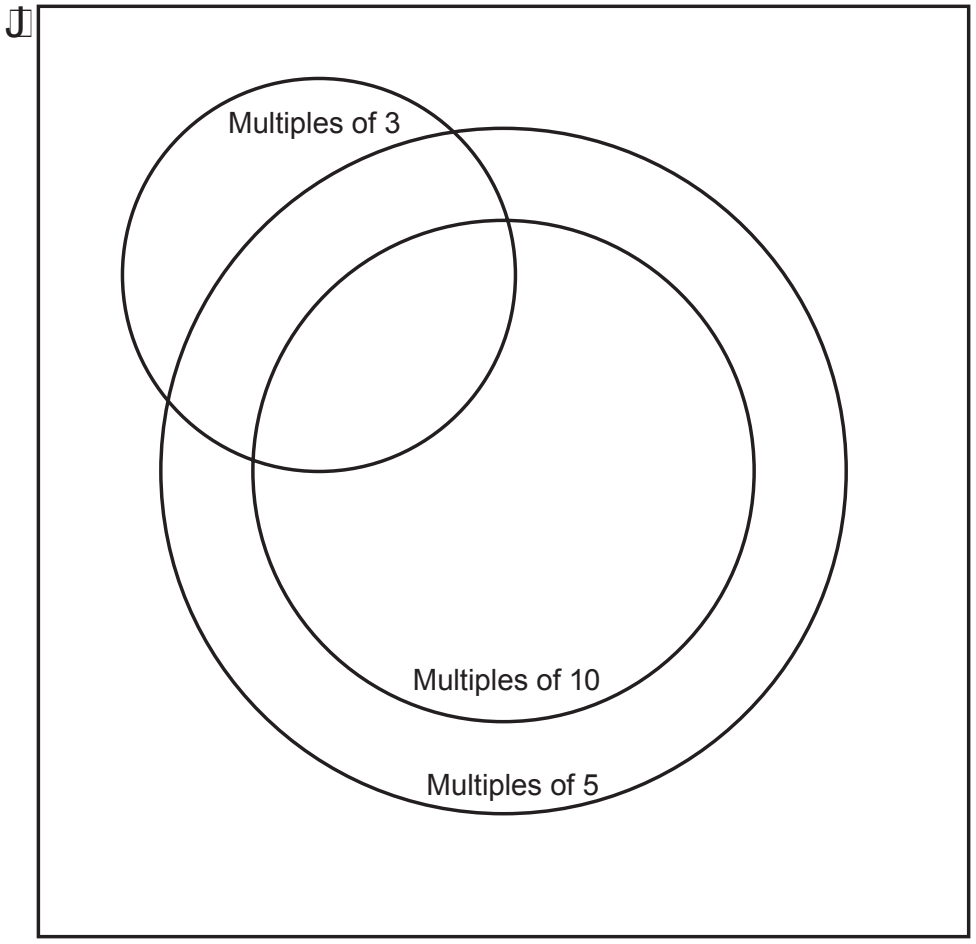
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**6.** *(a)* A Venn diagram is shown below.
Explain why the circle to represent multiples of 10 is drawn inside the circle to represent multiples of 5. [1]

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*(b)* (i) Place each of the six numbers 30, 32, 33, 35, 40, 45 in the correct position in the Venn diagram. [3]

(ii) A number is selected at random from the set {30, 32, 33, 35, 40, 45}.

Find the probability that the number selected is

a prime number, .....

a multiple of 10 that is also a multiple of 3, .....

neither a multiple of 3 nor 10. ..... [3]

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**7.** *(a)* Each **exterior** angle of a regular polygon is 18°.
How many sides does this regular polygon have? [2]

..... sides

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

Three of the **interior** angles of a pentagon are 125°, 130° and 135°.
The other two angles are equal.
Find the size of the other two angles. [7]

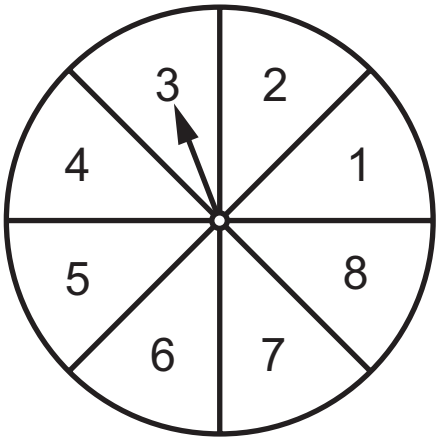


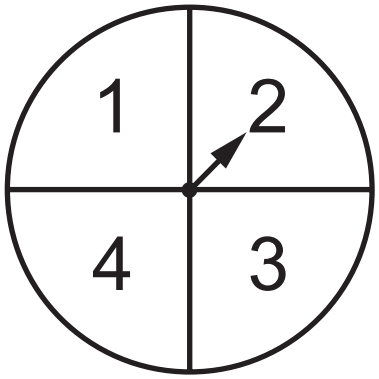
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**8.** A game is played in which these two spinners are spun at the same time.




The score is the **product** of the 2 numbers shown on the spinners.
In this example the score is 6, as 3 × 2 = 6.

*(a)* If the game were to be played 96 times, how many times would you expect to score 6? [3]

*(b)* Explain why even number scores are more likely than odd number scores. [2]

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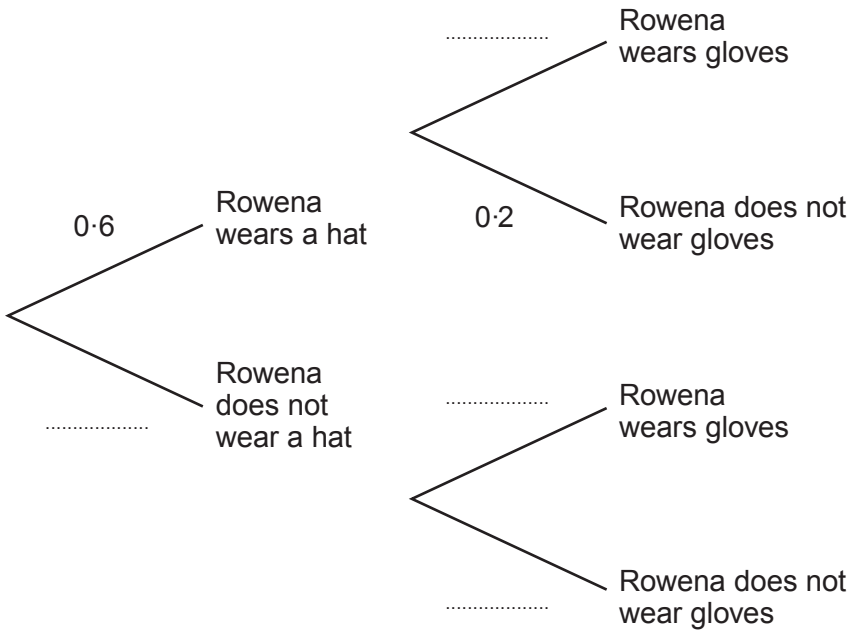
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**9.** Rowena sometimes wears a hat and sometimes wears gloves.

The probability that she wears a hat on a given day is 0·6.
The probability that she **does not** wear gloves on a given day is 0·2.
Wearing a hat and wearing gloves are independent.

*(a)* Complete the following tree diagram. [2]




*(b)* Calculate the probability that, on a given day, Rowena wears a hat but does not wear gloves. [2]

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*(c)* Calculate the probability that, on a given day, Rowena **does not** wear a hat or gloves. [2]

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**10.** *(a)* Evaluate $\frac{8\sqrt{5} \times \sqrt{3} \div \sqrt{6}}{2\sqrt{5}}$. [2]

*(b)* Evaluate $\frac{25^{\frac{1}{2}} \times 18}{\sqrt{9^2}}$. [3]

*(c)* Write 0·00006 in standard form. [1]

*(d)* Evaluate $\frac{3{\cdot}6 \times 10^8}{1{\cdot}2 \times 10^{-4}}$, giving your answer in standard form. [2]

*(e)* Simplify $\frac{5x}{2} + \frac{3x}{4}$.

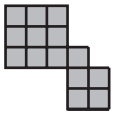
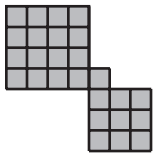
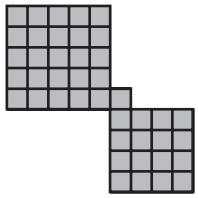
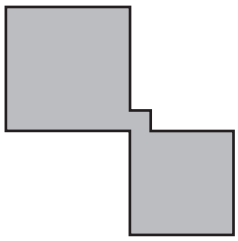
Give your answer in terms of $x$. [2]

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**11.** Use the table below to find an expression for the number of small squares in pattern number $n$. [3]

| Pattern number | Shape | Number of small squares |
|---|---|---|
| 1 |  | 6 |
| 2 |  | 14 |
| 3 |  | 26 |
| 4 |  | |
| | | |
| $n$ |  | ..... |

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**Turn over.**

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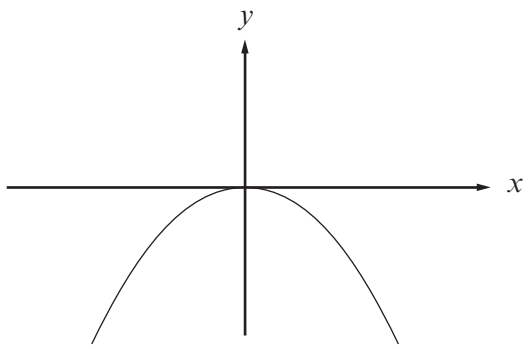
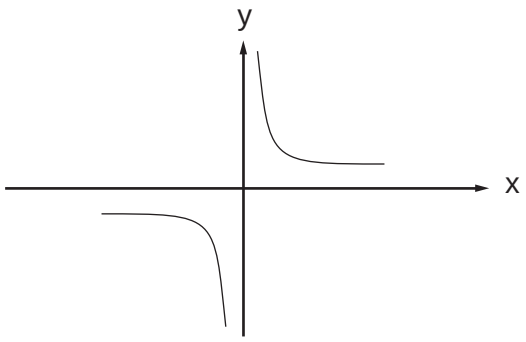
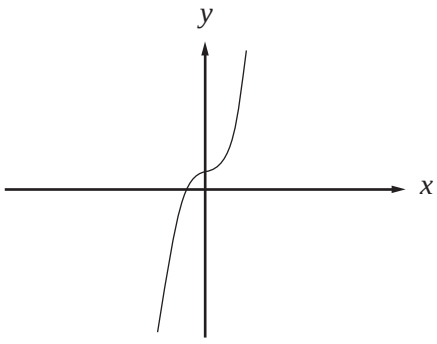
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**12.** Match each of the graphs shown below with an equation from the following list. [3]

$y = x^2 + 1$ $\quad y = x^2 - 1$ $\quad y = x^3 + 1$ $\quad y = x^3 - 1$

$y = -x^3$ $\quad y = -x^2$ $\quad y = -x^2 + 1$ $\quad y = -x^3 + 1$

$y = \frac{1}{x}$ $\quad y = \frac{-1}{x}$ $\quad y = x$ $\quad y = -x$

| | |
|---|---|
|  | $y =$ ..... |
|  | $y =$ ..... |
|  | $y =$ ..... |

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**13.**

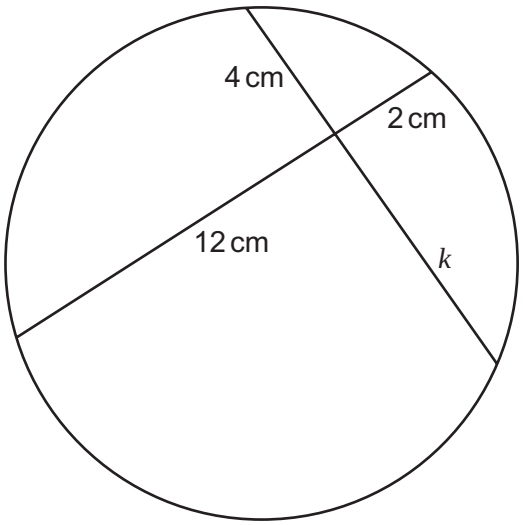



*Diagram not drawn to scale*

Find the length of the line marked $k$. [2]

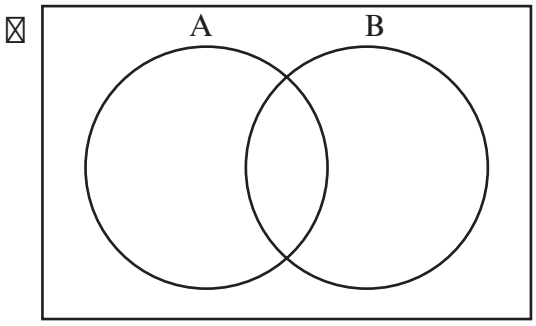
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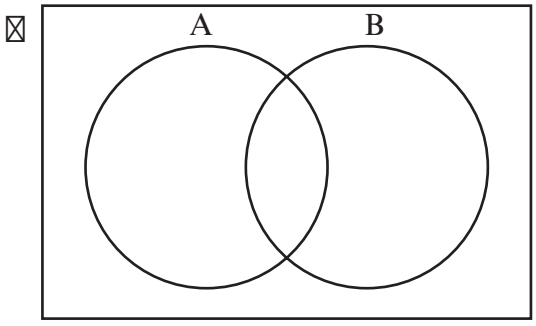
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**14.** On each Venn diagram, shade the appropriate region.

*(a)* A B [1]




*(b)* (A B)' [1]

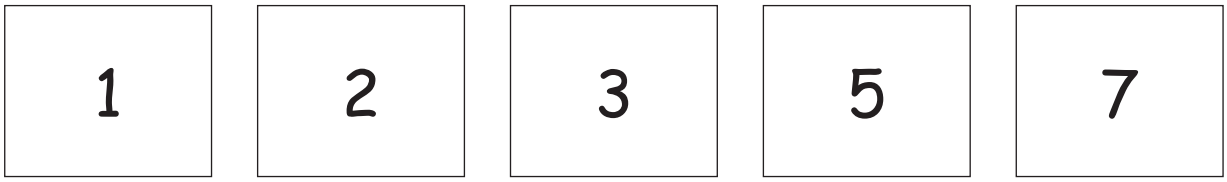



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**15.**




Five cards are numbered 1, 2, 3, 5 and 7 respectively.
The cards are shuffled and **two** cards are chosen at random.

*(a)* Write down the probability that at least one of the chosen cards shows an odd number. [1]

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*(b)* Calculate the probability that the **difference** between the numbers on the chosen cards is odd.
You must show your working. [3]

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**16.** *(a)* Show that the following identity is true. [4]

$$(x + 2)(2x - 5) + (1 - x)(3 + 2x) + 1 \equiv 2(x + 3)$$

*(b)* Simplify $\dfrac{x^2 + 7x + 12}{x^2 - 9}$. [3]



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**17.** The diagram shows two circles of equal radii with centres *A* and *B* joined with a straight line.
The line *TSP* is a tangent to both circles.
*S* lies on the circumference of both circles.
*E* and *F* lie on the circumference of one of the circles.
*G* and *H* lie on the circumference of the other circle.

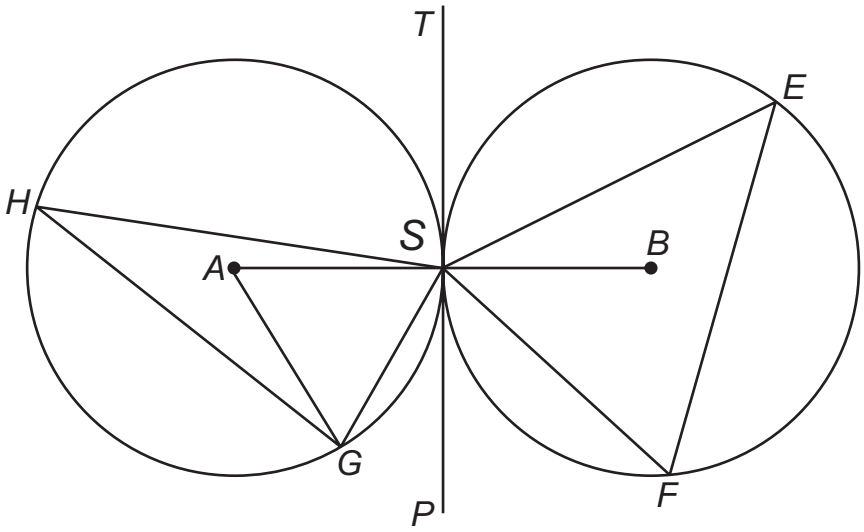



*Diagram not drawn to scale*

You are given that $S\hat{E}F = 2x°$ and $G\hat{S}P = x°$.

*(a)* State the size of each of the following angles in terms of $x$.

(i) $G\hat{S}F$. [1]

.....

.....

(ii) $A\hat{S}G$. [1]

.....

.....

(iii) $S\hat{A}G$. [1]

.....

.....

*(b)* *J* is the mid-point on the minor arc of the circle between *S* and *F*.
State the size of $S\hat{J}F$ in terms of $x$.
Give the reason for your answer. [2]

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**18.** *(a)* Express the following as a single fraction in its simplest terms. [3]

$$\frac{2x-3}{3} - \frac{x+5}{4}$$

*(b)* Express $x^2 + 18x + 100$ in the form $(x + a)^2 + b$ where $a$ and $b$ are values to be found. [2]

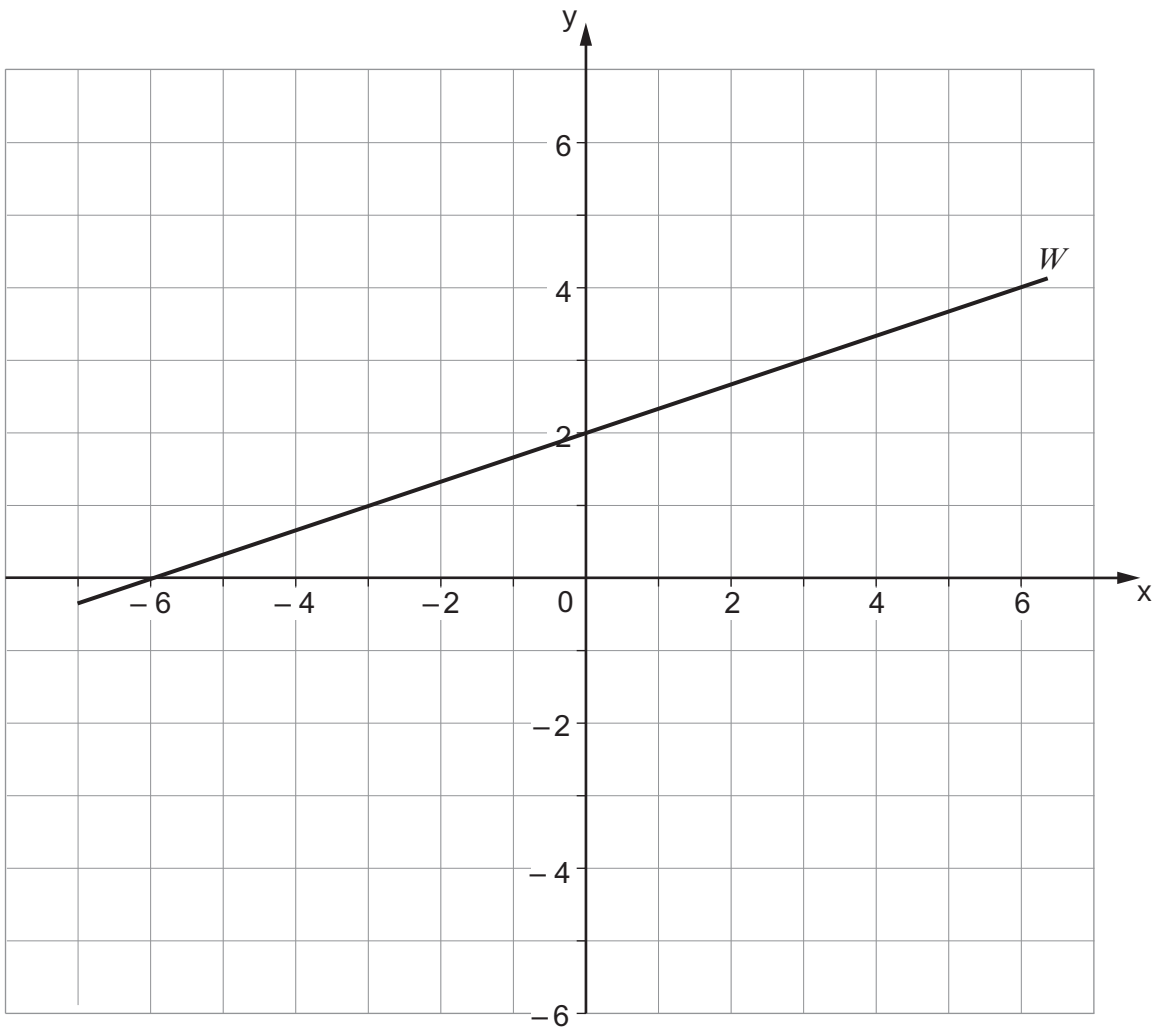
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**19.** A straight line, $W$, is shown on the axes below.




*(a)* The straight line, $V$, is parallel to $W$ and passes through (0, –5).
Find the equation of $V$.
Write your answer in the form $y = mx + c$. [2]

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*(b)* The straight line, $Z$, is

- perpendicular to the straight line $W$, and
- passes through the mid-point of (6, 5) and (–2, –5).

Find the equation of $Z$.
Write your answer in the form $y = mx + c$. [4]

**END OF PAPER**

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# GCSE MARKING SCHEME

## SUMMER 2016

## GCSE MATHEMATICS LINKED PAIR METHODS
## UNIT 1 HIGHER
## 4363-02

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## INTRODUCTION

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

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

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

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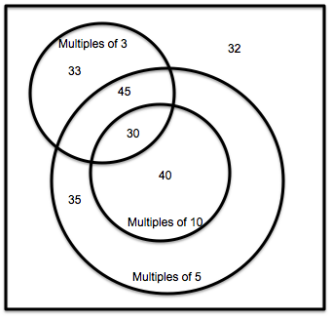
# METHODS IN MATHEMATICS
# UNIT 2 (HIGHER TIER) SUMMER 2016

| Methods in Mathematics<br>Unit 1 Higher Tier | Mark | Comments |
|---|---|---|
| 1. x= 40(°)<br>y = 75(°)<br>Sight of 180 – 75 – 40 or 105 – 40 or equivalent<br>z = 65(°) | B1<br>B1<br>M1<br>A1<br>4 | <br><br>FT 180 – 'their x' – 'their y'<br>FT 180 – 'their x' – 'their y' correctly evaluated |
| 2(a) 0.625<br>0.2727… or 0.27<br>Recurring, Terminating, Recurring | B1<br>B1<br>B1 | <br><br>FT provided at least 1 of the decimals is correct, i.e. at least B1 previously awarded |
| (b) $\frac{0.27}{5.4}$ or $\frac{0.9}{18}$ or $\frac{0.3}{6}$ or equivalent correct 1st step<br>$\frac{27}{540}$ or $\frac{9}{180}$ or $\frac{3}{60}$ or 0.05<br>1/20 | M1<br>M1<br>A1 | Allow for sight of 0.27<br>FT expressing as a fraction (with whole number numerator and denominator) provided equivalent level of difficulty, 2.7/5.4 = 27/54 or ½ is equivalent level of difficulty (M0, M1, A0)<br>CAO |
| (c) Method that '… × 12 + 56 = 200, or<br>$\frac{\ldots \times 12 + 56}{100} = 2$<br>Number is 12 | M1<br>A1<br>8 | OR 2×100, then 'their 200' – 56, then 'their 144' ÷ 12, or trial & improvement with correct operations in the correct order<br>CAO |
| 3(a)(i) -8<br>(ii) -1<br>(iii) 1 | B1<br>B1<br>B1 | <br><br> |
| (b)(i) -8g – 29h as an expression<br>(ii) x + 8 | B2<br>B1<br>6 | B1 for either -8g or -29h<br>Mark final answer<br>Accept $(x + 8)^1$ |
| 4.(a) rhombus<br>(b) kite | B1<br>B1<br>2 | <br>Do not accept diamond |
| 5.(a)(i) Method that produces prime factors with 2 correct primes before the 2nd error<br>Prime factors: 2, 2, 2, 3, 5, 5<br>$2^3 \times 3 \times 5^2$<br>(ii) 2×3 or 6 | M1<br>A1<br>B1<br>B1 | <br>Ignore 1s included<br>FT for equivalent level of difficulty<br>FT for equivalent level of difficulty from (i) |
| (b) 440 × 6 ÷ 11<br>(£)240 | M1<br>A1<br>6 | <br>Allow with sight of the smaller share |



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| Methods in Mathematics<br>Unit 1 Higher Tier | Mark | Comments |
|---|---|---|
| 6(a) Reason, e.g. 'all multiples of 10 are multiples of 5', 'multiples of 10 are also multiples of 5', 'not all multiples of 5 are multiples of 10', 'multiples of 10 is a subset of multiples of 5' | E1 | Do not accept 'some multiples of 10 are also multiples of 5' |
| (b)(i) 6 numbers placed correctly<br><br> | B3 | B2 for 4 or 5 numbers uniquely placed correctly, the other 2 or 1 number(s) respectively omitted or incorrectly placed or repeated, OR<br>B1 for 2 or 3 numbers uniquely placed correctly, the other 4 or 3 numbers respectively omitted or incorrectly placed or repeated<br><br>*Penalise extra numbers included -1 throughout*<br><br>*In (b)(ii) ignore incorrect cancelling.*<br>FT their Venn diagram |
| (ii) 0<br>1/6<br>2/6 ( = 1/3 ) | B1<br>B1<br>B1<br>7 | CAO |
| 7(a) 360 ÷ 18<br>20 (sides) | M1<br>A1 | Or equivalent **complete** method |
| (b) (Total of interior angles) 3×180(°) | M1 | or 5 × (180(°) - 360(°) ÷ 5 )<br>alternative full method |
| 540(°) | A1 | |
| 125(°) + 130(°) + 135(°) + …. + …. = sum of interior angles of a polygon | M1 | FT 'their 540' provided > 390 |
| (540(°) – 390(°))÷ 2 or 150(°)/2 | m1 | Rearranged form or manipulated correctly to this stage of working |
| (Each interior angle is ) 75(°) | A1 | *Alternative:*<br>*(Exterior angles are)*<br>*180(°) – 125(°),180(°) – 130(°) & 180(°) – 135(°)* *M1*<br>*(Each remaining exterior angle) FT from M1*<br>*360(°) – 55(°) - 50(°) – 45(°)* *M1*<br>*÷ 2* *m1*<br>*(depends on at least M1 previously awarded)*<br>*(Each exterior angle is) 105(°) CAO A1*<br>*(Each interior angle is) 75(°) A1*<br>*FT 180 – 'their 105' provided M1, M1 and m1 awarded* |
| QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**AND**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**OR**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer | QWC 2<br><br><br><br><br><br><br><br><br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |



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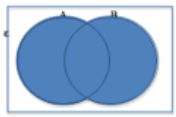
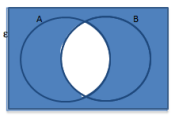
| Methods in Mathematics<br>Unit 1 Higher Tier | Mark | Comments |
|---|---|---|
| 8(a) Showing 6 can be scored in 3 ways,<br>6×1 2×3 (and 3×2) with no others<br>Idea that there are 32 possible outcomes<br><br>9 | B1<br><br>B1<br><br>B1 | Do not accept if 1×6 also given<br><br>Accept from sight of 4 × 8 or 1/8 × ¼ or similar<br>Allow from incorrect evaluation of a suitable calculation<br><br>FT 'their 3 ways' provided 6×1 is considered or 'their 32' outcomes provided their number of outcomes is >24, that is<br>(96 ÷ 'their number of outcomes')× 'their 3 ways', accept approximation or rounding of division to a whole number<br>An answer only given as a probability, 9/96, is awarded B1, B1, B0 |
| (b) Considering all possibilities, e.g.<br>odd×even=even, even×odd=even, odd×odd=odd and even×even=even, OR<br><br>Appropriate conclusion, e.g. stating that possible products more often give even, OR<br>stating possibility of odd 8 times with even 24 times, or equivalent, OR P(even) = 24/32 or P(odd) = 8/32<br><br>5 | B1<br><br>E1 | Accept for sight of 24/32 or 8/32<br><br>FT from 2 errors in the evaluation of the products<br><br>*Award B1 and E1 for a statement such as*<br>*'You **only** get odd numbers from odd times odd'*<br><br>If no marks, award SC1 for 'even × odd = even' with an appropriate conclusion stated |
| 9(a) Correctly completing the tree diagram 0.4, 0.8. 0.8, 0.2<br>(b) 0.6 × 0.2<br>= 0.12<br><br>(c) 0.4 × 0.2<br>= 0.08<br>6 | B2<br><br>M1<br>A1<br><br>M1<br>A1 | B1 for any one pair of branches correct (total 1)<br><br><br>Or equivalent<br><br>FT for their tree diagram<br>Or equivalent |

| | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** |
|---|---|---|---|---|---|---|---|---|
| **1** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **2** | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 |
| **3** | 3 | 6 | 9 | 12 | 15 | 18 | 21 | 24 |
| **4** | 4 | 8 | 12 | 16 | 20 | 24 | 28 | 32 |



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| Methods in Mathematics<br>Unit 1 Higher Tier | Mark | Comments |
|---|---|---|
| 10(a) 12 | B2 | B1 for one **appropriate** step, e.g. cancelling $\sqrt{5}/\sqrt{5}$, or sight of $\sqrt{9}$ or 3, not $(\sqrt{3})^2$<br>Do not accept $4\sqrt{45}/\sqrt{5}$ until simplified |
| (b) 10 (with no working or from correct working) | B3 | B2 for 5 AND …/9 respectively<br>B1 for 5 OR …/9 respectively<br>For B2or B1 the 5, …/9 may be in working, rather than expressed as a quotient |
| (c) $6 \times 10^{-5}$ | B1 | |
| (d) $3 \times 10^{12}$ | B2 | B1 for 3 000 000 000 000 or sight of … $\times 10^{12}$ |
| (e) $\frac{17\pi}{4}$ or $4\frac{1}{4}\pi$ or $4.25\pi$ | B2<br><br>10 | Mark final answer<br>B1 for $\frac{10\pi}{4} + \frac{7\pi}{4}$ or $2.5\pi + 1.75\pi$ or equivalent |
| 11. Strategy, e.g. 'square + 1 + square' OR attempt to look at second difference | S1 | OR break down, for a couple of patterns into:<br>" 'larger square' + 1 + 'smaller square' "<br>Maybe implied by … + $n^2$ or $(n+1)^2$ + … or for example '$6^2 + 5^2 + 1$', OR for giving the correct number of squares in any pattern number >4 (strictly >4, not for pattern 4), not for Pattern number 5 written in the table for Pattern n, but allow if shown in a sequence |
| $(n + 1)^2+1$ + … or … + 1+ $n^2$ or second difference 4 | M1 | Implies S1 also.<br>Allow for '$n^2 + 1 + n^2$' or '$n^2 + 1 + (n-1)^2$ or similar |
| $(n + 1)^2$ + 1 + $n^2$ or $2n^2 + 2n + 2$ or equivalent | A1<br><br>3 | ISW<br>$n+1 \times n + 1 + 1 + n^2$ is awarded S1, M1, A0 |
| 12. $y = -x^2$<br>$y = 1/x$<br>$y = x^3 + 1$ | B1<br>B1<br>B1<br>3 | |
| 13. $12 \times 2 = 4 \times k$<br>$k = 6$ (cm) | M1<br>A1<br><br>2 | Do not accept from incorrect working, e.g. 4 + 2, is awarded M0, A0 |
| 14(a) Correct region shaded  | B1 | |
| (b) Correct region shaded  | B1<br><br>2 | |



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| Methods in Mathematics<br>Unit 1 Higher Tier | Mark | Comments |
|---|---|---|
| 15.<br>(a) 1 or equivalent | <br>B1 | *Penalise incorrect cancelling of fractions-1 once* |
| (b) P(odd, even) + P(even, odd) | S1 | OR listing 10 correct no reverse combinations, or 20 correct combinations, or sight of 20 outcomes (e.g. for 5 × 4) |
| 4/5 ×1/4 + 1/5 (× 4/4) | M1 | Listing all 20 combinations and selecting the correct 8 odd results, or 10 combinations and selection of 4 odd results |
| = 8/20 ( = 4/10 = 2/5) | A1<br>4 | Accept a correct answer from 10 possible combinations.<br>Allow M1 A0 if FT from 1 slip in counting the combinations |
| 16(a) $2x^2 + 4x – 5x -10 + 3 – 3x + 2x – 2x^2 (+ 1)$ or<br>$2x^2 – x -10 + 3 – x – 2x^2 (+ 1)$ | M2 | M1 for any 4 terms correct |
| $-2x – 6 =$ | A1 | |
| $-2(x + 3)$ | A1 | Must be convincing from sight of $-2x – 6$<br>Allow expanding RHS provided M2, A1 previously awarded |
| (b) $(x + 3)(x + 4)$ | B1 | |
| $(x + 3)(x – 3)$ | B1 | |
| $\frac{x + 4}{x – 3}$ | B1<br>7 | Mark final answer. FT for equivalent level of difficulty provided B1 previously awarded and cancelling required |
| 17(a)(i) 3x(°) or equivalent | B1 | Mark final answer |
| (ii) 90(°) – x(°) | B1 | Mark final answer |
| (iii) 2x(°) | B1 | Mark final answer |
| (b) 180(°) – 2x(°) or equivalent | B1 | Mark final answer |
| Reason, '(Opposite angles of a) cyclic quadrilateral (are supplementary)' | E1<br>5 | Depends on the sight of SĴF = 180(°) – 2x(°) or equivalent |
| 18(a) 4(2x – 3) – 3(x + 5) as a numerator | B1 | Not depending on a correct denominator |
| 12 as a denominator | B1 | Attempt common denominator 12 or multiple of 12 |
| $\frac{5x - 27}{12}$ | B1 | Mark final answer |
| (b) $(x + 9)^2 + 19$ | B2<br>5 | B1 for a= (+)9, B1 for b = (+)19, only award B2 for $(x +9)^2 + 19$ |
| 19(a) y = ⅓ x – 5 or equivalent | B2 | Accept y = 2x/6 + - 5 or equivalent<br>Mark final answer<br>B1 for m = ⅓ or equivalent,<br>B1 for c = -5<br>Only award B2 if given as an equation |
| (b) Perpendicular gradient -3 | M1 | FT -1/their m |
| Mid point $\frac{6+ -2}{2}$ or $\frac{5 + -5}{2}$ | M1 | Sight of ( …, 0) is insufficient evidence for M1<br>Accept attempt to plot the 2 points with attempt to find the mid-point |
| (2, 0) | A1 | |
| y = -3x + 6 | A1<br>6 | ISW. FT provided M1 and M1 both awarded |



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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

W16-4363-02

## METHODS IN MATHEMATICS

### UNIT 1: Methods (Non-Calculator)
### HIGHER TIER

A.M. MONDAY, 11 January 2016

2 hours

**CALCULATORS ARE NOT TO BE USED FOR THIS PAPER**

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

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**ADDITIONAL MATERIALS**

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 $\pi$ as 3·14.

**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***(a)*.

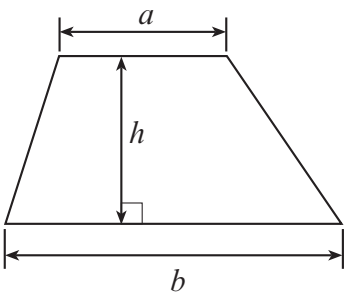
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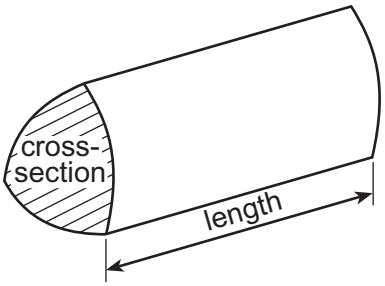
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## Formula List

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

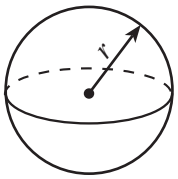



**Volume of prism** = area of cross-section × length



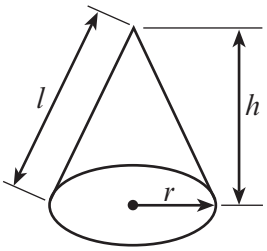

**Volume of sphere** $= \frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** $= \pi rl$

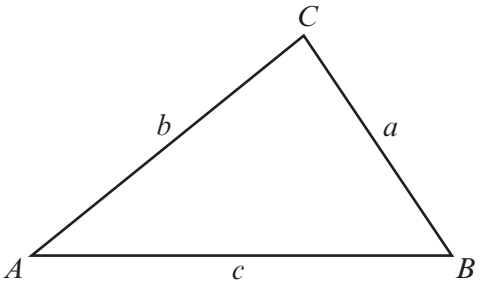



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

where $a$, $b$ and $c$ are given by

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

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**1.** *(a)*

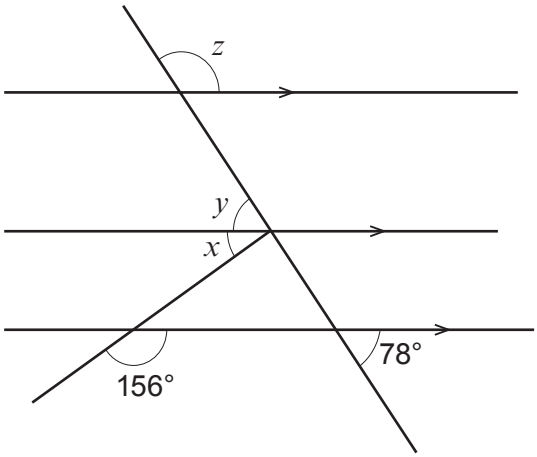



*Diagram not drawn to scale*

Calculate the size of angles $x$, $y$ and $z$. [3]

.....

.....

.....

.....

.....

$x$ = ..... ° $y$ = ..... ° $z$ = ..... °

*(b)*

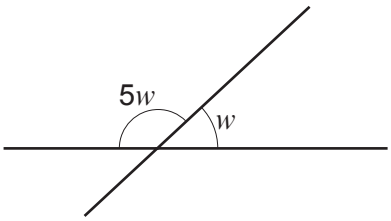



*Diagram not drawn to scale*

Calculate the size of angle $w$. [2]

.....

.....

$w$ = ..... °

5

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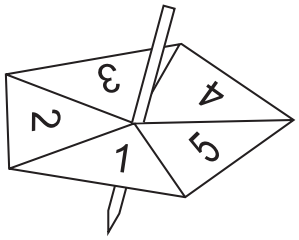
**Turn over.**

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**2.** A spinner is labelled with the numbers 1, 2, 3, 4 and 5.




After 100 spins, the outcomes were recorded.
The table shows some of the results.

| Number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Frequency | 44 | ..... | 22 | 10 | ..... |

*(a)* The frequencies of the numbers 2 and 5 are in the ratio 1 : 2.
Complete the table above. [3]

.....

.....

.....

.....

.....

.....

*(b)* Write the best estimate of the probability of each of the following:

(i) the number 3 occurring, [1]

.....

.....

(ii) a number greater than 1 occurring. [2]

.....

.....

.....

*(c)* Would you consider this to be a fair spinner?
You must give a reason for your answer. [1]

.....

.....

.....

7

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**3.** *(a)* Given that $a = 2$, $b = -1$ and $c = -6$, find the value of $\dfrac{4a - 3c}{b^2 + 1}$. [2]

*(b)* Simplify $68x - 18y - 70x - 7y$. [2]

4

**4.** Use **estimation** to complete the table below. [4]

| Number | Accuracy required | Rounded number |
|---|---|---|
| $35^2$ | Correct to the nearest 100 | 1200 |
| $3^4$ | Correct to the nearest 10 | 80 |
| $\sqrt{122}$ | Correct to 2 significant figures | ..... |
| $\sqrt{80{\cdot}805 + 63{\cdot}23}$ | Correct to 1 significant figure | ..... |
| $25^2$ | Correct to the nearest 100 | ..... |
| $\dfrac{89{\cdot}8}{0{\cdot}499}$ | Correct to the nearest 10 | ..... |

4

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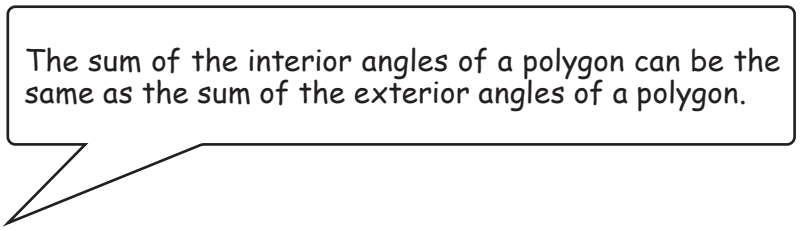

**Turn over.**

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

Cari says this to her friend Jake.




Help Cari convince Jake that she is correct.

You must

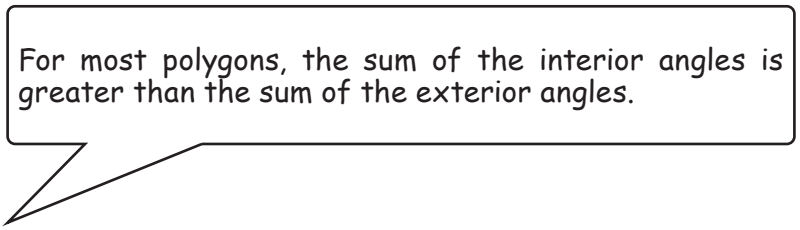
- name a suitable polygon
- give the sum of its exterior angles
- give the sum of its interior angles and
- show how the sum of its **interior** angles is calculated. [5]



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*(b)* Wesley says this to his friend Amelia.




Help Wesley fully convince Amelia that he is correct. [5]

.....

.....

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10

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**Turn over.**

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**6.** *(a)* Write each of 450 and 270 as products of prime factors using index notation. [4]

*(b)* Hence write down the lowest common multiple and the highest common factor of 450 and 270.
You must evaluate your answers. [4]

Lowest common multiple:

Highest common factor:



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**7.** *(a)* Rearrange $13g = 2(g + 3t)$ to make $g$ the subject of the formula. [3]

*(b)* Rearrange $\sqrt{h} + 4 = 3f$ to make $h$ the subject of the formula. [2]

5



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**Turn over.**

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**8.** Bethan is given the following information:

The universal set, $\mathbb{U}$, is the set of all fractions.

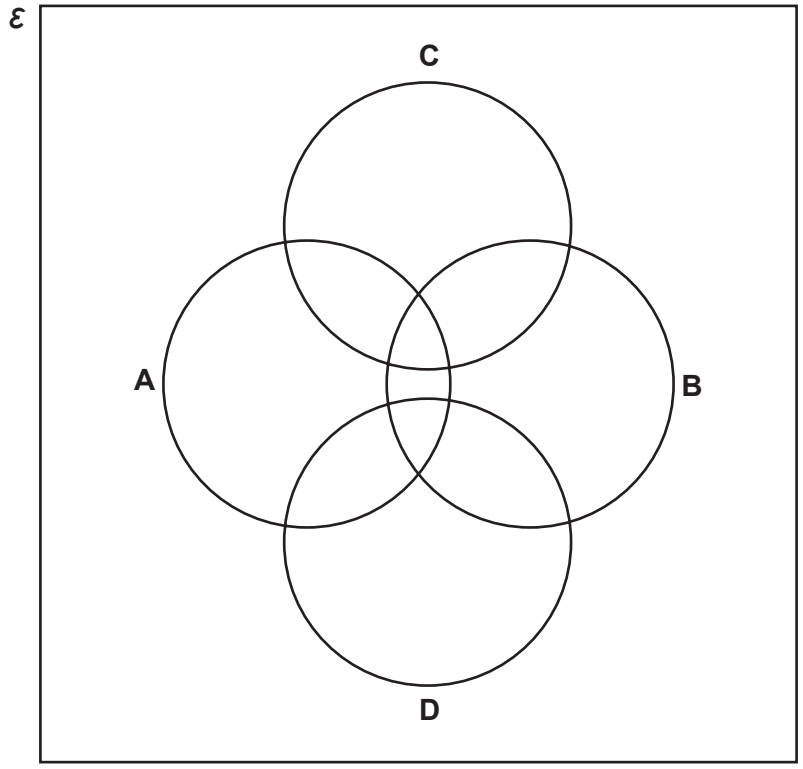
Set **A** contains all the fractions that can be written as **recurring decimals**.

Set **B** contains all the fractions that can be written as **terminating decimals**.

Set **C** contains any fractions that are equivalent to 40%.

Set **D** contains any fractions that are greater than 60%.

Bethan draws a Venn diagram to represent this information. Her Venn diagram is shown below.




*(a)* (i) Explain why set **C** and set **D** have no intersection in the Venn diagram. [1]

.....

.....

.....

.....

(ii) Sets with no entries are known as empty sets or null sets.
Shade the region that represents **A** ∩ **B** on Bethan's Venn diagram.
Explain how you know that **A** ∩ **B** will be a null set. [2]

.....

.....

.....

.....

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*(b)* The following fractions are to be placed in Bethan's Venn diagram.

$$\frac{3}{5} \quad \frac{24}{36} \quad \frac{6}{15} \quad \frac{3}{11} \quad \frac{5}{9} \quad \frac{45}{200}$$

(i) Complete the table below by writing each of these fractions as a decimal. The first two have already been done for you. [4]

| Fraction | Decimal |
|---|---|
| $\frac{3}{5}$ | 0·6 |
| $\frac{24}{36}$ | $0\cdot\dot{6}$ |
| $\frac{6}{15}$ | |
| $\frac{3}{11}$ | |
| $\frac{5}{9}$ | |
| $\frac{45}{200}$ | |

(ii) Place each of the 6 **fractions** in the appropriate position in the Venn diagram. [3]

(iii) List the fractions that are in the set **A′** in the Venn diagram. [1]

(iv) A fraction is selected at random from this list of 6 fractions.
Find the probability that the fraction selected is in the region **A** ∩ **B** . [1]



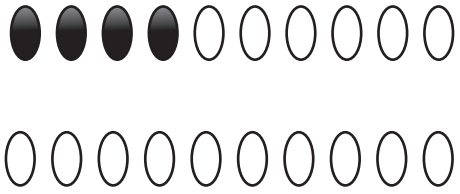
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**9.** Here are 20 beads, 4 are coloured black and 16 are coloured white.



These beads are to be placed inside two boxes, *A* and *B*.



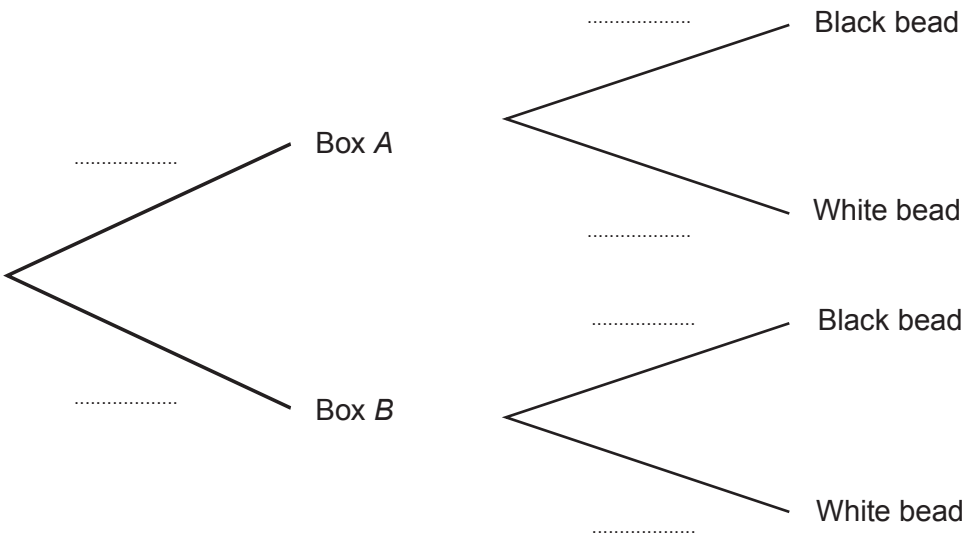

There are 5 beads in box *A* and 15 beads in box *B*.
All the black beads are in box *B*.

A contestant in a TV game show has to first select a box at random, and then select a bead at random from the chosen box.

*(a)* Complete the tree diagram. [4]

.....

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*(b)* If a contestant selects a black bead they win a prize.
Calculate the probability of a contestant winning a prize. [2]

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*(c)* The boxes are always prepared in the same way for each game.
Each of the last four contestants selected a black bead and won a prize.

Does this affect the probability that the contestant in the next game will win a prize?
You must give a reason for your answer. [1]

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**10.** *(a)* The $n$th term of a sequence is $3n^2 + 2n - 1$.
Calculate the 20th term of the sequence. [2]

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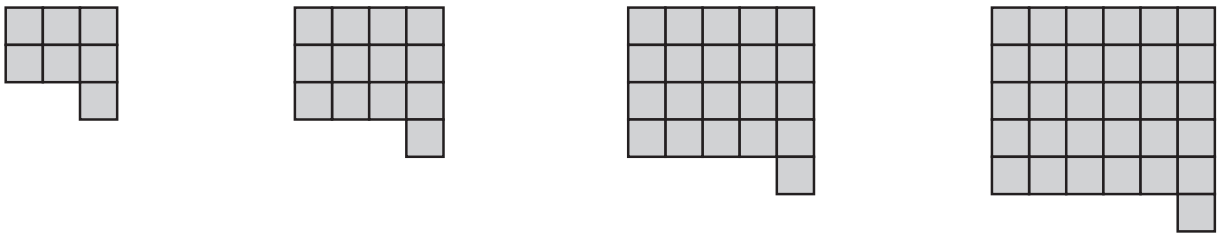
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*(b)* The diagram shows the first 4 patterns in a sequence.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

Write down an expression for number of squares in the $n$th pattern of the sequence. [3]

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**11.** *(a)* Factorise $3x^2 + 7x + 2$. [2]

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*(b)* Complete the following identity by inserting the missing values. [2]

$$10x^2 + \ldots\ldots x - 6 \equiv (5x \ldots\ldots)(2x + 3)$$

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**Turn over.**

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**12.** *PQ* is a tangent to both the circles.
The points *A* and *S* lie on the tangent *PQ*.
*E* is the centre of one of the circles, with points *A* and *B* on the circumference of this circle.
The points *S*, *T*, *W* and *Y* lie on the circumference of the other circle.

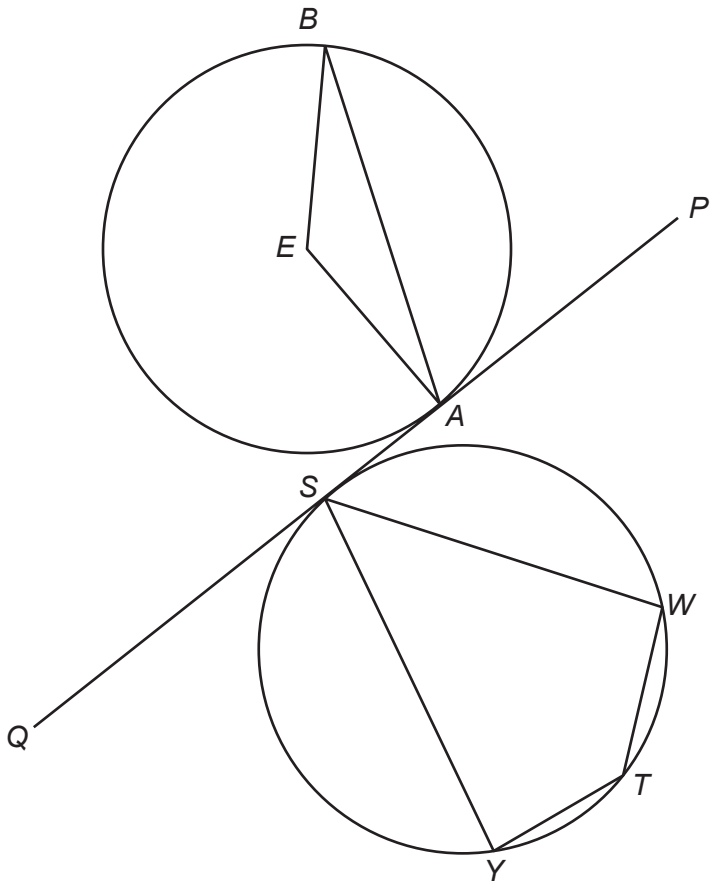



*Diagram not drawn to scale*

You are given three further facts:

- $B\hat{E}A = 144°$
- $P\hat{A}B = P\hat{S}W$
- $S\hat{W}T = 96°$

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Calculate the size of $W\hat{Y}T$.

You must show your working.
To do this, you may wish to label the size of any angles that you calculate and show any extra lines on the diagram. [7]

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**13.** *(a)* Express $\frac{5x}{x+6} - \frac{3x}{2x+7}$ as a single fraction in its simplest form. [4]

*(b)* Simplify $2+3\sqrt{2}\quad 7+5\sqrt{2}$ . [4]

8

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**14.** *(a)* The expression $x^2 + 10x + 3$ can be written in the form $(x + a)^2 + b$, where $a$ and $b$ are whole numbers.
Find the values of $a$ and $b$. [3]

*(b)* Hence solve $x^2 + 10x + 3 = 0$ leaving your answer in surd form. [4]

7

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**15.** The clues below describe a straight line.

The straight line:

- is perpendicular to $x + 4y - 3 = 0$,
- passes through the mid-point of the line joining (2, 2) and (6, 6).

Find the coordinates of the point where the straight line described intersects the $x$-axis. [7]

Intersection with $x$-axis is at (..... , .....)

7

**END OF PAPER**

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# GCSE LINKED PAIR PILOT

4363/02

S15-4363-02

## METHODS IN MATHEMATICS

### UNIT 1: Methods (Non-Calculator)
### HIGHER TIER

A.M. THURSDAY, 21 May 2015

2 hours

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

**INFORMATION FOR CANDIDATES**

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

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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**.

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

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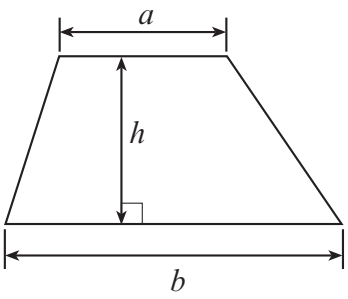
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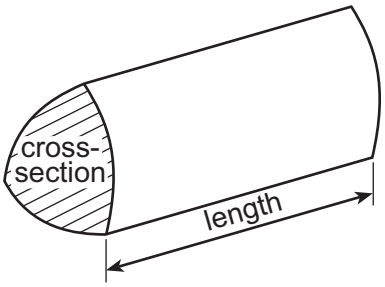
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## Formula List

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

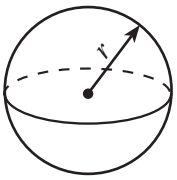



**Volume of prism** = area of cross-section × length



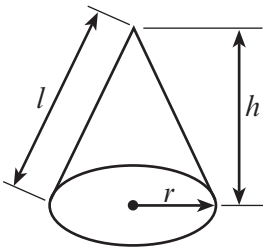

**Volume of sphere** $= \frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** $= \pi rl$

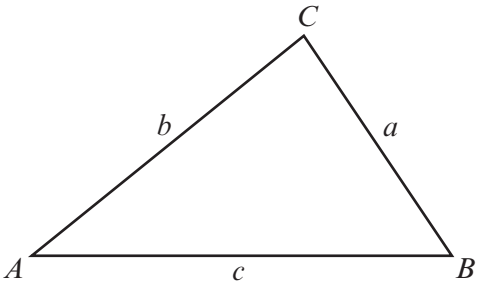



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

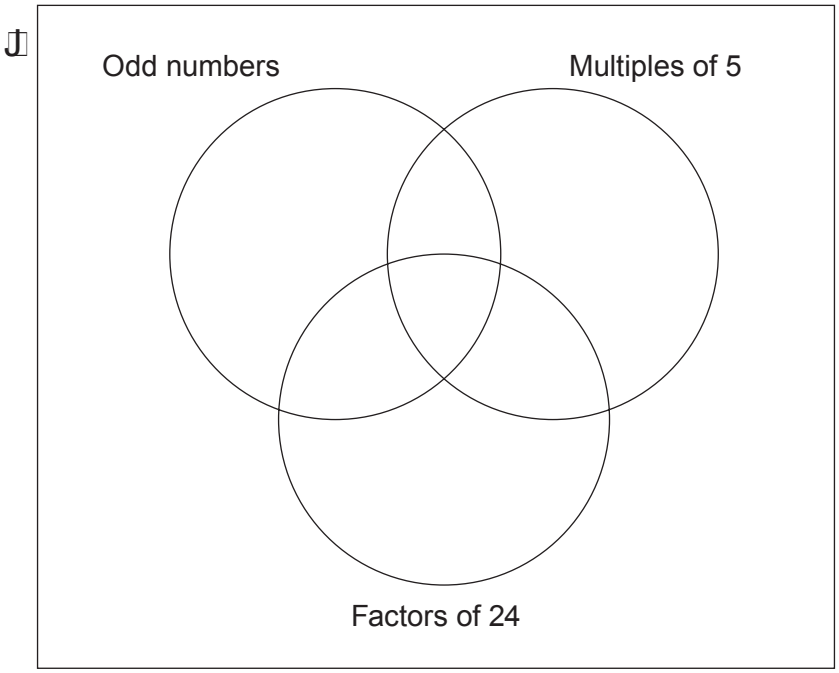
where $a$, $b$ and $c$ are given by $x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$

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**1.** *(a)* Place the whole numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 in the correct positions in the Venn diagram. [3]




*(b)* A whole number is selected at random from the set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}.

Find the probability that the number selected is:

an odd number .....

an odd number that is a factor of 24 .....

not a multiple of 5 and not a factor of 24. .....

[3]

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**2.**

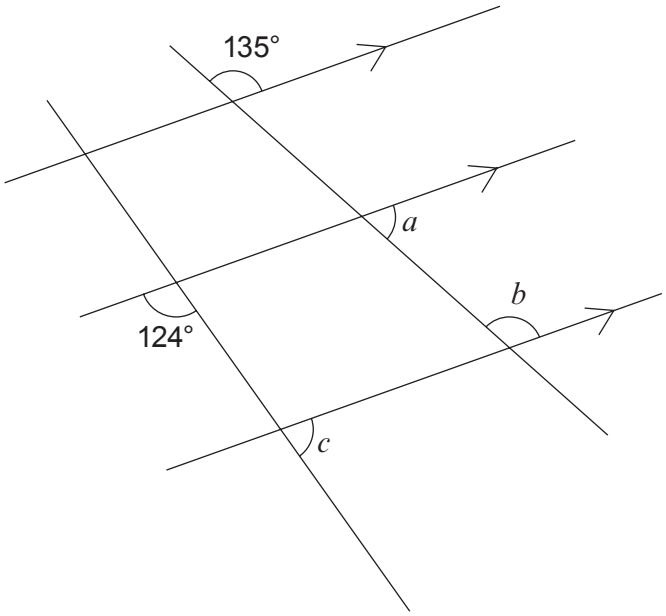



*Diagram not drawn to scale*

Find the size of each of the angles $a$, $b$ and $c$. [3]

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$a$ = ..... °

$b$ = ..... °

$c$ = ..... °

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**3.** *(a)* Use the formula below to find the value of $g$ when $e = 8$ and $h = -2$. [3]

$$g = \frac{e(5 - h)}{4}$$

*(b)* Find the value of $k^2 - 10$ when $k = -5$. [1]

**4.** *(a)* Expand $5(x + 8)$. [1]

*(b)* Expand $x(x^2 + 7)$. [2]

*(c)* Simplify $\frac{1}{2}f + 5f - 17f - 1{\cdot}5f + 6f$. [1]

*(d)* Factorise $7p + 28$. [1]

*(e)* Factorise $3x^2 + 27x$. [2]



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**5.** Write 800 as a product of prime factors using index notation. [3]

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**6.** A spinner shows 5 colours.
The spinner was spun 50 times.
Some of the outcomes were recorded in a table.

| Colour | Purple | Black | White | Red | Yellow |
|---|---|---|---|---|---|
| Number of times | 7 | 8 | 20 | ..... | ..... |

*(a)* Red occurred twice as many times as yellow.
Complete the table above. [1]

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*(b)* Write down the best estimate for the following probabilities on a single spin.
You must express each of your answers as a **decimal**.

(i) The probability of obtaining black. [1]

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(ii) The probability of **not** obtaining white. [2]

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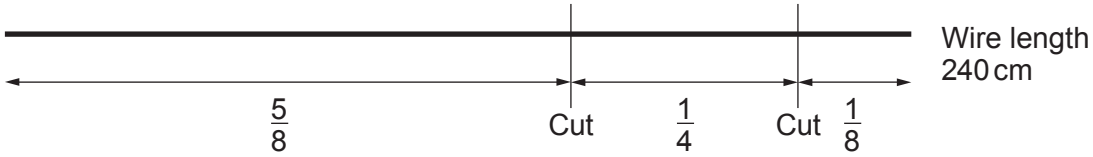
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**7.** *(a)* A length of wire measuring 240 cm is to be cut into 3 pieces as shown in the diagram.




Calculate the length of each of the 3 pieces of wire. [2]

*(b)* A different piece of wire of length 308 cm is cut in the ratio 2 : 4 : 5.
Calculate the length of each of the 3 pieces of wire. [3]

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

Each interior angle of a regular polygon is 160°.
How many sides does this regular polygon have? [5]



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**9.** *(a)* The diagram below shows dark and light triangular tiles.
The tiles are all identical isosceles triangles.

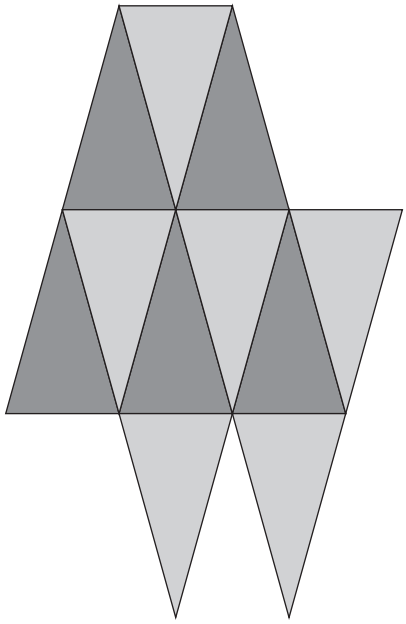


*Diagram not drawn to scale*

Explain why the tiles tessellate.
You must give a reason, based on angle facts, for your answer. [2]

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*(b)* Labels have been inserted on the diagram showing the tiles.

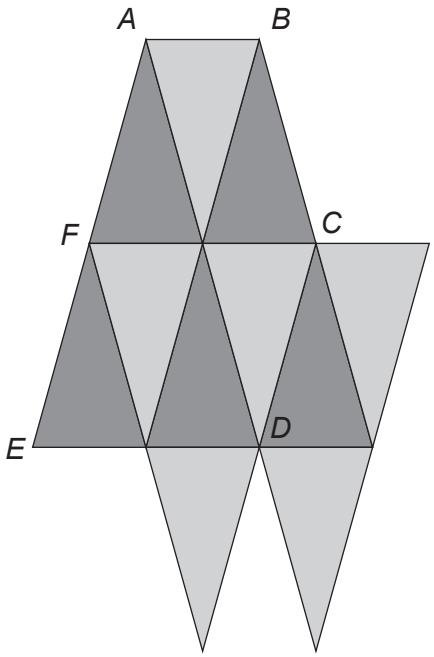



*Diagram not drawn to scale*

The smallest angle in each of the isosceles triangular tiles is 26°.

(i) Use angle facts to show that *AB* is parallel to *FC*.
You must show your calculations. [3]

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(ii) Use angle facts to show that *FCDE* is a parallelogram.
You must show your calculations. [2]

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**10.** The length of one side of a quadrilateral is $x$ cm.
The length of one of the other sides of this quadrilateral is $(x + 7)$ cm.
The length of each of the other sides is double the length of the shortest side of the quadrilateral.
The sum of all the lengths of the sides of the quadrilateral is $F$ cm.

Write a formula that could be used to find the sum of the lengths of all the sides of this quadrilateral.
Give your answer in its simplest form. [3]

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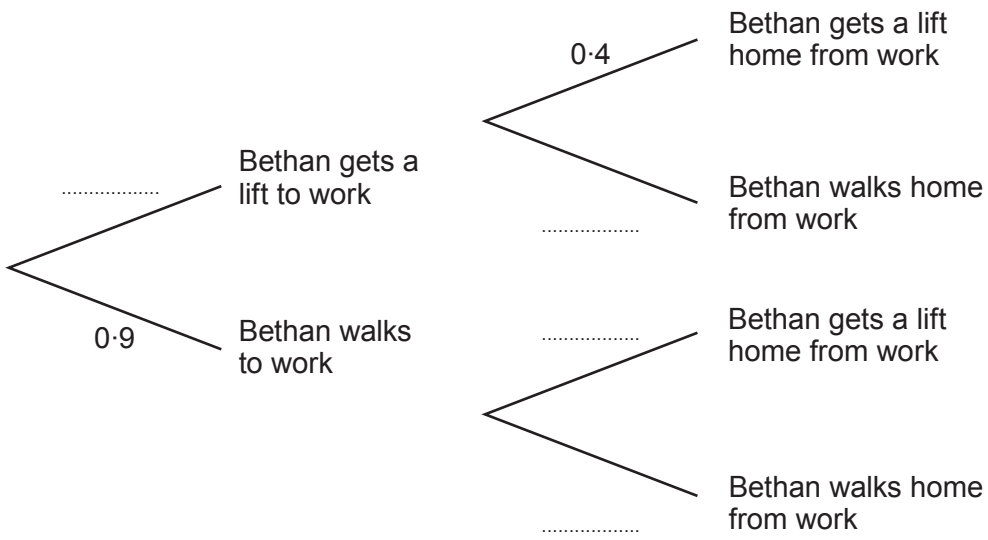
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**11.** Bethan sometimes gets a lift to and from work.
When she does not get a lift, she walks.
The probability that she walks to work is 0·9.
The probability that she gets a lift home from work is 0·4.
Getting to work and getting home from work are independent.

*(a)* Complete the following tree diagram. [2]




*(b)* Calculate the probability that Bethan walks to work and gets a lift home from work. [2]

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*(c)* Calculate the probability that Bethan gets a lift to work but **does not** get a lift home from work. [2]

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**12.** *(a)* Make $g$ the subject of the following formula. [2]

$$tg^2 = m$$

*(b)* Make $q$ the subject of the following formula. [3]

$$hq - c = yq + f$$

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**13.** The $n$th term of a sequence is $\frac{n(n+1)}{4}$.

*(a)* Calculate the value of the 20th term of the sequence. [2]

*(b)* Which term in the sequence has a value of 33? [3]

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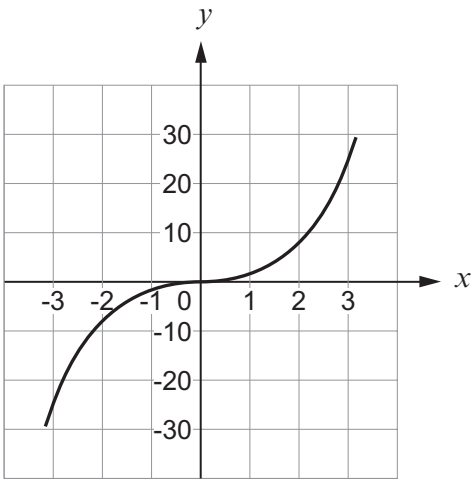
Examiner only

**14.** Match each of the given graphs with one of the possible equations shown below.

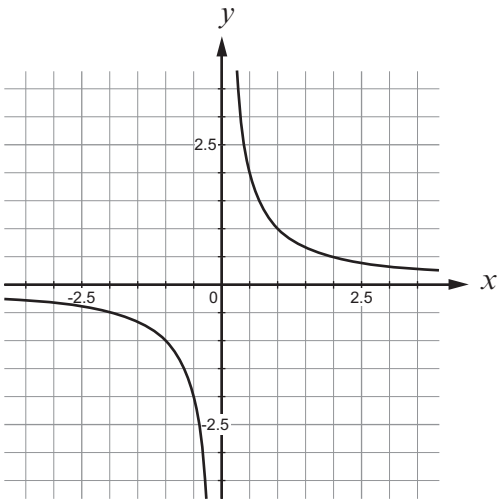
Possible equations:

| | | | | | |
|---|---|---|---|---|---|
| $y = x$ | $y = x^2$ | $y = x^3$ | $y = \frac{1}{x}$ | $y = -x$ | $y = -x^2$ |

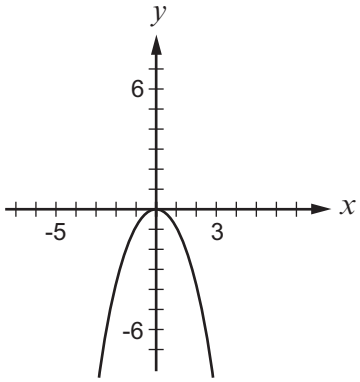
Graphs




Equation: ..... [1]




Equation: ..... [1]




Equation: ..... [1]

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**15.** *(a)* Express $\sqrt{75}$ in the form $a\sqrt{b}$, where $a$ and $b$ are whole numbers. [2]

*(b)* Evaluate the following, giving your answer in standard form. [2]

$$\frac{2{\cdot}1 \times 10^{23} + 7{\cdot}5 \times 10^{23}}{4 \times 10^{-6}}$$



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**16.** *(a)* The diagram shows a circle with centre *O* and a tangent *TAP.*
The points *A*, *B* and *C* lie on the circumference of the circle.

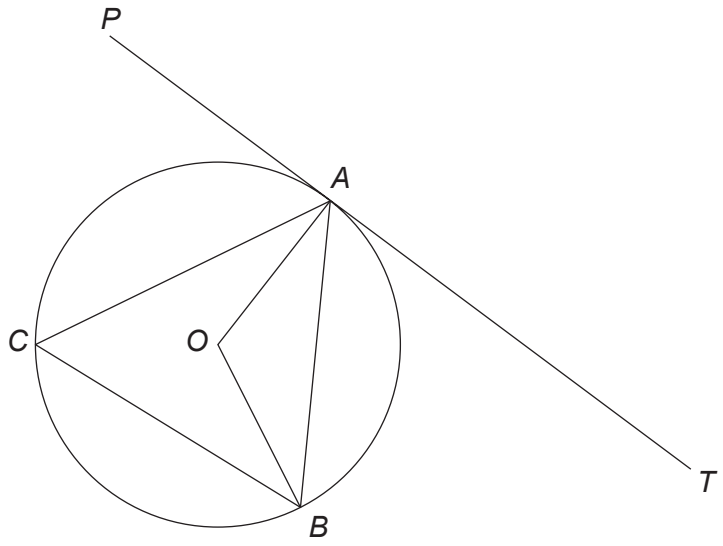



*Diagram not drawn to scale*

Given that $\hat{TAB} = 50°$, calculate the **reflex** angle $\hat{AOB}$.
You must show all your working. [3]

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*(b)* The points *B*, *C*, *D* and *E* lie on the circumference of another circle.
The point *A* lies outside the circle.
*ABE* and *ACD* are straight lines.

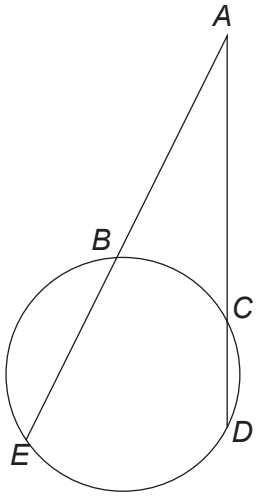



*Diagram not drawn to scale*

Given that *AB* = 9 cm, *AC* = 10 cm and *CD* = 8 cm, calculate the length of *BE*. [2]

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**Turn over.**

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Examiner only

**17.** *(a)* Given that $x$ is a whole number, explain why $2x + 1$ is an odd number. [1]

*(b)* Write down an expression for the next **odd** number after $2x + 1$. [1]

*(c)* Expand and simplify $(2x + 1)^2$. [2]

*(d)* Expand and simplify the square of the expression you found in **part *(b)***. [2]

*(e)* Using your answers from **part *(c)*** and **part *(d)***, explain why the difference between the squares of two consecutive odd numbers is always a multiple of 8. [3]

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**18.** A box contains 2 mango yogurts, 4 vanilla yogurts and 6 cherry yogurts.
Three yogurts are selected at random from the box without replacement.

*(a)* Calculate the probability that all three selected yogurts are vanilla. [2]

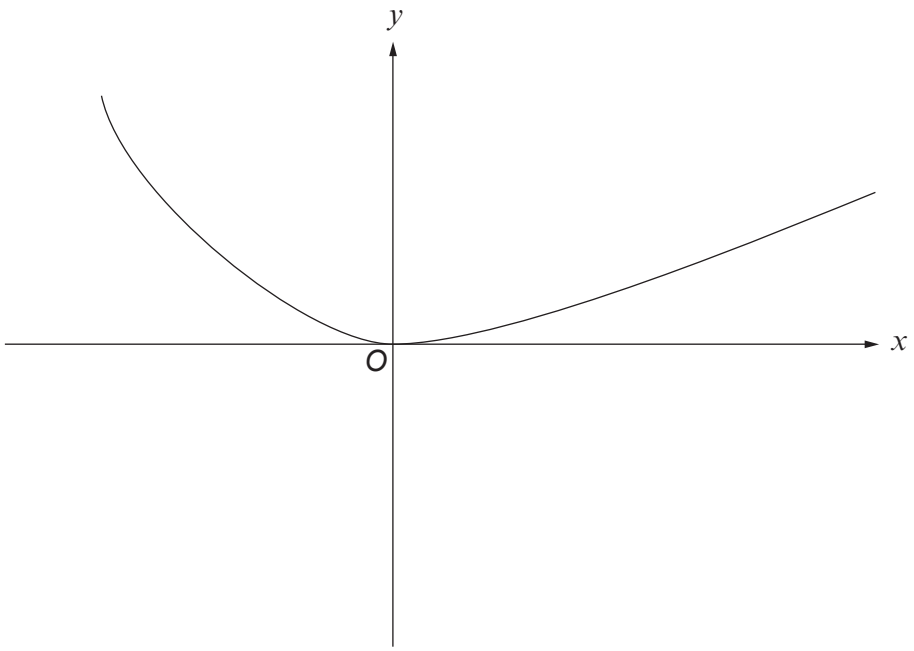
*(b)* Calculate the probability that at least one of the selected yogurts is a cherry yogurt. [3]

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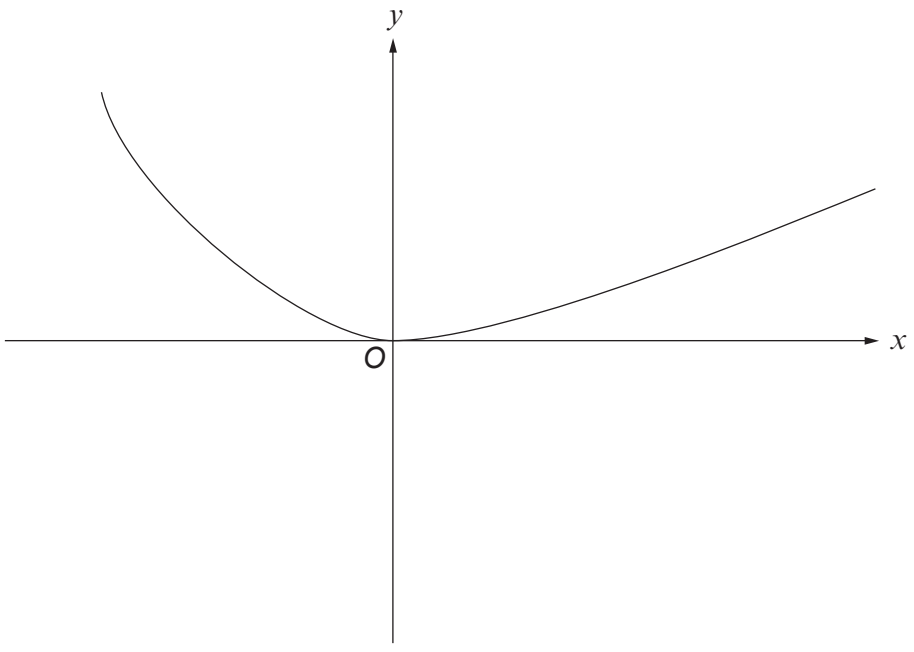
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**19.** *(a)* The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = f(x - 4)$.
Mark clearly the coordinates of the point where this curve touches an axis. [2]




*(b)* The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = -f(x) + 2$.
Mark clearly the coordinates of the point where this curve meets the $y$-axis. [3]




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**20.** A straight-line graph is to be drawn using the following information.

- It is perpendicular to the line with equation $2y = 4x + 3$.
- It intersects the line $x + 3y = 12$ at the point where $x = 0$.

Write down the equation of the straight-line that is to be drawn.
Then use the graph paper below to draw the graph of this straight line. [6]

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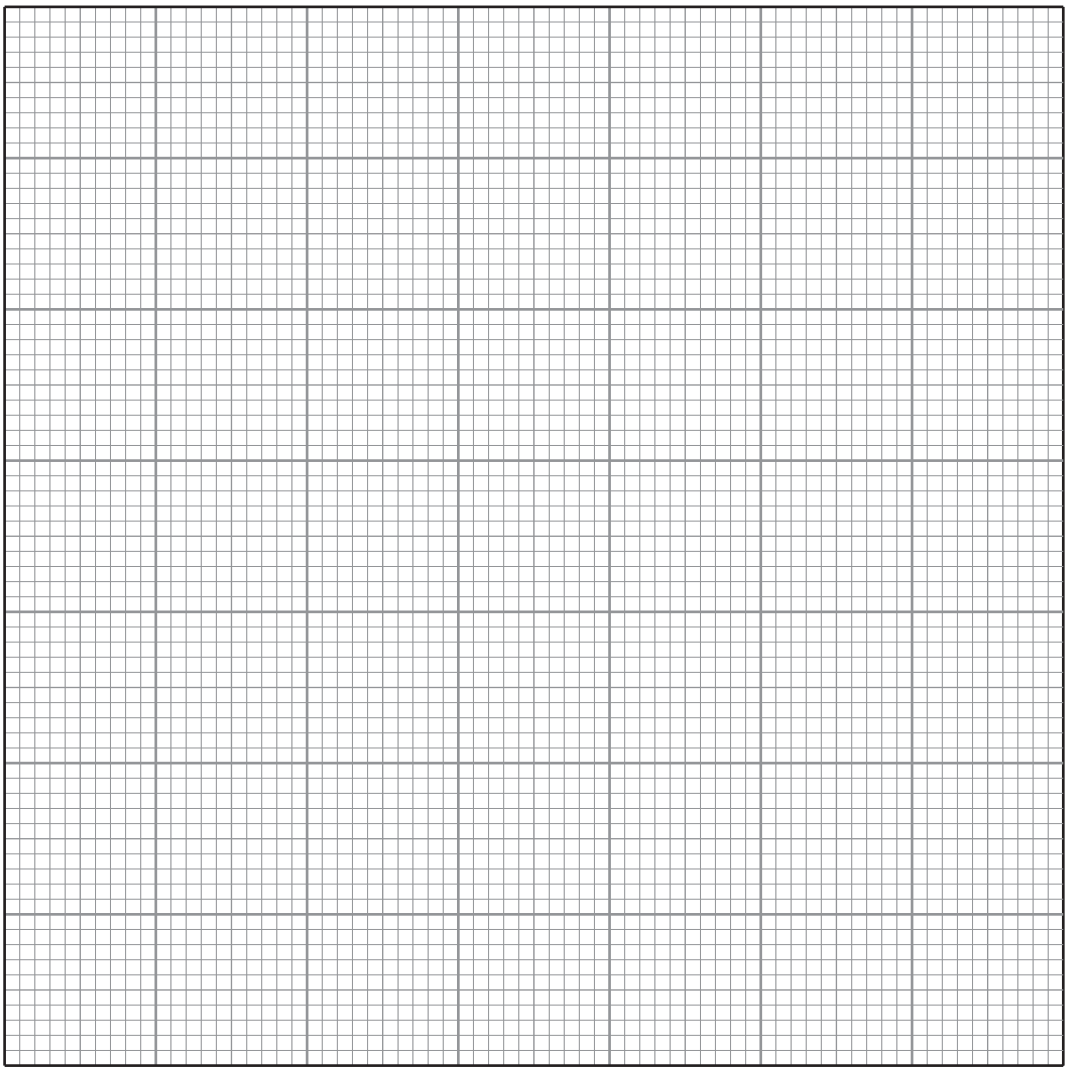
.....

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Equation of the straight-line: .....



**END OF PAPER**

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|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

W15-4363-02

# METHODS IN MATHEMATICS

## UNIT 1: Methods (Non-Calculator)
## HIGHER TIER

A.M. FRIDAY, 9 January 2015

2 hours

**CALCULATORS ARE NOT TO BE USED FOR THIS PAPER**

### ADDITIONAL MATERIALS

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 $\pi$ as 3·14.

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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.** | **7** | |
| **2.** | **10** | |
| **3.** | **3** | |
| **4.** | **6** | |
| **5.** | **9** | |
| **6.** | **3** | |
| **7.** | **3** | |
| **8.** | **5** | |
| **9.** | **8** | |
| **10.** | **4** | |
| **11.** | **6** | |
| **12.** | **9** | |
| **13.** | **5** | |
| **14.** | **4** | |
| **15.** | **4** | |
| **16.** | **7** | |
| **17.** | **7** | |
| **Total** | **100** | |

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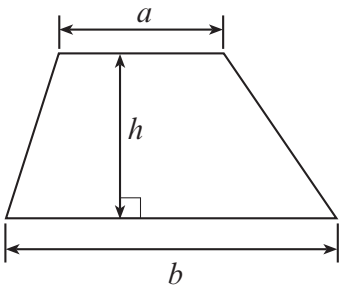
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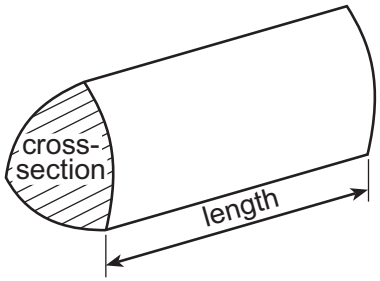
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## Formula List

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

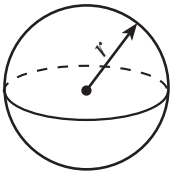



**Volume of prism** = area of cross-section × length



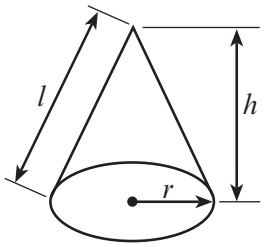

**Volume of sphere** $= \frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** $= \pi rl$

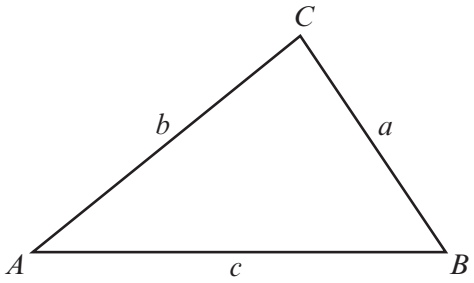



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

where $a$, $b$ and $c$ are given by

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

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**1.** Sanjay has two fair dice.
One dice is coloured red and the other is coloured yellow.

The two dice are thrown.
The two outcomes are multiplied together, and then the two outcomes are added on to obtain the score.
For example, if the two outcomes are 3 and 5, then the score is $3 \times 5 + 3 + 5 = 23$.
The table shows how the scores are recorded.

| | | **Yellow dice** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** |
| **Red dice** | **1** | 3 | 5 | 7 | 9 | 11 | 13 |
| | **2** | 5 | | | | 17 | 20 |
| | **3** | 7 | | | 19 | 23 | |
| | **4** | | | 19 | | | 34 |
| | **5** | 11 | 17 | 23 | 29 | 35 | 41 |
| | **6** | 13 | 20 | 27 | 34 | 41 | 48 |

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

*(b)* Write down the probability of obtaining a score that is [4]

equal to 11

.....

an even number

.....

an odd number

.....

a square number.

.....

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**2.** *(a)* Express $\frac{7}{8}$ as a decimal. [2]

*(b)* Express $\frac{1{\cdot}2 \square 0{\cdot}4}{48}$ as a fraction in its simplest form. [3]

*(c)* A number is divided by 3 then 7 is added. This gives an answer of 40.
Find the number. [2]

*(d)* Evaluate $5{\cdot}23 \times 2{\cdot}1$, giving your answer correct to 2 significant figures. [3]

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**3.**

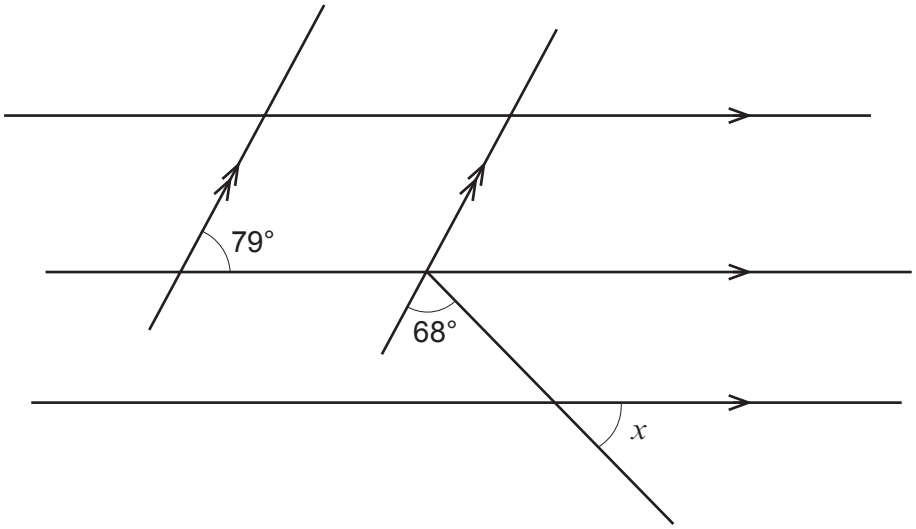



*Diagram not drawn to scale*

Calculate the size of the angle $x$.
You must show your working below or on the diagram. [3]

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.....

.....

$x$ = ..... °

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

Four of the seven **exterior** angles of a 7-sided polygon are 34°, 46°, 53° and 77°.
The other three exterior angles are all **consecutive** multiples of 10°.
Calculate the sizes of the three remaining **exterior** angles of this 7-sided polygon.
You must show all your working. [6]

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**5.** *(a)* Find the highest common factor of 120 and 140. [1]

*(b)* Find the lowest common multiple of 14 and 22. [2]

*(c)* Showing all your working, write $\frac{13}{20}$, $\frac{3}{4}$ and $\frac{3}{5}$ in **descending** order. [3]

*(d)* Express 180 as a product of prime factors using index notation. [3]



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**6.** *(a)* Given that $t = 5q^2 + 8w$, calculate the value of $t$ when $q = -3$ and $w = \frac{1}{4}$. [2]

*(b)* Which has the greater value, $3x^2$ or $(3x)^2$, when $x = 2$?
You must show your working. [1]

**7.** A length of cable is cut into three pieces in the ratio 3 : 4 : 5.
The **longest** piece of cable is 35 metres in length.
Calculate the lengths of the other two pieces of cable. [3]

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**8.** It is known that two of the interior angles of a kite are 155° and 45°.
This kite does not have an interior angle of 80°.
Find the **two** possibilities for the other two interior angles of this kite. [5]

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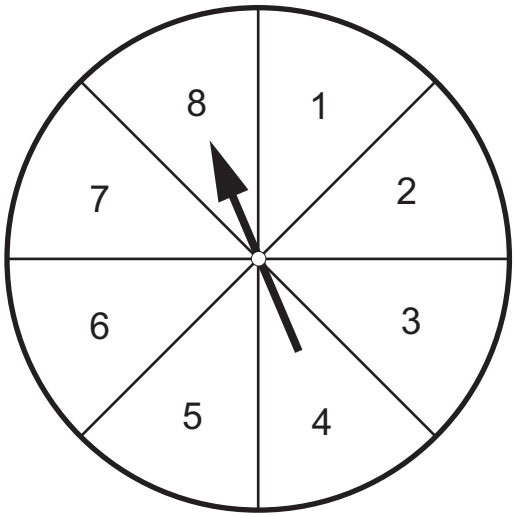
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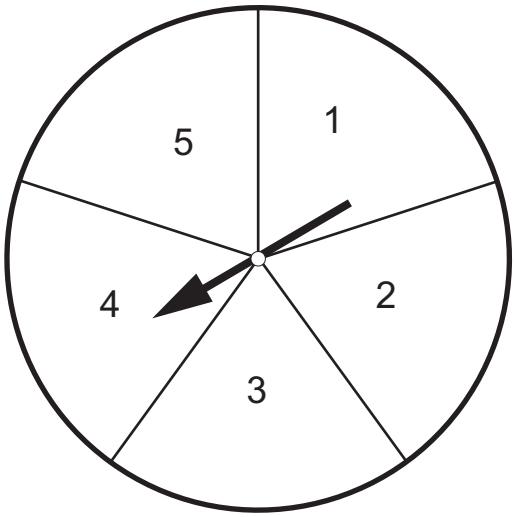


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**9.**




The scores on the two spinners are added together.
The two spinners shown give a **total score** of 12.

*(a)* Assuming that both spinners are not biased, calculate the probability of getting a **total score** of 5 using these two spinners. [3]

*(b)* If the spinner numbered 1 to 8 is not biased, how many sixes would you expect in 200 spins? [2]

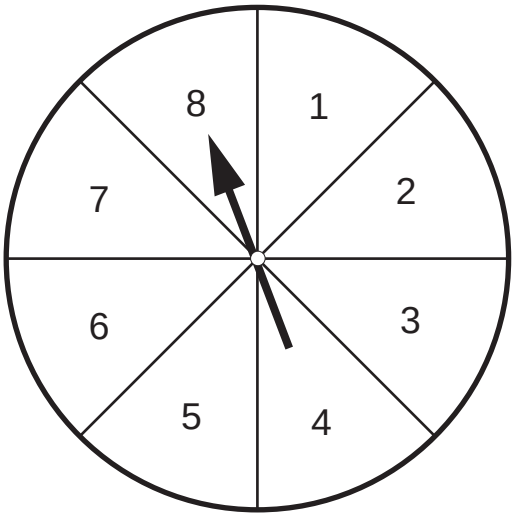
*(c)* After 200 spins of the spinner numbered 1 to 8, it was found that the number six occurred on 80 occasions.
Explain clearly how you know that this spinner is almost certainly biased. [1]

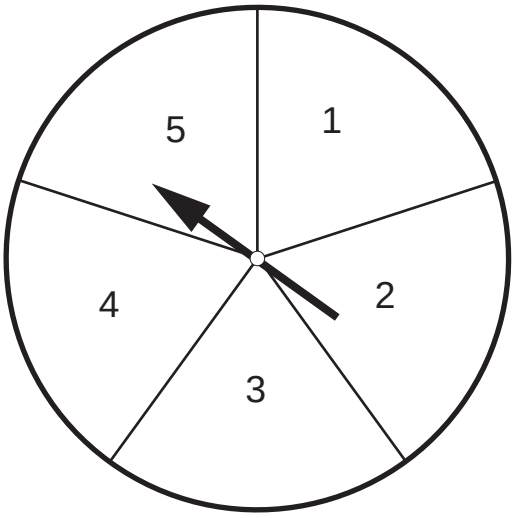
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*(d)* The spinner numbered 1 to 8 is **biased** towards landing on six.
The other spinner is **not biased**.




In part *(a)*, you worked out the probability of getting a total score of 5 using the two spinners by assuming the spinners were not biased.
You now know that the spinner numbered 1 to 8 is biased.

Is the probability of getting a total score of 5
- the same as your answer in part *(a)*, or
- greater than your answer in part *(a)*, or
- less than your answer in part *(a)*?

You must give a reason for your answer. [2]

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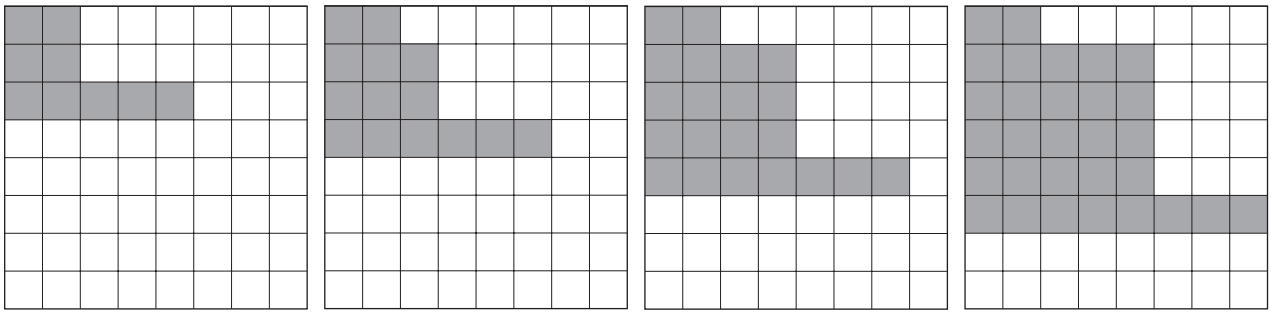
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**10.**



Pattern 2 Pattern 3 Pattern 4 Pattern 5

*(a)* There are 9 shaded squares in Pattern 2.
How many shaded squares would there be in Pattern 1? [1]

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*(b)* Find an expression, in terms of $n$, for the number of shaded squares in Pattern $n$. [3]

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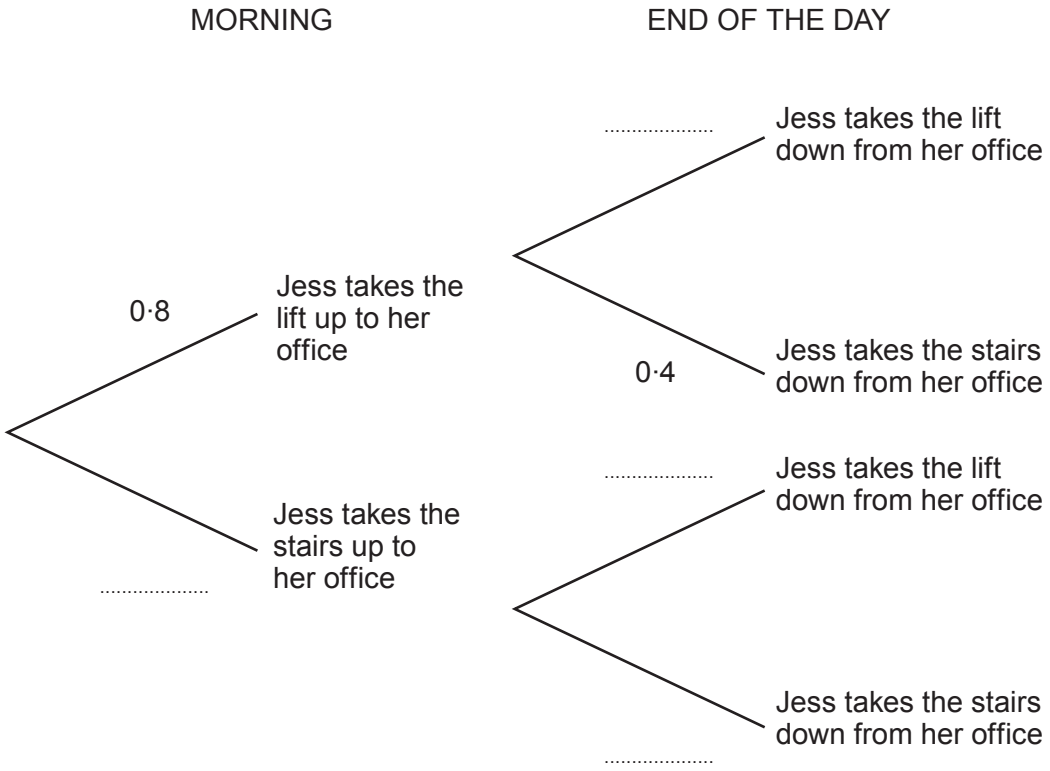
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**11.** Jess works on the 8th floor of an office block.
To get up to her office in the morning and down from her office at the end of the day, she uses either the lift or the stairs.

The probability that she takes the lift up to her office is 0·8.
The probability that she takes the stairs down from her office is 0·4.
Going up to her office and coming down from her office are independent events.

*(a)* Complete the following tree diagram. [2]




*(b)* Calculate the probability that Jess takes the lift up to her office in the morning and takes the stairs down from her office at the end of the day. [2]

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*(c)* Calculate the probability that Jess **does not** use the lift when she goes up to her office in the morning or when she comes down at the end of the day. [2]

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**12.** *(a)* Express 0·000007 in standard form. [1]

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*(b)* Make $x$ the subject of the formula $7x - h = 3x + m$. [2]

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*(c)* Factorise $x^2 - 49$. [1]

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*(d)* (i) Expand and simplify $(x + 3)(2x + 1)$. [2]

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(ii) **Hence**, solve $(x + 3)(2x + 1) = 7$. [3]

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**13.** *(a)* Calculate the length $a$. [2]

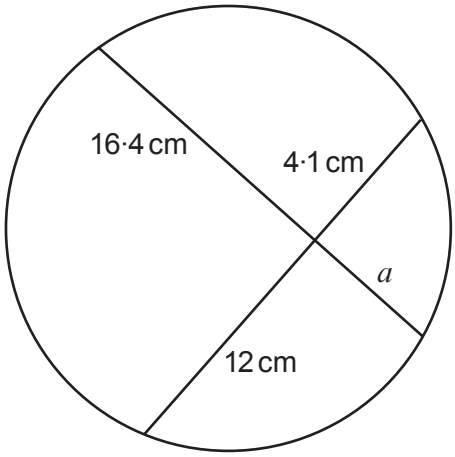



*Diagram not drawn to scale*

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$a$ = ..... cm

*(b)* *PT* is a tangent to the circle.

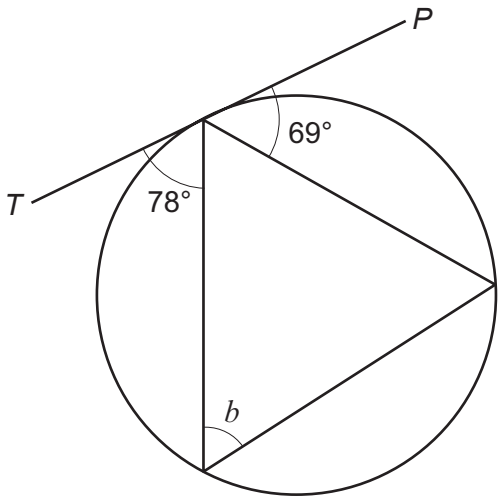



*Diagram not drawn to scale*

Find the size of the angle $b$. [1]

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$b$ = ..... °

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*(c)* The point *O* is the centre of the circle.

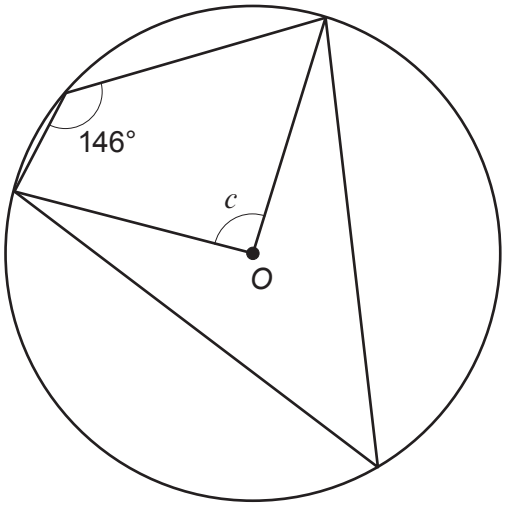



*Diagram not drawn to scale*

Find the size of angle $c$.
You must show your working. [2]

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.....

$c$ = ..... °

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**14.** Express the following as a single fraction in its simplest form. [4]

$$\frac{7}{x-3} - \frac{4}{3x+5}$$

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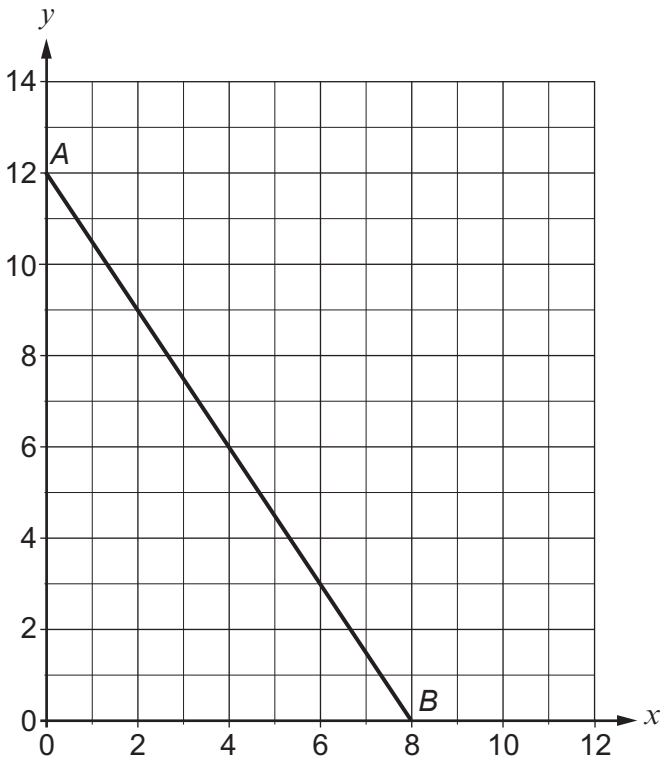
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**15.** Select **two** of the following lines which are **perpendicular** to the straight line, *AB*, shown on the grid.
You must write a reason for your selections.

$y = \frac{3}{2}x + 8$ $\quad 2x + 3y = 8$ $\quad 2y = 3x + 6$

$y = \frac{-2x + 8}{3}$ $\quad 3y = 2x + 5$ $\quad 2x - 3y = 8$




Reason for selections: [4]

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**16.** *(a)* Express $x^2 + 10x + 14$ in the form $(x + a)^2 + b$, where $a$ and $b$ are whole numbers to be found. [3]

*(b)* **Hence** solve $x^2 + 10x + 14 = 0$, leaving your answers in surd form. [4]

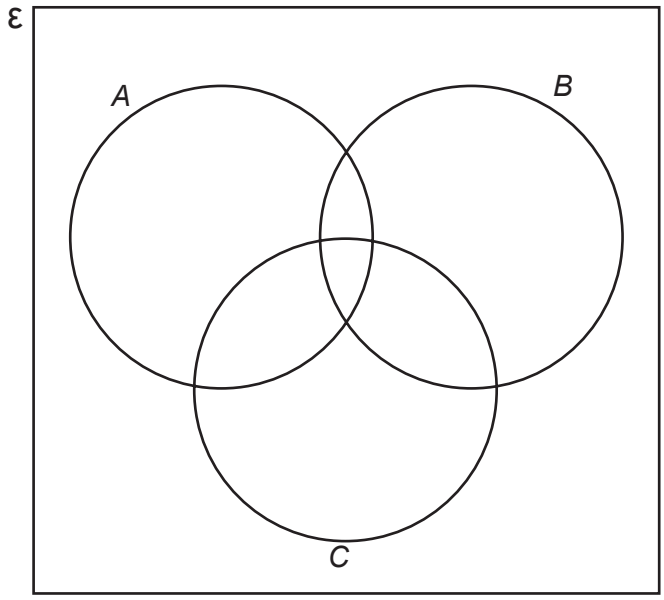
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**17.**




An outline of a Venn diagram is shown above.
You are given the following information.

- $P(A \cap B \cap C)' = 0{\cdot}01$
- $P(A \cap B \cap C) = 0{\cdot}2$
- $P(B \cap C) = 0{\cdot}5$
- $P(A \cap B) = 0{\cdot}3$
- $P(A \cap C) = 0{\cdot}65$

Calculate $P(B)$. [7]

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**END OF PAPER**

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# GCSE MARKING SCHEME

## METHODS IN MATHEMATICS (LINKED PAIR PILOT)

## JANUARY 2015

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## 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 |


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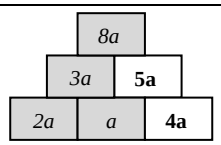
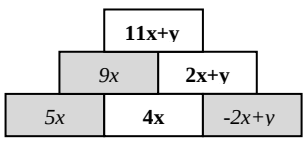
# METHODS UNIT 1
# FOUNDATION TIER

<table>
<tr><th>Methods Unit 1 Foundation Tier<br>January 2015</th><th>Mark</th><th>Comment</th></tr>
<tr><td>1. (a) (i) 9205<br>(ii) eight million, five hundred thousand<br>(b) (i) 112<br>(ii) 64<br>(iii) 9<br>(c) (i) 260<br>(ii) 7500<br>(d) 1, 2, 7, 14</td><td>B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B2<br><br>9</td><td><br>Accept eight and a half million<br><br><br><br><br><br>B1 for 3 or 4 correct factors and 1 incorrect factor<br>OR for 2 or 3 correct factors and no incorrect factors</td></tr>
<tr><td>2. Rectangle<br>Parallelogram<br>Trapezium<br>Kite</td><td>B1<br>B1<br>B1<br>B1<br>4</td><td><br><br><br>Award B0 for diamond.</td></tr>
<tr><td>3. (a) (i) even chance<br>(ii) impossible<br>(iii) unlikely<br>(b)<br><table><tr><td>H(am)</td><td>W(ater)</td></tr><tr><td>H</td><td>M(ilk)</td></tr><tr><td>H</td><td>O(range juice)</td></tr><tr><td>C(heese)</td><td>W</td></tr><tr><td>C</td><td>M</td></tr><tr><td>C</td><td>O</td></tr><tr><td>S(andwich)</td><td>W</td></tr><tr><td>S</td><td>M</td></tr><tr><td>S</td><td>O</td></tr></table></td><td>B1<br>B1<br>B1<br><br>B3<br><br><br><br><br><br><br><br><br><br><br><br>6</td><td><br><br><br><br>B2 for 6 correct combinations<br>B1 for 3 correct combinations<br><br>Ignore repeats<br><br>For incorrect combinations:<br>Add up the number of correct combinations and subtract the number of incorrect combinations (ignoring any repeats) and award marks based on this, e.g. 4 correct and 1 incorrect is 3 correct combinations so award B1.<br><br>Award SC2 for all combinations not explicitly given eg<br>ham with water, milk or orange juice<br>cheese with water, milk or orange juice<br>salad with water, milk or orange juice<br>Award SC1for 2 out of 3 of the above.</td></tr>
<tr><td>4. (a) 386<br><br>(b) 267<br>15 x<br>2670 OR 3000<br>1335 900<br>4005 105<br>4005<br><br>(c) 3.5<br>(d) 0.06<br>(e) 3<br>(f) 4</td><td>B1<br><br>M1<br><br>A1<br><br>A1<br><br><br>B1<br>B1<br>B1<br>B1<br>8</td><td><br><br>Any correct method for multiplying 267 by 15<br><br>For either 2670 or 1335 OR 3000 or 900 or 105<br>(Apply ‘one error’ in other methods)<br>CAO<br>Place value errors get M0 A0</td></tr>
<tr><td>5. All three points plotted correctly</td><td>B3<br><br><br><br>3</td><td>B1 for each point plotted correctly.<br>Ignore a line joining the plotted points.<br>If B0 awarded, then SC1 for (1, 2), (4, 8), (-2, -4) shown</td></tr>
</table>

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| Methods Unit 1 Foundation Tier<br>January 2015 | Mark | Comment |
|---|---|---|
| 6. **Team A**<br>General Knowledge<br>(5 × 5) + (5 × -3) (= 10)<br>AND<br>Picture Round<br>(3 × 10) + (2 × -5) ( = 20)<br><u>Total: 30</u><br><br>**Team B**<br>General Knowledge<br>(3 × 5) + (7 × -3) (= -6)<br>AND<br>Picture Round<br>(4 × 10) + (1 × -5) (= 35)<br><u>Total:29</u><br><br>Team A AND by one point<br><br>Look for:<br>Clear workings and labelling eg solution above (no need for brackets)<br><br>QWC2: Candidates will be expected to<br>• present relevant work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in spelling, punctuation and grammar<br><br>QWC1: Candidates will be expected to<br>• present work clearly which is mostly relevant, with words explaining process or steps<br>OR<br>• make few if any mistakes in spelling, punctuation and grammar and include units in their final answer | M1<br><br><br><br><br><br>M1<br><br><br><br><br>A1<br><br>B1<br><br><br><br>QWC 2<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>7 | Alternative method:<br>subtracting Team A and Team B for each of the correct and incorrect sections in both rounds eg<br>(25 – 15) + (-15 - -21) = 16 (General knowledge)<br>(30 – 40) + (-10 - -5) = -15 or 15 (Picture)<br>Team A wins by 1 point.<br>Apply M1 A1 for each row and B1 for the conclusion.<br>Allow M1 for one slip in incorrect use of points.<br><br><br><br><br><br>FT their answers for Team A and B provided at least M1 awarded.<br><br><br><br><br><br>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.<br><br>QWC1 Presents material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 7. (a) 0.07, 0.5, 0.507, 0.75<br>(b) (i) 2(/8)<br>(ii) 4(/8)<br>½, 3/8, ¼ | B1<br>B1<br>B1<br>B1<br>4 | <br><br><br>CAO. Accept 4/8, 3/8, 2/8. |
| 8. (a) <br><br>(b) <br> | B1<br>B1<br><br><br><br>B1<br>B1<br>B1<br>5 | For the 5*a*<br>For the 4*a* FT 'their 5*a*' - *a*<br><br><br><br>For the 4*x*<br>For the 2*x* + *y* FT 'their 4*x*' – 2*x* + *y*<br>For the 11*x* + *y* FT 9*x* + 'their 2*x* + *y*', must be in the form a*x* + b*y* |

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|---|---|---|
| 9.<br>For any angle in the rectangle = 90(˚)<br>(180- 30)/2<br>(<ABC) or (<ACB) = 75(˚)<br>(<ABE) = 165(˚) | <br>B1<br>M1<br>A1<br>A1<br>4 | Angles may be seen on the diagram.<br><br><br><br>FT 'their 75˚+90˚ provided M1 awarded |
| 10. (a) 8 yellow, 12 green, 6 blue balls<br><br><br><br>Red: 4/30<br>Yellow: 8/30<br>Green: 12/30<br>Blue: 6/30<br><br><br><br><br>(b) 4/30 +6/30<br>=10/30 | B2<br><br><br><br>B2<br><br><br><br><br><br><br><br>M1<br>A1<br>6 | Award B1 for either 8 yellow or 12 green and total is 30 OR<br>8 yellow and 12 green and total is not 30<br><br>FT 'their number of balls' / ' their total' OR 'their number of balls' /30<br>Award B1 for two or three correct.<br>Penalise incorrect notation once only<br>Do not penalise incorrect reduction here. If used subsequently in (b) only award M1 A0.<br>*B1 for consistent incorrect denominator* but correct numerators, e.g. 4/29, 8/29, 12/29, 6/29'.<br>FT from 'their P(red)' + 'their P(blue)' in (a) |
| 11 (a) 25x-3y<br><br>(b) 5×-3 + 3 × 6 (= -15+18)<br>3<br><br>(c) 2p +5p²<br><br>(d) 3y(x-3)<br><br>(e) Expression<br>Equation<br><br>(f) Conclusion (stated or implied) that $(3x)^2$ is greater with either sight of $3x^2 = 12$ AND $(3x)^2 = 36$<br>OR statement that $(3x)^2$ is 3 times the value of $3x^2$ OR Sight of $(3x)^2 = 9x^2$ is sufficient | B2<br><br>M1<br>A1<br><br>B2<br><br>B2<br><br>B1<br>B1<br><br>B1<br><br><br><br>11 | Must be in an expression, B1 for either 25*x* or -3*y*<br>Award B1 for 25*x* + - 3*y*<br>If use 3 not -3 award M0<br>CAO<br><br>Must be in an expression, B1 for either 2*p* or 5*p²*<br><br>B1 for correct partial factorisation eg 3(*xy* – 3*y*) or *y*(3*x* – 9), or 3y(… - 3) or 3y(x - ….)……<br><br><br>Allow sight of $3x^2 = 12$ AND $(3x)^2 = 36$ as implied conclusion |
| 12 (a) 9/30 and 0.3<br><br>10/40 and 0.25<br><br><br>(b) 0.25 or equivalent<br>Reason eg 'most throws', 'last value', 'uses all the data'.<br><br>4 | B1<br><br>B1<br><br><br>B1<br>E1 | <br><br>FT from 'their 9/30'<br>If B0 awarded for part (a) award SC1 for 9/30 AND 10/40<br>FT their final column entry in (a)<br>Do not accept 'better estimate'. |
| 13. 33(°)<br><br><br><br>3 | B3 | B2 for sight of '101 – 68', or '180 – 68 - 79' or '180 – 147' or '112 – 79', OR<br>B1 for appropriate indication of 101° or 147° or 112° |

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|---|---|---|
| 14. (a) 20 | B1 | |
| (b) 154 | B2 | B1 for 2×7×11 or for finding multiples for both numbers i.e.(14,) 28, 42, … and (22,) 44, 66, .., or factors for both numbers (2×7 and 2×11) or sight of (14×22=) 308 |
| (c) Method to find primes with 2 correct prime factors before the 2nd error | M1 | At least 2 primes found before second error |
| 2, 2, 3, 3, 5 | A1 | Ignore 1s |
| $2^2$ í $3^2$ í 5 | B1<br>6 | Correct FT with no 1s and at least one power >1 |

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# METHODS UNIT 1
# HIGHER TIER

| Methods Unit 1 Higher Tier<br>January 2015 | Mark | Comment |
|---|---|---|
| 1(a)<br>**1** 3 5 7 9 11 13<br>**2** 5 **8** **11** **14** 17 20<br>**3** 7 **11** **15** 19 23 **27**<br>**4** **9** **14** 19 **24** **29** 34<br>**5** 11 17 23 29 35 41<br>**6** 13 20 27 34 41 48 | B3 | All 10 entries correct<br><br>B2 for any7 correct entries, B1 for any 4 correct entries<br>FT for their completed table in (b) and ignore incorrect cancelling |
| (b)<br>4/36<br>9/36<br><br>27/36<br>2/36 | <br>B1<br>B1<br><br>B1<br>B1<br>7 | Penalise incorrect notation, e.g. 'out of', 'in', only once.<br>FT throughout consistent incorrect denominator<br><br>FT 1 – 'their 9/36', i.e. 1 – P(even) |
| 2(a) Attempt at method 7÷8<br>= 0.875 | M1<br>A1 | Or equivalent complete method |
| (b) Numerator 0.48 OR correct first stage of simplification<br>Multiplying numerator and denominator by suitable multiple of 10 (if correct 100) – for eliminating decimals OR sight of answer 0.01<br>1/100 | B1<br>B1<br><br>B1 | FT depending on their numerator.<br><br>CAO. B3 for an unsupported answer of 1/100 |
| (c) 99 | B2 | B1 for sight of 33, or x /3 + 7 = 40, or sight of 40-7 followed by 'their 33' ×3<br>or 2 trials substituted and correctly evaluated<br>*Answer only '11' is B0* |
| (d) Method to evaluate, allow 1 slip in tables<br>10.983<br>rounded to 11 | M1<br>A1<br>A1<br><br>10 | Accept digits 1 0 9 8 3 with incorrect place value<br><br>FT their 10.983 provided M1 awarded<br>Do not allow 11.00 as a final answer.<br>Do not accept unsupported answer of 11 |
| 3. 33(°) | B3<br><br><br><br>3 | B2 for sight of '101 – 68', or '180 – 68 - 79' or '180 – 147' or '112 – 79', OR<br>B1 for appropriate indication of 101° or 147° or 112° |

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|---|---|---|
| 4. Intention to subtract the sum of the 4 angles given from 360° | M1 | 360 – (34 + 46 + 53 + 77)<br>*Alternative using interior angles:*<br>*900 – (146+134+127+103)* |
| (Sum of remaining 3 angles is) 150(°) | A1 | *Sum of remaining 3 angles is) 390(°)* |
| 40(°), 50(°), 60(°) | B2 | If M1 awarded, B1 for 3 values all multiples of 10 with sum 'their 150'<br>*Alternative using interior angles:*<br>*B1 for values of 120(°), 130(°), 140(°)*<br><br>*If no marks, award SC1 for answers of 220(°), 230(°) and 240(°) following on from use of the interior angle sum of 900° and treating the given angles as interior. FT to award QWC marks.* |
| QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**AND**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**OR**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer | QWC 2<br><br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 5(a) 20 | B1 | |
| (b) 154 | B2 | B1 for 2×7×11 or for finding multiples for both numbers i.e.(14,) 28, 42, … and (22,) 44, 66, .., or factors for both numbers (2×7 and 2×11) or sight of (14×22=) 308 |
| (c) Two fractions correctly written in a form that allows for comparison<br>For all three correctly written in forms that allow for comparison<br><br>3/4, 13/20, 3/5 and in this order or equivalent | B1<br>B1<br><br>B1 | Allow reasonably accurate diagrammatic form<br><br>(e.g. 13/20, 15/20, 12/20 or 0.65, 0.75, 0.6 or 65/100, 75/100, 6/10 )<br><br>CAO. Answer only allow final B1 only |
| (d) Method to find primes with 2 correct prime factors before the 2nd error<br>2, 2, 3, 3, 5<br>$2^2$ í $3^2$ í 5 | M1<br>A1<br>B1<br>9 | At least 2 primes found before second error<br><br>Ignore 1s<br>Correct FT with no 1s and at least one power >1 |
| 6(a) 47 | B2 | B1 for 5×9 + 8×¼ (i.e. substitution with $-3^2 = 9$) or for 5×$-3^2$ + 2 (i.e. substitution shown, may be an arithmetic error in evaluating the 1st term, 8×¼ = 2 shown)<br>(B0 for 5×$-3^2$ + 8×¼ or (±)$15^2$ + 8×¼)<br>*If no marks SC1 for an answer of -43* |
| (b) Conclusion (stated or implied) that $(3x)^2$ is greater with either sight of $3x^2 = 12$ AND $(3x)^2 = 36$<br>OR statement that $(3x)^2$ is 3 times the value of $3x^2$<br>OR Sight of $(3x)^2 = 9x^2$ is sufficient | B1<br><br>3 | Allow sight of $3x^2 = 12$ AND $(3x)^2 = 36$ as implied conclusion |

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|---|---|---|
| 7. $3 \times 35 \div 5$ OR $4 \times 35 \div 5$ OR equivalent<br>21(m)<br>28(m) | M1<br>A1<br>A1<br><br>3 | <br>CAO<br>CAO<br>*Do not accept strategy 35/12 as a MR* |
| 8. Intention to subtract 155 and 45 from 360°<br><br>(Sum of remaining angles is) 160(°)<br><br>Realising one of the remaining angles has to be 155° or 45° as a kite has 2 equal angles<br><br>155(°) AND 5(°)<br>45(°) AND 115(°) | M1<br><br>A1<br><br>B1<br><br><br>B1<br>B1<br><br><br><br>5 | 360 – 155 – 45 If considering exterior angles: 360 - (180 - 155) - (180 - 45)<br>(Sum of remaining exterior angles is) 200(°)<br><br>Realising that one of the remaining exterior angles is 35° or 135°<br>*Allow B1 following M1 A0 for interior angles of (155, 45), and two angles equal to 'their 160'÷2*<br><br><br>*An unsupported single correct set of all four angles e.g. (155, 45,) 155, 5(°) or (155, 45,) 45, 115(°) receives M1 A1 B1 with B1 B0 or B0 B1depending on the solution given.* |
| 9(a) Indicates there are 4 ways of scoring 5<br>Indicates there are 40 possible outcomes, e.g. denominator 40 of a fraction<br><br>4/40 (= 1/10)<br><br>(b) 200 × ⅛ or equivalent<br>25<br><br>(c) Explanation comparing answer from (b) with 80, e.g. 'six more often than expected'<br><br>(d) Notices or implies that the (first) spinner must land on numbers other than 6 less often<br><br>Implies best estimate would be less than (a) | B1<br>B1<br><br>B1<br><br>M1<br>A1<br><br>E1<br><br><br>M1<br><br>A1<br><br><br>8 | 1, 4 2, 3 3, 2 4, 1<br>Accept sight of …/8 × …/5<br>Do not accept …/8 + …/5<br>Ignore incorrect cancelling<br>*Award B3 for an answer of 4/40*<br><br><br>A final answer of 25/200 implies M1, A0<br><br><br><br>Accept explanation that states, e.g. '6 not used in scoring 5', or '6 is opposite the numbers needed to score 5'<br>If no marks, SC1 if best estimate less than (a) with a reason based on an understanding of bias. |
| 10(a) 6<br><br>(b) $n^2 + 5$ or equivalent | B1<br><br>B3<br><br><br><br>4 | <br><br>Accept unsimplified equivalents<br>B2 for sight of $n^2 \pm \ldots$ (not for $n^2$), or a partially correct expression (e.g. looking at strips)<br>B1 for (9,) 14, 21, 30 with sight of second difference 2, or equivalent numerical pattern, or $n^2$ |
| 11(a) Correctly completing the tree diagram 0.2, 0.6. 0.6, 0.4<br><br>(b) 0.8 × 0.4 or 8/10 × 4/10 or equivalent<br>= 0.32 or 32/100 or equivalent.<br><br>(c) 0.2 × 0.4 or 2/10 ×4/10 or equivalent<br><br>= 0.08 or 8/100 or equivalent | B2<br><br><br>M1<br>A1<br><br><br>M1<br><br><br><br>A1<br><br>6 | B1 for any one pair of branches correct (total 1)<br><br><br><br>An incorrect answer of 3.2 is awarded M1, A0<br><br><br>Or other complete method.<br>FT for their P(stairs up) ×P(stairs down) correctly evaluated, or by alternative method<br><br><br>An incorrect answer of 0.8 from a correct tree diagram is awarded M1, A0 |

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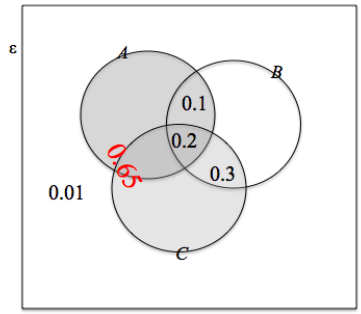
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|---|---|---|
| 12(a) $7 \times 10^{-6}$ | B1 | |
| (b) $7x - 3x = m + h$ or $4x = m + h$<br>$x = (m + h)/4$ | B1<br>B1 | FT until 2nd error<br>Allow $x = (m+h)/(7-3)$ |
| (c) $(x + 7)(x – 7)$ | B1 | ISW |
| (d)(i) $2x^2 + 6x + x + 3$<br>$2x^2 + 7x + 3$ | B1<br>B1 | Any 3 correct terms<br>CAO |
| (ii) $2x^2 + 7x + 3 - 7 = 0$ or $2x^2 + 7x - 4 = 0$<br>$(2x – 1)(x + 4)$ (=0)<br>$x = ½$ AND $x = -4$<br>9 | M1<br>M1<br>A1 | FT their $2x^2 + 7x + 3$ of equivalent difficulty<br>OR correct use of formula with $b^2$-4ac correctly evaluated (including FT equivalent difficulty)<br>CAO |
| 13(a) a í 16.4 = 12 í 4.1 or equivalent<br>a = 3 (cm) | M1<br>A1 | |
| (b) b = 69(°) | B1 | |
| (c) Angle opposite 146° in cyclic quadrilateral,<br>180(°) – 146(°) (= 34(°))<br>OR Reflex angle at the centre<br>2 × 146(°) (=292(°))<br>c = 68°<br>5 | M1<br><br><br><br>A1 | Accept indicated on the diagram or implied by further working.<br>The calculation 180(°) – 146(°) (= 34(°)) alone or with a misinterpretation as the angle at the centre is M0<br>Allow (O =) 2 × 146(°) provided not indicated as the acute angle on the diagram<br>CAO. Accept a correct answer without working for M1, A1; do not accept an incorrectly placed 68°. |
| 14. Numerator of $7(3x + 5) – 4(x– 3)$<br>Denominator of $(x– 3)(3x + 5)$<br>$\frac{17x+ 47}{(x– 3)(3x + 5)}$ or $\frac{17x+ 47}{3x^2 – 4x - 15}$<br>4 | M1<br>M1<br>A2 | FT 1 error from expansion of brackets or collection of like terms to allow A1, or<br>A1 for a correct numerator with an incorrect expansion of the denominator or if the denominator un-simplified ($3x^2 – 9x + 5x – 15$ )<br>If A2, penalise further incorrect work -1<br>*SC1 for sight of 17x + 47 if no other marks awarded* |
| 15. Sight (gradient) -12/8 or 8/12 or equivalents | B1 | |
| Selects $3y = 2x + 5$ AND $2x - 3y = 8$ **only** | B2 | Provided 1st B1 is awarded, allow further B1 for either selected with no more than 1 incorrect selection.<br><br>*Sight of gradient 12/8 with perpendicular gradient -8/12 award B0, B2 for y =(-2x+8)/3 AND 2x + 3y = 8, or B0 B1 for either selected with no more than one incorrect selection.* |
| Reason, e.g. ‘gradient given times gradient of these lines is -1’, or ‘(perpendicular) gradient is ⅔’, or ‘m×-1/m = -1’, or ‘product of gradients is -1’<br>4 | E1 | FT their gradient |

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| 16(a) a = 5<br>$x^2 + 10x + 25 - 11$ or $(x+5)^2 - 25 + 14$<br>OR alternative full method to find b<br>b = -11<br><br>(b) $(x + 5)^2 - 11 = 0$<br>$(x + 5)^2 = 11$<br>$x + 5 = (\pm)\sqrt{11}$<br><br>$x = -5 \pm \sqrt{11}$ | B1<br>M1<br><br>A1<br><br>B1<br>M1<br>M1<br><br>A1<br><br>7 | Accept an embedded answer<br>FT their a<br><br>Accept an embedded answer<br><br>FT their (a) provided it is equivalent in difficulty<br><br>If 'their 11' is negative then M0<br><br>CAO Must show ± or two answers<br>Use of formula leading to $(-10 \pm 2\sqrt{11})/2$ gets B2,<br>$(-10 \pm \sqrt{44})/2$ gets B0 |
| 17.<br><br><br>Note: Shaded $P(A \cup C) = 0.65$<br><br>Method to find B not intersecting with A nor C,<br>e.g. 1 – 0.65 - 0.01 (= 0.34)<br>P(B) = 0.34 + 0.1 + 0.2 + 0.3<br>P(B) = 0.94 | <br>B1<br><br>B3<br><br><br><br><br><br><br>M1<br><br>M1<br>A1<br><br><br><br><br>7 | Evidence for B marks may be seen in working<br>Correct indication of 0.01<br><br>For Venn diagram shown, correct indication of<br>• 0.1, 0.2 and 0.3, or<br>• the 0.3 shown and $A \cap B$ is 0.3 used<br>• the 0.1 shown and $B \cap C$ as 0.5 used<br><br><u>If not B3 then mark individually as follows</u>:<br>B1 for correct indication of 0.2,<br>B1 for correct indication of 0.3,<br>B1 for correct indication of 0.1<br><br>*Allow "P(B)" = 0.34 (not from 2 – 1.66)*<br><br>(FT 'their 0.34')<br>CAO<br>*Alternative*<br>$P((A \cup C) \cap B') = 0.65 - 0.2 - 0.3 - 0.1 (= 0.05)$ M1<br>P(B) = 1 – 0.01 – 0.05 = 0.94 (FT 'their 0.05') M1<br>P(B) = 0.94 (CAO) A1 |

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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS IN MATHEMATICS

## UNIT 1: Methods (Non-Calculator)
## HIGHER TIER

A.M. MONDAY, 9 June 2014

2 hours

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

### INFORMATION FOR CANDIDATES

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

Unless stated, diagrams are not drawn to scale.

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

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

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **2**.

| For Examiner's use only | | |
|---|---|---|
| **Question** | **Maximum Mark** | **Mark Awarded** |
| **1.** | **5** | |
| **2.** | **6** | |
| **3.** | **7** | |
| **4.** | **4** | |
| **5.** | **5** | |
| **6.** | **4** | |
| **7.** | **4** | |
| **8.** | **3** | |
| **9.** | **6** | |
| **10.** | **8** | |
| **11.** | **4** | |
| **12.** | **6** | |
| **13.** | **2** | |
| **14.** | **4** | |
| **15.** | **3** | |
| **16.** | **4** | |
| **17.** | **4** | |
| **18.** | **5** | |
| **19.** | **6** | |
| **20.** | **7** | |
| **21.** | **3** | |
| **Total** | **100** | |

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**1.**

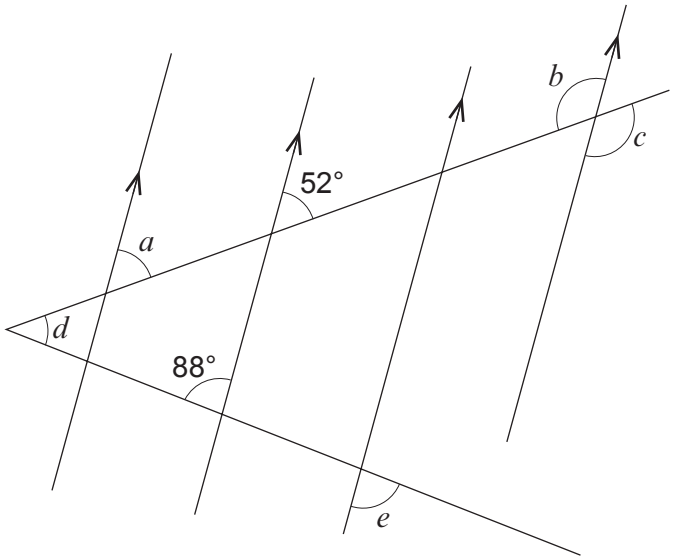



*Diagram not drawn to scale*

Find the size of each of the angles $a$, $b$, $c$, $d$ and $e$. [5]

.....

.....

.....

.....

.....

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.....

$a$ = ..... °

$b$ = ..... °

$c$ = ..... °

$d$ = ..... °

$e$ = ..... °

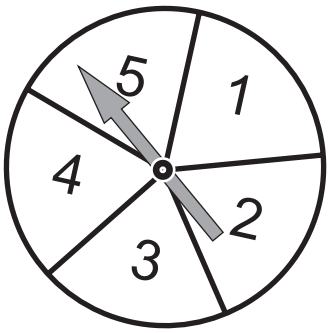
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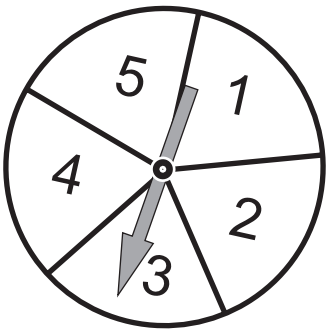


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**2.** *You will be assessed on the quality of your written communication in this question.*




The two spinners are spun.
The score is the total of the two numbers shown on the spinners.
The score shown above is eight.

There are two different game cards, card A and card B.
A game is played, crossing out the scores from the spinners on the game card as the spinners are spun repeatedly.
The first game card with all four scores crossed out is the winning card.

**Game card A**

| | |
|---|---|
| 3 | 2 |
| 9 | 10 |

**Game card B**

| | |
|---|---|
| 4 | 6 |
| 5 | 7 |

Which game card is more likely to be the winning card?
You must show your working and give a reason for your answer. [6]

.....

.....

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**3.** *(a)* Find the highest common factor of 36 and 90. [1]

*(b)* Find the lowest common multiple of 4 and 6. [1]

*(c)* Evaluate $\left(2{\cdot}5 \div 10 + 2\frac{3}{4}\right)^{-2}$. [2]

*(d)* Express $\frac{0{\cdot}15 \times 0{\cdot}4}{60}$ as a fraction in its simplest form. [3]

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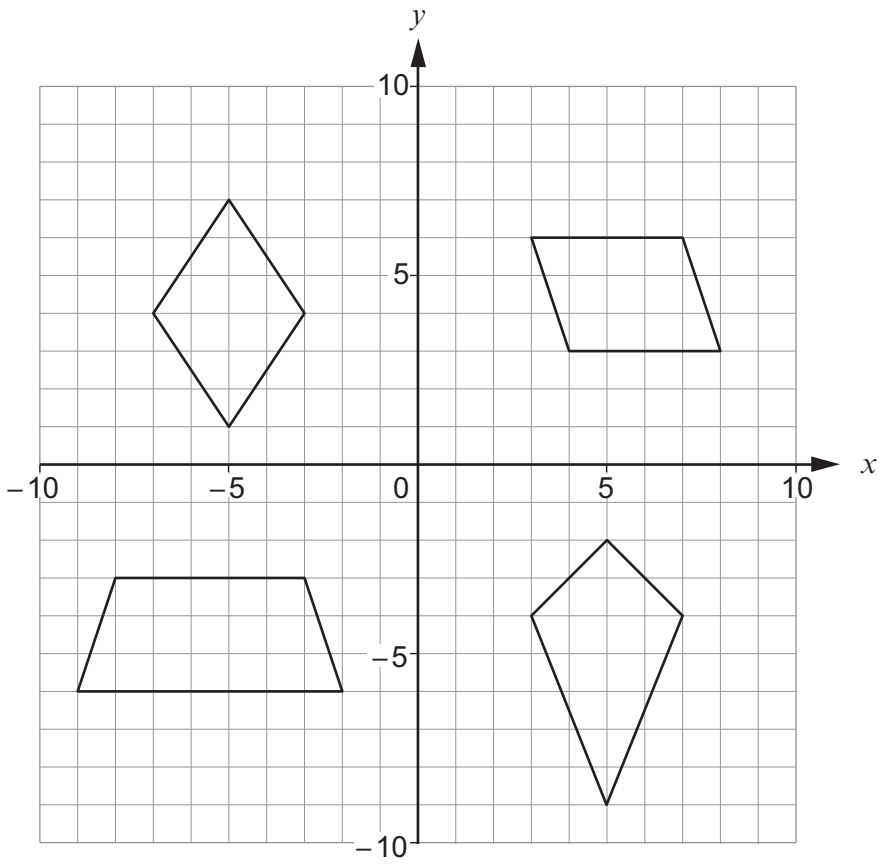
**4.** *(a)* Write down the name of a quadrilateral with diagonals that are equal in length. [1]

.....

*(b)* Write down the name of a quadrilateral with rotational symmetry of order 2. [1]

.....

*(c)* The diagram below shows four quadrilaterals drawn on a grid.




(i) Write down the coordinates of the centre of rotational symmetry of the rhombus. [1]

( ..... , ..... )

(ii) Write down the coordinates of the intersection of the diagonals of the kite. [1]

( ..... , ..... )

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**Turn over.**

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**5.** *(a)* Make $e$ the subject of the following formula. [2]

$$h = 5e - 4$$

.....

.....

.....

*(b)* Given that $a = 10$, $b = -3$ and $c = -5$, find the value of each of the following expressions.

(i) $b^2$ [1]

.....

(ii) $\frac{ab}{c}$ [1]

.....

.....

.....

.....

(iii) $\frac{2bc}{a}$ [1]

.....

.....

.....

.....

.....

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**6.** State whether the following statements are true or false.
You must give a reason for each of your answers.

*(a)* "All prime numbers have more than two factors." [2]

True or False? .....

.....

.....

.....

.....

.....

.....

.....

*(b)* "All square numbers have an odd number of factors." [2]

True or False? .....

.....

.....

.....

.....

.....

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**7.** There are two regular polygons, *X* and *Y*.
The size of each **exterior** angle in regular polygon *X*, is 9°.
Each **interior** angle of regular polygon *Y* is 120°.

Complete the sentences below. [4]

Regular polygon *X* has ..... sides.

Regular polygon *Y* has ..... sides.

**8.**




*Diagram not drawn to scale*

*ABC* is a straight line, *AB:BC* is 3:8 and the length of *BC* = 36 cm.
Calculate the length of *AC*. [3]

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**9.** *(a)* Write down the smallest possible number by which 24 has to be multiplied to create a perfect square. [2]

*(b)* Write $\frac{12}{99}$ as a recurring decimal. [2]

*(c)* Express 0·025 as a fraction in its simplest terms. [2]



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**10.** *(a)* Find the $n$th term of each of the following sequences.

(i) 7, 11, 15, 19, 23, 27, ... [2]

(ii) 72, 70, 68, 66, 64, 62, ... [2]

(iii) –7, –4, 1, 8, 17, 28, ... [2]

*(b)* A sequence has an $n$th term of $3n^2 + 4$.
Find the 20th term of this sequence. [2]

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**11.** Evaluate the following, giving each of your answers in standard form.

*(a)* $(2{\cdot}5 \times 10^6) \times (8 \times 10^3)$ [2]

*(b)* $5 \times 10^8 + 6{\cdot}8 \times 10^9$ [2]

**12.** *(a)* Factorise the following expressions.

(i) $12x^2 + 18xy$ [2]

(ii) $x^2 - 100$ [1]

*(b)* Factorise $x^2 - 5x - 14$ and hence solve $x^2 - 5x - 14 = 0$. [3]

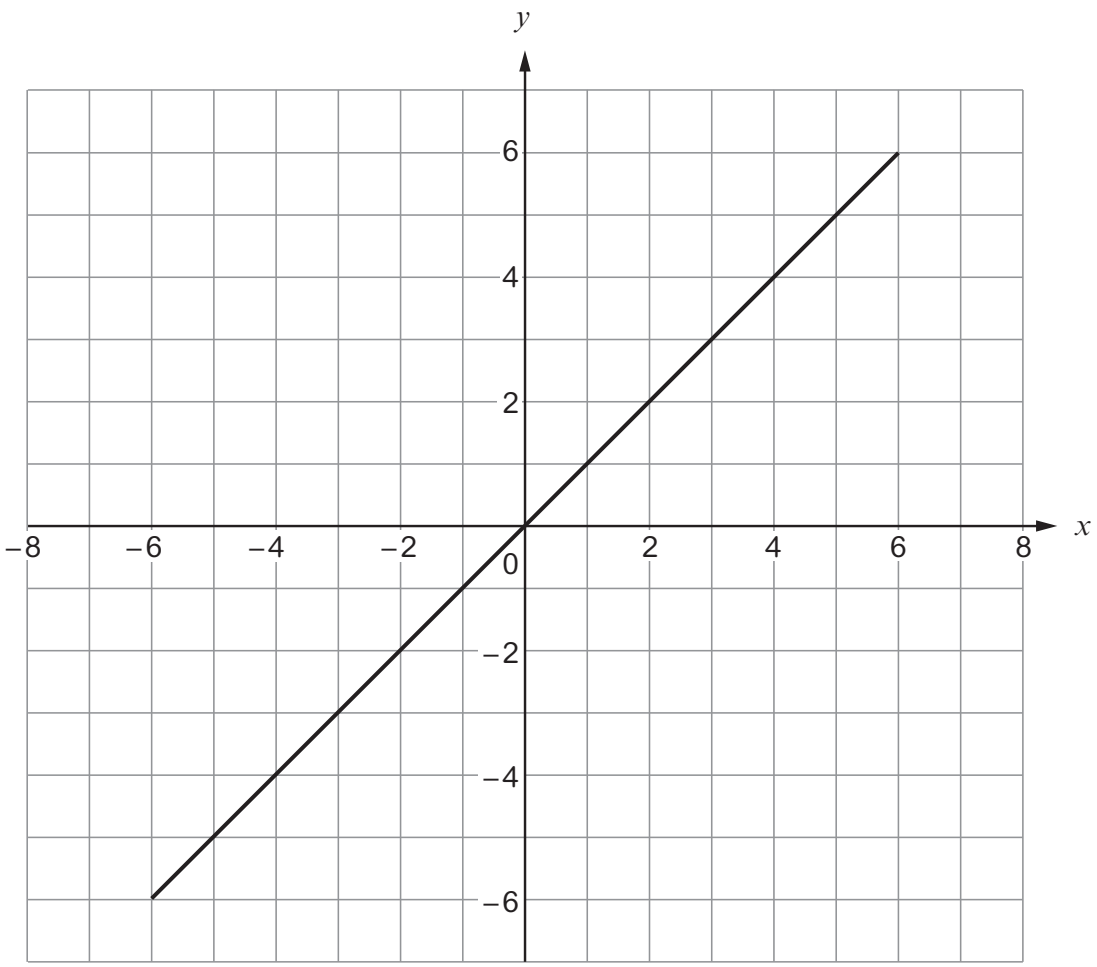
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**13.** The graph of the equation $y = x$ is shown on the axes below.




**Explain** how you would use the graph of $y = x$ to draw the graphs of the following equations.

*(a)* $y = x + 3$ [1]

.....

.....

.....

.....

*(b)* $y = -x$ [1]

.....

.....

.....

.....

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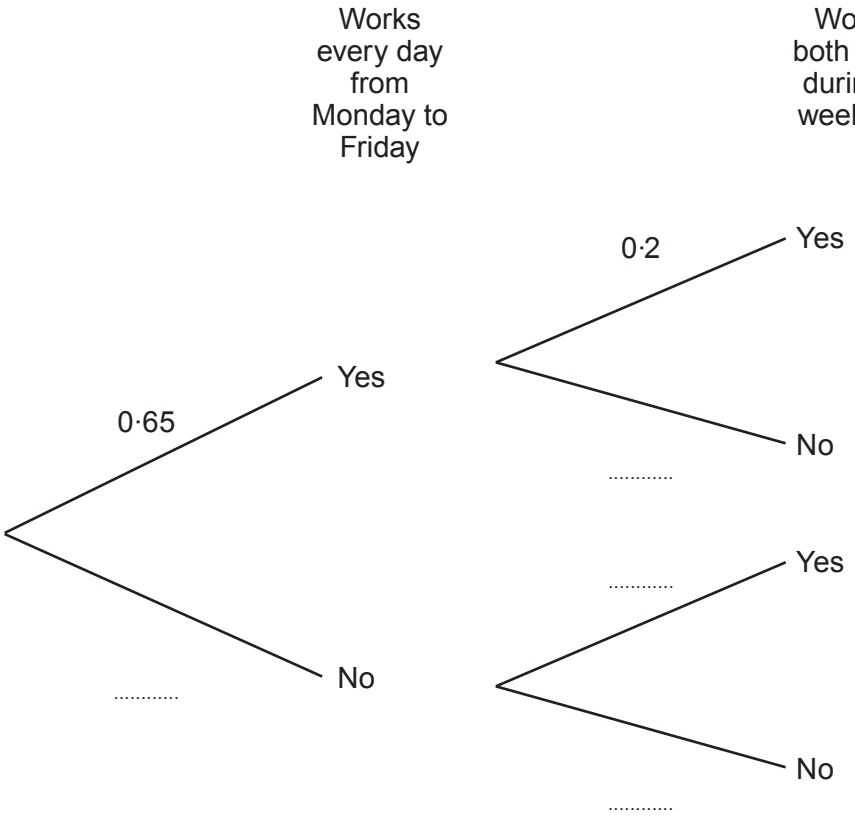
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**14.** Carys has a Monday to Friday job and a weekend job.
Working Monday to Friday and working weekends are independent events.

In any given week, the probability that Carys works every day from Monday to Friday is 0·65.
The probability that she works both days during a weekend is 0·2.

*(a)* Complete the following tree diagram. [2]




*(b)* Calculate the probability that next week Carys will work every day from **Monday to Sunday**. [2]

.....

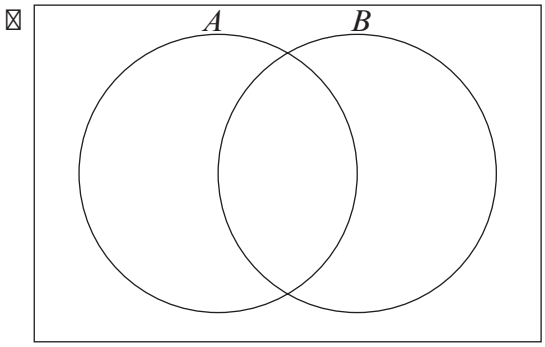
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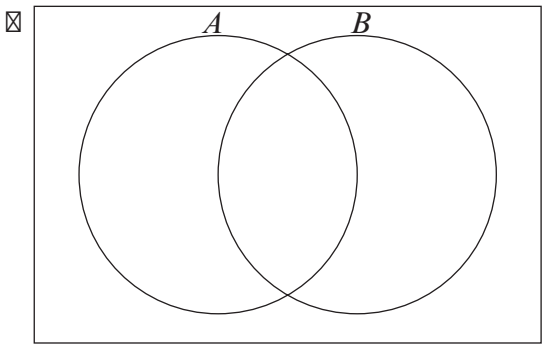
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**15.** On each Venn Diagram, shade the appropriate region to represent the information given in the question.

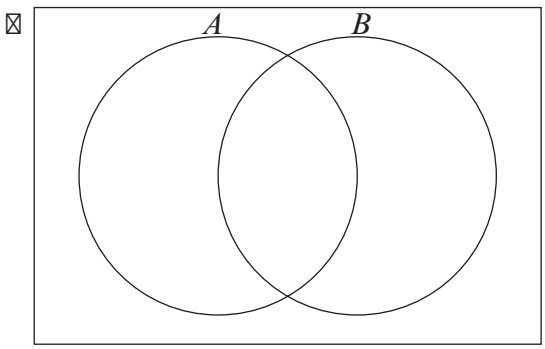
*(a)* $A \cap B$ [1]




*(b)* $(A \cap B)'$ [1]




*(c)* $A' \cap B$ [1]




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**16.** The three points *A*, *B* and *C* lie on the circumference of a circle centre *O*.
The tangent *XAY* touches the circle at *A*.

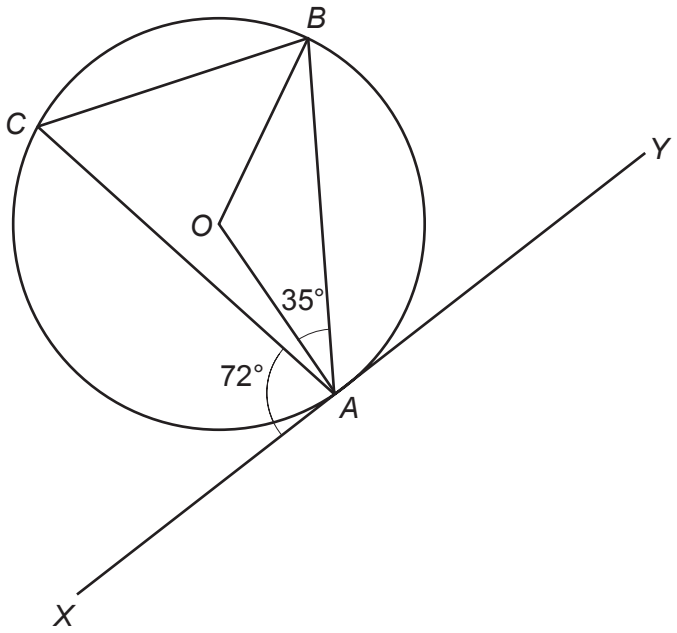



*Diagram not drawn to scale*

Find each of the following angles.
Give reasons for your answers.

*(a)* $C\hat{B}O$ [2]

.....

.....

.....

.....

*(b)* $B\hat{C}A$ [2]

.....

.....

.....

.....

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**17.** The diagram shows a circle with $DC = 30\,\text{cm}$, $ED = 40\,\text{cm}$ and $BC = 35\,\text{cm}$.

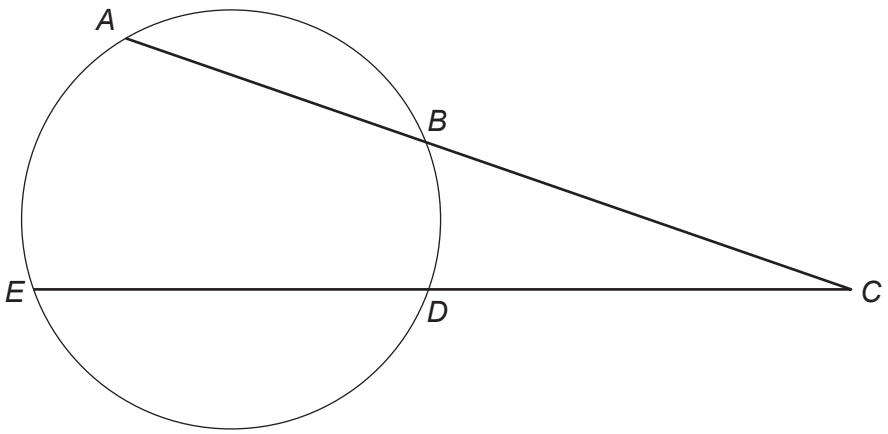



*Diagram not drawn to scale*

Calculate the length of $AB$. [4]

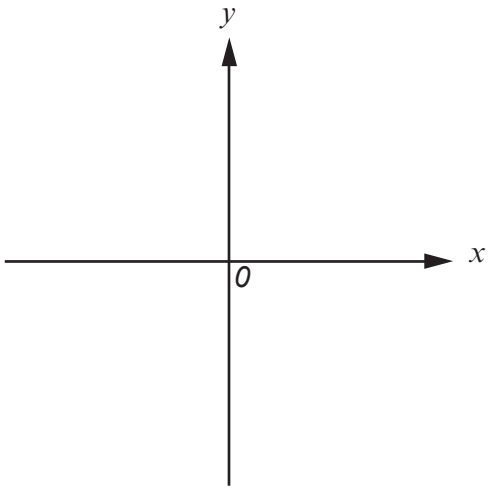
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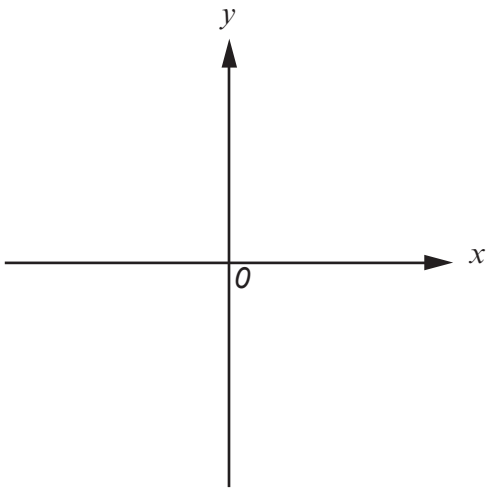
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**18.** *(a)* Use the axes below to sketch the graphs represented by each of the following equations.

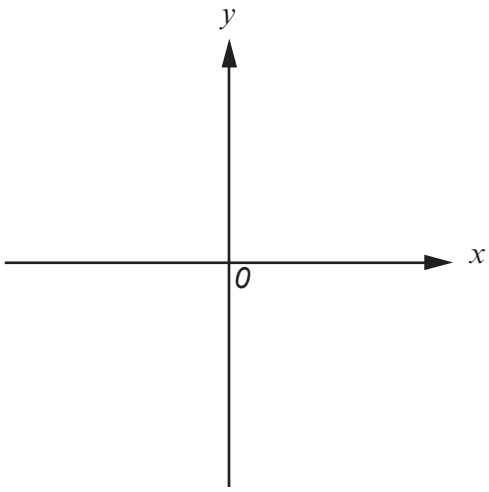
(i) $y = x^2$ [1]




(ii) $y = \frac{1}{x}$ [2]




*(b)* Use the axes below to sketch the graph of $y = 2^x$.
You must give the coordinates of any point at which your sketch intersects an axis. [2]




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**19.** The point (2, 26) lies on the curve $y = kx^2 + 3x$, where k is a constant.
Find the coordinates of the points where the curve $y = kx^2 + 3x$ intersects the $x$-axis. [6]

**20.** *(a)* Express $x^2 + 14x + 53$ in the form $(x + a)^2 + b$ where $a$ and $b$ are values to be found. [2]

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*(b)* Show that the following identity is true. [5]

$$\frac{3x+2}{5} - \frac{5x-2}{4} + \frac{7}{10} \equiv \frac{32-13x}{20}.$$

Examiner only

**21.** The probability of an event $A$ occurring is 0·4, and is written $P(A) = 0{\cdot}4$.
Independently, the probability of an event $B$ occurring is $x$, and is written $P(B) = x$.
The probability of $A'$ and $B$ occurring together is 0·48, and is written $P(A' \cap B) = 0{\cdot}48$.

Calculate $x$. [3]

**END OF PAPER**

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# GCSE MARKING SCHEME

## METHODS IN MATHEMATICS (LINKED PAIR PILOT)

## SUMMER 2014

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## 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.

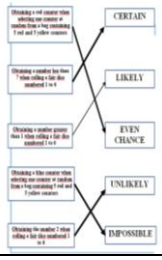
WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.


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


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## UNIT 1 (FOUNDATION TIER)

| Methods in Mathematics<br>June 2014 Unit 1 Foundation Tier | Mark | Comments |
|---|---|---|
| 1. (a) (i) 19004<br>(ii) five hundred and fifty thousand<br>(b) (i) 380<br>(ii) 16<br>(iii) 54<br>(iv) 13<br>(c) (i) 2190<br>(ii) 54000 | B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>8 | |
| 2.  | B4<br><br><br><br><br>4 | B1 for each correct answer |
| 3. Right angle<br>90(º)<br>Obtuse angle<br>Greater than 90(º) AND less than 180(º) | B1<br>E1<br>B1<br>E1<br>4 | <br><br><br>Accept 90(º) - 180(º), between 90(º) and180(º) |
| 4. 1st Diagram Circle : 4<br>Square : 5<br><br>2nd Diagram Right Hand Circle : 7<br>Square : -15<br>Bottom Circle : -18<br><br>(b)(i) 48<br>(ii) 8<br>(iii) 4 | B1<br>B1<br><br>B1<br>B1<br>B1<br><br>B1<br>B1<br>B1<br>8 | <br><br><br><br>FT from a negative answer in the square<br><br><br><br>Accept embedded answer |



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| Methods in Mathematics<br>June 2014 Unit 1 Foundation Tier | Mark | Comments |
|---|---|---|
| 5. Any correct strategy for finding the need for paying for 9 bottles from Len's store AND 8 bottles from Deb's store | S1 | |
| 9 × 90(p) or 8 × (£)1.00 | M1 | Or equivalent |
| 810(p) or (£)8.10 or (£)8 | A1 | Or equivalent |
| 810(p) or (£)8.10 AND (£)8 AND Deb's store | A1 | Or equivalent |
| | | Accept 8.1 for £8.10<br>If units are given they must be correct |
| Look for:<br>Clear process steps and labelling of calculations.<br>Correct use of pounds and pence. | | |
| QWC2: Candidates will be expected to<br>• present relevant work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in spelling, punctuation and grammar | 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: Candidates will be expected to<br>• present work clearly which is mostly relevant, with words explaining process or steps<br>OR<br>• make few if any mistakes in spelling, punctuation and grammar and include units in their final answer | | QWC1 Presents material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar. |
| | 6 | QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 6. a) 1/8<br>b) 2/8<br>c) 3/8<br>d) 5/8<br>e) 2/8<br>f) 2/8 | B1<br>B1<br>B1<br>B1<br>B1<br>B1 | penalise once only for consistent use of incorrect denominator, provided in a fraction <1<br>penalise once only for incorrect notation throughout<br>Ignore incorrect cancelling throughout |
| | 6 | *SC2 for all correct cards for parts c)-f)*<br>*SC1 for correct cards in 2 or 3 parts from c)-f)* |
| 7. a) For 2 correct in a form which allows comparison | B1 | |
| For all 3 correct in a form which allows comparison | B1 | |
| ¾, 5/8, ½ | B1 | Or equivalent<br>Answer only gets B0, B0, B1 |
| b) 50/400 | M1 | Or equivalent eg 0.5/4 |
| 1/8 | A1 | |
| | 5 | |
| 8. Appropriate sight of 90(˚) | B1 | |
| Appropriate sight 45(˚) or 90/2 | B1 | 2nd B1 implies 1st B1 |
| 180(˚)-45(˚) | M1 | FT 180- 'their 45' provided at least one B1 awarded |
| 135(˚) | A1 | CAO |
| | 4 | An unsupported answer gets full marks |



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| Methods in Mathematics<br>June 2014 Unit 1 Foundation Tier | Mark | Comments |
|---|---|---|
| 9. (a) $8x$<br>(b) $-2a + 9b$<br><br>(c) -25<br>(d) $6xy + 14x$<br><br>(e) 5a (2b - 5) | B1<br>B2<br><br>B2<br>B2<br><br>B2<br><br>9 | <br>Must be in an expression, B1 for sight of either $-2a$ or $9b$. Mark final answer.<br>B1 for either -40 or 15<br>Must be in an expression, B1 for sight of either $6xy$ or $14x$<br>B1 for $5a(\ldots - 5)$ or $5a(2b - \ldots.)$ or correct partial factorisation |
| 10 (a)(i) 1- (0.2 + 0.15 + 0.25)<br>0.4<br><br><br><br>(ii) Red and Yellow<br>(b) 0.3 | M1<br>A1<br><br><br><br>B1<br>B1<br>4 | Allow intention of brackets.<br><br>*(1 – 0.42=)0.58 gets SC1*<br>*If answer of 0.4 in table and contradicted in answer space then SC1*<br><br>FT from their (a)(i) provided it is ≤ 0.2 and ≠0 |
| 11<br>Three times a number $c$ : $3c$<br>Add 3 to a number $c$ and then multiply this total by 6 : $6(c + 3)$<br>Three times a number $c$ and then add 6 : $3c + 6$<br>Add 3 to a number $c$ and then divide this total by 6 : $\frac{c + 3}{6}$ | B4<br><br><br><br><br><br><br>4 | B1 for each correct entry |
| 12. (a) Square or rectangle or isosceles trapezium<br>(b) Parallelogram or rhombus or rectangle<br>(c)(i) ( -5 , 4 )<br>(ii) ( 5 , -4 ) | B1<br>B1<br>B1<br>B1<br>4 | |
| 13a) Multiples of 7<br>b) 28 and 35 placed correctly | B1<br>B2<br>3 | B1 for either |
| 14. 360 ÷ 9<br>… X … has **40** sides<br>360 ÷ (180 – 120) OR equivalent full method<br><br><br><br>… Y … has **6** sides | M1<br>A1<br>M1<br><br><br><br>A1<br>4 | An unsupported answer is awarded M1, A1<br>e.g. looking at matching a multiple of 180 with a multiple of 120:<br>180 360 540 720 900<br>120 240 360 480 600 720<br>An unsupported answer is awarded M1, A1 |
| 15. Interpretation that 36cm is 8 parts<br>$3 \times 36 \div 8 + 36$ OR $(3 + 8) \times 36 \div 8$<br><br>49.5(cm) or 49 ½ (cm) | S1<br>M1<br><br>A1<br>3 | Or sight of 36÷8 or 36/8 or 4.5<br>Full method to calculate AC. FT their miscalculated 36÷8, *not for 36÷11*<br>CAO. Do not accept 50(cm), unless 49.5 seen |



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<table>
<tr><th>Methods in Mathematics<br>June 2014 Unit 1 Foundation Tier</th><th>Mark</th><th>Comments</th></tr>
<tr>
<td>16. Considering all possible outcomes, e.g. use of two-way table, or showing all possible totals, or (Game card A) 6 possible (ways or outcomes) AND (Game card B) 16 possible (ways or outcomes)<br><br>Example:
<table>
<tr><th>+</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr>
<tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr>
<tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr>
<tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr>
</table>
Conclusion, game card B has the better chance</td>
<td>B3<br><br><br><br><br><br><br><br><br><br><br><br><br><br>E1<br>4</td>
<td>Accept 6/25 and 16/25. No extra outcomes should be included, e.g. including numbers not on the spinners<br>If card A list complete, accept stopping listing card B possibilities as soon as >6 possible ways indicated correctly.<br><br>B2 for at least 1 possible outcome indicated for each of the 4 numbers on card A AND at least 2 possible outcomes indicated for each of the 4 numbers on card B, OR for all possible outcomes for card B<br><br>B1 for 1 way of scoring a number on card A AND 2 ways for a number on card B, OR all outcomes for card A<br><br>The conclusion must be based on working, i.e. provided at least B2 previously awarded</td>
</tr>
</table>



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# UNIT 1 (HIGHER TIER)

<table>
<tr><th>Methods Unit 1 Higher Tier June 2014</th><th>Mark</th><th>Comment</th></tr>
<tr><td>1. a = 52°<br>b = 128°<br>c = 128°<br>d = 40°<br><br>e = 88°</td><td>B1<br>B1<br>B1<br>B1<br><br>B1<br>5</td><td><br><br>FT their b = c<br>FT 92 – their a, or their b – 88,<br>or their c – 88, or 128 – their e</td></tr>
<tr><td>2. Considering all possible outcomes, e.g. use of two-way table, or showing all possible totals, or<br>(Game card A) 6 possible (ways or outcomes) AND<br>(Game card B) 16 possible (ways or outcomes)<br><br>Example:<br><table><tr><th>+</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr></table><br>Conclusion, game card B has the better chance<br><br>Look for:<br>• clear organisation, ordered lists or tables<br>• labels linking working and game cards<br>• clear explanation in a conclusion<br>• if used, correct notation for probability<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer</td><td>B3<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>E1<br><br><br><br>QWC<br>2<br><br><br><br><br><br><br><br><br><br><br>6</td><td>Accept 6/25 and 16/25. No extra outcomes should be included, e.g. including numbers not on the spinners<br>If card A list complete, accept stopping listing card B possibilities as soon as >6 possible ways indicated correctly.<br><br>B2 for at least 1 possible outcome indicated for each of the 4 numbers on card A AND at least 2 possible outcomes indicated for each of the 4 numbers on card B, OR for all possible outcomes for card B<br><br>B1 for 1 way of scoring a number on card A AND 2 ways for a number on card B, OR all outcomes for card A<br><br>The conclusion must be based on working, i.e. provided at least B2 previously awarded<br><br><br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.</td></tr>
<tr><td>3.(a) 18 or equivalent<br>(b) 12 or equivalent<br>(c) 9<br>(d) Numerator 0.06(0) or 1 correct step in calculation<br>Multiplying numerator and denominator by suitable multiple of 10 – for eliminating decimals, or correct (FT) evaluation as a decimal<br><br>1/1000</td><td>B1<br>B1<br>B2<br>B1<br>B1<br><br><br>B1<br><br><br>7</td><td>Accept a product of factors<br>Accept a product of factors<br>B1 for sight of 3, or ¼ + 2¾, or 0.25 + 2.75<br><br>FT depending on their numerator.<br><br>These 1st 2 B marks are interchangeable<br>A final answer of 0.001 is awarded B1, B1, B0<br>CAO<br>(Example: 0.60/60 = 0.01 or 1/100 or 6/600 is awarded B0, B1, B0<br>60/600 as a 1st stage is awarded B0, B0, B0</td></tr>
</table>



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| | | |
|---|---|---|
| 4. (a) Square or rectangle or isosceles trapezium<br>(b) Parallelogram or rhombus or rectangle<br>(c)(i) ( -5 , 4 )<br>(ii) ( 5 , -4 ) | B1<br>B1<br>B1<br>B1<br>4 | |
| 5.(a) $h + 4 = 5e$ or $-5e = -4 - h$<br>$e = \frac{h+4}{5}$ or $e = \frac{-4-h}{-5}$<br>(b) (i) 9<br>(ii) 6<br>(iii) 3 | B1<br>B1<br><br>B1<br>B1<br>B1<br>5 | FT until 2nd error<br>*(e.g. 4h=5e leading to 4h/5 = e is awarded B0, B1)* |
| 6.(a) False with valid general reason, OR a correct general statement without selection of false | E2 | For example 'false, there is always 1 and the number itself', or 'false, as they have exactly two factors'<br>E1 for sight of at least 2 prime numbers, with **no** errors in choice of primes, and a list of the factors of at least 2 prime numbers<br>*Penalise incorrect reference to factors -1*<br>*Choice TRUE but correct general statement allow SC1* |
| (b) True with valid general reason, OR a correct general statement without selection of true | E2<br><br>4 | For example 'the square root is a factor times by itself, (other factors are in pairs)'<br>E1 for evidence of working with at least 2 square numbers, with **no** errors in choice of square numbers leading to<br>• correct factors<br>OR<br>• statement of the correct number of factors<br>OR<br>• 1 of each (1 example of factors and 1 example of number of factors)<br>*Choice FALSE but correct general statement allow SC1* |
| 7. 360 ÷ 9<br>… X … has **40** sides<br>360 ÷ (180 – 120) OR equivalent full method working with interior angles<br>… Y … has **6** sides | M1<br>A1<br>M1<br><br>A1<br>4 | <br>An unsupported answer is awarded M1, A1<br><br><br>An unsupported answer is awarded M1, A1 |
| 8. Interpretation that 36cm is 8 parts<br>$3 \times 36 \div 8 + 36$ OR $(3 + 8) \times 36 \div 8$<br>49.5(cm) or 49 ½ (cm) | S1<br>M1<br><br>A1<br>3 | Or sight of 36÷8 or 36/8 or 4.5<br>Full method to calculate AC. FT their miscalculated 36÷8, *not for 36÷11*<br>CAO. Do not accept 50(cm), unless 49.5 seen |
| 9.(a) 6<br>(b) 0.1212… or $0.\dot{1}\dot{2}$<br>(c) 1/40 | B2<br><br>B2<br><br>B2<br>6 | B1 for sight of 4 ×6 or 4×2×3 or $2^3 \times 3$<br>OR for sight of 144. Not for 2×12, this is B0<br>B1 for 0.12 or 0.12… or $0.\dot{1}\dot{2}$ as an answer or seen in working<br>B1 for sight of 25/1000 or equivalent unsimplified fraction |



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| | | |
|---|---|---|
| 10.(a)(i) $4n + 3$<br>(ii) $-2n + 74$<br>(iii) $n^2 - 8$<br><br>(b) $3\times20^2 + 4$<br>$= 1204$ | B2<br>B2<br>B2<br><br>M1<br>A1<br>8 | B1 for $4n$<br>B1 for $-2n$. Allow SC1 for $2n + 74$<br>B1 for $n^2$, not $an^2$ where $a\neq1$, OR<br>B1 for sight of second differences 2<br>Must clearly be $20^2$ not $(3\times20)^2$<br>CAO |
| 11.(a) $2 \times 10^{10}$<br><br><br><br>(b) $7.3 \times 10^9$ | B2<br><br><br><br>B2<br><br><br><br>4 | B1 for $20 \times 10^9$ or $0.2 \times 10^{11}$ or similar attempt at standard form<br>B0 for 20 000 000 000<br><br>B1 for $10^8( 5 + 6.8\times10)$ or $73 \times 10^8$ or $0.73 \times 10^{10}$ or similar attempt at standard form<br>B0 for 7 300 000 000<br>*If no marks in (a) & (b) then SC1 for both answers correct but not in standard form* |
| 12.(a) (i) $6x(2x + 3y)$<br><br>(ii) $(x + 10)(x - 10)$<br>(b) $(x + 2 )(x - 7)$ $(=0)$<br>$x= -2$ and $x =7$ | B2<br><br>B1<br>B2<br>B1<br>6 | B1 for a correct partially factorised expression, OR for sight of $6x(2x ...)$ or $6x( ... + 3y)$<br><br>B1 for $( x \dots 2)(x \dots 7)$<br>Must be from factorised expression or equation<br>FT from their pair of brackets |
| 13.(a) Explains parallel with intersection *y*-axis at 3, e.g. 'same gradient with intersection at (y=)3'<br><br><br><br>(b) Reflection (in *x*-axis) or perpendicular (through the origin) or change the sign of the y-coordinate | E1<br><br><br><br>E1<br><br><br><br><br>2 | Must imply parallel and mention (vertical) translation<br>Allow 'put the line up another 3 squares'<br>Do not accept 'm=1, c=3' unless related to y = x,<br><br>Accept use of knowledge 'm × -1/m = -1', or '$m_1\times m_2 = -1$'<br>Do not accept 'diagonally downwards', 'opposite (direction)', or 'reversed (direction)', or 'swap the coordinates'<br>Allow 'same but decreasing instead of increasing (as it is minus)', 'rotate 90° (about the origin)', 'change the sign of one of the coordinates' |
| 14.(a) 0.35 0.8 0.2 0.8 on the correct branches<br>(b) $0.65 \times 0.2$<br>$= 0.13$ | B2<br>M1<br>A1<br>4 | B1 for any two correct entries. Accept fractions |
| 15.(a) Correct region shaded<br>(b) Correct region shaded<br>(c) Correct region shaded | B1<br>B1<br>B1<br>3 | Union of A and B<br>All shaded except the intersection of A with B<br>All except the non overlap region of A |
| 16.<br><br><br>(a) 37(°)<br>Alternate segment theorem **and** isosceles triangle<br>(b) 55(°)<br>(Isosceles triangle,) angle at centre twice angle at circumference | <br><br><br>B1<br>E1<br>B1<br>E1<br>4 | The E1 mark depends on the B1 or sight of a correct method.<br>For E marks: Do not accept calculation<br><br>Or equivalent.<br><br>Or equivalent. |
| 17. $30 \times 70 = 35 \times AC$ OR $30 \times (30 + 40) = 35 \times AC$<br>$AC = 60$ (cm)<br>$AB = 60 - 35$<br>$= 25$ (cm) | M1<br>A1<br>m1<br>A1<br>4 | May be within a calculation towards AB directly<br>May be implied in further working<br>FT for their AC provided M1 awarded |



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| | | |
|---|---|---|
| 18.(a)(i) Sketch of $y=x^2$ symmetrical passing through the origin | B1 | Mark intention to be symmetrical passing through the origin |
| (ii) Sketch of $y=1/x$ in appropriate 2 quadrants with axes as asymptotes | B2 | B1 for sketch in 1 quadrant with axes as asymptotes, or for 2 curves appropriately in both quadrants but not clearly with intention of axes as asymptotes |
| (b) Sketch of $y = 2^x$ through (0,1), with 1 indicated on the y-axis or coordinate (0, 1) given | B2 | B1 for general shape, towards zero gradient for greater negative values of x, and rising for greater positive values of x, clearly through a point on positive y-axis |
| | 5 | |
| 19.Substitution of (2, 26), | M1 | |
| e.g. sight of $26 = k \times 2^2 + 3 \times 2$ | | |
| $k = 5$ | A1 | |
| Equating $y = 0$, e.g. sight of $0 = kx^2 + 3x$ | M1 | FT their k with $k \neq 0$, including 'k' |
| $x(5x + 3) = 0$ | m1 | Extracting common factor, accept $x(kx + 3) = 0$ |
| (0, 0) or $x = 0$ | A1 | Must be from correct working |
| (-3/5, 0) or $x = -3/5$ or equivalents | A1 | Accept $x = -3/k$. Not dependent on m1 |
| | 6 | |
| 20.(a) $(x + 7)^2 + 4$ | B2 | B1 for a= (+)7, B1 for b = 4, only award B2 for $(x +7)^2 + 4$ |
| (b) Attempt to use common denominator | B1 | e.g. allow sight of all 3 fractions denominator 20 without change to numerators |
| $\frac{4(3x+2) - 5(5x-2) + 14}{(20)}$ or equivalent | M2 | M1 for 2 of the three terms correct. May be expressed as separate fractions, or working without consideration of the denominator |
| $\frac{12x + 8 - 25x + 10 + 14}{20}$ or equivalent | A1 | Convincing step. FT from 1 error, i.e. M1. Must be clearly implying +10 term rather than -10 from notation. Denominator must be seen |
| $= \frac{32 - 13x}{20}$ | A1 | Must follow from correct working |
| | 7 | |
| 21.Sight of P(A') = 0.6 | B1 | |
| $0.6 \times x = 0.48$ OR $x = 0.48/0.6$ | M1 | FT their 1 - 0.4 incorrectly evaluated for M1 only, do not FT 0.4 for P(A') |
| $x = 0.8$ | A1 | CAO |
| | 3 | |



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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS OF MATHEMATICS

## UNIT 1: Methods (Non-Calculator)
## HIGHER TIER

A.M. FRIDAY, 10 January 2014

2 hours

**CALCULATORS ARE NOT TO BE USED FOR THIS PAPER**

### ADDITIONAL MATERIALS

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 $\pi$ as 3·14.

### INFORMATION FOR CANDIDATES

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

Unless stated, diagrams are not drawn to scale.

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

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

You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **2***(a)*.

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

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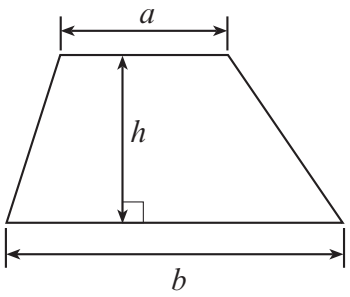
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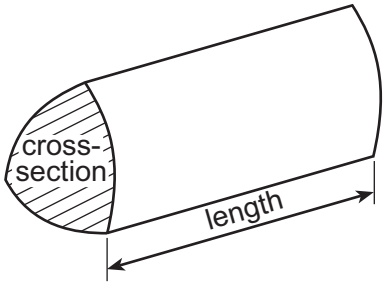
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## Formula List

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

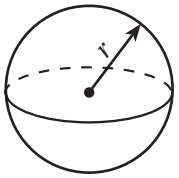



**Volume of prism** = area of cross-section × length



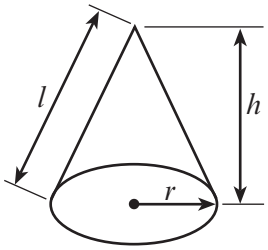

**Volume of sphere** $= \frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** $= \pi rl$

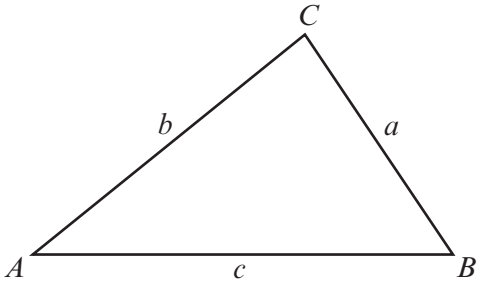



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

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

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**1.** *(a)* Given that $a = -3$, $b = -5$ and $c = 2$, find the value of $\dfrac{6c - 2b}{a^2 + 2}$. [2]

*(b)* Simplify $32x - 16y - 50x - 17y$. [2]

*(c)* Simplify $\dfrac{(2x + 7)^4}{2x + 7}$. [1]

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

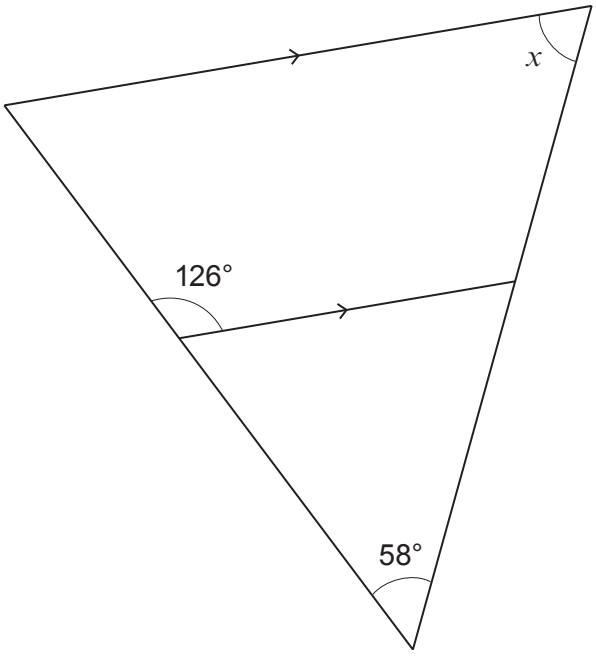



*Diagram not drawn to scale*

Calculate the size of angle $x$.
You must show all your working and explain each step of your answer. [5]

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*(b)* The tile shown is a rhombus.

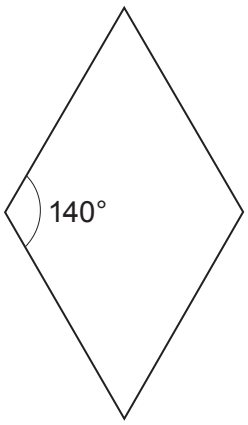



*Diagram not drawn to scale*

Explain why tiles identical to the one shown tessellate.
You must give reasons for your answer. [3]

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**3.** *(a)* Complete the following table.
The fraction must be expressed in its simplest form. [3]

| Fraction | Decimal | Is this a recurring or terminating decimal? |
|---|---|---|
| $\frac{2}{3}$ | $0\cdot\dot{6}$ | recurring |
| ..... | 0·15 | ..... |
| $\frac{7}{11}$ | ..... | ..... |

*(b)* Express $\frac{0\cdot24 \square 0\cdot03}{0\cdot002}$ as an improper fraction in its simplest form. [3]

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**4.** Points are plotted on a grid.
The rule $(a, 3a)$ is used to find all the points.

*(a)* Does the point with coordinates $(-5, -2)$ fit the rule?
You must give a reason for your answer. [1]

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*(b)* Plot five possible points with coordinates that fit the rule $(a, 3a)$ on the grid. [2]

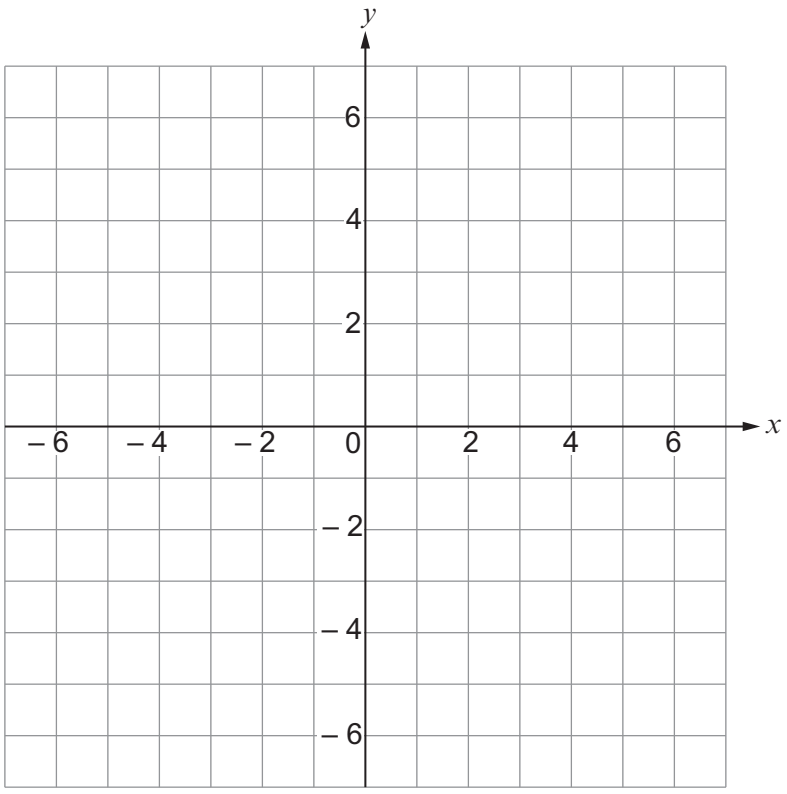
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*(c)* Write down the equation of the straight line that passes through all the points that fit the rule $(a, 3a)$. [2]

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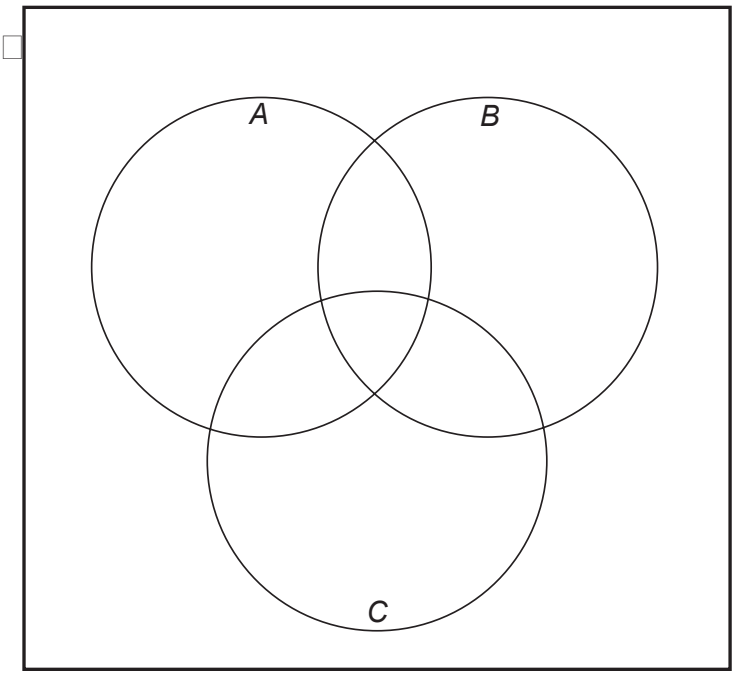
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**5.** The universal set, $\mathbb{U}$ = {22, 23, 24, 25, 26, 27, 28, 29, 30}.

Within this universal set $\mathbb{U}$,

- set *A* is the multiples of 2
- set *B* is the multiples of 4
- set *C* is the multiples of 5

*(a)* Complete the Venn diagram. [3]



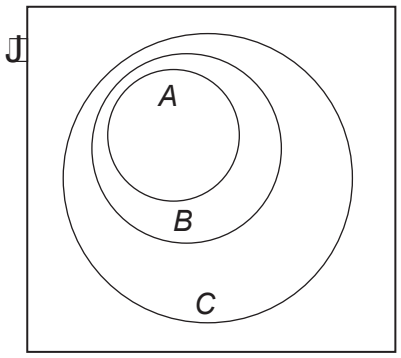


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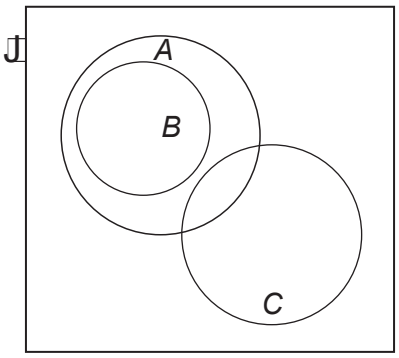
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*(b)* Which one of the following Venn diagrams could also be used to represent the sets $\mathbb{J}$, $A$, $B$ and $C$?
You must give a reason for your choice. [2]

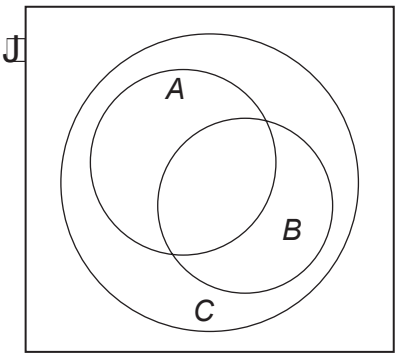
Venn Diagram 1




Venn Diagram 2




Venn Diagram 3




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*(c)* A whole number is selected at random from the universal set $\mathbb{J}$ = {22, 23, 24, 25, 26, 27, 28, 29, 30}.

Find the probability that the number selected is: [3]

a multiple of 2 but not a multiple of 4 .....

not a multiple of 5 .....

a multiple of 5 and a multiple of 2 .....

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**6.** A biased dice is thrown.
The letter 'o' is recorded when an odd number is thrown.
The letter 'e' is recorded when an even number is thrown.

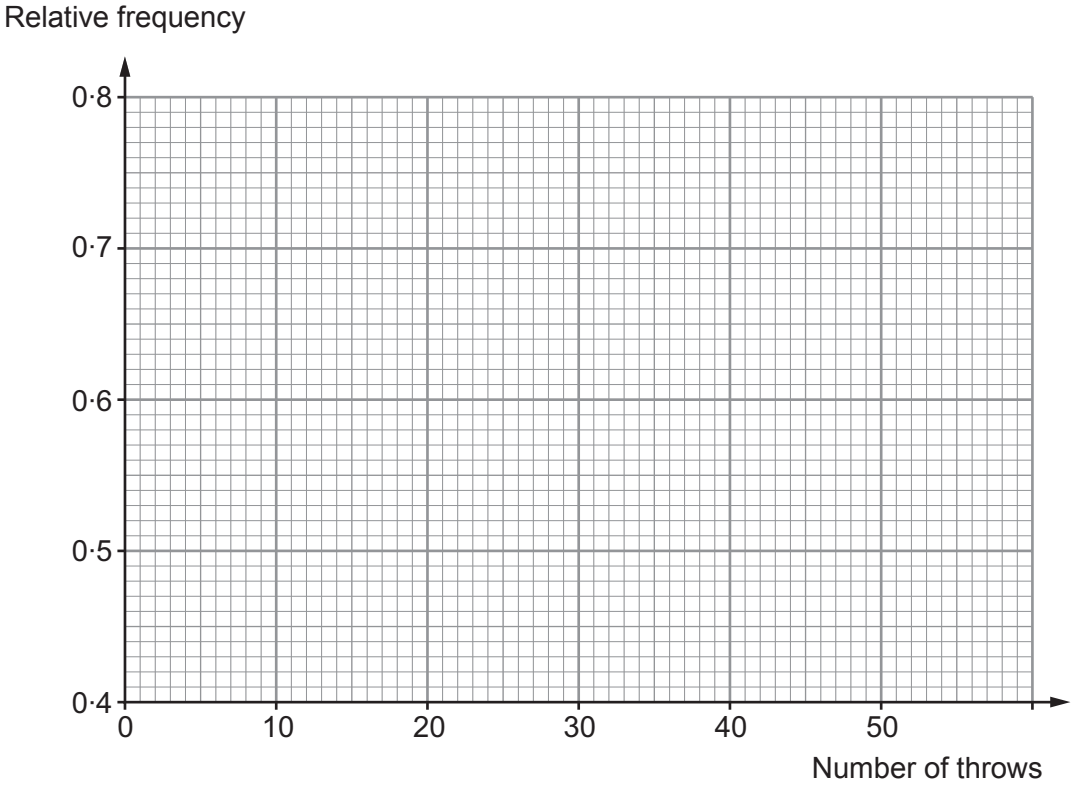
The dice is thrown in groups of ten throws.

| Odd and even numbers recorded in each group | ooooo ooeee | ooooo eeeoo | eeeeo ooooo | ooooe eeeee | ooooe eeeee |
|---|---|---|---|---|---|

*(a)* Calculate the relative frequency of throwing an odd number after 10, 20, 30, 40, and 50 throws.
Use your answers to complete the table below. [3]

| Total number of throws | | 10 | 20 | 30 | 40 | 50 |
|---|---|---|---|---|---|---|
| Relative frequency of throwing an odd number | Fraction | $\frac{7}{10}$ | | | | |
| | Decimal | 0·7 | | | | |

*(b)* Use the graph paper to plot the relative frequencies. [2]




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*(c)* Has the experiment been carried out a sufficient number of times to give a good estimate for the probability of throwing an odd number with this biased dice?
You must give a reason for your answer. [1]

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**7.** Four of the interior angles of a seven-sided polygon are 114°, 150°, 160° and 170°.
The other three interior angles of this polygon are equal.
Calculate the size of each of the other three interior angles. [5]

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**Turn over.**

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**8.** *(a)* Find the highest common factor of 36 and 54. [1]

*(b)* Simplify $\sqrt{(2^4 \times \sqrt{81})}$. [3]

*(c)* Use these clues to find the missing number. [3]

- This number is the product of 3 prime numbers
- 10 is a factor of this number
- 210 is a multiple of this number
- This number is greater than 30

The missing number is .....

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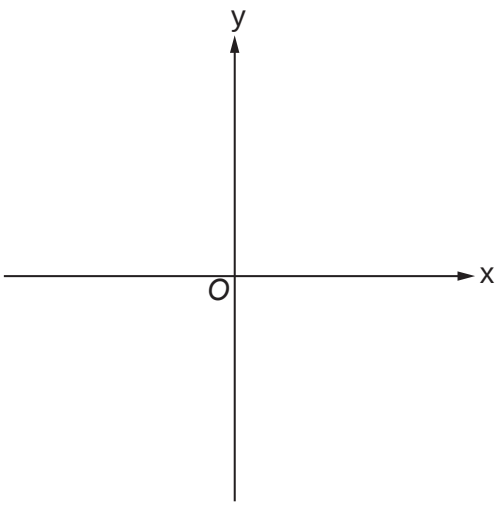


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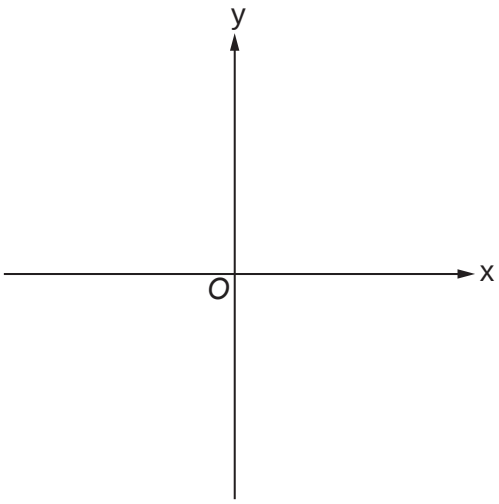
Examiner only

**9.** Use the axes given below to sketch the following.

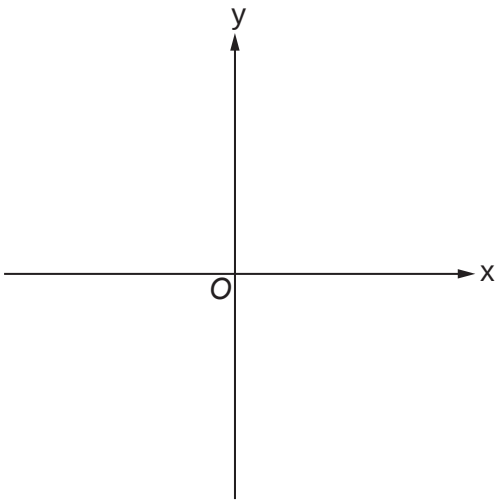
*(a)* $y = x^2$ [1]




*(b)* $y = -x^2$ [1]




*(c)* $y = x^3$ [1]



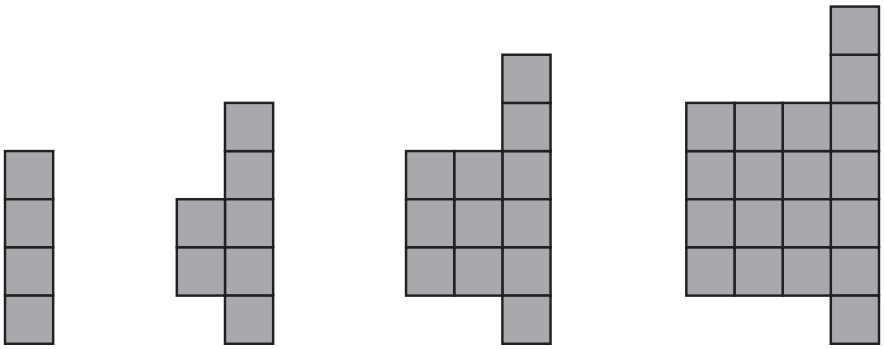

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**10.** *(a)* The $n$th term of a sequence is $5n^2 - 3n - 1$.
Calculate the 40th term of the sequence. [2]

*(b)* The diagram shows the first four patterns of a sequence.



Find the $n$th term of the sequence. [3]

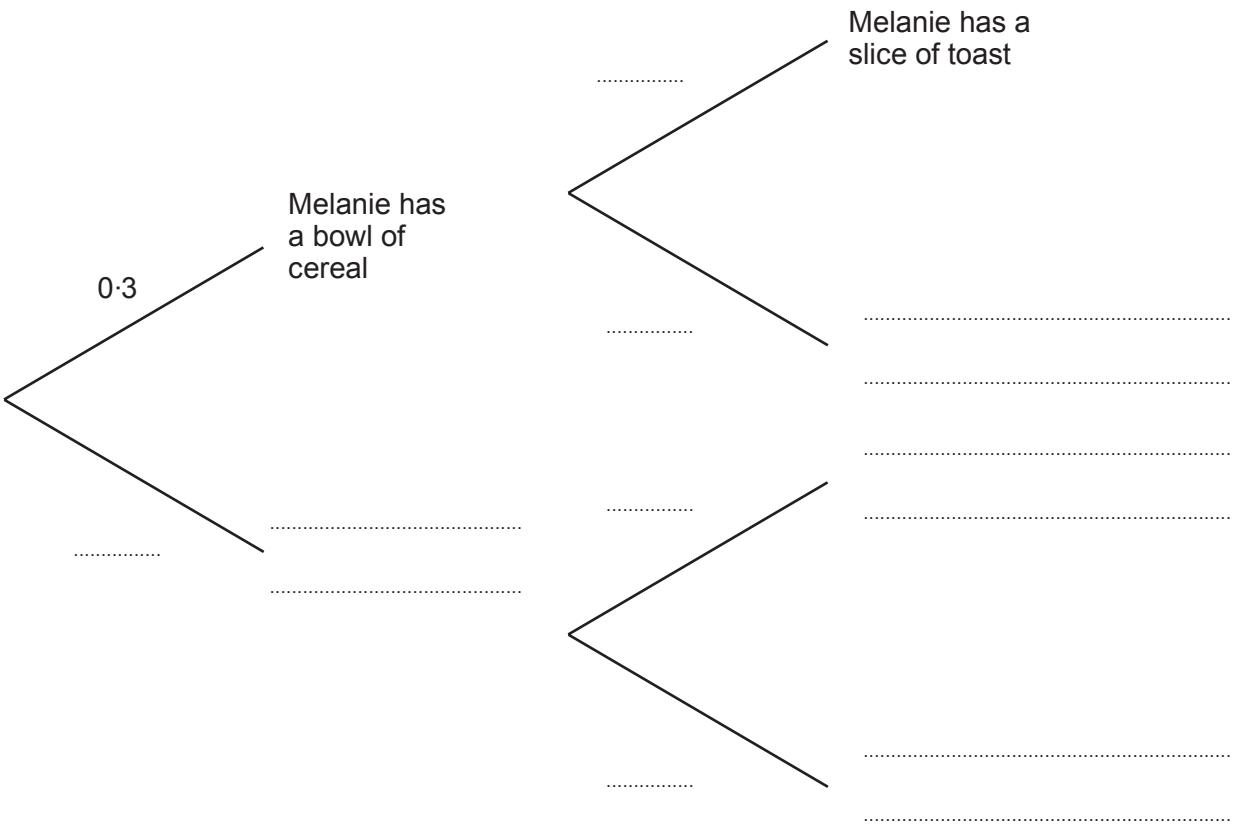
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**11.** At breakfast, the probability that Melanie has a bowl of cereal is 0·3 and the probability that Melanie has a slice of toast is 0·2.
Melanie having a bowl of cereal and Melanie having a slice of toast are independent events.

*(a)* Complete the tree diagram. [3]




*(b)* Find the probability that Melanie has a bowl of cereal and a slice of toast. [2]

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**12.** *(a)* Factorise $6x^2 + 13x - 5$. [2]

*(b)* Rearrange to make $m$ the subject of the following formula. [3]

$$w = \frac{3m^2}{d}$$

*(c)* Rearrange to make $b$ the subject of the following formula. [3]

$$ab = bc + e$$

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**13.** In a group of 15 people there are 5 men and 10 women.
One of the men and three of the women are wearing red jumpers.
A man is selected at random from the group.
Then a woman is selected at random from the group.

Is the probability that the people selected are both wearing red jumpers greater or less than 5%?
You must show your working and give a reason for your answer.

[5]

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**14.** *(a)* Simplify $(3x + 7y)(2x - 5y) + xy$. [3]

*(b)* Express $\frac{7x}{2x+3} + \frac{2}{3x-2}$ as a single fraction in its simplest form. [4]

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**15.** Two of the equations below represent straight lines that are perpendicular to each other.

$4y = x$ $\quad$ $4y = 3x$ $\quad$ $3y = x$

$y = x$ $\quad$ $-4y = x$ $\quad$ $y = -4x$

Select the two equations that represent lines that are perpendicular to each other.
You must show by calculation that the equations represent perpendicular lines. [3]

.....

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**16.** Two circles of equal radius intersect as shown in the diagram below.

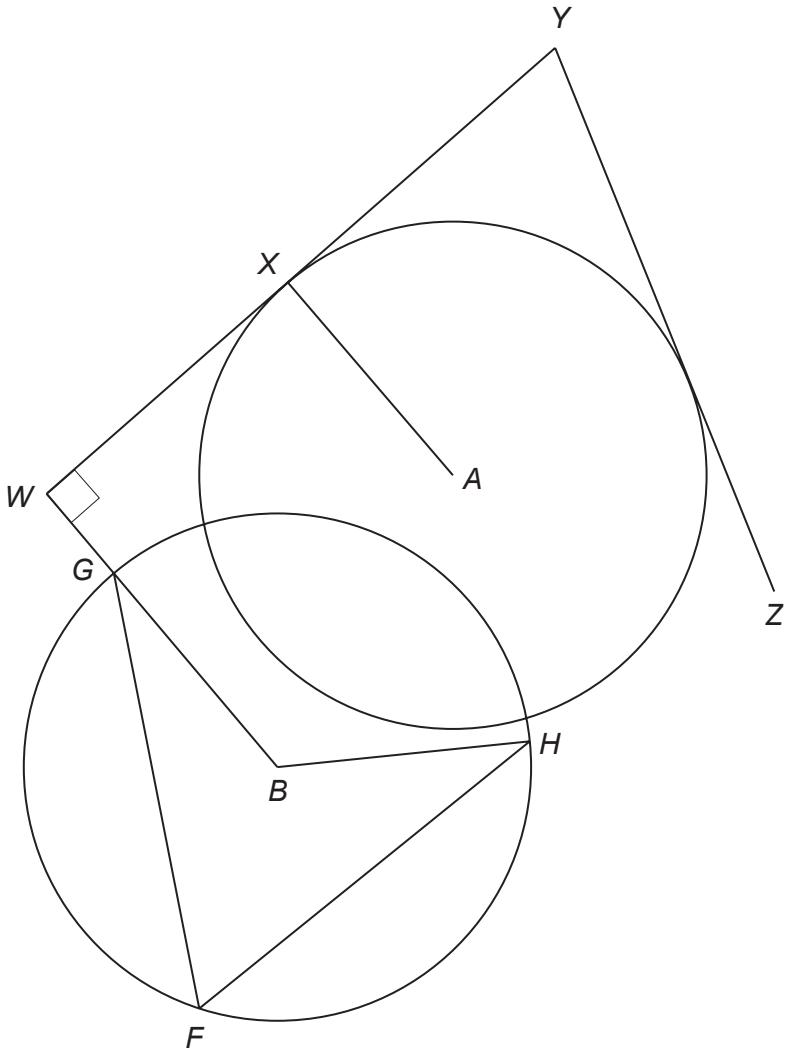



*Diagram not drawn to scale*

The centres of the circles are *A* and *B*.
The straight lines *WXY* and *YZ* are tangents to the circle with centre *A* and $G\hat{F}H = 80°$.

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*(a)* Indicate on one of the lines on the diagram on the previous page, where the point *P* lies, so that *YP* = *YX*. [1]

*(b)* Explain why *XA* is parallel to *WB*. [2]

*(c)* Given that a straight line drawn between the centres of the two circles bisects $H\hat{B}G$, calculate the size of $X\hat{A}B$. You must give reasons for your answer. [4]

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**Turn over.**

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**17.** *(a)* The expression $x^2 + 8x + 5$ can be written in the form $(x + a)^2 + b$, where $a$ and $b$ are whole numbers.
Find the values of $a$ and $b$. [3]

*(b)* **Hence**, solve $x^2 + 8x + 5 = 0$ leaving your answer in surd form. [4]

**END OF PAPER**

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# 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 |

# METHODS - UNIT 1
# FOUNDATION TIER

| Methods Unit 1 Foundation Tier January 2014 | Mark | Comments |
|---|---|---|
| 1. (a) (i) 5025<br>(ii) ten million<br>(b) (i) 121<br>(ii) 9<br>(iii) 48<br>(iv) 8<br>(c) (i) 1450<br>(ii) 1400 | B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>8 | |
| 2. Number other than 1-6<br>Any three different numbers from 1 to 6<br><br>Head OR Tail<br>Yellow | B1<br>B1<br><br>B1<br>B1<br>4 | <br>Eg, Odd (numbers) OR Even (numbers)<br>OR any other correct answer e.g. '1,2, or 3' or 'a prime number''.<br><br><br> |
| 3.<br>1 2 3 **4**<br>3 4 -5 **8**<br>**5** 4 **3** **-2**<br>1 0 9 0<br><br>3 | B3 | B2 for any 3 or 4 correct entries<br>B1 for 2 correct entries |
| 4. (Dylan saves) (1/10 × 400 =)(£) 40<br>(No of weeks) 250/ 40<br><br>6.25<br><br>(He can afford the bike after) 7 (weeks)<br><br>Look for:<br>• Clear workings and labelling<br>• Correct use of units eg £, weeks<br><br>QWC2: Candidates will be expected to<br>• present relevant work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in spelling, punctuation and grammar<br><br>QWC1: Candidates will be expected to<br>• present work clearly which is mostly relevant, with words explaining process or steps<br>OR<br>• make few if any mistakes in spelling, punctuation and grammar and include units in their final answer<br><br>6 | B1<br>M1<br><br><br>A1<br><br>A1<br><br><br><

| Methods Unit 1 Foundation Tier January 2014 | Mark | Comments |
|---|---|---|
| 5. (a) 9 | B3 | B2 for meeting any 3 clues e.g. 3, 15, 81,…<br>B1 for meeting any two clues<br>e.g. 1, 4, 5, 6, 7, 11, 12,... |
| (b) (i) 35 -10 | B1 | |
| (ii) 13 × 50 or 50 ×13 | B1 | |
| | 5 | |
| 6. 6 | B1 | |
| Valid Reason | E1 | E marks dependent on B marks<br>Eg 6 × 12=12 |
| 7 | B1 | |
| Valid Reason | E1 | Eg 1 and itself goes into it. Only 2 factors. |
| 10 | B1 | |
| Valid Reason | E1 | Eg 10 × 10 =100. Ten squared=100. |
| | 6 | |
| 7. 180/3 or 60 | B1 | Or seen in diagram. |
| 180- 60 | M1 | FT their 60 |
| 120 | A1 | CAO |
| | 3 | |
| 8. (a) Correct diagram | B1 | |
| (b) 14, 18, 22 | B2 | Award B1 for two correct entries |
| (c) Number of seats = Number of tables(t) × 4 +2 | B2 | Accept n for number of tables<br>Award B1 for × 4 + 2<br>Do not accept 'add four ' |
| (d) 30 | B1 | FT for equivalent level of difficulty |
| (e) (82 – 2)/4 | M1 | FT for equivalent level of difficulty<br>Or equivalent method |
| =20 | A1 | |
| | 8 | |
| 9. (a) $4x + 3y$ | B2 | Must be an expression, as shown.<br>Award B1 for either of the 2 terms correct within an expression or both terms correct but not in an expression. |
| (b) (4 x 3) – 5 | M1 | |
| =7 | A1 | CAO |
| | 4 | |
| 10. For 2 correct in a form which allows comparison | B1 | |
| For all 3 correct in a form which allows comparison | B1 | |
| 3/8, ½, ,¾ | B1 | Answer only gets B1. CAO |
| | 3 | |
| 11. (a) $x = 64$ | B1 | |
| $y = 30$ | B1 | |
| (b) $a = 80$ | B1 | |
| Noticing that $b$ and $b$ and 80 is 180 | M1 | FT their 80 |
| $b = 50$ | A1 | |
| | 5 | |



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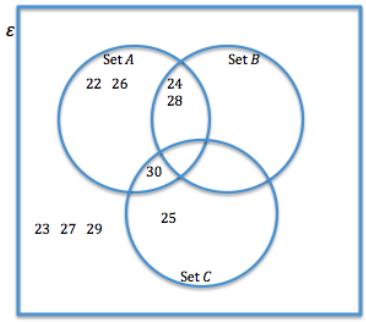
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| Methods Unit 1 Foundation Tier January 2014 | Mark | Comments |
|---|---|---|
| 12. (a)<br>\| \| 1 \| 2 \| 3 \| 4 \| 5 \| 6 \|<br>\| Head \| H1 \| H2 \| **H3** \| **H4** \| **H5** \| **H6** \|<br>\| Tail \| T1 \| **T2** \| **T3** \| **T4** \| **T5** \| **T6** \| | B2 | B1 for at least 6 correct entries |
| (b) 1/12 | B1 | Across parts (b) and (c), penalise incorrect notation, e.g. 1 in 12, once only. |
| (c) 2/12 | B1<br>4 | ISW<br>FT for consistent incorrect denominator |
| 13. (a) $5x - 20 + 6x - 3$<br>$11x - 23$<br>(b) $4x(2 - y)$ | B1<br>B1<br>B2<br>4 | B1 for $4x(\ldots - y)$ or $4x(2 - \ldots.)$ or correct partially factorised |
| 14(a) $180 - 126$ (=54°) | B1 | 1st step of appropriate working OR an appropriate 54(°) indicated on the diagram. Allow B1 even if then incorrectly assuming an 'isosceles trapezium' |
| x indicated as ( 180 – 58 – '54' =) 68(°) | B1 | FT 'their 54°' (=180 – 126) evaluated correctly<br>May be on diagram, do not accept contradiction in answers for x in working space and on diagram |
| Two appropriate stages of explanation given, e.g. 'angles on a straight line 180°'AND<br>• 'angles in a triangle 180°', or<br>• corresponding angles or equivalent, or<br>• interior angles, or equivalent | E1 | Accept reference to 'C' and 'F' angles<br>Allow FT for 'isosceles trapezium' provided both stages explained, i.e. parallel fact and sum 360°<br><br>If no marks: SC2 for x = 61° from an isosceles triangle with explanation of triangle sum 180° AND a parallel line fact, OR<br>SC1 for x = 61° from an isosceles triangle<br><br>*Alternative method*<br>*M1 126 – 58*<br>*A1 = 68(°)*<br>*B1 Explanation: 'exterior angle of a triangle is the sum of the two other angles' AND 'corresponding angle'* |
| (b) Sight of 40(°) | B1 | May be shown on a diagram, showing angles at a point, or a diagram showing they do tessellate |
| Showing or stating 140 + 140 + 40 + 40<br>OR 140 + 40 = 180° WITH straight line sum 180° stated | B1 | FT their '180 - 140' |
| Use of, or statement that, angles at a point add to 360(°) | E1<br>6 | OR 'angle sum of the tile is 360(°).<br>For award of E1 360(°) at a point MUST be stated, not simply implied<br><br>If no marks then allow B2 for the statement 'all quadrilaterals tessellate', then possible E1 for an explanation, e.g. 'angle sum at a point is 360(°)' |
| 15(a) All 4 correct entries<br>\| Fraction \| Decimal \| Recurring or terminating? \|<br>\| \| \| \|<br>\| 3/20 \| \| Terminating \|<br>\| \| 0.6363(63…) \| Recurring \| | B1<br>B1<br>B1<br>3 | 3/20. Do not accept 15/100<br>0.6363... Do not accept 0.63 unless 0.6363 seen in working<br>Terminating and recurring in the correct cells. CAO |



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| Methods Unit 1 Foundation Tier January 2014 | Mark | Comments |
|---|---|---|
| 16(a) **No** AND a reason, e.g. 'y coordinate is not 3 times the x coordinate', or 'a=-5 then 3a=-15'<br>(b) All 5 points plotted fit rule (a, 3a), with no incorrect plots | E1<br><br>B2<br><br>3 | Any counter example ((-5, -15) or (-2/3, -2)) must be relevant and correct with NO stated<br>B1 for at least 3 correct plots and no more than 2 incorrect plots, OR B1 for 5 sets of possible coordinates listed, which may be outside the grid |
| 17(a) All 9 numbers placed correctly<br><br> | B3 | B2 for any 7 or 8 numbers placed correctly, the other numbers omitted or incorrectly placed, OR<br>B1 for any 5 or 6 numbers placed correctly, the other numbers omitted or incorrectly placed.<br>*Any ambiguous duplicates are marked as an incorrect placement for that number* |
| (b) Venn diagram 2 AND full reason, e.g. 'multiples of 4 are a subset of multiples of 2 and there is a multiple of 2 which is a multiple of 5', or 'set B is a subset of set A, and set A intersects with set C', or 'A & B share some of the numbers, but C only shares numbers with A', or 'C & B have nothing in common, and B shares everything with A' | E2<br><br>5 | OR selects Venn diagram 2 and explains why the other 2 Venn diagrams are not selected<br>E1 for choice of Venn diagram 2 AND a partial reason, i.e. only mentions 1 aspect or attempts an explanation e.g. '4 times table is within 2 times table', or 'shows which of A are within 4 times table', or '22 is in A but not in C', or 'no multiples of 4 in C' OR<br>E1 for selection of Venn diagram 2 and explains why 1 of the other 2 Venn diagrams are not selected<br>*Accept informal words such as 'within' for 'subset', 'overlap' for 'intersection'* |



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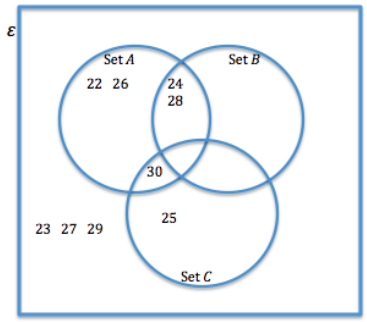
# METHODS UNIT 1
# HIGHER TIER

| Methods Unit 1 Higher Tier January 2014 | Mark | Comment |
|---|---|---|
| 1(a) $(12 + 10)/(9 + 2)$<br>$= 2$<br>(b) $-18x - 33y$<br><br><br>(c) $(2x + 7)^3$ | M1<br>A1<br>B2<br><br><br>B1<br>5 | Allow 1 error with a sign or 1 slip<br>CAO<br>Must be an expression as shown<br>B1 for either of the 2 terms<br>Do not ignore further work if B2 then -1<br>ISW |
| 2(a) $180 - 126$ (=54°)<br><br><br>x indicated as ( 180 – 58 – '54' =) 68(°)<br><br><br>Two appropriate stages of explanation given, e.g. 'angles on a straight line 180°' AND<br>• 'angles in a triangle 180°', or<br>• corresponding angles or equivalent, or<br>• interior angles, or equivalent<br><br>Look for:<br>• Clear identification of any angles referred to on the diagram<br>• Use of degree symbol<br>• Appropriate use of '='<br>• Use of correct terminology for angles, not 'C' or 'F' angles<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**AND**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**OR**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer<br><br><br><br>(b) Sight of 40(°)<br><br>Showing or stating 140 + 140 + 40 + 40<br>OR 140 + 40 = 180° WITH straight line sum 180° stated<br>Use of, or statement that, angles at a point add to 360(°) | B1<br><br><br>B1<br><br><br>E1<br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br><br>B1<br><br>B1<br><br><br>E1<br><br><br><br><br>8 | 1st step of appropriate working OR an appropriate 54(°) indicated on the diagram. Allow B1 even if then incorrectly assuming an 'isosceles trapezium'<br><br>FT 'their 54°' (=180 – 126) evaluated correctly<br>May be on diagram, do not accept contradiction in answers for x in working space and on diagram<br>Accept reference to 'C' and 'F' angles<br>Allow FT for 'isosceles trapezium' provided both stages explained, i.e. parallel fact and sum 360°<br><br>If no marks: SC2 for x = 61° from an isosceles triangle with explanation of triangle sum 180° AND a parallel line fact, OR<br>SC1 for x = 61° from an isosceles triangle<br><br>*Alternative method*<br>*M1 126 – 58*<br>*A1 = 68(°)*<br>*B1 Explanation: 'exterior angle of a triangle is the sum of the two other angles' AND 'corresponding angle'*<br><br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.<br><br>May be shown on a diagram, showing angles at a point, or a diagram showing they do tessellate<br>FT their '180 - 140'<br><br>OR 'angle sum of the tile is 360(°).<br>For award of E1 360(°) at a point MUST be stated, not simply implied<br><br>If no marks then allow B2 for the statement 'all quadrilaterals tessellate', then possible E1 for an explanation, e.g. 'angle sum at a point is 360(°)' |

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| Methods Unit 1 Higher Tier January 2014 | Mark | Comment |
|---|---|---|
| 3(a) All 4 correct entries<br>Fraction \| Decimal \| Recurring or terminating?<br>3/20 \| \| Terminating<br>\| 0.6363(63…) \| Recurring | B1<br>B1<br>B1 | 3/20. Do not accept 15/100<br>0.6363... Do not accept 0.63 unless 0.6363 seen in working<br>Terminating and recurring in the correct cells. CAO |
| (b) $\frac{0.0072}{0.002}$ OR $120 \times 0.03$ OR $\frac{24 \times 0.03}{0.2}$<br>$\frac{72}{20}$ OR 3.6 OR $\frac{0.72}{0.2}$ OR $\frac{7.2}{2}$<br>18/5 | M1<br>m1<br>A1<br>6 | OR any appropriate **correct first calculation**<br>Place value must be correct for M1<br>OR appropriate **correct second calculation**<br>CAO. Allow sight of $3^3/_5$<br>Must be from correct working, watch for compensating errors.<br>If no working then $3^3/_5$ allow M1 m1 A1 |
| 4(a) **No** AND a reason, e.g. 'y coordinate is not 3 times the x coordinate', or 'a=-5 then 3a=-15'<br>(b) All 5 points plotted fit rule (a, 3a), with no incorrect plots<br>(c) y = 3x | E1<br>B2<br>B2<br>5 | Any counter example ((-5, -15) or (-2/3, -2)) must be relevant and correct with NO stated<br>B1 for at least 3 correct plots and no more than 2 incorrect plots, OR B1 for 5 sets of possible coordinates listed, which may be outside the grid<br>FT their points provided they fall on a straight line<br>B1 for attempt to find the gradient as 3/1, or y = 3a, or equivalent |
| 5(a) All 9 numbers placed correctly<br><br><br>(b) Venn diagram 2 AND full reason, e.g. 'multiples of 4 are a subset of multiples of 2 and there is a multiple of 2 which is a multiple of 5', or 'set B is a subset of set A, and set A intersects with set C', or 'A & B share some of the numbers, but C only shares numbers with A', or 'C & B have nothing in common, and B shares everything with A'<br>(c) 3/9 (=1/3)<br>7/9<br>1/9 | B3<br>E2<br>B1<br>B1<br>B1<br>8 | B2 for any 7 or 8 numbers placed correctly, the other numbers omitted or incorrectly placed, OR<br>B1 for any 5 or 6 numbers placed correctly, the other numbers omitted or incorrectly placed.<br>*Any ambiguous duplicates are marked as an incorrect placement for that number*<br>OR selects Venn diagram 2 and explains why the other 2 Venn diagrams are not selected<br>E1 for choice of Venn diagram 2 AND a partial reason, i.e. only mentions 1 aspect or attempts an explanation e.g. '4 times table is within 2 times table', or 'shows which of A are within 4 times table', or '22 is in A but not in C', or 'no multiples of 4 in C' OR<br>E1 for selection of Venn diagram 2 and explains why 1 of the other 2 Venn diagrams are not selected<br>*Accept informal words such as 'within' for 'subset', 'overlap' for 'intersection'*<br>FT their Venn diagram.<br>FT a slip in the denominator used consistently<br>FT a slip in the denominator used consistently |

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| Methods Unit 1 Higher Tier January 2014 | Mark | Comment |
|---|---|---|
| 6(a)<br>(10) \| 20 \| 30 \| 40 \| 50<br>(7/10) \| 14/20 \| 20/30 \| 24/40 \| 28/50<br>(0.7) \| 0.7 \| 0.66… \| 0.6 \| 0.56<br>0.66 or 0.67 Not 0.6<br>(b) Relative frequencies plotted accurately<br><br><br><br>(c) Conclusion, 'no, as there is still a variation in relative frequencies', 'no, the results are not settled', 'results are still going down' | B1<br>B1<br>B1<br><br><br><br>B2<br><br><br><br>E1<br><br><br>6 | Cumulative numbers 7, 14, 20, 24, 28<br>Fractions, FT their cumulative numbers<br>Decimals, FT their cumulative numbers as quotients over cumulative denominators, correctly evaluated<br>Ignore if points joined or not<br>FT their relative frequencies provided no more than 1 is outside the range 0.4 to 0.8.<br>B1 for 3 plots accurate.<br>Do not accept FT answers of yes.<br>Allow 'no, needs more to get a more accurate answer'. Ignore further foolish comments.<br>Do not accept 'no, need to throw more times' |
| 7. Total of interior angles $5 \times 180(°)$<br>$= 900(°)$<br>900 – sum of 4 angles given (594°) (=306)<br>÷3<br>(Each of the 3 angles is) 102(°) | M1<br>A1<br>M1<br>m1<br>A1<br><br><br><br><br><br><br><br><br>5 | Or equivalent full method<br><br>FT 'their 900' provided >594<br>Unique division by 3, no further operations<br><br>Alternative:<br>Corresponding exterior angles are 66(°), 30(°), 20(°) and 10(°) B1<br>Remaining exterior angles = 360 – sum of exterior angles found (126°) (=234°) M1<br>÷ 3 m1<br>(Each of the remaining 3 exterior angles =) 78(°) A1<br>(Each of the remaining 3 interior angles =) 102(°)<br>*FT provided B1, M1, m1, 180 – 'their 78'* A1 |
| 8(a) 18<br>(b) $\sqrt{(16 \times 9)}$<br>$= 12$<br><br>(c) Two of the prime factors are 2 and 5<br>Other factor is either 3 or 7<br>Missing number is 70 | B1<br>M2<br>A1<br><br>M1<br>M1<br>A1<br><br><br><br><br><br><br><br><br><br><br>7 | <br>M1 for sight of each of 16 or 9<br>FT from M1 provided simplified using surd notation if necessary<br><br><br><br><br>An answer of 2×5×7 gets M1, M1, A0<br>Award all 3 marks for sight of unsupported 70.<br>An answer of 70 from incorrect working is not awarded all 3 marks<br>*Example: An answer of 30 is M1, M1, A0 (as it meets M1, M1 for factors 2 and 5, with 3)*<br>If no marks, allow SC1 for prime numbers which sum to 70 AND clues 2 to 4 are met, e.g. 2+31+37<br><br>*Alternative:*<br>*Considering multiples of a number which would include 210 M1*<br>*Considering multiples of 10 which would include 210, i.e. multiples of 30 or 70 m1*<br>*Answer 70 A1* |
| 9(a) Correct sketch<br>(b) Correct sketch<br>(c) Correct sketch | B1<br>B1<br>B1<br>3 | <br>FT reflection in x-axis of their (a) |
| 10(a) $5\times40^2 - 3\times40 - 1$ with $5\times40^2$ evaluated as 8000<br>$= 7879$<br>(b) $n^2 + 3$ or equivalent | M1<br>A1<br>B3<br><br><br><br>5 | <br><br>Accept full description in words or given in a fully labelled diagram for B3, B2 or B1 as appropriate<br>B2 for $1n^2 \pm \ldots$ (not for $1n^2$), OR<br>B1 for $1n^2$ or for sight of the 2nd difference 2 |

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| Methods Unit 1 Higher Tier January 2014 | Mark | Comment |
|---|---|---|
| 11(a) Correct entries 0.7 and 0.2<br>Other entries 0.8, 0.2 with 0.8<br><br>Labels correct for no cereal, no toast, toast and no toast<br><br><br>(b) $0.3 \times 0.2$<br>$= 0.06$ (=6/100) | B1<br>B1<br><br>B1<br><br><br>M1<br>A1<br>5 | <br>In this order if no labels, otherwise as their label order<br>Not a FT need to match probabilities. If labels incorrect B0, however allow previous B1 for order 0.8, 0.2, 0.8<br>FT from their probability tree for M1 only<br>CAO. Allow M1 for sight of an unsupported 0.6 |
| 12(a) $(2x + 5)(3x -1)$<br><br>(b) $dw = 3m^2$<br>$m^2 = dw/3$<br>$m = (\pm) \sqrt{(dw/3)}$<br><br>(c) $ab – bc = e$<br>$b(a – c) = e$<br>$b = \frac{e}{a-c}$ | B2<br><br>M1<br>m1<br>A1<br><br>B1<br>B1<br>B1<br>8 | B1 for $(2x\pm \ldots)(3x\pm \ldots)$<br><br><br><br>Square root must clearly be over dw/3 entirely<br>If no marks SC1 for $\sqrt{(w/3d)}$ from 1 initial error<br>Collect FT until 2nd error<br>Factorise<br>Divide |
| 13. Strategy, e.g. suitable outline of a suitable tree diagram<br>Sight of P(man red) = 1/5 or P(woman red) = 3/10<br>$1/5 \times 3/10$<br>$= 3/50$<br>Conclusion 'greater than' stated or implied, with reason, e.g. 6/100>5/100 | S1<br><br>B1<br>M1<br>A1<br>E1<br><br>5 | Listing WM, MW, MM, WW is not a suitable strategy<br><br>The award of M1 also implies S1<br><br>FT provided at least 1 other mark has been awarded. Accept if compared with 6%, i.e. same format for 5% and their answer |
| 14(a) $6x^2 + 14xy -15xy – 35y^2$ (+ xy)<br>$= 6x^2 – 35y^2$<br>(b) $7x(3x – 2) + 2(2x + 3)$ as a numerator<br>$(2x + 3)(3x – 2)$ as a denominator<br>$21x^2 -14x + 4x + 6$<br>$\frac{21x^2 -10x + 6}{(2x + 3)(3x – 2)}$ | B2<br>B1<br>M1<br>M1<br>A1<br>A1<br><br>7 | B1 for any 2 of the expansion terms correct<br>FT from B1. Mark final answer. Allow $6x^2 +– 35y^2$<br><br><br><br>Mark final answer. If the denominator is expanded it must be correct. FT from 1 error in numerator expansion, provided it is a trinomial |
| 15. Selecting $4y = x$ AND $y = -4x$<br>Showing that $m_1 = ¼$ and $m_2 = -4$<br>$¼ \times -4 = -1$ or equivalent | B1<br>M1<br>A1<br>3 | |
| 16(a) P indicated correctly, where XY touches the circle<br><br>(b) WXY is a tangent meeting the circle radius at 90°<br>Corresponding angles equal (angles at X and W) OR Supplementary angles OR shows or states both angles are 90°<br><br>(c) <HBG=160° or <ABW= 80° or equivalent<br>Reason, e.g. 'angle at the centre is twice the angle at the circumference'<br>100°<br>Reason, e.g. ' sum of angles in a quadrilateral is 360° (and right angle where tangent meets the radius)' or 'allied (interior) angles' | B1<br><br><br>B1<br>B1<br><br><br><br>B1<br>E1<br><br>B1<br>E1<br><br>7 | <br><br><br>Accept description in words<br>Accept description in words |

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| Methods Unit 1 Higher Tier January 2014 | Mark | Comment |
|---|---|---|
| 17(a) a = 4<br>$x^2 + 8x + 16$ (-11) OR alternative method to find b<br>b = -11<br><br>(b) $(x + 4)^2 - 11 = 0$<br><br>$(x + 4)^2 = 11$<br>$x + 4 = (\pm)\sqrt{11}$<br>$x = \pm\sqrt{11} - 4$ | B1<br>M1<br>A1<br><br>B1<br><br>M1<br>M1<br>A1<br><br>7 | Accept embedded answers<br><br>Accept embedded answers<br><br>Use of completing the square from (a), FT from their (a) provided equivalent format<br><br>Must show $\pm$<br>Use of formula leading to $(-8\pm2\sqrt{11})/2$ gets B2, $(-8\pm\sqrt{44})/2$ gets B0 |

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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS IN MATHEMATICS

## UNIT 1: Methods (Non-Calculator)
## HIGHER TIER

A.M. TUESDAY, 11 June 2013

2 hours

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

### 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**.

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

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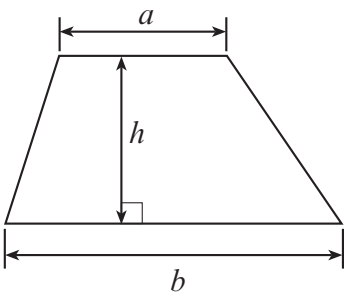
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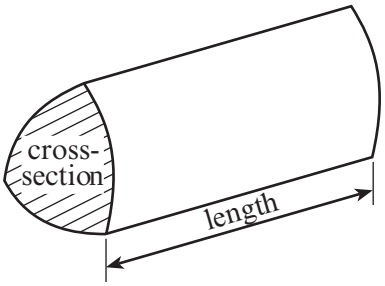
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## Formula List

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

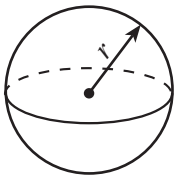



**Volume of prism** = area of cross-section × length



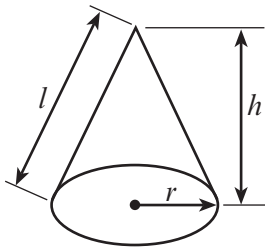

**Volume of sphere** = $\frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** = $\pi rl$

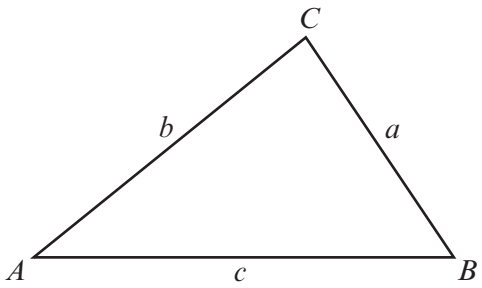



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

where $a \neq 0$ are given by

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

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**1.**

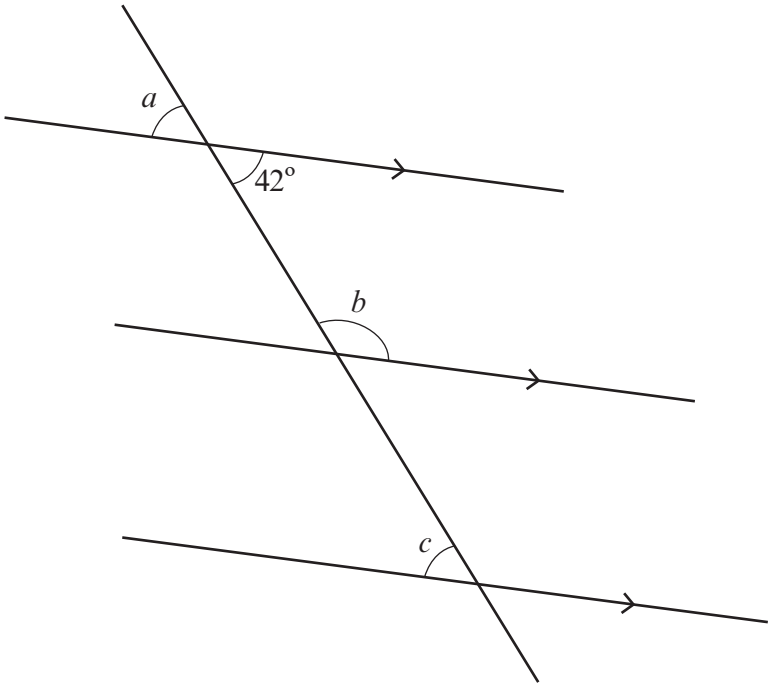



*Diagram not drawn to scale*

Find the size of each of the angles $a$, $b$ and $c$.

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$a$ = ..... ° $b$ = ..... ° $c$ = ..... °

[3]

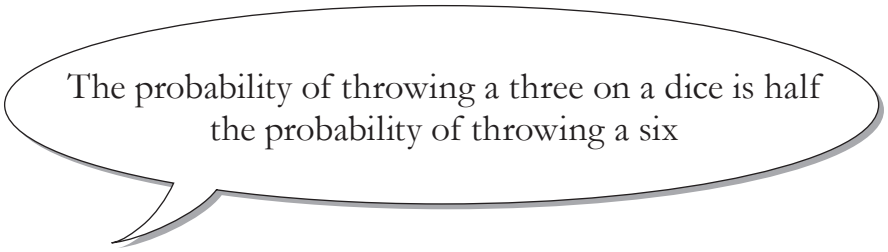


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**2.** Nancy makes two statements about the probability of events based on throwing fair dice.

For each of her statements below, decide if Nancy is correct or not.
You must explain your decisions **using probabilities**.




Is Nancy correct? .....

Explanation:

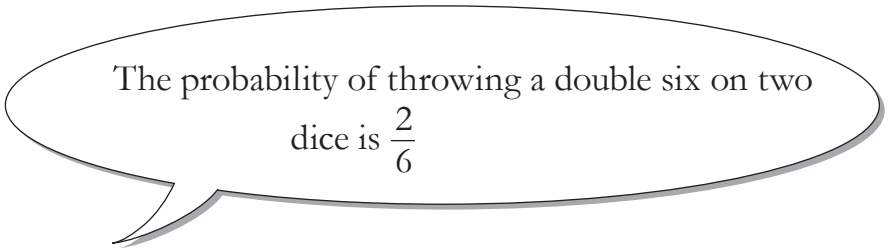
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[2]




Is Nancy correct? .....

Explanation:

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[2]

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**3.** Given the following information, complete the Venn diagram shown below.

- J = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12}
- **A** is the set of factors of 24
- **B** is the set of multiples of 3
- **C** is the set of common factors of 30 and 70

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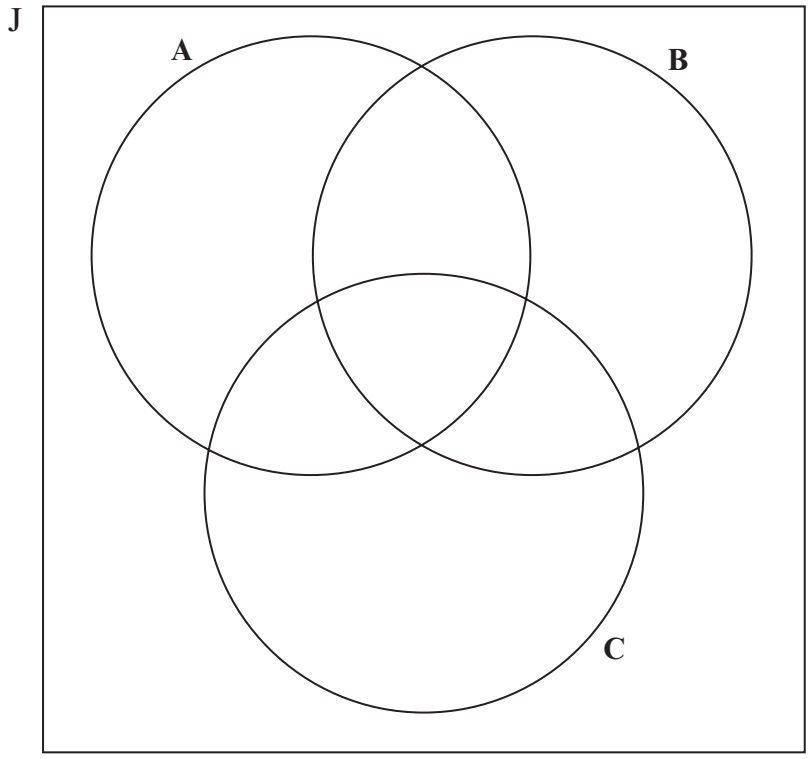
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[4]

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**4.** *(a)* You are given the coordinates of three of the four vertices of a parallelogram.

They are (3, 2) (5, –2) (7, 2).

Find the coordinates of two possible positions for the fourth vertex.

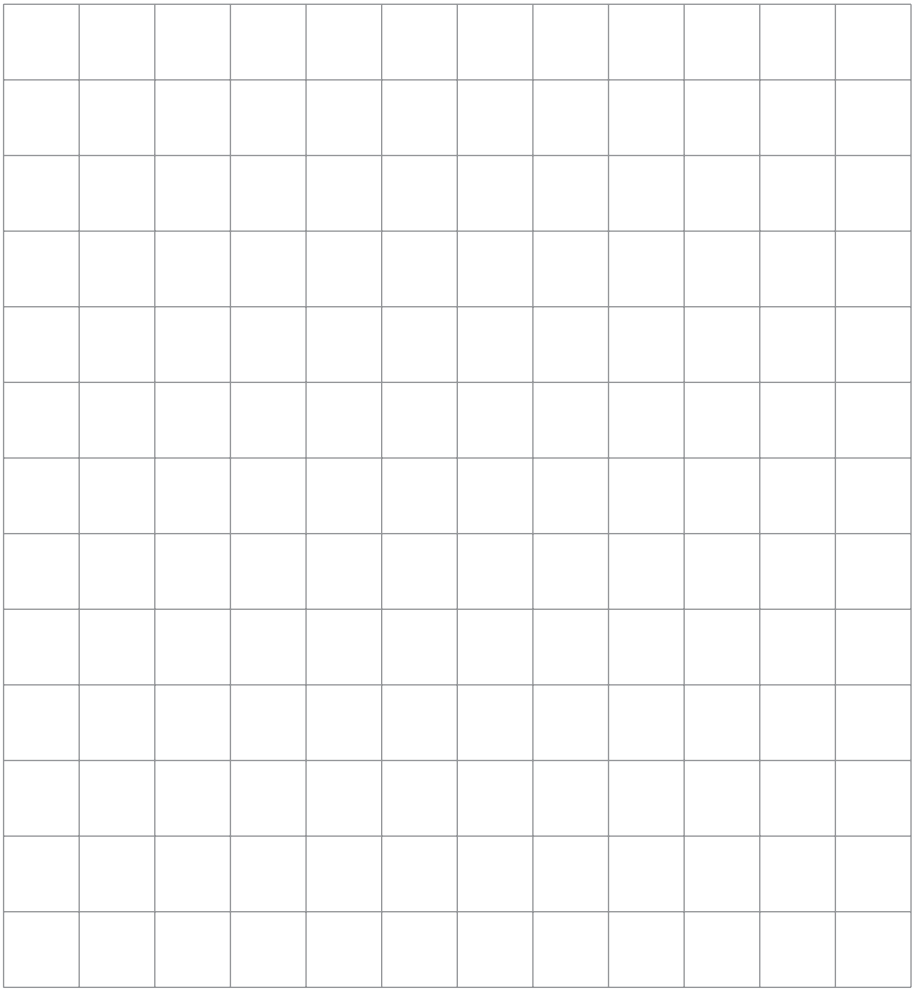
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Coordinates of one of the possible answers (..... , .....)

Coordinates of another possible answer (..... , .....)

[4]

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*(b)* Complete the table below.

| Name of quadrilateral | Number of lines of symmetry | Are both diagonals perpendicular to each other? Yes or No | Are both pairs of opposite angles always equal? Yes or No |
|---|---|---|---|
| Kite | ..... | ..... | ..... |
| Isosceles trapezium | ..... | ..... | ..... |
| ..... | 2 | Yes | Yes |

[3]



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**5.** Complete the following table.

| Fraction | Decimal | Recurring decimal? Yes or No | Terminating decimal? Yes or No |
|---|---|---|---|
| $\frac{2}{5}$ | | | |
| $\frac{5}{8}$ | | | |
| $\frac{7}{9}$ | | | |
| $\frac{2}{11}$ | | | |

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[4]

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**6.** Three farmers shared an order for fertiliser between them in the ratio 3 : 4 : 7.
Jade got the largest share.
Bethan got the smallest share.
Noah's share was 60 kg.
Calculate how much of the fertiliser Jade and Bethan each received.

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Jade ..... kg  Bethan ..... kg

[4]



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**Turn over.**

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**7.** Ali has a number of tiles.
He has some squares tiles and some tiles in the shape of equilateral triangles.
The edges of all the tiles are of equal length.
He uses some tiles of each shape to make an example of a tessellation.

- Sketch how Ali can use square tiles **and** tiles in the shape of equilateral triangles to make an example of a tessellation.
- Explain, using your knowledge of angle facts, why this is an example of a tessellation.
  You must include at least one tile of each shape and show all your calculations.

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[4]

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

Three of the exterior angles of a pentagon are 105°, 115° and 80°.
The other two exterior angles are equal.
Calculate the size of each of the **interior** angles of the pentagon.
You must show all your working.

[7]

**9.** Jack makes the following statements.

- 36 and 60 are both common factors of 180.
- The highest common factor of 36 and 60 is **not** a factor of 180.

Decide whether each of Jack's statements is correct.
You must show your working and give a reason for your answer.

[3]

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**10.** *(a)* Use the grid below to draw graphs to represent each of the following equations.

(i) $y = \frac{1}{2}x + 6$

(ii) $x + y = 8$

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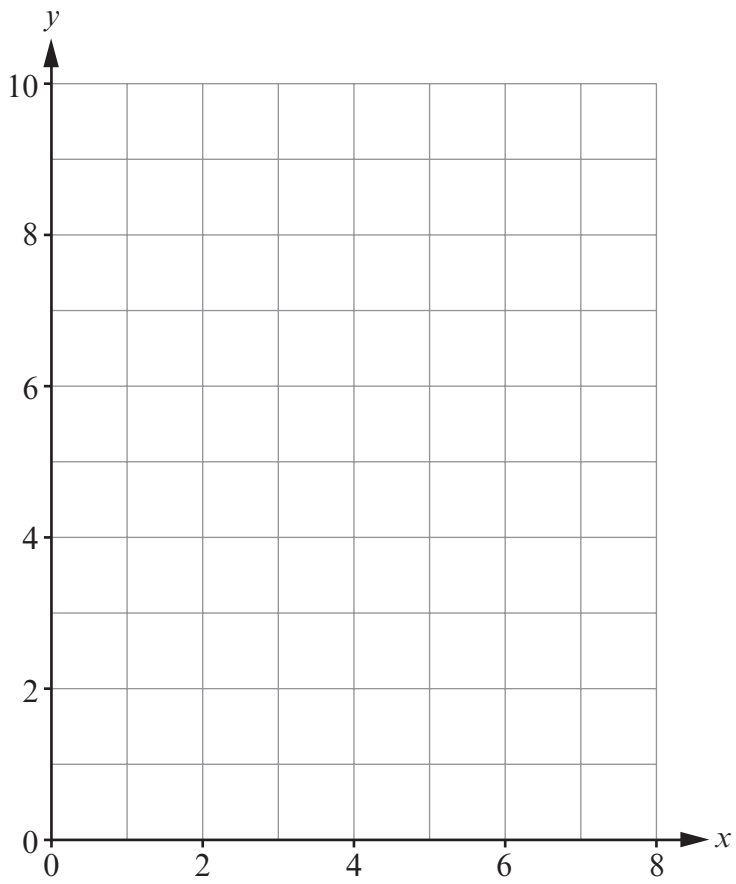
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Label your lines (i) and (ii) as appropriate.




[4]

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*(b)* Using your answer to *(a)*, are the lines $y = \frac{1}{2}x + 6$ and $x + y = 8$ perpendicular to each other?
Give a reason for your answer.

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.....

[1]

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**11.** *(a)* Rearrange the following to make $t$ the subject of the formula

$$3(t - g) = h(f - t).$$

[4]

*(b)* Find the $n$th term of the following sequences.

(i) 3, 13, 23, 33, 43, ....

[2]

(ii) 50, 40, 30, 20, 10, ....

[2]

(iii) 8, 14, 24, 38, ....

[2]

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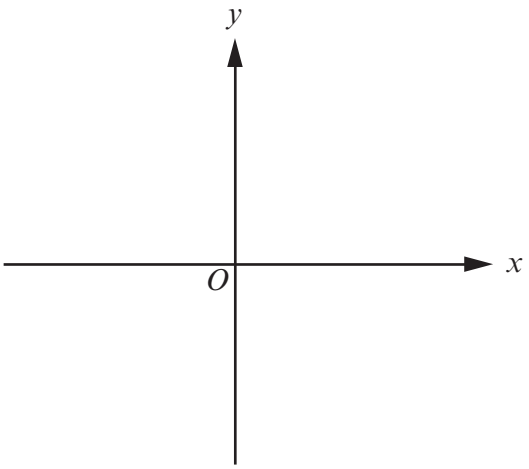
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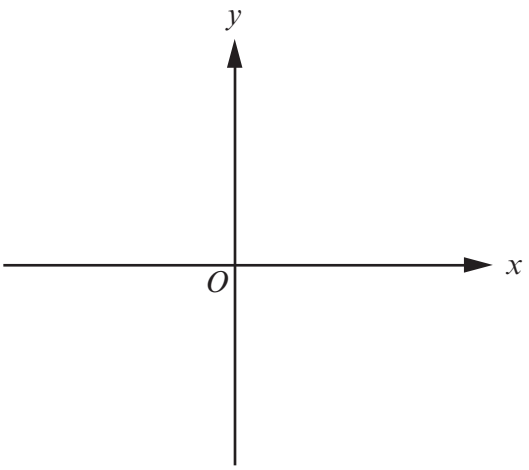
**12.** *(a)* Use the axes provided to sketch the graphs of the following.

(i) $y = x^3$



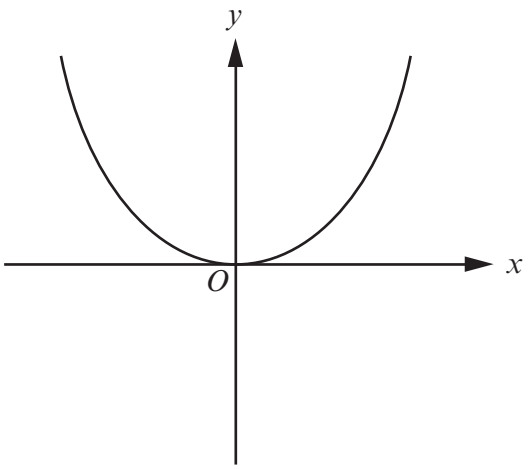

[1]

(ii) $y = \frac{1}{x}$




[1]

*(b)* The sketch below shows $y = x^2$




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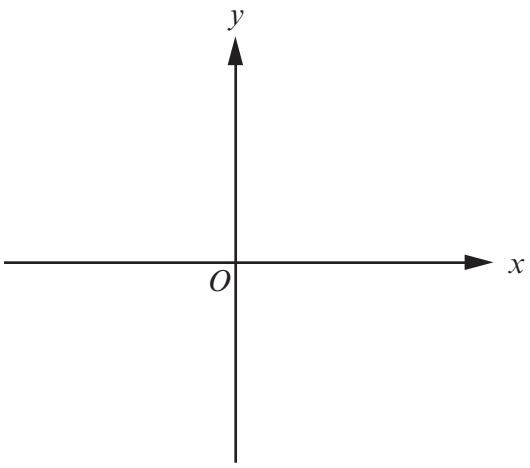


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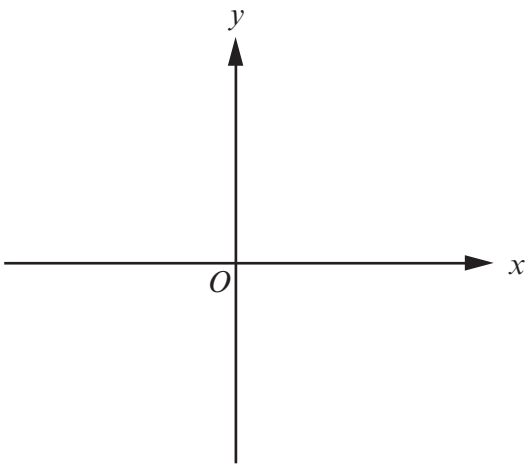
Use the axes provided to sketch the graphs of the following.
Give coordinates of any points where the graphs intersect the $y$-axis.

(i) $y = -x^2$



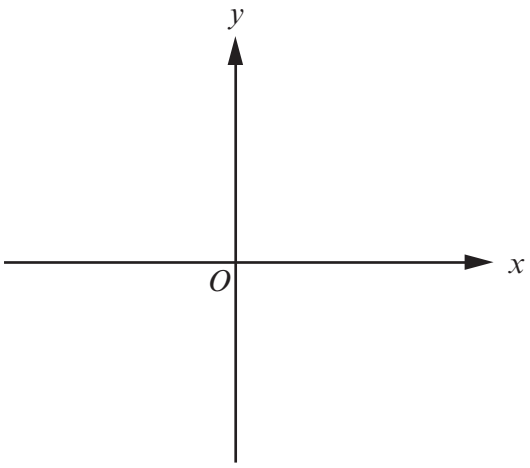

[1]

(ii) $y = x^2 + 3$




[2]

(iii) $y = 8x^2$




[1]

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**13.** Show that $(2x + 7)(x - 4) + x(x + 1) + 4 \} 3(x^2 - 8)$.

[3]

**14.** Evaluate the following, giving your answer in standard form.

*(a)* $\dfrac{6{\cdot}3 \times 10^{12}}{12{\cdot}6 \times 10^{8}}$

[2]

*(b)* $(8 \times 10^{2}) \times (3 \times 10^{6})$

[2]

*(c)* $(3{\cdot}24 \times 10^{8}) + (1{\cdot}2 \times 10^{7})$

[2]

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**15.** *(a)* Evaluate $6\sqrt{5} \times 2\sqrt{5}$.

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[2]

*(b)* Evaluate $(7\sqrt{2} - 4\sqrt{2})^4$.

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[3]

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**16.** *(a)* In the diagram below $RX = a$, $XT = b$, $XS = c$ and $UX = d$.

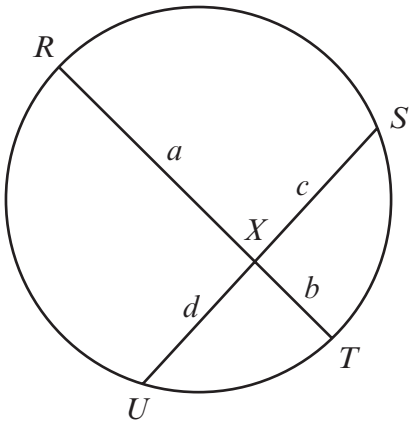



*Diagram not drawn to scale*

Write an expression for $b$ in terms of $a$, $c$ and $d$.

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.....

.....

[2]

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*(b)* In the diagram below:

- Point $O$ is the centre of the circle
- Points $A$, $B$, $C$ and $D$ lie on the circumference of the circle
- $RAP$ is a tangent to the circle
- $A\hat{C}D = x$

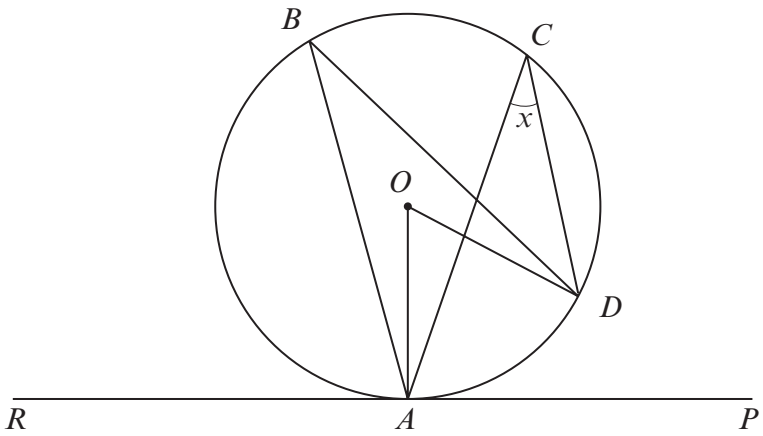



*Diagram not drawn to scale*

(i) Write down the size of $O\hat{A}P$, giving a reason for your answer.

.....

.....

.....

[2]

(ii) Complete the following statements in terms of $x$.

$D\hat{O}A =$ .....

$D\hat{B}A =$ .....

[2]

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**Turn over.**

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**17.** As part of a competition twenty tickets are placed in a hat.
The tickets are numbered from 1 to 20.
Anna is going to pick out two tickets.

*(a)* If the rule for winning a prize is

'numbers that are multiples of six win a prize',

calculate the probability that Anna picks out two winning tickets.

[4]

*(b)* If the rule for winning a prize is

'numbers that are factors of eighteen win a prize',

calculate the probability that Anna picks out at least one winning ticket.

[4]

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**18.** *(a)* Simplify $\dfrac{x^2 - 81}{2x^2 + 13x - 45}$.

[4]

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*(b)* (i) Express $x^2 + 12x + 14$ in the form $(x + a)^2 + b$, where $a$ and $b$ are whole numbers to be found.

[3]

(ii) Hence solve $x^2 + 12x + 14 = 0$ leaving your answer in surd form.

[4]

**END OF PAPER**

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# GCSE MARKING SCHEME

## METHODS OF MATHEMATICS (LINKED PAIR PILOT)

## SUMMER 2013

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## 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.

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# UNIT 1 (FOUNDATION TIER)

| Methods Unit 1 Foundation June 2013 | | Final |
|---|---|---|
| 1. (a) 8039<br>(b) forty eight thousand seven hundred and two<br>(c) 4<br>16<br>7<br>(d) 3000 or 3 thousand<br>(e) 51700<br>(f) Sensible estimates, that would lead to single digit multiplication<br>Correct answer from their estimates | B1<br>B1<br>B3<br><br><br>B1<br>B1<br>M1<br><br>A1<br><br>9 | <br><br>Award B1 for each correct answer.<br><br><br>Accept thousand(s) but not 1000.<br><br>Eg 50 × 4 or 50 × 3.9 or 51 × 4<br><br>Award M1 A1 for unsupported answers of 200, 195 or 204<br>Award M1 A1 for unsupported answer of 195 - 204<br>Award M0 A0 for (51 × 3.9 =) 198.9 |
| 2. (a) 524<br>(b) 279<br>(c) 36<br>(d) 516<br>× 82<br>1032<br>41280<br>42312<br><br>(e) 9<br>(f) Explanation given AND Sian given as incorrect (stated or implied) | B1<br>B1<br>B1<br>M1<br><br><br>A1<br>A1<br><br>B1<br>E1<br><br><br><br>8 | <br><br><br>Any correct method for the multiplication of 516 by 82<br><br><br>For either 1032 or 41280 (Apply 'one error' in other methods)<br>CAO<br>Place value errors get M0 A0<br>Watch out for an incorrect answer of -9<br>Eg Sian incorrect because 6 coaches would be just over 300 people, so 10 coaches would be far too many.<br>Or 530 is a lot more.<br>Do not award E1 for statement incorrect only. |
| 3.<br>6 1 **8**<br>**7** 5 **3**<br>**2** **9** 4 | B3<br><br><br><br><br><br>3 | Award B3 for all correct<br>Award B2 for 3 or 4 correct entries<br>Award B1 for 1 correct row or column or the other diagonal or 2 correct only if working to a total of 15. |
| 4. (a) A at ½<br>B at 1<br>C at 0<br>D at or near $^1/_3$<br>(b) 5/7<br>3/7<br><br>(c) Explanation given and neither more likely or both equally likely (stated or implied) | B1<br>B1<br>B1<br>B1<br>B2<br><br><br>E1<br><br>7 | <br><br><br>For position of 'D' accept >1/4 but < 1/2<br>Award B1 for each correct answer.<br>Penalise -1 once only if consistent use of incorrect notation.<br><br>Eg.Both have the same chance as they each have 5 tickets with different numbers. Each number has the same probability. |
| 5.(a) 81<br>Multiplying previous term by three<br>(b) $4x - 3$<br><br>(c) Workings for Jenny (0 + 2) × 2 = 4 AND Steve 0 × 2 + 2 = 2 AND Steve correct stated or implied by correct working<br>(d) $27 = 12 + n$<br>$n = 15$<br>(e) $5x$<br>(f) $12x - 21$ | B1<br>B1<br>B2<br><br>B2<br><br>B1<br>B1<br>B1<br>B1<br>10 | <br>Accept "times by 3" or "× 3"<br>Award B1 for either $4x$ or $-3$ within an expression. Award B1 for $4x + -3$<br><br>Award B1 for workings for Jenny (0 + 2) × 2 = 4 OR Steve 0 × 2 + 2 = 2<br>Accept embedded answers<br><br><br><br>Mark final answer |
| 6. (a) For 2 correct in a form which allows comparison.<br>For all 3 correct in a form, or steps, that will allow comparison of all 3<br>$^{35}/_{100}$, 0.37, $^2/_5$ or equivalent<br>(b) 200 | B1<br>B1<br><br>B1<br>B2<br>5 | <br><br><br>CAO. Correct answer only award B0 B0 B1<br>B1 for either 8 or 25. |

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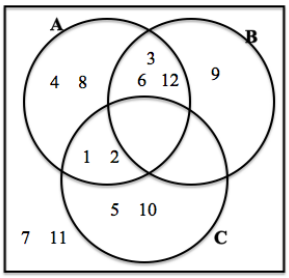
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| | | |
|---|---|---|
| 7. $a = 180 - 90 - 38$<br>$= 52(°)$<br>$b = 180 - 90 - 21$<br>$= 69\ (°)$<br>Sight of $(180 - 114 =)$ 66 (°)<br>$c = 180 - 69 - 66$<br>$= 45\ (°)$ | M1<br>A1<br>M1<br>A1<br>B1<br>M1<br>A1<br>7 | *Alternative method 114 – 'b'*<br>FT their *b* and/or their 66 *= 45(°) S1 M1 A1* |
| 8. (Difference in cost of packages) $(845 - 655 =)$ (£)190<br>(Cost per night) $(190 \div 2 =)$ (£)95<br>(5 nights costs) $(5 \times 95 =)$ (£)475<br>(Return airfare) $(655 - 475 =)$ (£)180<br><br>QWC:<br>Look for<br>• Correct units used<br>• Clarity of text explanation<br>• Correct terminology<br>• the use of simplified notation (watch for the use '=' being appropriate)<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer | B1<br>B1<br>B1<br>B1<br><br>Q<br>W<br>C<br>2<br><br>6 | FT their 190<br>FT their 95 *OR 7 nights costs (7 × 95 =) (£)665*<br>FT their 475 *Return airfare (845 – 665 =) (£)180 FT their 665*<br><br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 9. At least 6 additional given shapes tessellating correctly<br>For B2 the tessellation must be in more than one direction. (ie a cluster) | B2<br><br>2 | Award B1 for at least 3 additional given shapes tessellating correctly with at least one that meets the given shape |
| 10. 42, 138, 42 | B3<br><br>3 | B1 for each correct answer.<br>FT c = a or c = 180 - b |
| 11. No AND reason (both the same) 1/6<br><br>No AND reason $(1/6 \times 1/6 =)$ 1/36 | B2<br><br>B2<br><br>4 | Accept NO with appropriate sight of 1/6.<br>Accept refer to 1/6 in words.<br>B1 for No AND reason implying both the same, i.e. 1/6 not given in the response,<br>or sight of 1/6 with no conclusion or 'Yes'<br>B1 for No AND reason maybe based on sample space, e.g. 'No because there are more ways of getting it' (without contradiction)<br>or, gives 1/6×1/6 without stating 1/36,<br>or,, gives 1/6×1/6 with an incorrect response, e.g. 2/36<br>or, sight of 1/36 with no conclusion<br>Do not accept incorrect probability with statement 'No' without working |

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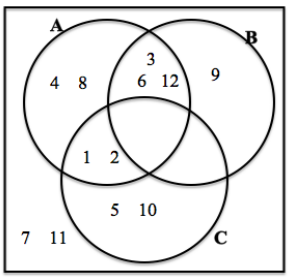
| | | |
|---|---|---|
| 12. Venn diagram correct<br><br> | B4<br><br><br><br><br><br><br><br>4 | No extra number >12<br>Mark unique placements of numbers, for duplicates mark the incorrect number then award as follows:<br>B3 for any 9, 10 or 11 numbers correctly placed with no more than 1 extra number >12<br>B2 for any 6, 7 or 8 numbers correctly placed with no more than 2 extra numbers >12<br>B1 for any 3, 4 or 5 numbers correctly placed and ignore any extra numbers<br>If no marks awarded SC1 for sight of sets A, B and C correct (including any extra numbers), shown in working or within Venn diagram |
| 13.(a) Strategy to find at least one 4th vertex, e.g. axes with 3 plots of given points **and** show understanding of parallel side requirement, OR a correct arithmetic method<br><br>Any 2 of: (5, 6) (9, -2) (1, -2) | M2<br><br><br><br>A2<br><br><br><br><br><br>4 | M1 axes and plot the 3 points given, OR a reasonable attempt at an arithmetic method, OR axes and plot the 2 of the 3 points given with an attempt draw 2 appropriate parallel lines<br><br>A1 for one correct, or for 2 indicated but coordinates not given or given incorrectly<br>If one correct, this implies M2 (and A1)<br><br>If no marks, award SC1 for evidence that the 3 coordinates have been reversed but a strategy to draw an appropriate parallel line is attempted. Do not penalise reverse coordinates if SC1 awarded.<br><br>*Candidates clearly and consistently working with reverse coordinates should be penalised -1 only* |
| 14. (i) At least 2 correct points found or plotted<br>Correct straight line shown<br>(ii) At least 2 correct points found or plotted<br>Correct straight line shown | M1<br>A1<br>M1<br>A1<br>4 | |
| 15. (a)10n - 7<br>(b) -10n + 60 or equivalent | B2<br>B2<br>4 | B1 for sight of 10n<br>For B2 mark final answer. B1 for sight of -10n |

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## UNIT 1 (HIGHER TIER)

<table>
<tr><th>Methods Unit 1 June 2013 Higher Tier</th><th></th><th>Final</th></tr>
<tr><td>1. 42, 138, 42</td><td>B3<br>3</td><td>B1 for each correct answer.<br>FT c = a or c = 180 - b</td></tr>
<tr><td>2. No AND reason (both the same) 1/6<br><br>No AND reason (1/6×1/6 =) 1/36</td><td>B2<br><br>B2<br><br>4</td><td>Accept NO with appropriate sight of 1/6.<br>Accept refer to ⅙ in words.<br>B1 for No AND reason implying both the same, i.e. 1/6 not given in the response,<br>or sight of 1/6 with no conclusion or ‘Yes’<br>B1 for No AND reason maybe based on sample space, e.g. ‘No because there are more ways of getting it’ (without contradiction)<br>or, gives 1/6×1/6 without stating 1/36,<br>or,, gives 1/6×1/6 with an incorrect response, e.g. 2/36<br>or, sight of 1/36 with no conclusion<br>Do not accept incorrect probability with statement ‘No’ without working</td></tr>
<tr><td>3. Venn diagram correct<br>
</td><td>B4<br><br>4</td><td>No extra number >12<br>Mark unique placements of numbers, for duplicates mark the incorrect number then award as follows:<br>B3 for any 9, 10 or 11 numbers correctly placed with no more than 1 extra number >12<br>B2 for any 6, 7 or 8 numbers correctly placed with no more than 2 extra numbers >12<br>B1 for any 3, 4 or 5 numbers correctly placed and ignore any extra numbers<br>If no marks awarded SC1 for sight of sets A, B and C correct (including any extra numbers), shown in working or within Venn diagram</td></tr>
<tr><td>4.(a) Strategy to find at least one 4th vertex, e.g. axes with 3 plots of given points and show understanding of parallel side requirement, OR a correct arithmetic method<br><br>Any 2 of: (5, 6) (9, -2) (1, -2)<br><br>(b)
<table>
<tr><td>Quadrilateral</td><td>Line symmetry</td><td>Diagonals perpendicular</td><td>Opposite angles equal</td></tr>
<tr><td>(Kite)</td><td>1</td><td>Yes</td><td>No</td></tr>
<tr><td>(Isos. Trap.)</td><td>1</td><td>No</td><td>No</td></tr>
<tr><td>Rhombus</td><td>(2)</td><td>(Yes)</td><td>(Yes)</td></tr>
</table></td><td>M2<br><br>A2<br><br><br><br><br><br><br>B3<br><br>7</td><td>M1 axes and plot the 3 points given, OR a reasonable attempt at an arithmetic method, OR axes and plot the 2 of the 3 points given with an attempt draw 2 appropriate parallel lines<br><br>A1 for one correct, or for 2 indicated but coordinates not given or given incorrectly<br>If one correct, this implies M2 (and A1)<br><br>If no marks, award SC1 for evidence that the 3 coordinates have been reversed but a strategy to draw an appropriate parallel line is attempted. Do not penalise reverse coordinates if SC1 awarded.<br><br>Candidates clearly and consistently working with reverse coordinates should be penalised -1 only<br><br>B2 for any 5 or 6 correct entries<br>B1 for any 3 or 4 correct entries</td></tr>
<tr><td>5.
<table>
<tr><td>Fraction</td><td>Decimal</td><td>Recurring</td><td>Terminating</td></tr>
<tr><td>2/5</td><td>0.4</td><td>No</td><td>Yes</td></tr>
<tr><td>5/8</td><td>0.625</td><td>No</td><td>Yes</td></tr>
<tr><td>7/9</td><td>0.77(777..) or 0.78</td><td>Yes</td><td>No</td></tr>
<tr><td>2/11</td><td>0.18(18..)</td><td>Yes</td><td>No</td></tr>
</table></td><td>B4<br><br><br><br><br><br>4</td><td>All correct<br>B3 any 3 rows correct or all 4 decimals correct<br>B2 any 2 rows correct or 3 decimals correct<br>B1 any 1 row correct or 2 decimals correct<br><br>Accept unambiguous intention for Yes/No columns<br>Accept if candidate indicates yes without giving the corresponding no, unless there is a contradiction, and vice versa</td></tr>
<tr><td>6. (1share is 60/4 =) 15kg<br>Either 3×15 or 7×15 seen in working<br>Jade 105 (kg) Bethan 45 (kg)</td><td>B1<br>M1<br>A2<br><br>4</td><td>FT their 60/4 incorrectly evaluated<br>A1 for each correct response<br>If answers reversed then, B1 M1 A1<br>SC1 if 60kg misinterpreted but then used correctly leading to correctly evaluated responses, 60/14 = 4.285… leading to 12.85…, 17.14… and 30 (accept 13, 17 and 30)</td></tr>
</table>

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| | | |
|---|---|---|
| 7. An example of a tessellation covering a space having an element of a **repeating** pattern with at least one 360° point formed by using both of the shapes of tiles<br><br>Use of angles at a point is 360(°)<br><br>Shows sum to 360(°) including at least one 90(°) and at least one 60(°) | B2<br><br>B1<br><br>B1<br><br>4 | B1 for an example of a tessellation covering a space with at least one 360° point formed by using **both** of the shapes of tiles.<br><br>Accept sight of knowledge that angles at a point is 360(°)<br><br>Accept if implied, e.g. '2 squares 180° and 3 (isosceles) triangles 180°' |
| 8. (Sum of the three angles given is 300(°))<br>(Each of other two exterior angles is) 360 – 300<br>÷ 2<br>(Each of the other exterior angles is) 30(°)<br>Use of 'interior angle + exterior angle = 180(°)'<br>Interior angles 75(°), 65(°), 100(°), 150(°), 150(°)<br><br>QWC2: Candidates will be expected to<br>• present relevant work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in spelling, punctuation and grammar<br><br>QWC1: Candidates will be expected to<br>• present work clearly which is mostly relevant, with words explaining process or steps<br>OR<br>• make few if any mistakes in spelling, punctuation and grammar and include units in their final answer | M1<br>m1<br>A1<br>M1<br>A1<br><br>QWC 2<br><br>7 | FT their 300, sum of the three angles given<br>FT their 300, sum of the three angles given<br>CAO<br>Or use of 'interior = 180 – exterior'<br>FT 180 – their 30 provided M1 awarded<br><br>OR Alternatively:<br>(Use of interior angle + exterior angle = 180°)<br>Interior angles 75(°), 65(°), 100(°) B1<br>Sum of the interior angles = 3 × 180(°) (= 540(°)) M1<br>Remaining interior angles = 540 – (75 + 65 + 100) m1<br>=300(°) A1<br>Each of the remaining angles = 150(°) A1<br><br>*If no marks, SC1 for answers of 120° and 120° from incorrectly using 540° as exterior sum of the angles*<br><br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |

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| | | |
|---|---|---|
| 9. 180÷36 = 5 and 180÷60=3, OR<br>36 =2×2×3×3, 60 =2×2×3×5,<br>and 180 =2×2×3×3×5, OR<br>36, 72, 108, 144, 180, … with 60, 120, 180, …<br><br>HCF of 36 & 60 is 2×2×3 or 12<br><br>Conclusion, e.g. 'this common factor of 12 is a factor of 180 so Jack is not correct (for this part of his statement)' | B1<br><br><br><br><br>B1<br><br>E1<br><br>3 | Must <u>check</u> 1st part of Jack's statement<br><br><br><br><br><br>Depends on 2nd B1 |
| 10.(a) (i) At least 2 correct points found or plotted<br>Correct straight line shown<br>(ii) At least 2 correct points found or plotted<br>Correct straight line shown<br>(b) No AND a reason, e.g. 'they don't intersect (meet) at 90° (right angles)' | M1<br>A1<br>M1<br>A1<br>E1<br><br><br><br><br>5 | <br><br><br><br><br>Do not accept 'No they are not perpendicular'<br>FT provided one of their lines is correct<br>Also FT provided one of their lines is correct, but then the incorrect line happens to be perpendicular, then 'Yes' with the reason 'intersect at 90°' |
| 11.(a) $3t - 3g = hf - ht$<br>$3t + ht = hf + 3g$<br>$t(3 + h) = hf + 3g$<br>$t = \frac{hf + 3g}{h + 3}$<br>(b)(i)10n - 7<br>(ii) -10n + 60 or equivalent<br>(iii) $2n^2 + 6$ or equivalent | B1<br>B1<br>B1<br>B1<br><br>B2<br>B2<br>B2<br>10 | Incorrect expansions is 1 error ***FT until 2nd error***<br>Collection of t terms, or all negative<br>Factorise t<br>Division. Mark final answer<br><br>B1 for sight of 10n<br>For B2 mark final answer. B1 for sight of -10n<br>For B2 mark final answer. B1 for sight of $2n^2$ (or equivalent) |
| 12.(a)(i) Correct sketch<br>(ii) Correct sketch<br>(b)(i) Correct sketch through (0,0)<br>(ii) Sketch of any vertical translation<br>Correct sketch with<br>either (0,3) stated or 3 indicated on the y-axis<br>(iii) Correct sketch through (0,0) | B1<br>B1<br>B1<br>B1<br>B1<br><br>B1<br>6 | *Throughout this question mark intention in the 2 correct quadrants* |
| 13. $2x^2 + 7x - 8x - 28 + x^2 + x + 4$ OR $2x^2 - x - 28 + x^2 + x + 4$<br>$3x^2 - 24 = 3(x^2 - 8)$, i.e.both steps shown | M2<br>A1<br>3 | M1 if 1 slip or error<br>CAO |
| 14.(a) $5 \times 10^3$<br>(b) $2.4 \times 10^9$<br>(c) $3.36 \times 10^8$ | B2<br>B2<br>B2<br><br><br><br>6 | B1 for $0.5 \times 10^4$ or $\frac{1}{2} \times 10^4$ or 5000<br>B1 for $24 \times 10^8$ or 2 400 000 000<br>B1 for attempt to match addition of numbers, e.g. breaking down to $3.24 \times 10^7 \times 10$ or alternative strategy, or sight of 336 000 000 |
| 15.(a) 60<br>(b) 324 | B2<br>B3<br><br><br>5 | B1 for sight of $\sqrt{5} \times \sqrt{5} = 5$<br>B2 for $(3\sqrt{2})^4$ with an attempt to evaluate, 81× ..or ..×4, OR 18×18<br>B1 for $(3\sqrt{2})^4$ OR multiply pair brackets to 18 |
| 16.(a) $b = cd/a$<br>(b)(i) 90° or right angle<br>Reason 'tangent meets radius (at 90°)'<br>(ii) 2x<br>x | B2<br>B1<br>B1<br>B1<br>B1<br>6 | B1 for $a \times b = c \times d$<br>May be indicated on the diagram |

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| | | |
|---|---|---|
| 17.(a) Sight of 6, 12, 18 (as winning tickets) or realising there are 3 winning tickets | B1 | |
| Idea to calculate P(win) × P(win) | S1 | Accept from incorrect replacement idea |
| $3/20 \times 2/19$ | M1 | FT their 3 if clear that an attempt to find multiples of 6 |
| 6/380 (=3/190) | A1 | ISW |
| (b) Sight of 1, 2, 3, 6, 9, 18 or realising that there are 6 winning tickets | B1 | |
| Considers P(win) × P(win), P(win) × P(lose), P(lose) × P(win) | S1 | OR 1 – P(not winning). Accept from incorrect replacement idea |
| $6/20 \times 5/19 + 6/20 \times 14/19 + 14/20 \times 6/19$ (30/380 + 84/380 + 84/380) | M1 | FT their factors, provided clearly shown at least 4 of them OR $1 - 14/20 \times 13/19$ (= 1 – 182/380) |
| 198/380 (= 99/190) | A1 | ISW |
| | 8 | |
| 18.(a) $(x + 9)(x – 9)$ | B1 | |
| $(2x - 5)(x + 9)$ | B2 | B1 for $(2x \ldots 5)(x \ldots 9)$ |
| $\underline{x – 9}$ | B1 | FT if possible for similar level of difficulty |
| $2x - 5$ | | Mark final answer, do not ISW |
| (b)(i) a = 6 | B1 | |
| $x^2 + 12x + 36$ (-22) OR method to find b | M1 | |
| b = -22 | A1 | Accept embedded answers |
| (ii) $(x + 6)^2 – 22 = 0$ | B1 | Use of completing the square from (i), FT |
| $(x + 6)^2 = 22$ | M1 | |
| $x + 6 = \underline{+}\sqrt{22}$ | M1 | |
| $x = \underline{+}\sqrt{22} - 6$ | A1 | Must show $\underline{+}$ |
| | 11 | |

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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS IN MATHEMATICS

## UNIT 1: Methods (Non-Calculator)
## HIGHER TIER

A.M. FRIDAY, 11 January 2013

2 hours

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

### 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***(a)*.

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

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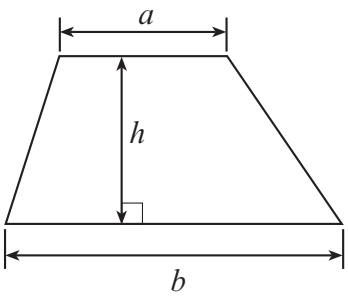
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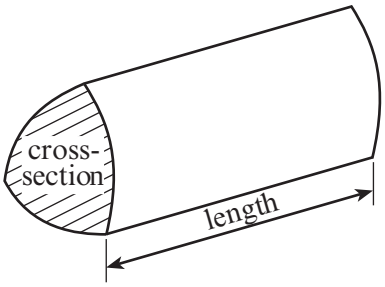
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## Formula List

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

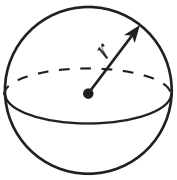



**Volume of prism** = area of cross-section × length



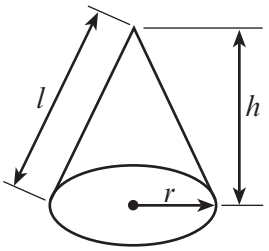

**Volume of sphere** = $\frac{4}{3}\pi r^3$

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




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

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

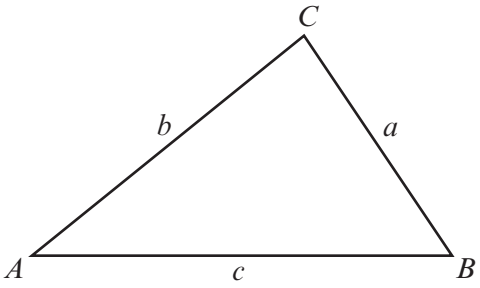



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

where $a \neq 0$ are given by

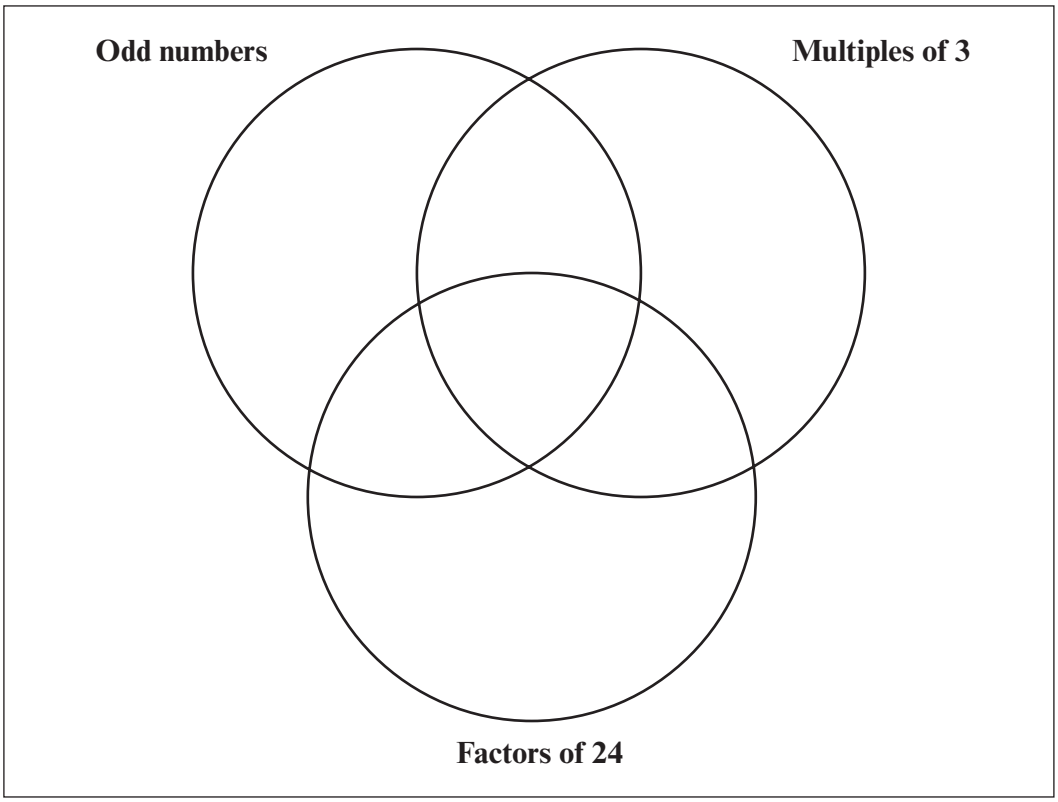
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

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**1.** *(a)* Place the whole numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10 in the correct positions in the Venn diagram.




[3]

*(b)* A whole number is selected at random from the set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}.

Find the probability that the number selected is

an odd number, .....

an odd number that is a factor of 24, .....

not a multiple of 3 and not a factor of 24. .....

[3]

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**2.** Find the size of the angles $q$, $r$, $s$ and $t$.

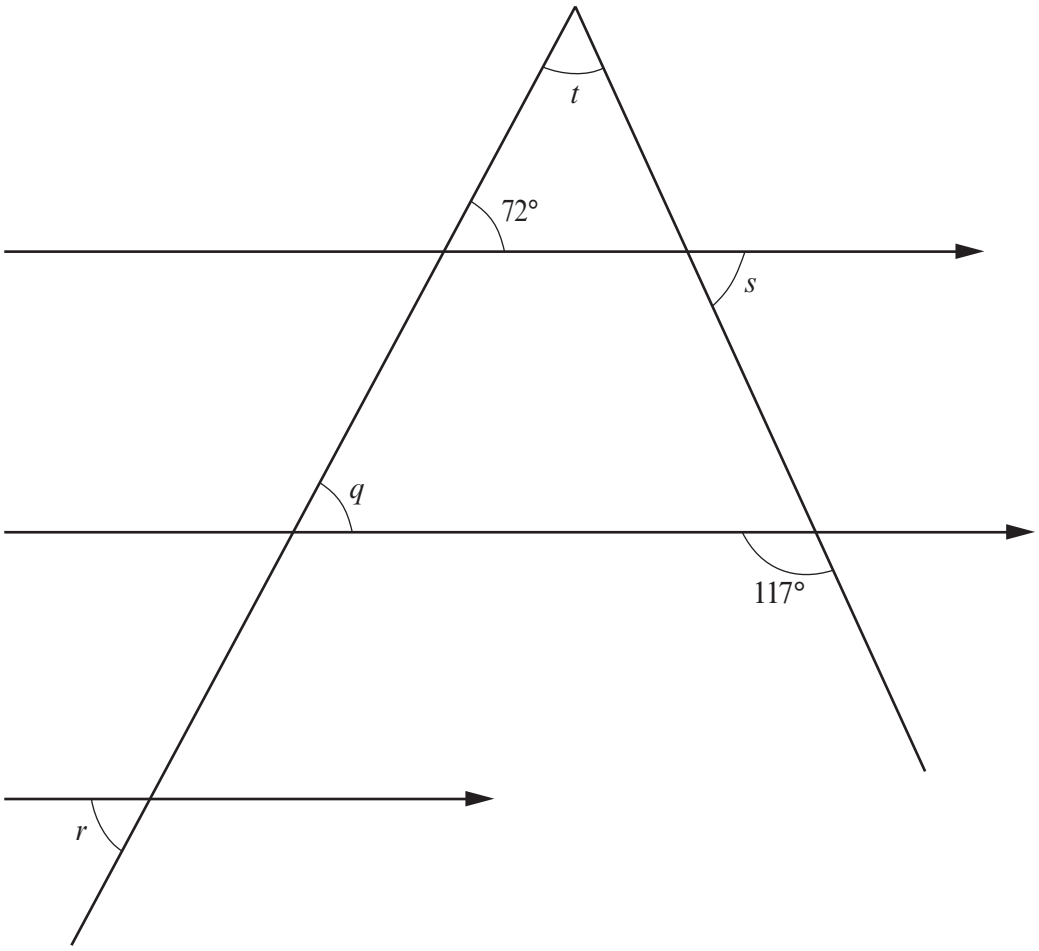



*Diagram not drawn to scale*

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$q$ = ..... ° $r$ = ..... ° $s$ = ..... ° $t$ = ..... °

[4]

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**3.** *(a)* Write 3600 as a product of prime factors using index notation.

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[3]

*(b)* The sum of 4 consecutive prime numbers is 60.
Calculate the sum of these 4 prime numbers together with the next two prime numbers.

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.....

[4]



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**Turn over.**

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**4.** *(a)* The two smaller angles in a kite are 30° and 70°.
Calculate the size of the other angles of this kite.

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[3]

*(b)* Draw an example of a trapezium with equal diagonals.
You must make it clear why the diagonals are equal.

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[3]

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**5.** *(a)* Evaluate 4·21 × 1·3 giving your answer correct to 2 significant figures.

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[3]

*(b)* Convert each of the following fractions into a decimal **and** state whether or not the decimal is a terminating or recurring decimal.
Show **all** your working.

$\frac{7}{8}$

.....

.....

$\frac{2}{9}$

.....

.....

$\frac{4}{11}$

.....

.....

[4]



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**6.** Alma is mixing paint.
She needs to create a colour that is a mix of yellow, blue and white paint in the ratio 2 : 3 : 10.
She wants to make 4·5 litres of this colour paint.
Alma has enough yellow and white paint, but she needs to buy the blue paint.
Blue paint is sold in $\frac{1}{2}$ litre tins, with each tin costing £3.72.

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

Calculate how much Alma will need to spend on buying the blue paint.
You must show **all** your working.

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[7]

*(b)* How much of the blue paint will Alma have left over?

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[1]

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**7.** A ten-sided spinner has sides labelled with numbers from 1 to 10.

The spinner is spun 20 times.
It shows the number 3 on six of these occasions.

The spinner is spun another 20 times.
It shows the number 3 on four of these occasions.

*(a)* Do you think this is a fair spinner?
You must show your working and give a reason for your answer.

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[2]

*(b)* Find the best estimate for the probability of the spinner showing the number 3 on a single spin.

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[2]

*(c)* How could your estimate for the probability of the spinner showing the number 3 be improved?

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[1]

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**Turn over.**

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**8.** A certain pentagon has 5 angles known as the first, second, third, fourth and fifth angles.

- The second angle is twice the size of the first angle.
- The third angle is three times the size of the second angle.
- The fourth and the fifth angles are both right angles.

Calculate the size of the **largest angle** in the pentagon.

[7]

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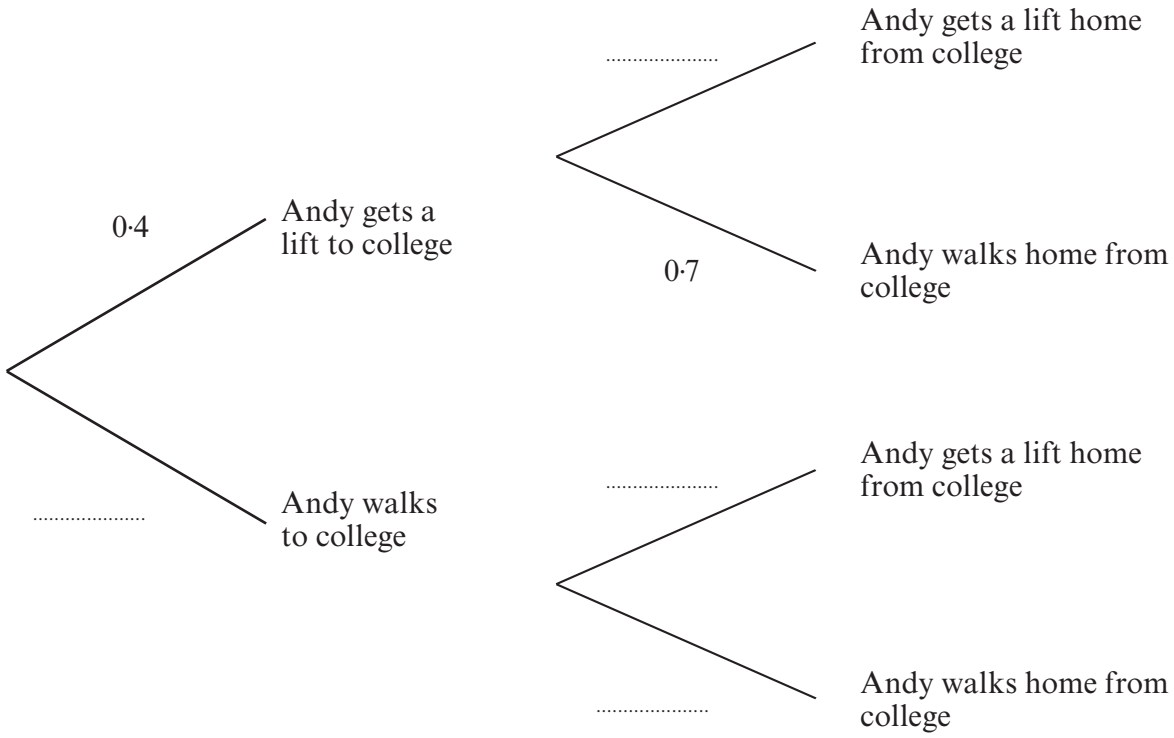


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**9.** Andy sometimes gets a lift to and from college.
When he does not get a lift he walks.
The probability that he gets a lift to college is 0·4.
The probability that he walks home from college is 0·7.
Getting to college and getting home from college are independent events.

*(a)* Complete the following tree diagram.




[2]

*(b)* Calculate the probability that Andy gets a lift to college and walks home from college.

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[2]

*(c)* Calculate the probability that Andy **does not** get a lift to or from college.

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[2]

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**10.** *(a)* Evaluate $\dfrac{\sqrt{5} \times \sqrt{3} \times \sqrt{3}}{\sqrt{5}}$.

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.....

[2]

*(b)* Evaluate $2^{-3} \times 16^{\frac{1}{2}}$.

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[3]

*(c)* Write 0·00085 in standard form.

.....

[1]

*(d)* Evaluate $\dfrac{3{\cdot}9 \times 10^{7}}{1{\cdot}3 \times 10^{-2}}$, giving your answer in standard form.

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[2]

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**11.** *(a)* Find the *n*th term of the sequence 8, 11, 16, 23, 32, .....

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[2]

*(b)* Make $x$ the subject of the following formula.

$$\frac{ax + b}{cx + d} = 2$$

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[5]

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**12.**

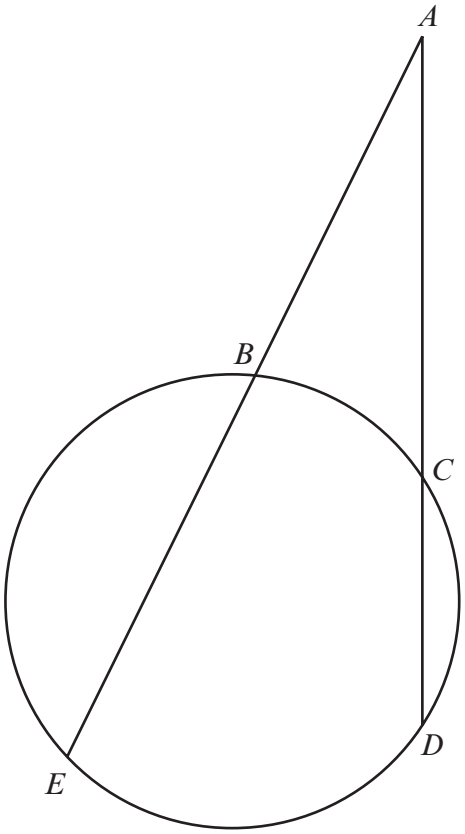



*Diagram not drawn to scale*

Given that $AC = 6\,\text{cm}$, $AB = 5\,\text{cm}$ and $BE = 7\,\text{cm}$, calculate the length of $AD$.

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[2]

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**13.** *(a)* Factorise the expression $x^2 + 14x - 15$ and hence solve the equation $x^2 + 14x - 15 = 0$.

[3]

*(b)* Express $x^2 + 6x + 25$ in the form $(x + a)^2 + b$, where $a$ and $b$ are values to be found.

[2]

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**14.** *(a)* Use the graph paper opposite to draw the graph of $y = -2x^2 - 8x$ for values of $x$ from $x = -5$ to $x = 2$. [5]

*(b)* Use your graph to solve $-2x^2 - 8x = 0$.

[2]

*(c)* Find the equation of the straight line that is parallel to $y = -2x$ and intersects the graph of $y = -2x^2 - 8x$ at the point $(-4, 0)$.

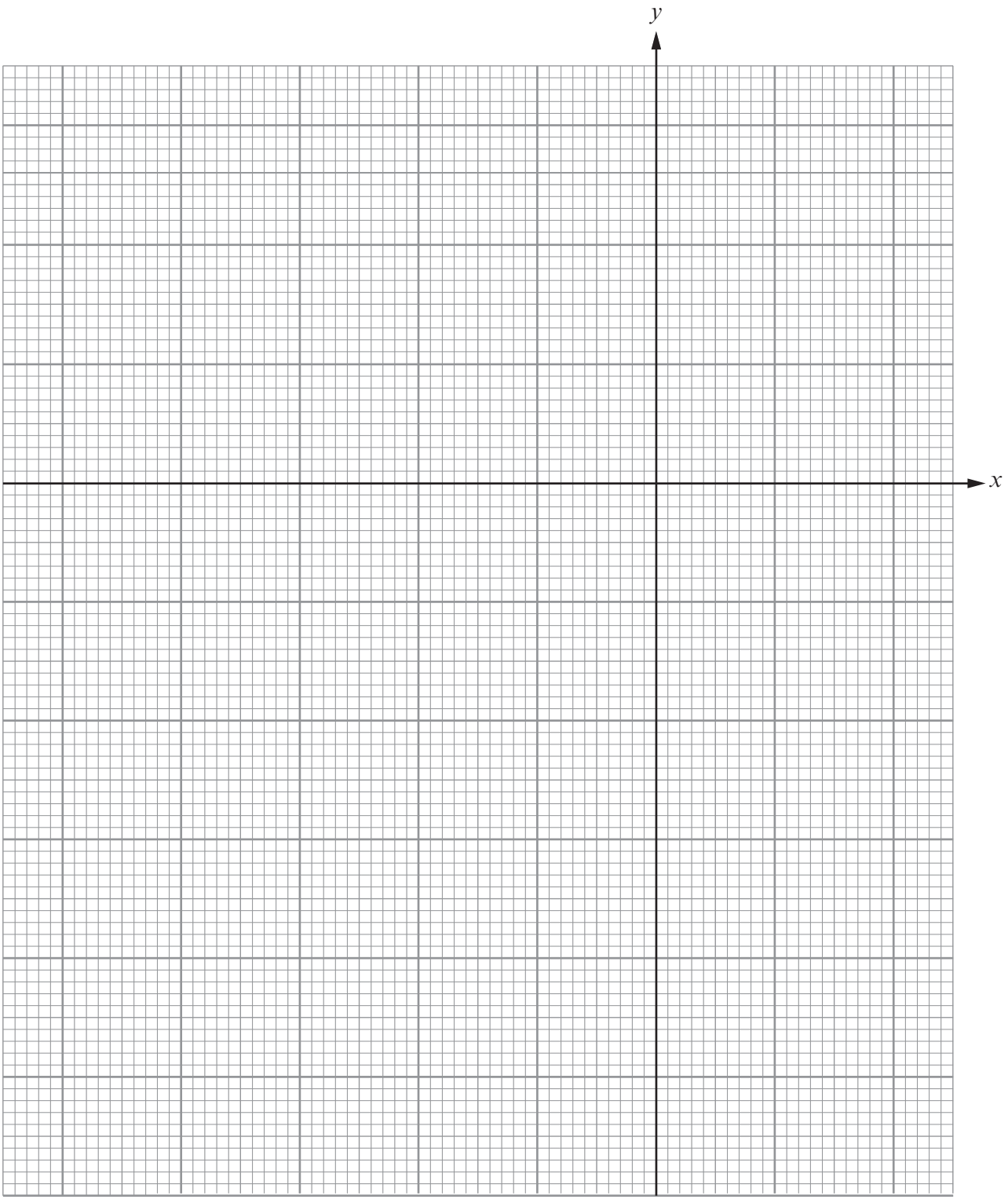
[3]

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**15.** Prove that $\dfrac{1}{2x+1} + \dfrac{1}{2x-1} - \dfrac{1}{4x} \equiv \dfrac{12x^2+1}{4x\left(4x^2-1\right)}$.

[6]

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**16.** Maisy is given a multiple-choice test during a job interview.
There are five possible choices given for each question but only one is the correct answer.
Maisy knows the correct answers to 60% of the questions in the test.
For all the other questions Maisy selects an answer at random.

*(a)* A question is selected at random from the test.
Calculate the probability that Maisy answers this question correctly.

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[4]

*(b)* The test has 200 questions.
Calculate how many questions you might expect Maisy to answer correctly.

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[2]

**END OF PAPER**

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# GCSE MARKING SCHEME

## METHODS IN MATHEMATICS (LINKED PAIR PILOT)

## JANUARY 2013

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## 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.

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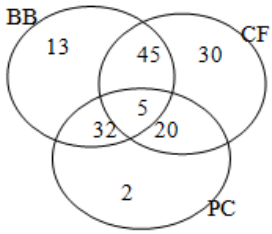
# UNIT 1 - FOUNDATION TIER

| Methods Unit 1 Foundation Tier January 2013 | | Final |
|---|---|---|
| 1. (a) 7028 | B1 | |
| (b) nine million two hundred thousand | B1 | Accept ninety two hundred thousand and nine point two million |
| (c) 105 | B1 | |
| (d) 79 | B1 | |
| (e) 56 | B1 | |
| (f) 1, 5, 11, 55 | B2 | B1 for 2 or 3 correct factors with no incorrect factors OR 3 or 4 correct factors and only 1 incorrect,<br>Ignore duplicates. |
| (g) 2840 | B1<br>8 | |
| 2.(a) (i) even chance | B1 | |
| (ii) impossible | B1 | |
| (iii)unlikely | B1 | |
| (b)(i) 45/100 or equivalent | B1 | Penalise consistent use of incorrect notation eg. 45 in 100 once only in part (b) |
| (ii) 51/100 or equivalent | B1 | |
| (iii) 13/100 or equivalent | B1 | If no marks awarded in (b) award SC1 if (i), (ii) and (iii) have correct numerators in a fraction < 1. |
| | 6 | |
| 3. (a) B (0, -5) | B1 | Reversed coordinates B0 throughout |
| C (-3, -2) | B1 | |
| (b) D plotted at (0, 1) | B1 | |
| (c) Line drawn through C perpendicular to AC | B1<br>4 | |
| 4. (a) 2678 | B1 | |
| (b) 49 | B1 | |
| (c) 706 | M1 | Any correct method for the multiplication of 706 by 38 |
| × 38 OR | | |
| 5648 228 | A1 | For either 5648 or 21180 OR 228 or 26600<br>(Apply 'one error' in other methods) |
| 21180 26600 | | |
| 26828 26828 | A1 | CAO<br>Place value errors get M0 A0<br>*Note - count incorrect multiplication of 0 by 3 and 8 as 1 error.* |
| (d) 15 | B1 | |
| (e) 36 | B1<br>7 | |
| 5. (a) 9 | B1 | |
| (b) 162 | B1 | |
| Multiply (the previous term) by three | B1 | Accept ' times by 3' or × 3 or equivalent |
| (c) × 4 and -1 | B1 | Accept Multiply by 4, subtract 1 |
| (d) 6*d* | B1 | |
| (e) 8*m* – 6*n* | B2 | Award B1 for either 8*m* or – 6*n* within an expression or for 8*m* AND -6*m* written separately, eg. Award B1 for 8*m*, -6*m*. Award B1 for 8*m* + - 6*m*. |
| (f) 7(*y* + 2) | B1<br>8 | ISW |

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| Methods Unit 1 Foundation Tier January 2013 | | Final |
|---|---|---|
| 6. (Nia = ) 5 × 6 + 3 × -4<br>(30 – 12 ) = 18<br>(Charlotte = ) 3 × 6 + 5 × -4<br>(18 – 20) = -2<br>Difference = (18 - -2 =) 20<br><br>Look for<br>• Spelling<br>• Labels<br>• Correct terminology<br>• the use of simplified notation, watch for the use of '=' being appropriate<br><br>For QWC2 labels and the correct use of "-" must be evident.<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer | M1<br>A1<br>M1<br>A1<br>A1<br><br>Q<br>W<br>C<br>2<br><br>7 | *Be aware for alternative strategies eg 10 points difference per game, so total difference is 20.*<br><br>Follow through their Nia and their Charlotte if at least one M1 awarded, **providing one is negative**.<br><br>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.<br><br>QWC1 Presents material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 7. (a) 0.04, 0.3, 0.34, 0.403<br>(b) 3/8 + 4/8<br>7/8 or equivalent | B1<br>M1<br>A1<br>3 | Any correct method |
| 8. (a) (180 – 30) ÷ 2<br>=75(°)<br>105(°)<br><br>(b) 360 ÷ 5<br>72(°) | M1<br>A1<br>A1<br><br>M1<br>A1<br>5 | Check diagram throughout this question<br><br>FT 180 - their 75 evaluated correctly, provided M1 awarded |
| 9(a) 35 + 20 × 4<br>= (£)115<br>(b) (total cost =) 35 + 20 × number of hours | M1<br>A1<br>B2<br><br>4 | For the intention of multiplying and then adding<br><br>Accept use of letters. Award B1 for sight of 20 × number of hours OR for a correct description of how to calculate the cost |
| 10. (a) $a/2 = ½ a$<br>$a^2 = a \times a$<br>$a + a = 2a$<br>$3a = a + 2a$<br>(b) $(a^3 =) a \times a \times a$ or equivalent<br>$(2(a + 3) =) 2a + 6$ or equivalent | B4<br><br><br><br>B1<br>B1<br>6 | Award B1 for each correct pair |
| 11. Three circles with the number 5 in the correct place<br>45 correct for Brecky Bix & Crispy Flakes only<br>32 correct for Brecky Bix & Pop Chocs only<br>20 correct for Crispy Flakes & Pop Chocs only<br>13 30 2 (any 2 correct)<br>The number of people that took part in the survey = 147<br><br> | B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>6 | CAO |

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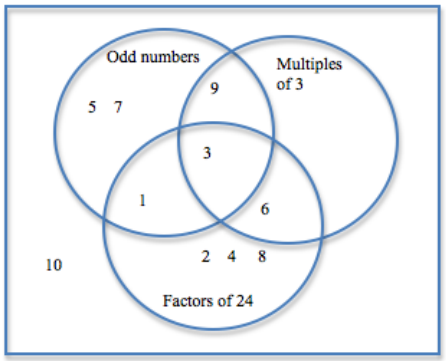
| Methods Unit 1 Foundation Tier January 2013 | | Final |
|---|---|---|
| 12. (q=) 72<br>(r =) 72<br>(s= ) 63<br>(t= ) 45 | B1<br>B1<br>B1<br>B1<br>4 | <br>FT their q<br><br>FT '108 – their s', i.e. check s + t = 108° |
| 13.(a) Method to find prime factors<br>2, 2, 2, 2, 3, 3, 5, 5<br>$2^4 \times 3^2 \times 5^2$<br>(b) 1 correct trial by summing 4 (consecutive) primes<br>11, 13, 17, 19<br>Next two consecutive primes: 23, 29<br>112 | M1<br>A1<br>B1<br>S1<br>B1<br>M1<br>A1<br>7 | 2 correct before 2nd error<br>Ignore 1s for A1, but not for B1<br>FT provided an index>1 involved. Accept "."<br>Must be sum 4 primes numbers (e.g. 7, 11, 19, 23)<br>Seen or implied (by next prime being 23)<br>FT their 4 numbers ('primes') to next 2 primes<br>CAO |
| 14.(a) Reason, e.g. '1/10 (expected if fair)', or '(6/20 =) 3/10 AND (4/20 = )2/10', or '10/40 = 2.5/10' or 'should be 2 times in 20 spins'<br>Conclusion 'No' from a comparison with 1/10<br><br>(b) 10/40 (=1/4 = 0.25 or 25%)<br><br><br><br>(c) Explanation, e.g. 'more spins' | M1<br><br>A1<br><br><br>B2<br><br><br><br>E1<br>5 | Must show numerical value for reason<br>Do not accept 10/40 = ¼ unless comparison with 1/10<br><br>Do not accept 'No' if an aspect of **reasoning statement** is incorrect, other than 1 slip in reading one of the given statements<br>Ignore incorrect cancelling<br>B1 for sight denominator 40, or sight of '… in/out of 40'<br>*If no marks (a) and (b) then SC1 for sight of 10/40 (=1/4 = 0.25 or 25%) in the part (a)* |

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# UNIT 1 - HIGHER TIER

| Methods Unit 1 Higher Tier January 2013 | | Final |
|---|---|---|
| 1. (a)<br><br><br>(b) 5/10 ISW<br>2/10 ISW<br>3/10 ISW | B3<br><br><br><br><br><br><br><br><br><br><br>B1<br>B1<br>B1<br><br><br>6 | Penalise any extra numbers (e.g. >10), -1 only<br>B2 for 7, 8 or 9 of the numbers placed correctly, marking any repeats as incorrect, OR<br>B1 for 4, 5 or 6 of the numbers placed correctly, marking any repeats as incorrect<br><br><br><br><br><br><br><br><br><br>OR FT from their Venn diagram<br>OR FT from their Venn diagram.<br>OR FT from their Venn diagram<br>If no marks in (b) award SC1 for 5, 2 and 3 or identifying the correct regions by listing the correct numbers<br>*Penalise incorrect notation once only, -1* |
| 2. (q=) 72<br>(r =) 72<br>(s= ) 63<br>(t= ) 45 | B1<br>B1<br>B1<br>B1<br>4 | <br>FT their q<br><br>FT '108 – their s', i.e. check s + t = 108° |
| 3.(a) Method to find prime factors<br>2, 2, 2, 2, 3, 3, 5, 5<br>$2^4 \times 3^2 \times 5^2$<br>(b) 1 correct trial by summing 4 (consecutive) primes<br>11, 13, 17, 19<br>Next two consecutive primes: 23, 29<br>112 | M1<br>A1<br>B1<br>S1<br>B1<br>M1<br>A1<br>7 | 2 correct before 2nd error<br>Ignore 1s for A1, but not for B1<br>FT provided an index>1 involved. Accept "."<br>Must be sum 4 primes numbers (e.g. 7, 11, 19, 23)<br>Seen or implied (by next prime being 23)<br>FT their 4 numbers ('primes') to next 2 primes<br>CAO |
| 4.(a) 360(°) – 70(°) – 30(°) or equivalent full method<br>= 260(°)<br>130(°) (and 130(°))<br><br><br><br>(b) An isosceles trapezium, drawn with<br>equal sides indicated<br>or statement 'isosceles trapezium',<br>or equal base angles indicated,<br>or equal 'top' angles indicated,<br>(or symmetrical) would be a sufficient reason | M1<br>A1<br>A1<br><br><br><br>B3<br><br><br><br><br><br><br>6 | Allow intention only if 260 seen<br><br>FT 'their 260' ÷ 2 evaluated correctly<br>OR Alternatively Reflex kite, 360 – 70 - 30 – 70 = 190, so other angles are 70 and 190, M1, A1, A1, with FT to last A1 from 1 arithmetic error only, provided M1<br>Accept statements or indication on their diagram.<br>Ignore spelling.<br>Parallel lines need to appear as such, but may not be indicated<br>B2 for trapezium drawn which may have equal diagonals but the equal sides or equal angles are not marked i.e. intention isosceles trapezium, or<br>B1 for an attempt to draw trapezia (at least 2) working towards equal diagonals (showing some ideas), one of these may be a rectangle<br>*If no marks then allow SC1 for a rectangle with a pair of opposite sides indicated as equal* |
| 5.(a) Method to evaluate, allow 1 slip in tables<br>5.473<br>rounded to 5.5<br>(b) 0.875<br>0.22(22…)<br>0.36(36…)<br>terminating, recurring, recurring (decimal) stated | M1<br>A1<br>A1<br>B1<br>B1<br>B1<br>B1<br>7 | Accept digits 5 4 7 3 with incorrect place value<br><br>FT their 5.473 provided M1 awarded<br><br><br><br><br>FT their responses provided at least B2 already awarded |

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| Methods Unit 1 Higher Tier January 2013 | | Final |
|---|---|---|
| 6.(a) 4.5 ÷ 15 (=0.3 litres) or 4500 ÷ 15 (= 300ml or $cm^3$ )<br>×3 ×3<br>(3 × 0.3 =) 0.9(litres) or (3 × 300 =) 900(ml or $cm^3$)<br>2 tins needed<br><br>(£)7.44<br><br>Look for<br>• relevance<br>• spelling<br>• clarity of ongoing text explanations,<br>• the use of notation and units<br><br>For QWC2 there must be sufficient process steps, not from a simplified problem. If simplified problem then QWC1 if process steps, units and labelled staged with clear final answer<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer<br><br>(b) 0.1(litre) or 100(ml or $cm^3$) | M1<br>m1<br>A1<br>A1<br><br>A1<br><br><br><br><br><br><br>QWC 2<br><br><br><br><br><br><

| Methods Unit 1 Higher Tier January 2013 | | Final |
|---|---|---|
| 8. Method to find the sum of the interior angles of a pentagon, e.g. 3× 180° | M1 | |
| (Sum of interior angles) 540° | A1 | |
| (Hence 540 – 90 – 90 so first three angles total is) 360° | B1 | May be implied in later work. FT 'their 540°' |
| Strategy, e.g. use of trial and improvement meeting both criteria i.e. their relative angles are in the ratio 1 to 2 to 6 AND also working towards a total of 360° | S2 | FT 'their 360°'<br>Accept if working with the 2 angles of 90° and working to a total of 'their 540°', this implies previous B1 provided 540° correct.<br>S1 for sight of their relative angles in the ratio 1 to 2 to 6<br>B marks are independent of S marks |
| (Smallest angle =) 40° OR sight of calculation 360 ÷9 ×6 | B1 | FT their 2nd angle twice their first angle<br>Also FT 'their 540°' |
| (Largest angle =) 240° | B1 | FT 6× their 1st angle, their largest angle six times their first angle provided answer >90° |
| | 7 | *Candidates working from total sum 360° rather than 540° may be awarded:*<br>*M0, A0, FT for possible*<br>*B1 (360-180=) 180,*<br>*S2 (strategy 1 to 2 to 6 and working towards '180°') or S1*<br>*B1 (1st 20°, 2nd 40°)*<br>*B1 (1st 20°, largest 120°)* |
| 9.(a) Correctly completing the tree diagram 0.6, 0.3. 0.3, 0.7 | B2 | B1 for any one pair of branches correct (total 1) |
| (b) 0.4 × 0.7 | M1 | |
| = 0.28 | A1 | |
| (c) 0.6 × 0.7 | M1 | Or other complete method.<br>FT for their P(walk to college) ×P(walk home) correctly evaluated, or by alternative method |
| = 0.42 | A1<br>6 | |
| 10.(a) 3 | B2 | B1 for one appropriate step, e.g. cancelling $\sqrt{5}/\sqrt{5}$, or sight of $\sqrt{9}$. Do not accept $\sqrt{45}/\sqrt{5}$ until simplified. |
| (b) ½ or 0.5 (with no working or from correct working) | B3 | B2 for 1/8 AND 4 respectively OR $2^{-1}$ OR 4/8<br>B1 for 1/8 OR 4 respectively OR $2^{-3}\times(2^4)^{1/2}$ |
| (c) $8.5 \times 10^{-4}$ | B1 | |
| (d) $3 \times 10^9$ | B2<br>8 | B1 for 3 000 000 000 or sight of $10^9$ |
| 11.(a) $n^2 + 7$ | B2 | B1 for $n^2 + \ldots$ OR second difference of 2 with $n^2$ |
| (b) $ax + b = 2(cx + d)$ | B1 | Accept intention, i.e. missing brackets. FT until 2nd error |
| $ax + b = 2cx + 2d$ | B1 | |
| $ax - 2cx = 2d - b$ OR $b - 2d = 2cx - ax$ | B1 | |
| $x(a - 2c) = 2d - b$ OR $b - 2d = x(2c - a)$ | B1 | |
| $x = \frac{2d - b}{a - 2c}$ OR $\frac{b - 2d}{2c - a} = x$ | B1<br>7 | |
| 12. $5 \times 12 = AD \times 6$ or equivalent OR CD = 4 (cm) | M1 | |
| AD = 10 (cm) | A1<br>2 | |
| 13.(a) (x +15)(x -1) | B2 | B1 for (x…15)(x…1) or split mid term and 1st step factor |
| -15 and 1 | B1 | FT from a pair of brackets |
| (b) $(x + 3)^2 + 16$ | B2<br>5 | B1 for a=3 or B1 for b=16 |

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| Methods Unit 1 Higher Tier January 2013 | | Final |
|---|---|---|
| 14.(a) Suitable uniform scales on both axes | B1 | x from -5 to 2 and y from -24 to 0 OR FT their y values provided at least 3 are correct |
| Evidence of finding at least 5 correct points | B1 | |
| Plotting all 8 correct points correctly | P2 | P1 for at least 5 correct points plotted correctly |
| Intention of joining all points plotted with a curve | C1 | Depends on P1<br>Accept if the curve slightly missing plots, it is for intention |
| | | x: -5, -4, -3, -2, -1, 0, 1, 2<br>y: -10, 0, 6, 8, 6, 0, -10, -24 |
| (b) -4 and 0 | B2 | FT for their curve<br>Accept if given as coordinates. B1 for any 1 correct |
| (c) Use of gradient -2 | M1 | |
| Intersection with y axis found to be -8 | M1 | |
| Equation y = -2x - 8 | A1 | |
| | | *Or alternative method:*<br>*y = -2x + c* *M1*<br>*0 = -2×-4 +c or c = -8* *M1*<br>*y = -2x - 8* *A1* |
| | 10 | |
| 15.Attempt to use a common denominator | B1 | Or multiply each term by 4x(2x+1)(2x-1) |
| (2x-1)(4x) + (2x+1)(4x) – (2x+1)(2x-1) | M1 | For sight of, not necessarily seen as a numerator |
| $8x^2 – 4x + 8x^2 + 4x – 4x^2 + 1$ | A2 | Allow A1 for one slip, or error with the final '-' affecting the final pair of brackets |
| Convincing $\frac{12x^2 + 1}{4x(4x^2 – 1)}$ | A2<br>6 | A1 if convincing, but left as $\frac{12x^2 + 1}{4x(2x+1)(2x-1)}$ |
| 16.(a) 0.6 x 1 or equivalent, AND an attempt to consider the other 40% | M1 | Not for sight of 60% alone |
| 0.4 x 0.2 or 40(%)÷5 or equivalent | M1 | |
| Showing the need to add (0.6 + 0.08) | M1 | Method considers '60% + 40% of 1/5' |
| 0.68 or equivalent | A1 | |
| (b)Probability from part (a) í 200 or 60% of 200+1/5 of 80 | M1 | FT from part (a), apart from 60% giving an answer of 120, this is M0 A0 |
| 136 | A1<br>6 | FT from part (a), apart from 60%<br>A final answer of 136/200 is M1, A0 |

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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS IN MATHEMATICS

## UNIT 1: METHODS (NON-CALCULATOR)

## HIGHER TIER

P.M. MONDAY, 11 June 2012

2 hours

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

### 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(b)***.

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

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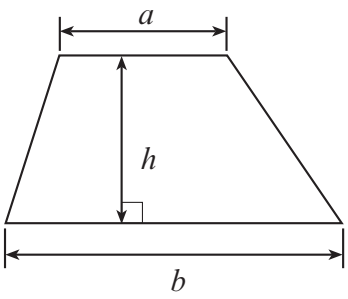
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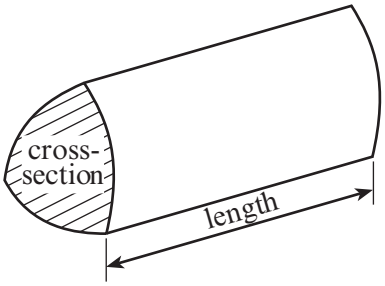
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## Formula List

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

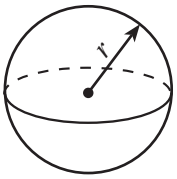



**Volume of prism** = area of cross-section × length



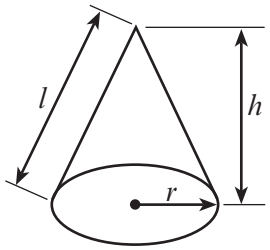

**Volume of sphere** = $\frac{4}{3}\pi r^3$

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




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

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

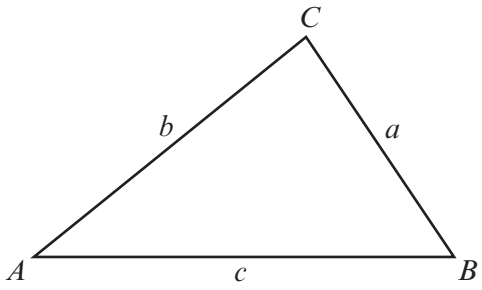



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

where $a \neq 0$ are given by

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


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**1.** *(a)* Find the highest common factor of 48 and 64.

.....

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.....

.....

[1]

*(b)* Find the lowest common multiple of 36 and 90.

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[1]

*(c)* Write down all the prime numbers between 70 and 80.

.....

.....

[1]

*(d)* Evaluate $(0.78 \times 10 + 3.2)^2$.

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[2]



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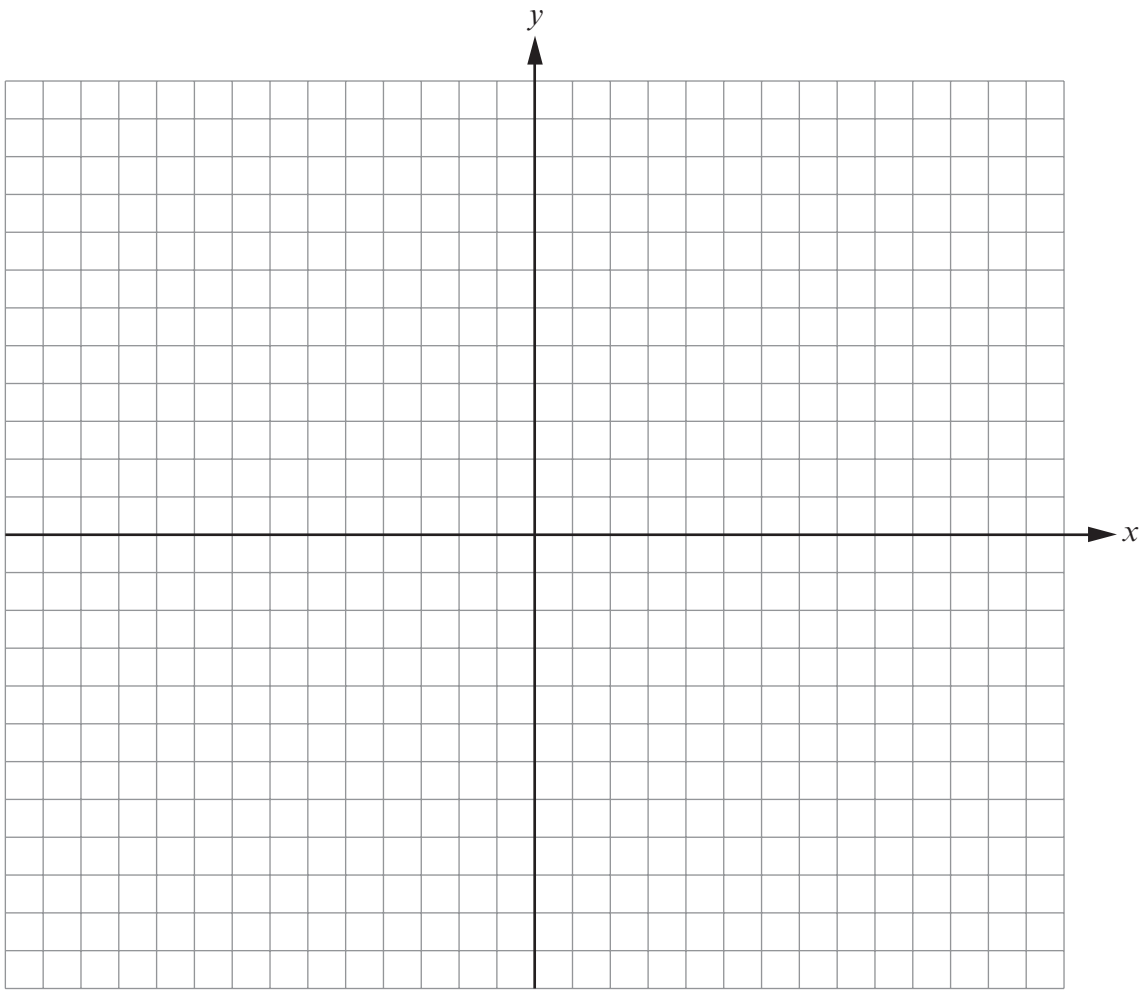


**Turn over.**

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**2.** The coordinates of three vertices of a parallelogram are (5, –2), (–3, –2) and (–2, –6).




*(a)* Find the coordinates of a fourth vertex of the parallelogram.

.....

.....

(..... , .....)

[2]

*(b)* Find the coordinates of the mid point of a diagonal of your parallelogram.

.....

.....

(..... , .....)

[2]

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**3.** Two sets of rods of length 1, 2, 4, 8, 16 and 32 cm are available to make shapes.

| | | | | | |
|---|---|---|---|---|---|
| 1 cm | 2 cm | 4 cm | 8 cm | 16 cm | 32 cm |
| 1 cm | 2 cm | 4 cm | 8 cm | 16 cm | 32 cm |

Rods are joined end to end, with all parts of the rods forming part of the shape.

*(a)* Show how you could use some of these rods to make an equilateral triangle with sides of length 10 cm.

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.....

.....

[1]

*(b)* What would be the lengths of the sides of the **largest** possible equilateral triangle that could be made using these rods? You must state which rods are used and how the equilateral triangle is to be made.

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.....

[2]

*(c)* Explain why it is not possible to create a rhombus using some of these rods.

.....

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.....

.....

[2]

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**4.** Simon has two fair dice in his pocket, one blue dice and one red dice.

The two dice are thrown and the two outcomes are multiplied together then the two original outcomes are added on to obtain the total score.

Simon writes the rule as follows:

**red × blue + red + blue**

The table below shows the possible outcomes and how some of the total scores are recorded.

| | | **Blue dice** | | | | | |
|---|---|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** | **5** | **6** |
| **Red dice** | **1** | 3 | 5 | | | | |
| | **2** | | | 11 | | | 20 |
| | **3** | 7 | | | | 23 | |
| | **4** | | | | | | |
| | **5** | 11 | | | 29 | | |
| | **6** | | 20 | | | | |

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

*(b)* Write down the probability that the total score is

(i) less than 10,

.....

[1]

(ii) a factor of 14,

.....

[1]

(iii) a 2-digit number.

.....

[1]



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**5.** *(a)* Divide £2680 in the ratio 5 : 3 : 2.

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.....

.....

[3]

*(b)* (i) Write 1200 as a product of prime factors using index notation.

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[3]

(ii) Write down the smallest possible number by which 1200 has to be multiplied to create a perfect square.

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[1]

*(c)* Write $\frac{13}{99}$ as a recurring decimal.

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.....

[2]

*(d)* Express $\frac{1}{2}$% as an equivalent decimal.

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.....

[1]



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**6.** *(a)* Write down the *n*th term of the following sequences.

(i) 6, 13, 20, 27, .....

.....

.....

[2]

(ii) 26, 20, 14, 8, .....

.....

.....

[2]

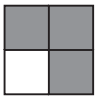


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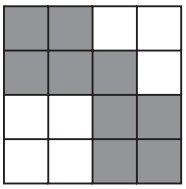
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*(b)* *You will be assessed on the quality of your written communication in this part of the question.*

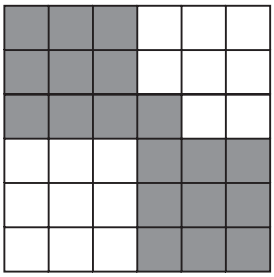
The diagrams show tile patterns.
Each pattern has some shaded tiles and some white tiles.



Pattern 1



Pattern 2



Pattern 3

Find the expression for the total number of tiles in Pattern $n$, the expression for the number of shaded tiles in Pattern $n$ and the expression for the number of white tiles in Pattern $n$.

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.....

.....

[7]



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**7.** Two of the exterior angles of a pentagon are 110° and 130°.
The other exterior angles of this pentagon are all equal.
Calculate the size of the largest of the interior angles of this pentagon.

[6]

**8.** *(a)* Express 0·000053 in standard form.

[1]

*(b)* Evaluate $(4.5 \times 10^7) \times (4 \times 10^5)$ giving your answer in standard form.

[2]



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**9.** Rearrange the following to make $r$ the subject of the formula

$$A = \frac{4\pi r^2}{3}.$$

.....

.....

.....

.....

.....

.....

[3]

**10.**

| Line | Equation |
|---|---|
| A | $y = 3x + 4$ |
| B | $y = -3x + 3$ |
| C | $y = -2x - 4$ |
| D | $y = 3x - 5$ |
| E | $y = 4x + 4$ |

*(a)* Which two of the above lines are parallel?
You must give a clear reason for your answer.

.....

.....

.....

.....

[2]

*(b)* Which two of the above lines intersect each other on the $y$-axis?

.....

.....

[1]



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**11.** The table shows some of the values of $y = 2x^2 + 3x - 9$ for values of $x$ from –4 to 3.

*(a)* Complete the table below.

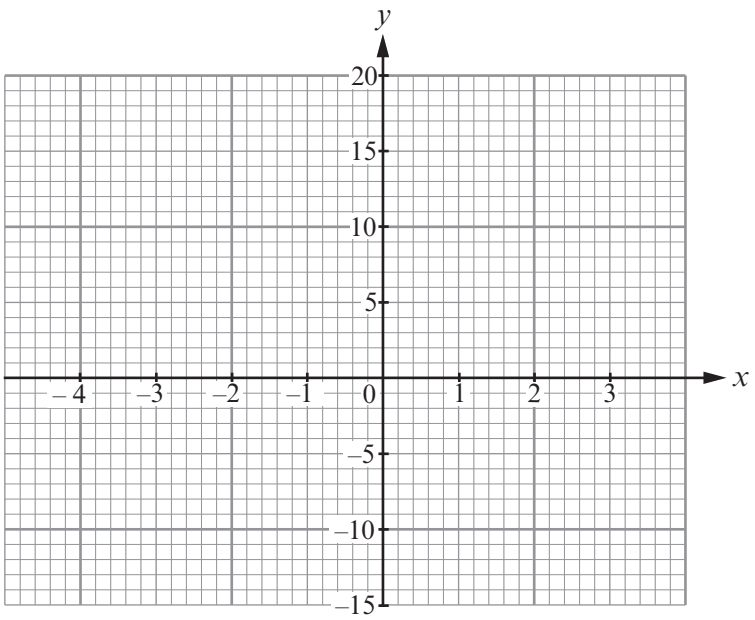
| $x$ | –4 | –3 | –2 | –1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|
| $y = 2x^2 + 3x - 9$ | 11 | 0 | | –10 | –9 | –4 | | 18 |

.....

.....

[2]

*(b)* On the graph paper below, draw the graph of $y = 2x^2 + 3x - 9$ for values of $x$ from –4 to 3.




[3]

*(c)* Use your graph to solve $2x^2 + 3x - 9 = 0$.

.....

.....

[2]

*(d)* Use your graph to solve $2x^2 + 3x - 9 = 6$.

.....

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.....

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[2]



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**12.** The diagram shows a circle with $BC = 30\,\text{cm}$, $AB = 50\,\text{cm}$ and $CD = 25\,\text{cm}$.

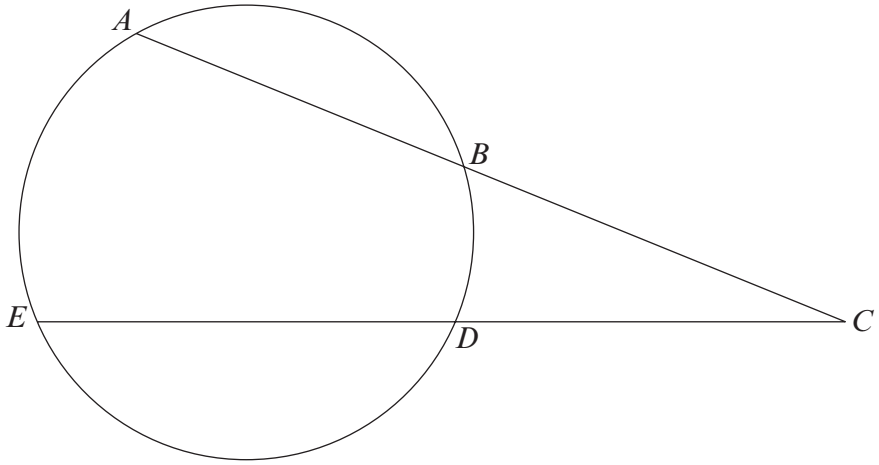



*Diagram is not drawn to scale*

Calculate the length of $ED$.

.....

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.....

[4]





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**13.** *(a)* Express $8^{-\frac{2}{3}}$ as a decimal.

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.....

[2]

*(b)* Factorise $4x^2 - 1600$.

.....

.....

[3]

*(c)* Evaluate $(\sqrt{3})^6$.

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[1]

*(d)* Simplify $(2 + 3\sqrt{2})(5 - \sqrt{2})$.

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[3]

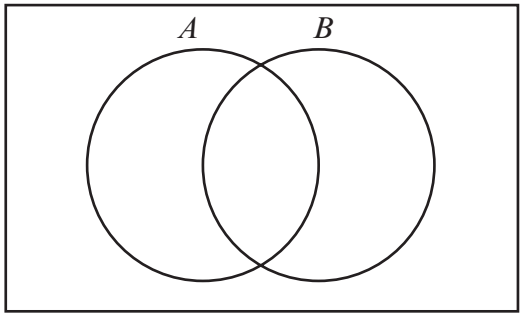


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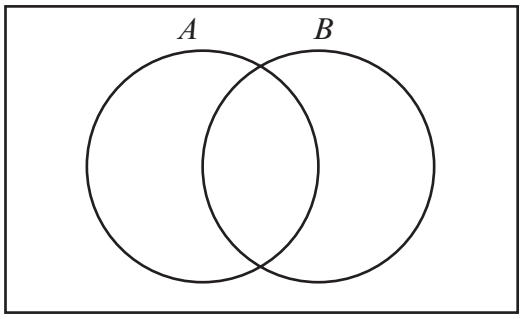
**14.** On each Venn diagram, shade the appropriate region to represent the information given in each part of the question.

*(a)* $A \cap B$



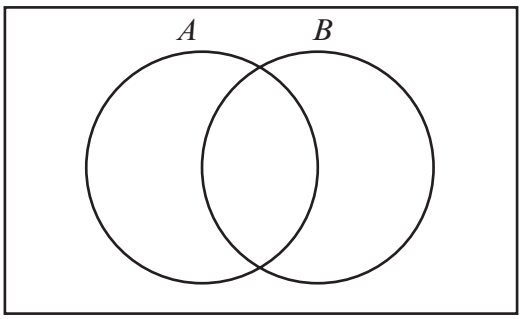

[1]

*(b)* $(A \cup B)'$




[1]

*(c)* $A \cup B'$



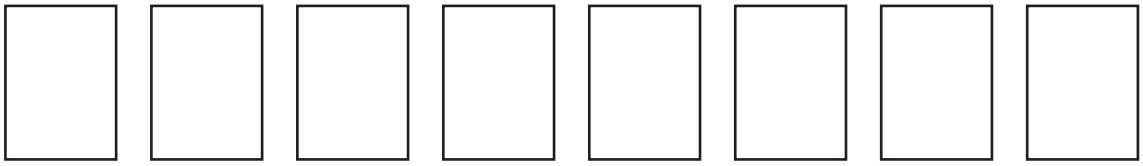

[1]



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**15.** Each of eight cards has one factor of 70 on it.
The eight numbers are all different.



Two cards are selected at random without replacement.

*(a)* Calculate the probability that the **difference** of the two numbers on the selected cards is odd.

[5]

*(b)* Calculate the probability that at least one of the selected cards is even.

[3]

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**16.** *(a)* Express $x^2 - 16x + 66$ in the form $(x + a)^2 + b$ where $a$ and $b$ are values to be found.

[2]

*(b)* Prove that $\frac{2x + 3}{4} - \frac{3x - 2}{3} + \frac{1}{6} \equiv \frac{19 - 6x}{12}$.

[5]

*(c)* Simplify $\frac{2x^2 + 5x - 7}{10x + 35}$.

[4]



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# GCSE MARKING SCHEME

## METHODS IN MATHEMATICS (LINKED PAIR PILOT)

## SUMMER 2012

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## 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.

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# UNIT 1 (FOUNDATION TIER)

| Methods Unit 1Foundation Tier Summer 2012 | | FINAL |
|---|---|---|
| 1. 48<br>10<br>13<br>9<br>27<br>8 | B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>6 | |
| 2.(a) 13506<br>(b) seven million five hundred thousand<br>(c) 9000<br>(d) 3687<br>(e) 100 × 5 or 100 × 5.1 or 98 × 5<br>= 500 or 510 or 490 | B1<br>B1<br>B1<br>B1<br>M1<br>A1<br>6 | <br>Accept seven and a half million.<br>OR 9 thousand. Accept thousand(s) but not 1000(s).<br><br><br>Award M1 A1 for unsupported answer of 490 - 510 |
| 3. (a) 19<br>(b) 455<br>(c) 504<br>(d)Any correct method for dividing 602 by 14<br><br>= 43<br><br>(e) 519<br>×43<br>1557<br>20760<br>22317<br><br>(f) Changing 7/10 to 0.7(0)<br>6.62<br>(g) 9 ÷ 0.5 =<br>18<br>(18 + 1 = ) 19 pylons | B1<br>B1<br>B1<br>M1<br><br>A1<br><br>M1<br><br>A1<br><br>M1<br>A1<br>M1<br>A1<br>B1<br>13 | <br><br><br>Must be a complete correct algorithm that would lead to a correct answer<br><br><br>Any correct method for the multiplication of 519 by 43<br><br>For either 1557 or 20760 (Apply 'one error' in other methods)<br>CAO<br>Place value errors get M0 A0<br>Or knowing value of 9 in 5.92 is 9/10<br><br><br>Award M1A1 for an answer of 18<br>FT "their 18" + 1 |
| 4. A at ½<br>B at 1<br>C at 0<br>D at or near ¼ | B1<br>B1<br>B1<br>B1<br>4 | <br><br><br>D should be nearer to ¼ than C or A |
| 5. +3 -7 -1 + 0 + 2 + 6 -5 | B3<br><br>3 | Award B2 for finding at least 3 cards that make -2<br>Award B1 for finding any 2 cards that make -2 |
| 6. (a) 6y<br>(b) 13a + 12b<br><br>(c) 20 = 12 + m<br>m = 8<br>(d) 30q + 2 | B1<br>B2<br><br>B1<br>B1<br>B2<br><br><br><br>7 | <br>Award B1 for either 13a or + 12b in an expression. If B2 awarded penalise -1 only for further incorrect working<br>Award B1 for sight of 12 for 2p<br>Accept embedded answers<br>ISW. Award B1 for either 30q or 2 or both not in an expression.<br>OR award B1 for 7q + 6q + 3 + 5q + 4q – 2 + 8q + 1 or equivalent |
| 7. (a) 180 – 90 – 53<br>= 37 (°)<br>(b) 360 – 85 – 115 – 84<br>= 76 (°)<br>(c) 30(°)<br>360 – 90 – 30 – 125<br>= 115(°) | M1<br>A1<br>M1<br>A1<br>B1<br>M1<br>A1<br>7 | Accept 90 - 53<br><br><br><br>*Alternative method 360 – 150 – 90 – 'their 55' M1*<br>*= 65 A1 CAO*<br>*(180 – 65 = )115 A1 FT their 65 if M1 awarded* |

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| Methods Unit 1Foundation Tier Summer 2012 | | FINAL |
|---|---|---|
| 8. (a) 12 18 24 30 36<br>10 15 20 25 30<br>12 16 20 24<br>9 12 15 18<br>12 | B2 | Award B1 for 12 correct. |
| (b) 8/36 ISW | B2 | FT their table. B1 for a numerator of 8 in a fraction <1. B1 for the 36 in a fraction <1. Do not penalize incorrect reduction of fractions. |
| (c) 8/36 × 720<br>= 160 | M1<br>A1<br><br>6 | FT their (b) × 720 (≠ ½ )<br>A0 here if there is incorrect reduction<br>M1 A0 for 160/720<br>Notes<br>Penalise -1 for use of words such as "8 out of 36", "8 in 36" OR "8:36". When fraction and wrong notation seen, DO NOT penalise wrong notation. |
| 9. At least 3 additional given shapes tessellating correctly with at least one that meets given shapes<br>At least 6 additional given shapes tessellating correctly | M1<br><br>A1<br>2 | The additional shapes must consist of at least 1 square **and** 1 hexagon.<br>Award A0 for any error in their tessellation. |
| 10. 4.5 × 40 = 180<br>(Cooking time =) 180mins (or 3hrs) + 25 mins<br>= 205 mins or 3 hours 25 mins<br>(Chef begins cooking at) 10.05 (am)<br><br>4.5 × 40 = 180 + 25 will lose at least QWC1<br><br>Look for<br>• spelling<br>• clarity of labels<br>• Use of correct notation for time<br>• the use of simplified notation (watch for the use '=' being appropriate)<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer | B1<br>M1<br>A1<br>B1<br><br>Q<br>W<br>C<br>2<br><br>6 | FT their 4.5 × 40<br><br>FT their cooking time<br><br>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.<br><br>QWC1 Presents material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 11. (a) plots<br>Curve<br><br>(b) x-values from their graph | P1<br>C1<br><br>B1<br><br>3 | FT their plots. Must be a curve through the points. Polygon gets C0<br>For both x-values.<br>FT their graph if at least 2 points of intersection |
| 12.(a) (6, -6) or (-10,-6) or (4,2)<br><br>(b) Method to find midpoint – on diagram or calculation shown<br><br>(1.5,-4) or (-2.5, -4) or (1,-2) | B2<br><br>M1<br><br><br>A1<br>4 | B1 for either coordinate correct OR B1 for a correct point plotted (with assumed scale from other points or default 1-1 scale)<br>FT their parallelogram. Accept point plotted by the candidate as a method, hence M1<br>*If calculation method shown, then one correct coordinate implies M1.*<br>*No method shown, one correct coordinate M0, A0* |

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| Methods Unit 1Foundation Tier Summer 2012 | | FINAL |
|---|---|---|
| 13.(a) A suitable triangle shown or described<br>(b) E.g.32+8+2, 32+8+2, 16+16+4+4 +1+1 (side length 42 cm) | B1<br>B2<br><br><br>3 | Any use of subtraction ideas must be shown (justified)<br>B1 for showing **selection** of rods that make a smaller equilateral triangle of side length >10 cm, OR for knowing sides are 42(cm) |
| 14. (a) 7n - 1<br>(b) -6n + 32 | B2<br>B2<br>4 | B1 for 7n $\pm$ …<br>B1 for -6n $\pm$ … |
| 15. (a) 2680/10 (=268) with method to find 5, 3 or 2 shares<br>1340, 804, 536 | M1<br>A2 | A1 for any one of these correct<br>*Unsupported answers, need sight of 2 of the 3 correct responses to imply the method*<br>*Incorrect method seen implies M0, A0* |
| (b)Method to find prime factors, 2 correct before 2nd error<br>2, 2, 2, 2, 3, 5, 5<br>$2^4 \times 3 \times 5^2$ | M1<br>A1<br>B1<br>6 | <br>Ignore 1s for A1 but not for B1<br>FT provided an index>1 involved. Accept "." for multiply |

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# UNIT 1 (HIGHER TIER)

<table>
<tr><th>Methods Unit 1 Higher Tier Summer 2012</th><th></th><th>FINAL</th></tr>
<tr><td>1.(a) 16 or equivalent<br>(b) 180 or equivalent<br>(c) 71, 73 and 79<br>(d) Attempt to evaluate 11×11<br>121</td><td>B1<br>B1<br>B1<br>M1<br>A1<br>5</td><td>Accept a product of factors<br>Accept a product of factors<br><br>Not just sight of 11×11</td></tr>
<tr><td>2.(a) (6, -6) or (-10,-6) or (4,2)<br><br>(b) Method to find midpoint – on diagram or calculation shown<br><br><br>(1.5,-4) or (-2.5, -4) or (1,-2)</td><td>B2<br><br><br>M1<br><br><br>A1<br>4</td><td>B1 for either coordinate correct OR B1 for a correct point plotted (with assumed scale from other points or default 1-1 scale)<br>FT their parallelogram. Accept point plotted by the candidate as a method, hence M1<br>If calculation method shown, then one correct coordinate implies M1.<br>No method shown, one correct coordinate M0, A0</td></tr>
<tr><td>3.(a) A suitable triangle shown or described<br>(b) E.g.32+8+2, 32+8+2, 16+16+4+4 +1+1 (side length 42 cm)<br><br>(c) Strategy of working to find 4 equal sides<br>Explanation, could be by example;<br>e.g. 32, 32, 16+16, rods left only make 30, or similar</td><td>B1<br>B2<br><br>B1<br>E1<br>5</td><td>Any use of subtraction ideas must be shown (justified)<br>B1 for showing selection of rods that make a smaller equilateral triangle of side length >10 cm, OR for knowing sides are 42(cm)<br>Knowing that 4 equal sides are needed<br>Do not accept ‘can’t find 4 rods the same length’, B1, E0<br>Accept ‘not enough to make 4 numbers the same’, B1, E1</td></tr>
<tr><td>4.(a)
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>1</td><td>3</td><td>5</td><td>7</td><td>9</td><td>11</td><td>13</td></tr>
<tr><td>2</td><td>5</td><td>8</td><td>11</td><td>14</td><td>17</td><td>20</td></tr>
<tr><td>3</td><td>7</td><td>11</td><td>15</td><td>19</td><td>23</td><td>27</td></tr>
<tr><td>4</td><td>9</td><td>14</td><td>19</td><td>24</td><td>29</td><td>34</td></tr>
<tr><td>5</td><td>11</td><td>17</td><td>23</td><td>29</td><td>35</td><td>41</td></tr>
<tr><td>6</td><td>13</td><td>20</td><td>27</td><td>34</td><td>41</td><td>48</td></tr>
</table>
(b)(i) 8/36<br>(ii) 4/36<br>(iii) 28/36</td><td>B3<br><br><br><br><br>B1<br>B1<br>B1<br>6</td><td>B2 for any 20 to 26 correct entries,<br>B1 for any 10 to 19 correct entries<br><u>FT for their completed table in (b) and ignore incorrect cancel</u><br>ISW<br>ISW<br>ISW FT 1 – (i)</td></tr>
<tr><td>5.(a) 2680/10 (=268) with method to find 5, 3 or 2 shares<br>1340, 804, 536<br><br><br>(b)(i) Method to find prime factors, 2 correct before 2nd error<br>2, 2, 2, 2, 3, 5, 5<br>$2^4 \times 3 \times 5^2$<br>(ii) 3<br>(c) 0.1313… or $0.1\dot{3}\dot{}$<br><br>(d) 0.005</td><td>M1<br>A2<br><br><br><br>M1<br>A1<br>B1<br>B1<br>B2<br><br>B1<br>10</td><td><br>A1 for any one of these correct<br>Unsupported answers, need sight of 2 of the 3 correct responses to imply the method<br>Incorrect method seen implies M0, A0<br>Ignore 1s for A1 but not for B1<br><br>FT provided an index>1 involved. Accept ”.” for multiply<br>FT from their (i)<br>B1 for 0.13 or 0.13… or $0.13\dot{}$ as an answer or seen in working</td></tr>
</table>

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| Methods Unit 1 Higher Tier Summer 2012 | | FINAL |
|---|---|---|
| 6.(a)(i) $7n - 1$<br>(ii) $-6n + 32$<br><br>(b) Total number of tiles $4n^2$ or equivalent<br>(Number of tiles) shaded $2n^2 + 1$ **and**<br>(Number of ) white $2n^2 - 1$ or equivalents<br><br><br><br><br><br><br>Candidates without algebraic generalisations may be awarded QWC2 provided their process steps lead to a statement<br><br>Look for<br>• spelling<br>• clarity of labels<br>• the use of simplified notation, e.g. $n^2$ rather than n×n, and watch for the use '=' being appropriate<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer | B2<br>B2<br><br>B2<br>B3<br><br><br><br><br><br><br><br><br><br>Q<br>W<br>C<br>2<br><br><br><br><br><br><br><br><br><

| Methods Unit 1 Higher Tier Summer 2012 | | FINAL |
|---|---|---|
| 9. $3A = 4\Pi r^2$<br>$\frac{3A}{4\Pi} = r^2$<br>$r = \sqrt{(3A/4\Pi)}$ | B1<br>B1<br><br>B1<br>3 | *FT until 2nd error*<br>Accept multiplication signs shown throughout |
| 10.(a) A and D selected<br>Gradients are both 3 or gradients are the same<br><br>(b) A and E selected | B1<br>E1<br><br>B1<br>3 | <br>Depends on B1 being awarded. Accept 'slope' or similar.<br>m = 3 or 'both 3x' is insufficient, needs interpretation |
| 11.(a) -7 and 5<br>(b) All plots correct<br>All their 8 plots joined with a curved line<br>(c) -3 and 1.5 ($\pm$0.1)<br>(d) y = 6 seen or implied<br>2.1 ($\pm$0.1) **and** -3.6 ($\pm$0.1) | B2<br>B2<br>B1<br>B2<br>M1<br>A1<br>9 | B1 for each correct answer<br>FT from (a). B1 for any 5 correct plots<br>FT from (a)<br>FT from (b). B1 for each correct answer<br><br>FT from (b). |
| 12. $30 \times 80 = 25 \times CE$ OR $30 \times (30 + 50) = 25 \times CE$<br>$CE = 96$ (cm)<br>$DE = 96 - 25$<br>$= 71$ (cm) | M1<br>A1<br>m1<br>A1<br>4 | |
| 13.(a) 0.25<br><br>(b) $4(x - 20)(x + 20)$<br><br><br>(c) 27<br>(d) $10 + 15\sqrt{2} - 2\sqrt{2} - 6$<br>$= 4 + 13\sqrt{2}$ | B2<br><br>B3<br><br><br>B1<br>B2<br>B1<br>9 | B1 for 2 correct steps, following through 1 error: reciprocal, cube root, square. B1 for an answer of 1/4<br>B2 for $(2x - 40)(2x + 40)$ or other correct partially factorised including a correct pair of brackets<br>B1 for $4(x \ldots 20)(x \ldots 20)$ or $(2x \ldots 40)(2x \ldots 40)$<br><br>B1 for any 3 of the 4 terms correct<br>CAO. Mark final answer |
| 14.(a) Correct region shaded<br>(b) Correct region shaded<br>(c) Correct region shaded | B1<br>B1<br>B1<br>3 | Intersection of the two regions A and B indicated<br>Outside A and B but within rectangle indicated<br>A together with outside B indicated |
| 15. Sight of numbers (on the cards): 1, 2, 5, 7, 10, 14, 35, 70<br><br>(a) Strategy, need to find P(even, odd) and P(odd, even)<br>4/8×4/7 seen<br>4/8×4/7 + 4/8×4/7 OR 2× 4/8×4/7<br>= 32/56 or equivalent<br>(b) Strategy, e.g. 1 – P(no even)<br>1 - P(no even) = 1 - 4/8×3/7<br>= 44/56 or equivalent | B1<br><br>S1<br>M1<br>M1<br>A1<br>S1<br>M1<br>A1<br>8 | FT in (a) and (b) from incorrect factors, provided all unique and at least four numbers are correct factors of 70<br>OR **full** alternative<br><br><br><br>Mark final answer<br>Or equivalent complete strategy<br>Or other full method<br>Mark final answer |
| 16.(a) $(x - 8)^2 + 2$<br>(b) Attempt to use common denominator<br>$\frac{3(2x+3) - 4(3x-2) + 2}{(12)}$ or equivalent<br><br>$\frac{6x + 9 - 12x + 8 + 2}{12}$ or equivalent<br>$= \frac{19 - 6x}{12}$ with statement<br><br>(c) $\frac{(2x + 7)(x - 1)}{5(2x + 7)}$<br>$\frac{x - 1}{5}$ | B2<br>B1<br><br>M2<br><br><br><br>A1<br><br>A1<br><br><br>B2<br>B1<br>B1<br>11 | B1 for a= -8, B1 for b = 2, only award B2 for $(x - 8)^2 + 2$<br><br>M1 for 2 of the three terms correct.<br>May be expressed as separate fractions, or working without consideration of the denominator<br>Convincing step. FT from 1 error, i.e. A1. Denominator must be seen<br>Must follow from correct working<br>Accept LHS=RHS or writing $(19 - 6x)/12 = (19 - 6x)/12$<br><br>B1 for $(2x \ldots 7)(x \ldots 1)$<br><br>CAO. Mark final answer |

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| Surname | Centre Number | Candidate Number |
|---|---|---|
| Other Names | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS IN MATHEMATICS

## UNIT 1: METHODS (NON-CALCULATOR)
## HIGHER TIER

A.M. WEDNESDAY, 11 January 2012

2 hours

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

### 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**.

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

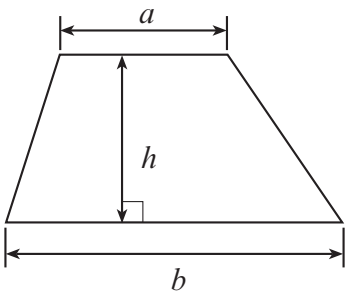
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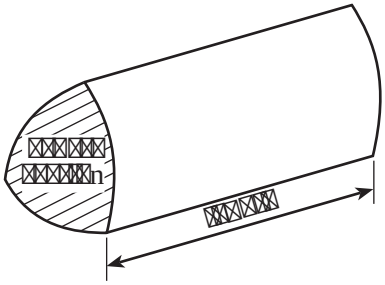
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## Formula List

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

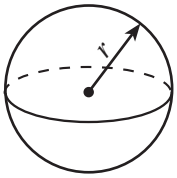



**Volume of prism** = area of cross section × length



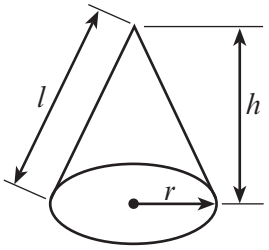
**Volume of sphere** $= \frac{4}{3}\pi r^3$

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




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

**Curved surface area of cone** $= \pi rl$

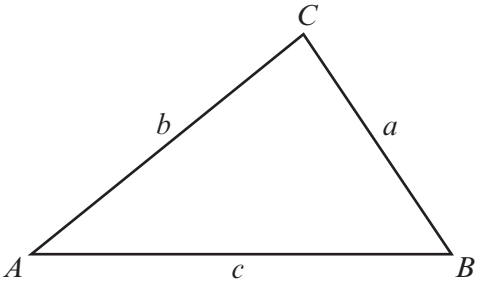



**In any triangle** $ABC$

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

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

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




**The Quadratic Equation**

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

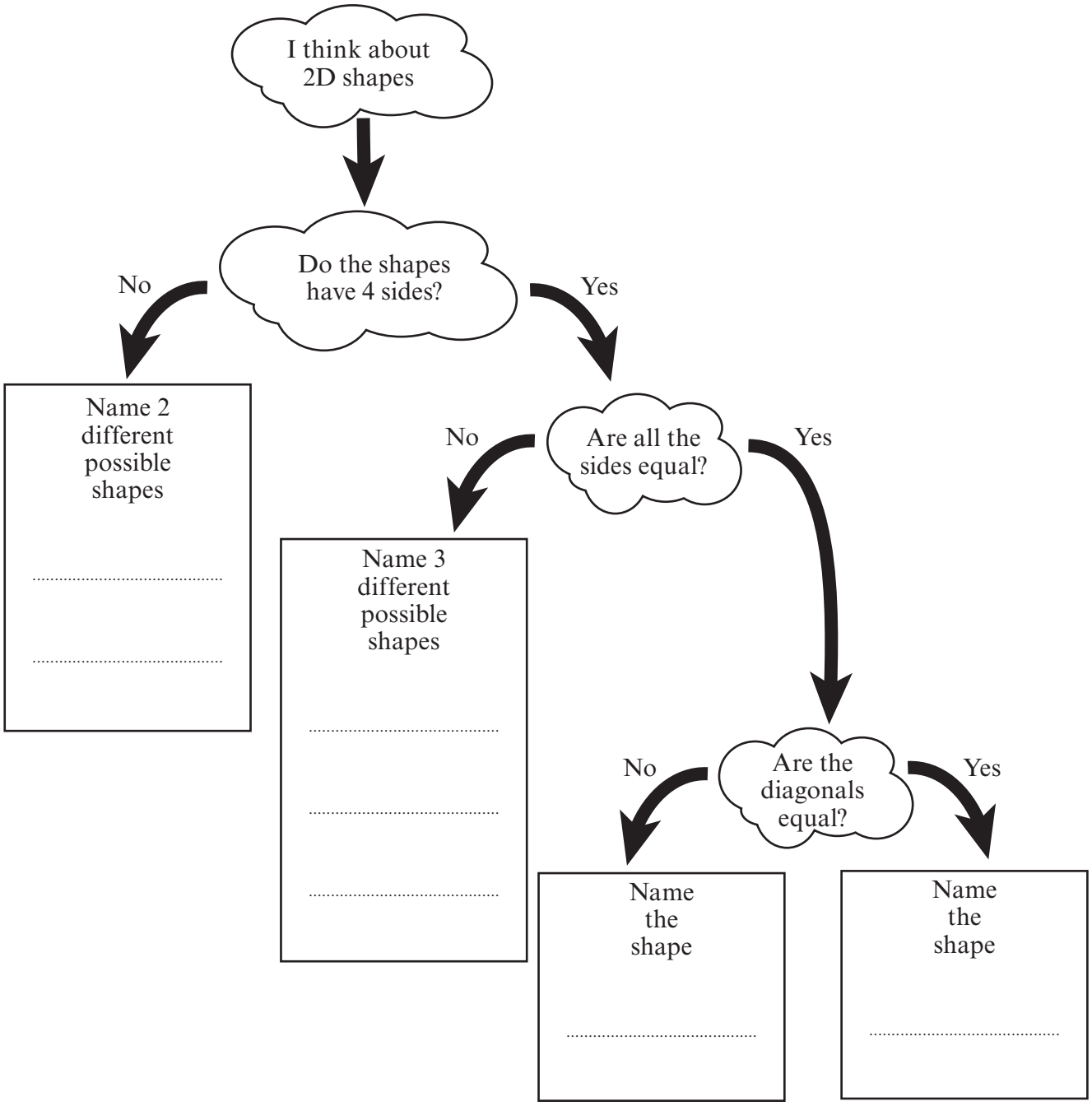
$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$



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**1.** Fill in the answers in the shape sorter below.




[5]

4363 020003



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**2.** *(a)* Express $\frac{3}{8}$ as a decimal.

.....

.....

.....

[2]

*(b)* Express $\frac{0{\cdot}12 \boxtimes 0{\cdot}03}{36}$ as a fraction in its simplest form.

.....

.....

.....

.....

.....

[3]

*(c)* A number is divided by 6 then 8 is added. This gives an answer of 78.
Find the number.

.....

.....

.....

.....

.....

[2]



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Examiner only

**3.**

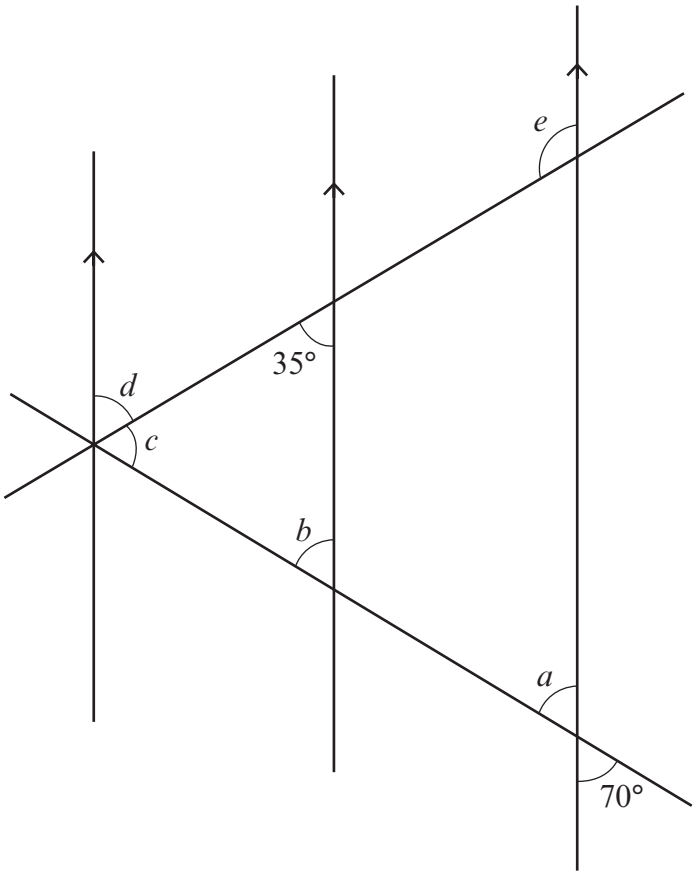



*Diagram not drawn to scale*

Find the size of the angles marked *a, b, c, d* and *e*.

.....

.....

.....

$a$ = ..... °

$b$ = ..... °

$c$ = ..... °

$d$ = ..... °

$e$ = ..... °

[5]



**Turn over.**

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4363 020005

Examiner only

**4.** *(a)* Given that $a = -2$, $b = -4$ and $c = 8$ find the value of $\frac{3c}{b^2} - 4a$.

.....

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.....

[2]

*(b)* Simplify $12x - 50y - 40x - 35y$.

.....

.....

.....

[2]

*(c)* The $n$th term of a sequence is $3n^2 + 2n$.

(i) Write down the first three terms of the sequence.

.....

.....

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.....

[2]

(ii) Find the 10th term of the sequence.

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[1]

*(d)* Simplify $\frac{(3a + 2)^8}{3a + 2}$.

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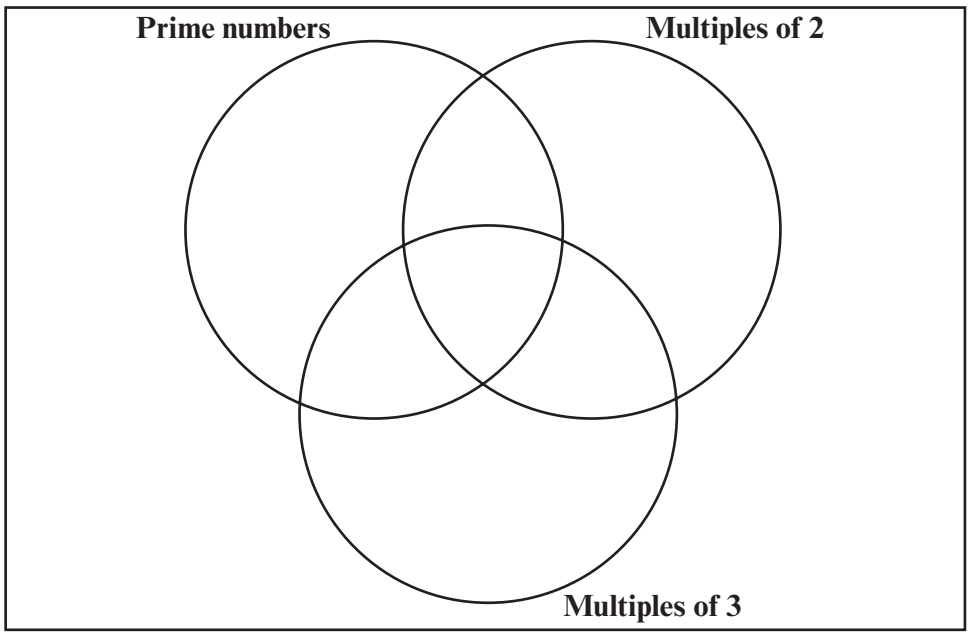
[1]



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Examiner only

**5.** *(a)* (i) Place each of the whole numbers 42, 43, 44, 45, 46, 47, 48, 49, 50 in the correct positions in the Venn diagram.




[3]

(ii) A whole number is selected at random from the set {42, 43, 44, 45, 46, 47, 48, 49, 50}.

Find the probability that the number selected is

a prime number, .....

not a prime number, .....

a prime number that is also a multiple of 3. .....

[3]

*(b)* A die has previously been used and shown to be fair.
This fair die is thrown a further 60 times; a six is scored on the die on 15 of these throws.
**Giving a reason for your answer,** write down the probability that a six is scored on the next throw.

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[2]

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**Turn over.**

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Examiner only

**6.** *(a)* Find the highest common factor of 30 and 75.

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[1]

*(b)* Find the lowest common multiple of 6 and 21.

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[2]

*(c)* Simplify $\sqrt{\left(2^3 \times \sqrt{64}\right)}$ .

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[3]

**7.** Between Monday and Friday Sonia earns £8 per hour for working in a shop.
At weekends the hourly rate of pay is doubled.
She works $x$ hours on Friday, $(x + 2)$ hours on Saturday and $(x + 3)$ hours on Sunday.
Write down, in its simplest form, an expression for Sonia's total pay for working on Friday, Saturday and Sunday.

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[4]

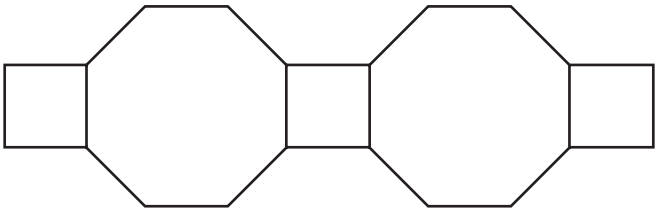


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**8.** *You will be assessed on the quality of your written communication in this question.*

The pattern below is made using small square tiles and regular octagonal tiles.



Is it possible to use this pattern of tiles to tessellate and completely cover a rectangular area with only the need to cut tiles at the edges of the rectangle?
You must show **all** your working and explain your answer.

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.....

[8]



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Examiner only

**9.** *(a)* Make $x$ the subject of the formula $ax - g = bx + h$.

[3]

*(b)* Factorise $x^2 - 16$.

[1]

*(c)* Factorise $x^2 - 8x + 15$.

[2]

*(d)* Find the $n$th term of the sequence 4, 7, 12, 19, 28 .....

[2]



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*(e)* Given that the product of $(x + 4)$ and $(2x + 3)$ is $-3$ find all the possible values of $x$.

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[5]

**10.** *(a)* Express 2 380 000 in standard form correct to two significant figures.

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[2]

*(b)* (i) Express $10^6$ as a product of prime factors in index form.

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[2]

(ii) Explain how you know that one million is a square number.

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[1]



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**11.**

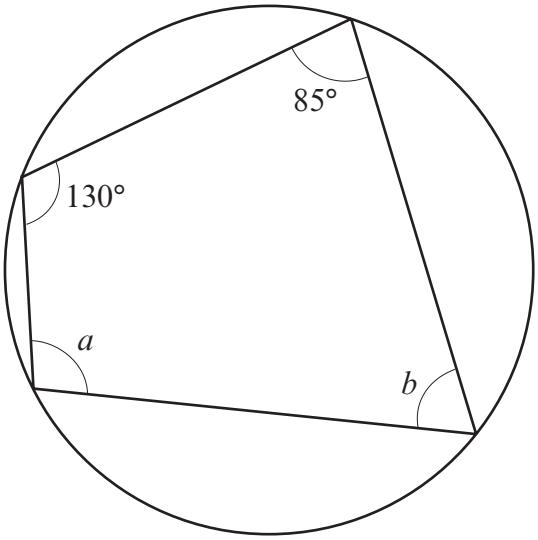



*Diagram not drawn to scale*

Giving a reason for your answers, calculate the size of the angles marked *a* and *b* in the diagram.

.....

.....

.....

$a =$ ..... ° $b =$ ..... °

[3]



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**12.** At lunchtime, the probability that Kelly buys a bowl of soup is 0·7.
The probability that Kelly buys a sandwich is independent of her buying a bowl of soup.
The probability that Kelly buys a bowl of soup **and** a sandwich is 0·28.

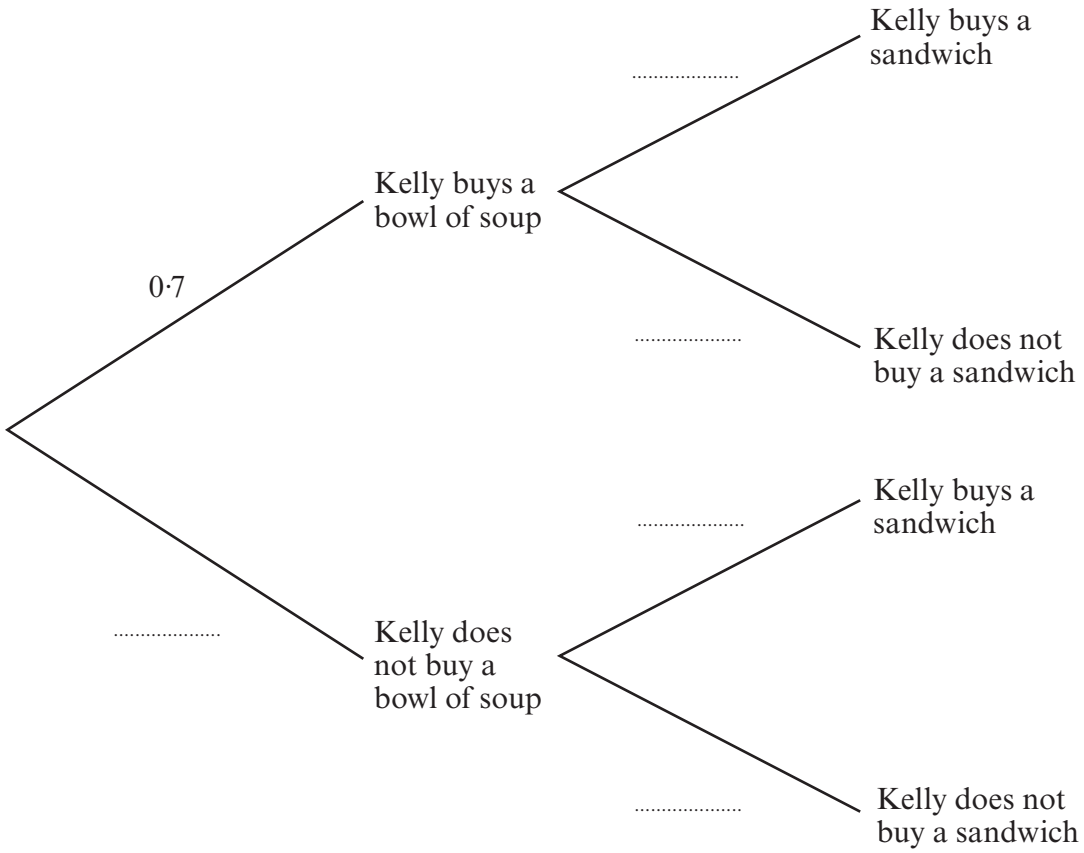
*(a)* Complete the tree diagram.

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[4]

*(b)* Find the probability that Kelly does not buy soup and does not buy a sandwich.

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[2]



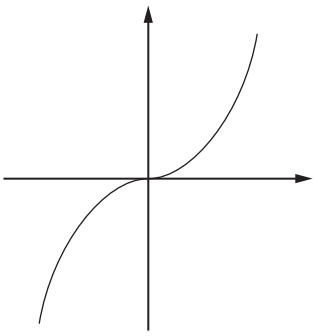
**Turn over.**

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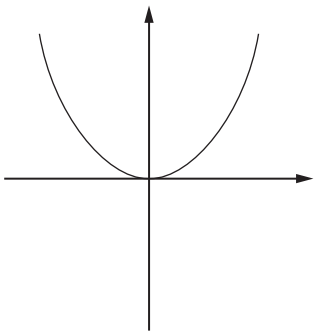
Examiner only

**13.**

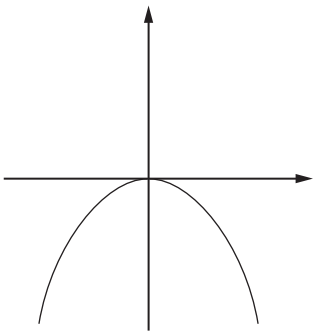
Sketch **A**

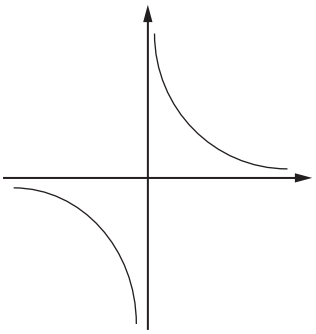


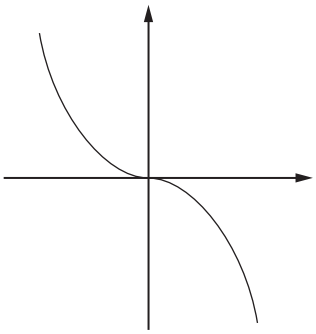
Sketch **B**

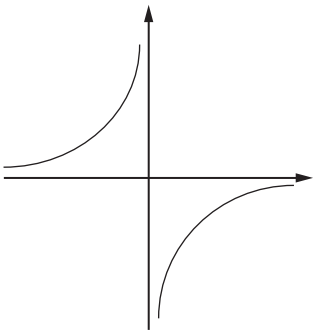


Sketch **C**









Sketch **D**

Sketch **E**

Sketch **F**

Match the sketches shown above with an equation in the table below.

| Equation | Sketch |
|---|---|
| $y = x^2$ | |
| $y = x^3$ | |
| $y = \frac{1}{x}$ | |
| $y = -x^2$ | |
| $y = -x^3$ | |
| $y = -\frac{1}{x}$ | |

[4]



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**14.** *(a)* Express $1000^{\frac{2}{3}}$ as a decimal.

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[3]

*(b)* (i) Express $x^2 + 14x + 47$ in the form $(x + a)^2 + b$, where $a$ and $b$ are whole numbers to be found.

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[3]

(ii) Hence solve $x^2 + 14x + 47 = 0$ leaving your answer in surd form.

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[4]

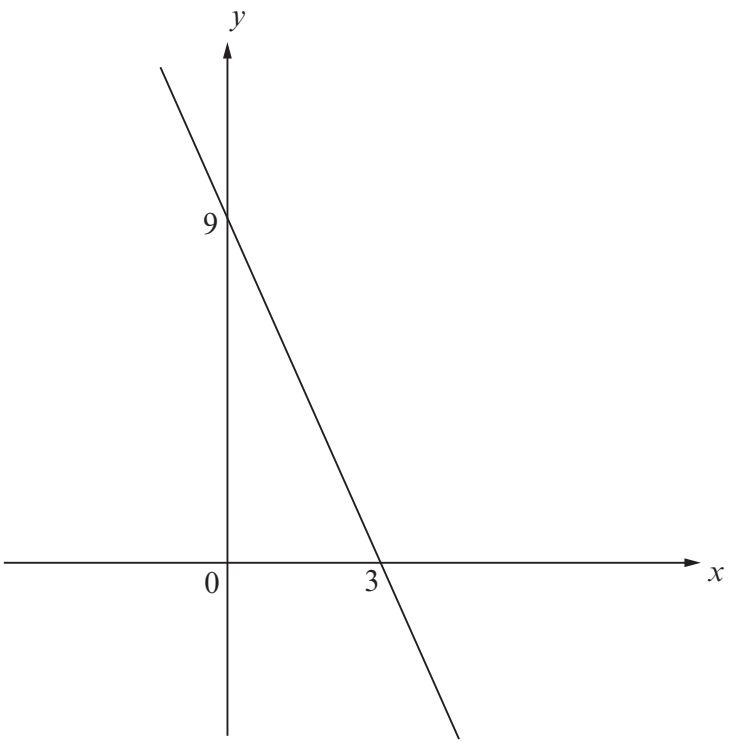


**Turn over.**

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**15.**




The straight line, shown in the sketch above, intersects with another straight line which is not shown.
The other straight line is perpendicular to the straight line shown.
The two straight lines intersect at the point where $x = 1$.
Find the equation of this other straight line.

[8]



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WJEC
CBAC

# GCSE MARKING SCHEME

## METHODS IN MATHEMATICS
## (LINKED PAIR PILOT)

## JANUARY 2012

## INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2012 examination in GCSE METHODS IN MATHEMATICS. 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 | 4 |

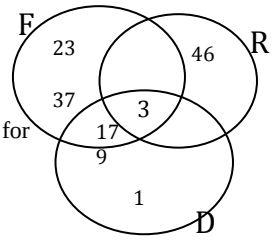
# Unit 1 – Foundation Tier

<table>
<tr><th>Methods Unit 1 Foundation Tier January 2012</th><th>Mark</th><th>Comment</th></tr>
<tr><td>1. (a) 18 & 15<br>(b) 5 and/or 10<br>(c) 5 and/or 13<br>(d) 21</td><td>B1<br>B1<br>B1<br>B1<br>4</td><td>Any incorrect answer(s) award B0 throughout<br>Eg If answers of 5 & 15 in part (b) award B0<br><br><br><br>Accept 3 × 7</td></tr>
<tr><td>2. 594</td><td>B2<br><br>2</td><td>B1 for sight of 600 or 6 OR B1 for 100 times as much.</td></tr>
<tr><td>3. (a) 268<br>(b) 174<br>(c) 23<br>(d) 463<br>× 27<br>3241<br>9260<br>12501</td><td>B1<br>B1<br>B1<br>M1<br><br>A1<br><br>A1<br><br>6</td><td><br><br><br><br><br>For either 3241 or 9260 (Apply ‘one error’ in other methods)<br><br>CAO<br>Place value errors get M0 A0</td></tr>
<tr><td>4 (a) (i) impossible<br>(ii) likely<br>(iii) unlikely<br>(b) 1/26<br>(c) 6/17</td><td>B1<br>B1<br>B1<br>B1<br>B1<br>5</td><td><br><br><br><br>Penalise consistent use of incorrect notation e.g. 1 in 26 once only in parts (b) & (c)</td></tr>
<tr><td>5. A plotted at (2, 4)<br>B(-2, 0)<br>C(4, -2)</td><td>B1<br>B1<br>B1<br><br>3</td><td>Reversed coordinates B0 throughout<br>Penalise -1 once only for incorrect coordinate notation e.g. (-2x, 0y)</td></tr>
<tr><td>6. (a)
<table>
<tr><th>Position</th><th>Name</th><th>Score</th></tr>
<tr><td>1st</td><td>F. Loxley</td><td>-7</td></tr>
<tr><td>2nd</td><td></td><td></td></tr>
<tr><td>3rd</td><td>A. Jenkins</td><td>-2</td></tr>
<tr><td>4th</td><td>G. Francis</td><td>-1</td></tr>
<tr><td>5th</td><td></td><td></td></tr>
<tr><td>6th</td><td></td><td></td></tr>
<tr><td>7th</td><td>H. Smith</td><td>8</td></tr>
</table>
(b) 8<br>(c) A. Jenkins & F. Loxley</td><td>B3<br><br><br><br><br><br><br><br>B1<br>B1<br>5</td><td>B2 for 2 or 3 correct<br>B1 for 1 correct.<br><br><br><br><br><br><br><br>Accept -8<br>Accept -2 and -7 OR 1st and 3rd.</td></tr>
<tr><td>7. (a) 40<br>(b) 15<br>Halving or dividing the previous term by two<br>(c) 1<br>(d) 13a<br>(e) 13x + 6<br><br>(f) 5m – 2n<br>(g) 30 or 14 seen<br>= 44<br>(h) 10 × 8 ÷ 5<br>= 16</td><td>B1<br>B1<br>B1<br>B1<br>B1<br>B2<br><br>B1<br>B1<br>B1<br>M1<br>A1<br>12</td><td><br><br>Accept “divide by 2” OR “ ÷ 2”<br><br><br><br>Award B1 for either 13x or + 6 within an expression<br><br><br><br>CAO</td></tr>
</table>



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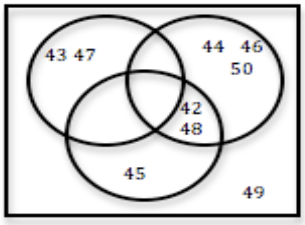
| Methods Unit 1 Foundation Tier January 2012 | Mark | Comment |
|---|---|---|
| 8. (a) a = 145(°)<br>b = 180 – 145<br>= 35(°)<br><br>(b) c = (180 – 80) ÷ 2<br>= 50(°)<br><br>(c) (180 – 50) ÷ 2<br>65(°)<br>d = 115(°) | B1<br>M1<br>A1<br><br>M1<br>A1<br><br>M1<br>A1<br>A1<br><br>8 | <br>Accept (360 – 290) ÷ 2<br><br><br><br><br><br>FT 50 + "their 65" OR 180 – "their 65". "Their 65" may be on the diagram |
| 9. (a) 8 9 10 11 12<br>7 8 9 10 11<br>7 8 9 10<br>6 7 8 9<br>8<br>(b) 4/36 ISW<br><br><br><br>(c) 4/36 × 180<br>= 20 | B2<br><br><br><br><br>B2<br><br><br><br>M1<br>A1<br><br><br><br><br>6 | Award B1 for 12 correct.<br><br><br><br><br>FT their table.<br>B1 for a numerator of 4 in a fraction <1. B1 for the 36 in a fraction <1. Do not penalize incorrect reduction of fractions.<br><br>FT their (b) × 180 (≠ ½ )<br>A0 here if there is incorrect reduction<br>M1 A0 for 20/180<br><u>Notes</u><br>Penalise -1 for use of words such as "4 out of 36", "4 in 36" OR "4:36". When fraction and wrong notation seen, DO NOT penalise wrong notation. |
| 10. An attempt to buy box of jam tarts with getting the 2nd at half price<br>A method allowing at least 70 to be bought<br>Cost of their method of buying at least 70<br>Method to get (cheapest) of 4 Jumbo + 2 Regular<br>Cost = 3 + £1.50 + 3 + 1.50 + 1.30 + 0.65<br>= £10.95 (and implied as cheapest)<br><br><br><br>Look for<br>• Correct units used<br>• Spelling in at least 1 statement/sentence<br>• Clarity of text explanations<br>• Correct terminology<br>• the use of simplified notation (watch for the use '=' being appropriate)<br>• Clearly linking work with amount of boxes bought<br><br>QWC2: Candidates would be expected to<br>• clearly show how they arrived at their solution and show correct units<br>AND<br>• have few errors in spelling, punctuation and grammar<br><br>QWC1: Candidates would be expected to<br>• clearly show how they arrived at their solution and show correct units<br>OR<br>• have few errors in spelling, punctuation and grammar | S1<br><br>M1<br>A1<br>M1<br>M1<br>A1<br><br><br><br><br>QWC 2<br><br><br><br><br><

| Methods Unit 1 Foundation Tier January 2012 | Mark | Comment |
|---|---|---|
| 11. Three circles with the number 3 in the correct place<br>37 correct for football & rounders only<br>9 correct for rounders & dance only<br>17 correct for football & dance only<br>23 46 1 (any 2 correct) & correct labeling<br><br><br>136 children | B1<br><br>B1<br>B1<br>B1<br>B1<br><br>B1<br><br>6 | <br>Accept F, R, D for labels<br>CAO |
| 12. Left box: any triangles or polygons with ≥5 sides (including a circle)<br><br><br>Next box: any 3 quadrilaterals, not rhombus or square<br>Next: Rhombus<br>Far right: Square | B1<br><br><br>B2<br>B1<br>B1<br>5 | Needs 2 answers for B1. (Accept e.g. isosceles triangle & right-angled triangle as different).<br>**All boxes** - do not accept 'polygon' or 'quadrilateral'<br>B1 for any 2 correct answers<br>CAO. Do not accept 'diamond'<br>CAO |
| 13. a = 70<br>b = 70<br>c = 75<br>d = 35<br>e = 145 | B1<br>B1<br>B1<br>B1<br>B1<br>5 | <br><br>FT 145 – b<br>FT 110 - c<br> |
| 14. 1/6<br><br>Explanation related to FAIR or relative frequency, e.g. '6 sides have equal/same probability/chance' | B1<br><br>E1<br><br><br>2 | OR e.g. 115/660 OR 1015/6060 OR other suitable approximation to 0.166666<br>With a response of 1/6, accept 'there are 6 faces on a dice', or 'previous results have no impact on fairness' |
| 15.(a) 15<br>(b) 2×3 and 3×7 OR other method<br>42 | B1<br>M1<br>A1<br>3 | CAO<br>Or sight of 2×3×7<br>CAO |



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# Unit 1 – Higher Tier

| Methods Unit 1 Higher Tier January 2012 | Mark | Comment |
|---|---|---|
| 1. Left box: any triangles or polygons with $\geq$5 sides (including a circle)<br><br>Next box: any 3 quadrilaterals, not rhombus or square<br>Next: Rhombus<br>Far right: Square | B1<br><br><br><br>B2<br>B1<br>B1<br>5 | Needs 2 answers for B1. (Accept e.g. isosceles triangle & right-angled triangle as different).<br>All boxes - do not accept 'polygon' or 'quadrilateral'<br>B1 for any 2 correct answers<br>CAO. Do not accept 'diamond'<br>CAO |
| 2.(a) Attempt at method 3÷8<br>= 0.375<br>(b) Numerator 0.0036<br>Multiplying numerator and denominator by suitable multiple of 10 (if correct 10000) – for eliminating decimals<br>1/10000<br>(c) 420 | M1<br>A1<br>B1<br>B1<br><br><br>B1<br>B2<br><br>7 | Sight of digits 375<br>CAO<br>OR 0.03/300, or 0.12/1200<br>FT depending on their numerator. OR 36/360000, or 3/30000, or 12/120000<br><br><br>CAO<br>B1 for sight of 70 with intention to multiply by 6, OR (78-8)×6, OR 2 trials substituted and correctly evaluated |
| 3. a = 70<br>b = 70<br>c = 75<br>d = 35<br>e = 145 | B1<br>B1<br>B1<br>B1<br>B1<br>5 | <br><br>FT 145 – b<br>FT 110 - c<br> |
| 4.(a) (24 + 8)/16<br>= 2<br>(b) -28x – 85y<br><br>(c)(i) 5, 16, 33<br><br>(ii) 320<br>(d) $(3a + 2)^7$ | M1<br>A1<br>B2<br><br>B2<br><br>B1<br>B1<br>8 | Allow 1 error with a sign<br>CAO. (an answer of -2 implies M1)<br>B1 for each term. Do not ignore further work if B2 then -1<br>B1 for 2 correct terms in the correct position, or for 0, 5, 16<br> |
| 5.(a)(i) The numbers 42 to 50 placed correctly<br><br><br>(ii) 2/9<br>7/9<br>0<br>(b) 1/6<br><br>Explanation related to FAIR or relative frequency, e.g. '6 sides have equal/same probability/chance' | B3<br><br><br><br><br><br><br><br><br>B1<br>B1<br>B1<br>B1<br><br>E1<br><br>8 | B2 for 7 or 8 numbers placed correctly, the other 2 or 1 number(s) respectively omitted or incorrectly placed, OR<br>B1 for 5 or 6 numbers placed correctly, the other 4 or 3 numbers respectively omitted or incorrectly placed<br><br><br><br><br>*In (a)(ii) and (b) ignore incorrect cancelling.*<br>Or FT their Venn diagram<br>FT 1 – 1st answer<br><br>OR e.g. 115/660 OR 1015/6060 OR other suitable approximation to 0.166666<br>With a response of 1/6, accept 'there are 6 faces on a dice', or 'previous results have no impact on fairness' |
| 6.(a) 15<br>(b) 2×3 and 3×7 OR other method<br>42<br>(c) $\sqrt{(8 \times 8)}$<br>8 | B1<br>M1<br>A1<br>M2<br>A1<br>6 | CAO<br>Or sight of 2×3×7<br>CAO<br>M1 for each<br>CAO |



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| Methods Unit 1 Higher Tier January 2012 | Mark | Comment |
|---|---|---|
| 7. Idea × 16 for Saturday and Sunday<br>8x + 16(x + 2) + 16(x + 3) or equivalent<br>8x + 16x + 32 + 16x + 48 or equivalent<br>40x + 80 or 40(x +2) or other correctly factorised expression | B1<br>B1<br>B1<br>B1<br>4 | *FT until 2nd error*<br>Not giving double rate for Sat / Sunday is1 error |
| 8. Square 90°<br>Octagon: 360÷8<br>Exterior 45°<br>Interior 135°<br>Gap shown to be either 90+45 OR 360 – 135 – 90<br>Suitable explanation of filling the gap, e.g. 'no gaps', 'fit perfectly together', 'fit together'<br><br>Confusion between interior and exterior angles will affect the QWC mark, giving a maximum QWC1.<br>If no calculation, still could be QWC2 if sufficient text (e.g. 2 short meaningful sentences, or one long clear meaningful sentence)<br><br>Do not penalise no ruler in a sketch<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**AND**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>**OR**<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar and include units in their final answer | B1<br>M1<br>A1<br>A1<br>B1<br>E1<br><br><br><br><br><br><br><br><br>QWC 2<br><br><br><br><br><br><br><br><br><br><br><br>8 | Or alternative methods<br>At least 1 of the exterior or interior maybe implied<br>FT 180 – their exterior, or equivalent<br>Or equivalent<br>Conclusions must be stated not just implied. Must imply 'Yes'<br>*If no calculations shown:*<br>*SC2 for at least another 2 rows drawn, e.g. hexagons above and hexagons below, with squares OR*<br>*SC1 for at least another 1 row drawn, OR appropriate cuts with 'fill in' described or shown, to continue the pattern or complete a rectangle.*<br>*THEN E mark if appropriate*<br><br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 9.(a) ax – bx = h + g<br>x(a – b) = h + g<br>x = (h + g)/(a – b)<br>(b) (x + 4)(x – 4)<br>(c) (x – 3)(x -5)<br><br>(d) $n^2 + 3$<br><br><br>(e) (2x +3)(x + 4) = -3<br><br>$2x^2 + 8x + 3x + 12$<br><br>$2x^2 + 11x + 15 = 0$<br>(2x + 5)(x + 3) = 0<br>x = -5/2 AND x = -3 | B1<br>B1<br>B1<br>B1<br>B2<br><br>B2<br><br><br>S1<br><br>B1<br><br>B1<br>M1<br>A1<br>13 | Collect x terms FT until 2nd error<br>Factorise<br>Division<br>ISW<br>B1 for (x ..3)(x .. 5) or x(x-5) -3(x-5) or equivalent.<br>If B2 penalise 'solving' -1<br>B1 for $n^2$ + … (not 0) OR second difference of 2 with $n^2$<br>*Alternative:*<br>*Correct interpretation of the information*<br><br>*At least 2 suitable trial with product evaluated, 1 above & 1 below*<br>*First value found*<br>*At least 2 suitable trials, 1 above & 1 below*<br>*Second value found with confirmation* |



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| Methods Unit 1 Higher Tier January 2012 | Mark | Comment |
|---|---|---|
| 10.(a) $2.4 \times 10^6$ | B2 | B1 for $2.38 \times 10^6$ OR 2 400 000 or equivalent to 2400000 (may be incorrect standard form) |
| (b)(i) Idea of 2×5 OR 2 and 5 both found as factors | M1 | |
| $2^6 \times 5^6$ | A1 | |
| (ii) E.g. "there is an even number of each of the prime factors", OR "all prime factors have even powers", OR " 1 million = 1000 × 1000", OR "$10^6 = 10^3 \times 10^3$", '$10^6$ is an even power' | E1 | Accept $\sqrt{1000000} = 1000$.<br>Do not accept 'all powers even' without working.<br>Accept inaccurate notation if intention clear, e.g. square and square root used inaccurately |
| | 5 | |
| 11. 180 – 85 OR 180 – 130 | M1 | Or statement that opposite angle cyclic quad 180° |
| a = 95° | A1 | |
| b = 50° | A1 | No FT |
| | 3 | For reversed answers award SC2 |
| 12.(a) 0.3 indicated for no soup | B1 | In working or on tree |
| Idea 0.7 ×… = 0.28 | M1 | |
| P(buys a sandwich) = 0.4 | A1 | In working or on tree |
| Second branches 0.4 0.6 0.4 0.6 | B1 | FT their P(buys sandwich) if M1 awarded |
| (b) 0.3 × 0.6 | M1 | FT their 0.6 from (a) |
| = 0.18 | A1 | |
| | 6 | |
| 13. B A D C E F | B4 | B3 for any 4 or 5 unambiguously correct, OR<br>B2 for any 2 or 3 unambiguously correct, OR |
| | 4 | B1 for any 1 unambiguously correct, OR |
| 14.(a) $1/1000^{2/3}$ OR $10^{-2}$ or similar first step | M1 | |
| $1/10^2$ OR 1/100 or similar second step | M1 | Needs reciprocal. First M1 mark maybe implied. |
| 0.01 | A1 | CAO |
| (b)(i) a = 7 | B1 | Accept embedded answers |
| $x^2 + 14x + 49$ (-2) OR method to find b | M1 | |
| b = -2 | A1 | Accept embedded answers |
| (ii) $(x + 7)^2 - 2 = 0$ | B1 | Use of completing the from (i) |
| $(x + 7)^2 = 2$ | M1 | |
| $x + 7 = (\pm)\sqrt{2}$ | M1 | |
| $x = \pm\sqrt{2} - 7$ | A1 | Must show $\pm$ |
| | 10 | |
| 15. m = -9/3 (=-3) | B1 | |
| c = 9 | B1 | |
| Equation y = -3x + 9 | B1 | FT their m and c |
| Use of x = 1 OR alternative method to find y coord. | M1 | FT |
| y = 6 | A1 | FT |
| Perpendicular gradient -1/m (= 1/3) | B1 | FT from their m |
| Method to find perpendicular equation | M1 | FT their -1/m and y coordinate. |
| x – 3y +17 = 0 or equivalent | A1 | Accept unsimplified forms. Ignore further incorrect working once a correct equation is seen |
| | 8 | |



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| Candidate Name | Centre Number | Candidate Number |
|---|---|---|
| | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS IN MATHEMATICS

## UNIT 1: METHODS (NON-CALCULATOR)

## HIGHER TIER

P.M. MONDAY, 13 June 2011

2 hours

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

### 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.

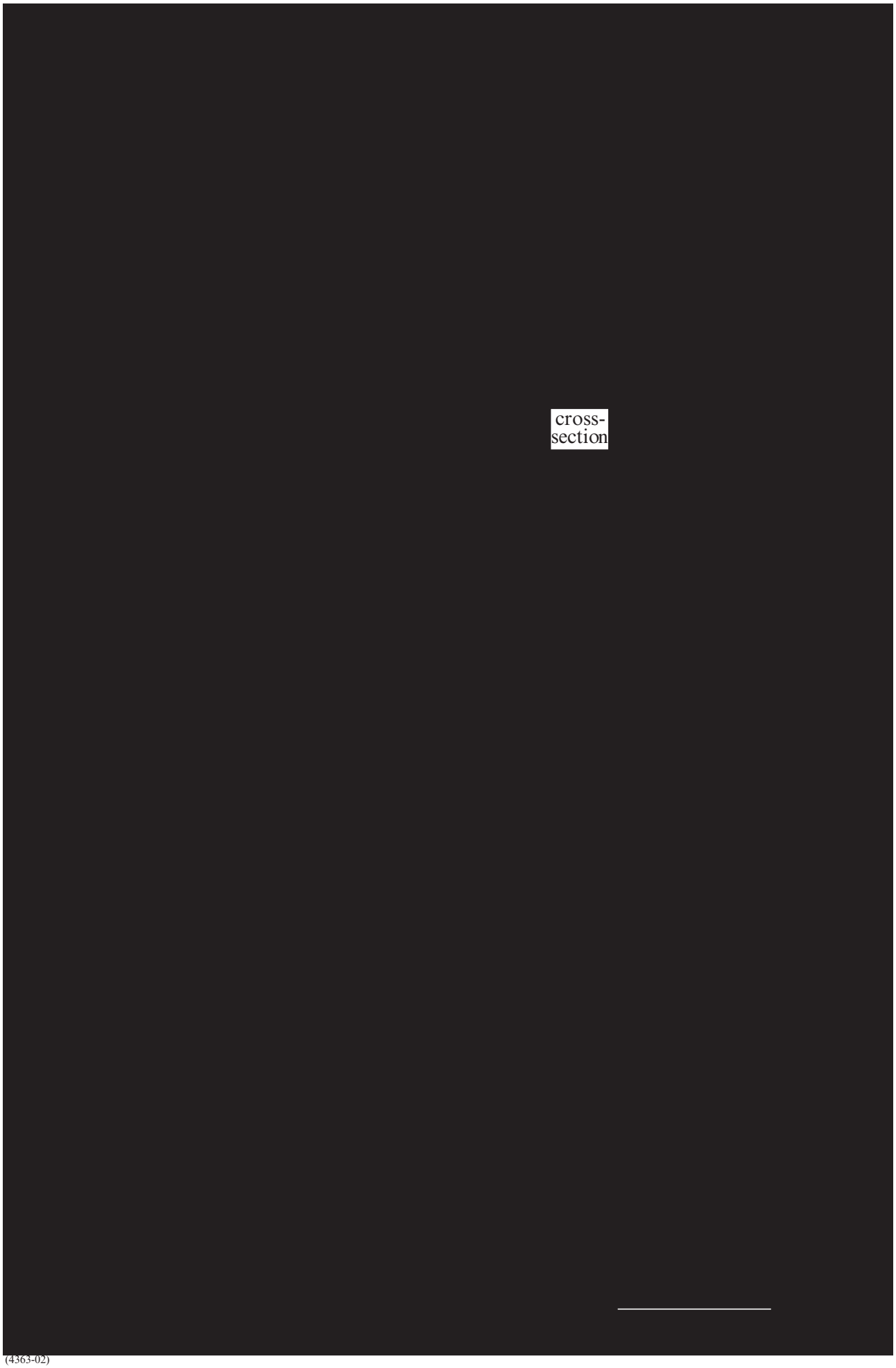
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **3**.

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

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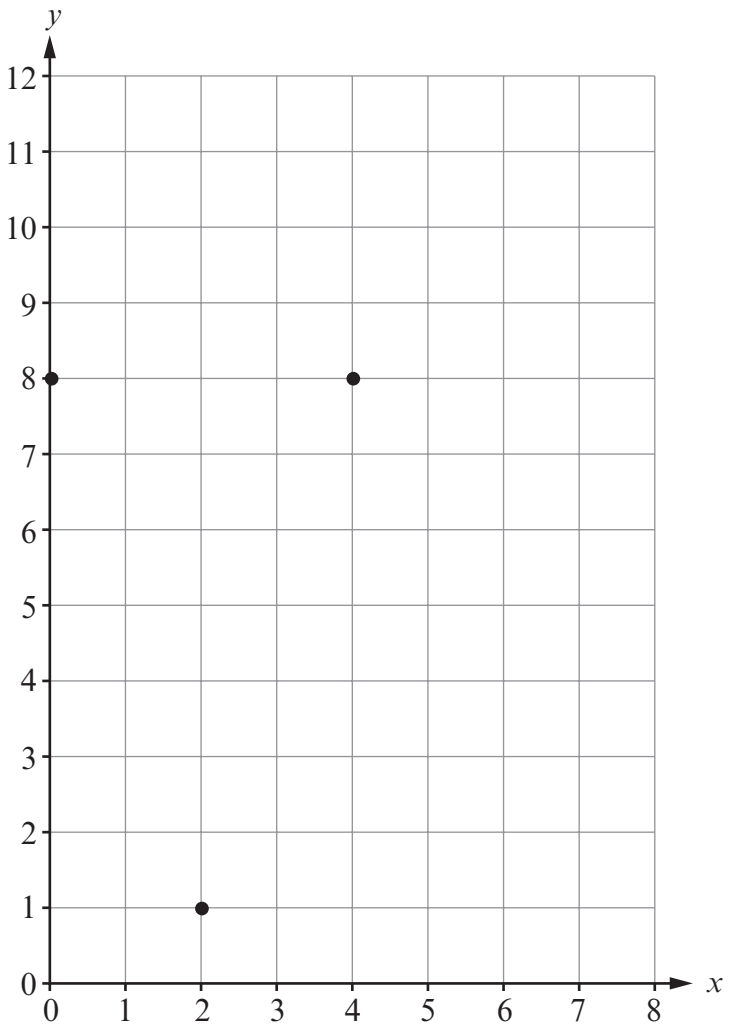


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cross-
section

Examiner only

**1.** Three points (0, 8), (4, 8) and (2, 1) are shown on the grid below.




Give the coordinates of a possible fourth point that could be plotted on the grid in order to make a kite when all four points are joined together.

(..... , .....)

[2]

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Examiner only

**2.** *(a)* Calculate the size of each of the angles marked $x$, $y$ and $z$ in the diagram below.

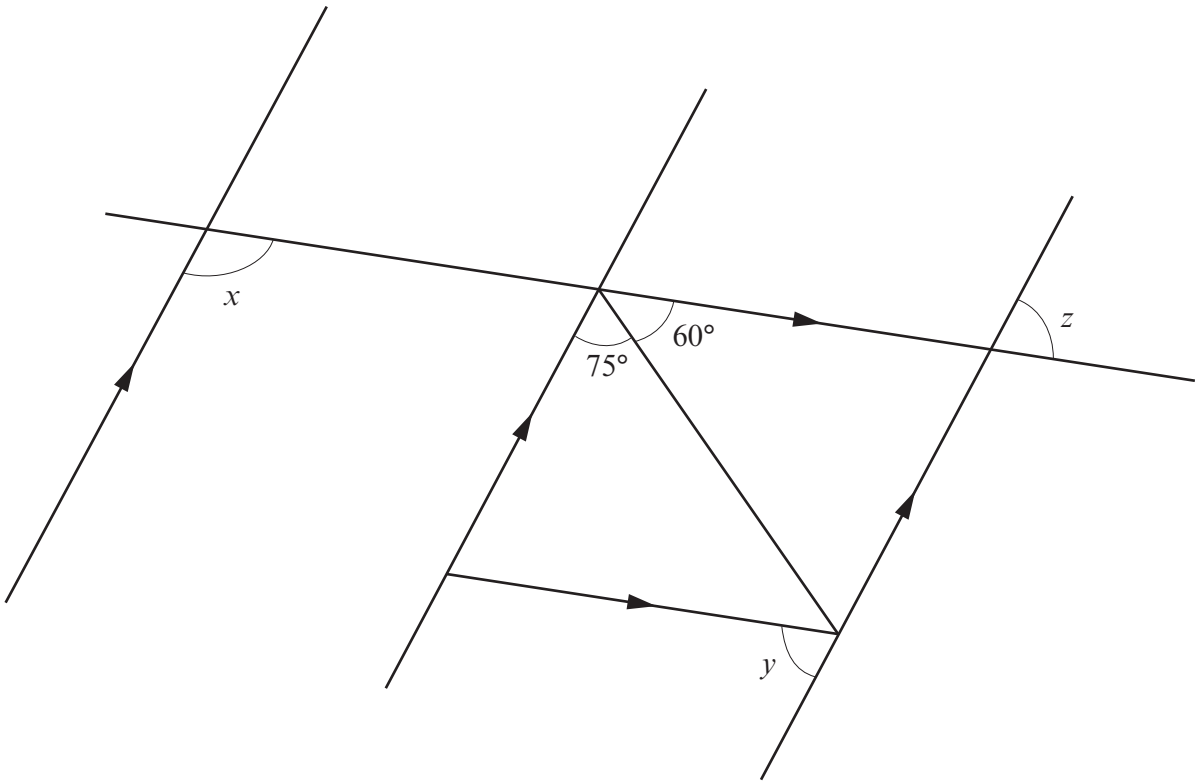



*Diagram not drawn to scale*

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$x =$ ..... ° $y =$ ..... ° $z =$ ..... °

[4]

*(b)* Three of the interior angles of a pentagon are 110°, 120° and 170°.
The other two angles are equal.
Calculate the size of each of the other two interior angles.

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[5]



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Examiner only

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

Jasmine and Harry carry out surveys.

Jasmine asked 20 women about healthy eating and finds that 9 of the women questioned said they have read about the need to eat 5 portions of fruit and vegetables a day.
Harry asked 50 people he met in the fitness centre about healthy eating and finds that 25 of the people questioned said they eat 5 portions of fruit and vegetables a day.

Compare the way in which Jasmine and Harry carry out their surveys and draw a conclusion about each difference.
Write down **three** differences in the way that Jasmine and Harry carried out their surveys.

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[5]

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Examiner only

**4.** *(a)* Find the highest common factor of 30 and 45.

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[1]

*(b)* Find the lowest common multiple of 18 and 24.

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[2]

*(c)* Showing **all** your working, write $\frac{4}{15}$, $\frac{1}{6}$ and $\frac{2}{5}$ in descending order.

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[3]

*(d)* Express 525 as a product of prime numbers using index notation.

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[3]



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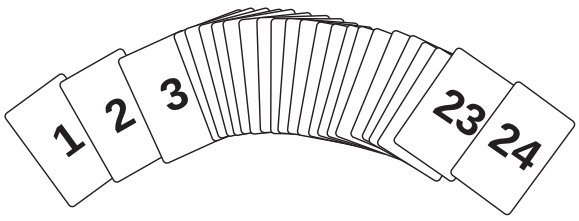
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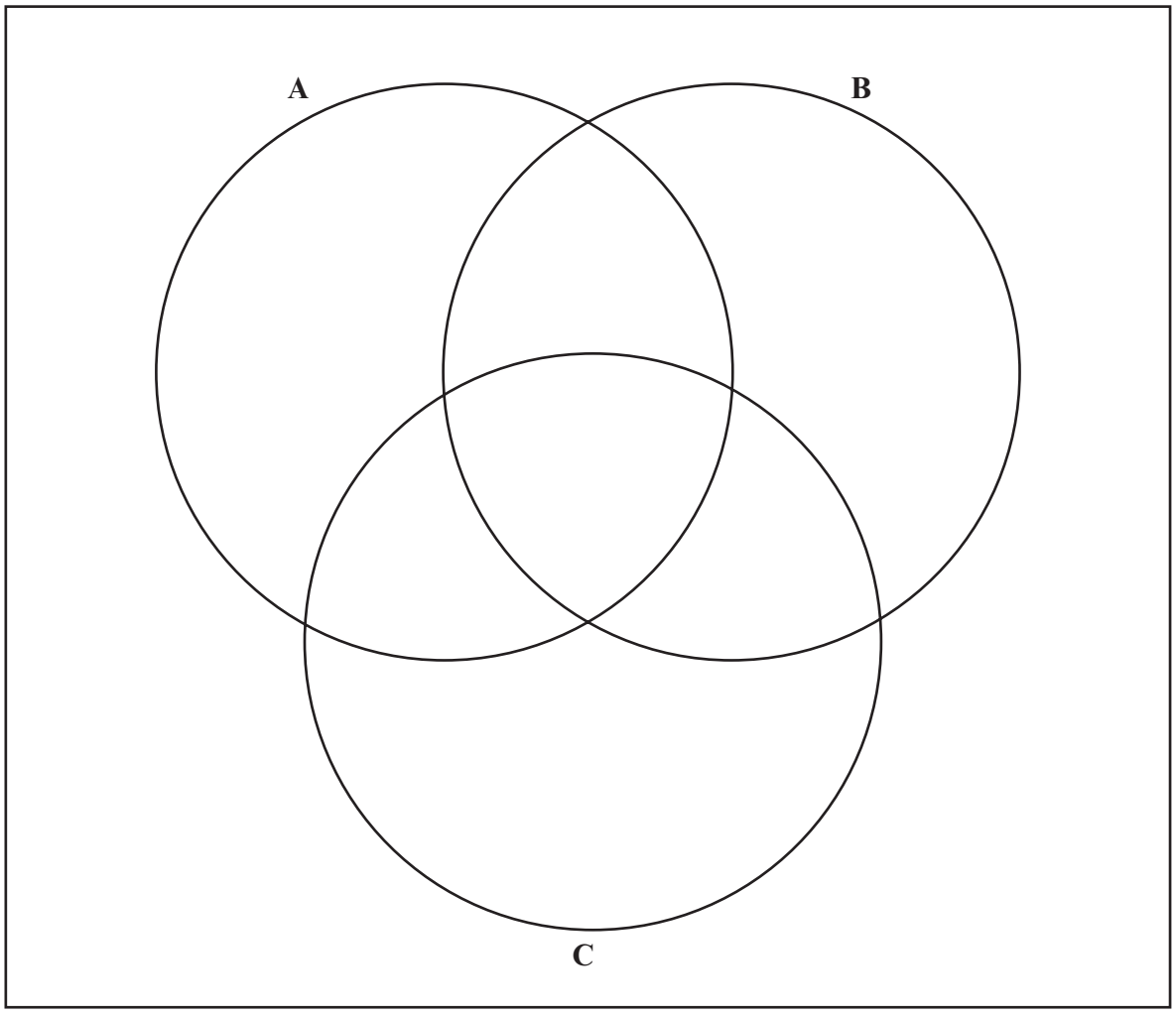
Examiner only

**5.** A set of 24 cards are numbered from 1 to 24.




Set **A** are the cards with the even numbers from 2 to 24 inclusive.
Set **B** are the cards with the multiples of three from 3 to 24 inclusive.
Set **C** are the cards with the multiples of four from 4 to 24 inclusive.

*(a)* Complete the Venn diagram.




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[5]



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*(b)* One card from the pack of 24 cards is selected at random.
Find the probability that the card chosen is

(i) a multiple of 3,

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[1]

(ii) odd,

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[1]

(iii) a multiple of 3, or a multiple of 4, or a multiple of both 3 and 4.

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[1]

**6.** Admiralty Brass contains copper, zinc and tin in the ratio 69 : 30 : 1.
When 345 kg of copper is used to make Admiralty Brass, calculate the quantities of zinc and tin that are needed.

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Zinc = ..... kg  Tin = ..... kg

[3]





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Examiner only

**7.** Here are equations of three straight lines.

$$y = 3x + 8$$
$$2y = 6x + 15$$
$$2y = 3x + 7$$

Explain how you know which two of the three straight lines are parallel.

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[3]

**8.** *(a)* The $n$th term of a sequence is $n^2 + 5$.

(i) List the first three terms of the sequence.

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[2]

(ii) State the value of the first term of the sequence that is greater than 100.

.....

[1]

*(b)* Factorise $x^2 + 4x$.

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[1]

*(c)* Make $y$ the subject of the formula $3y - 4 = h$.

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[2]



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Examiner only

*(d)* Simplify $6(4y + 3) + 5(3y - 8)$.

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[2]

*(e)* Expand $w(3w^3 - 5)$.

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[2]

*(f)* Find the value of $5g^2 - 6h$ when $g = -2$ and $h = -\frac{1}{2}$.

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[2]

*(g)* Solve $x^2 - 3x - 10 = 0$.

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[3]



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Examiner only

**9.** Megan works in an electronics store and wants a total wage of $W$ pounds per week.
On Mondays to Fridays she earns £8 per hour.
On Saturdays she is paid at double this rate.
Megan needs to work a total of $x$ hours between Monday and Friday and $t$ hours on a Saturday in order to earn $W$ pounds in the week.
Find a formula for $t$ in terms of $W$ and $x$.

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[5]

**10.** The distance of the Moon from the Earth varies between $3.56 \times 10^5$ km and $4.06 \times 10^5$ km.
Find the difference between these two distances. Give your answer in standard form.

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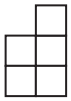
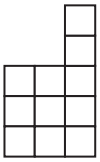
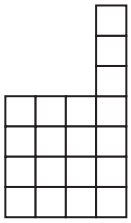
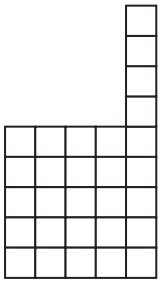
[2]



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Examiner only

**11.** Use the table below to find an expression for the number of small squares in Pattern number $n$.

| Pattern number | Shape | Number of small squares |
|---|---|---|
| 1 |  | 5 |
| 2 |  | 11 |
| 3 |  | 19 |
| 4 |  | ..... |
| ⋮ | ⋮ | ⋮ |
| $n$ |  | ..... |

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[4]



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Examiner only

**12.** *(a)* Which is the greater $(n + 1)^2$ or $n^2 + 2n + 2$?
You **must** show **all** your working.

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[3]

*(b)* Which is the greater $0.\dot{1}\dot{2}$ or $\frac{119}{990}$ ?

You **must** show **all** your working.

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[3]



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Examiner only

**13.** *(a)* Simplify each of the following.

(i) $8^{\frac{2}{3}}$

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[2]

(ii) $25^{-\frac{1}{2}}$

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[2]

*(b)* Expand and simplify $(7-\pi)(10-\pi)$, leaving $\pi$ in your answer.

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[3]

*(c)* Find the value of $\left(\sqrt{32}-\sqrt{2}\right)^2$.

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[3]

*(d)* Given that $p=\sqrt{7}$, $q=\sqrt{11}$ and $r=\sqrt{154}$, write $pqr$ in the form $a\sqrt{2}$.

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[2]



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Examiner only

**14.** *(a)* Find the length marked $w$.
You **must** give a reason for your answer.

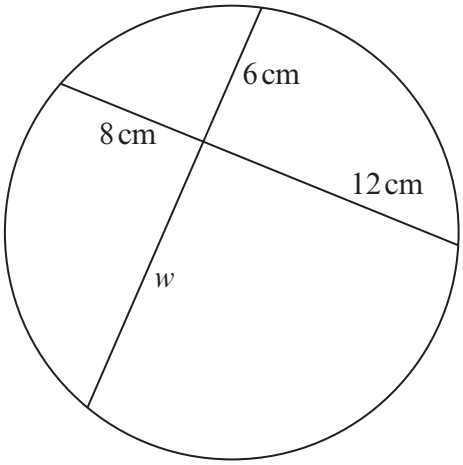



*Diagram is not drawn to scale*

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[3]

*(b)* Given that $CD$ is a tangent to the circle, find the size of the angle marked $x$.
You **must** give a reason for your answer.

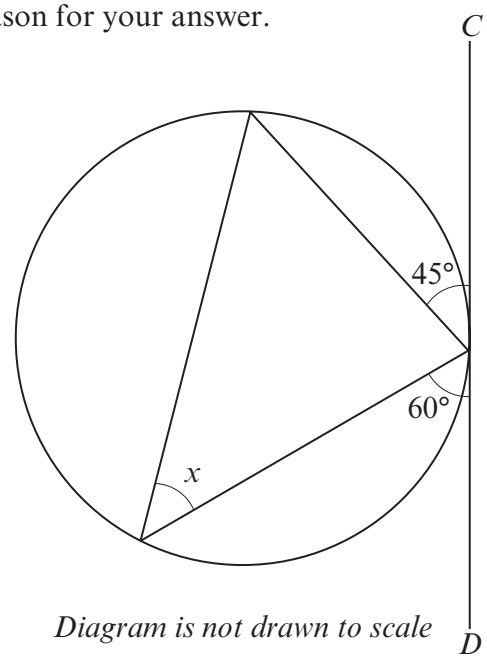



*Diagram is not drawn to scale*

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[2]



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Examiner only

*(c)* Find the size of the angle marked $y$.
You **must** give a reason for your answer.

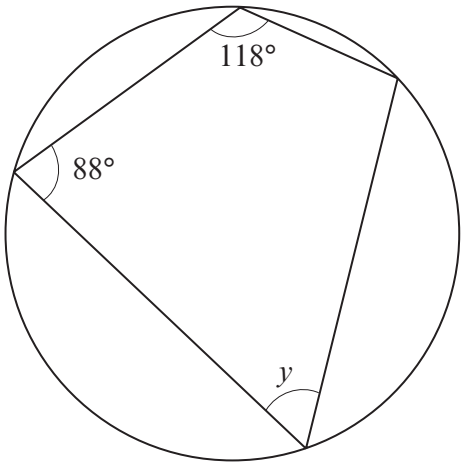



*Diagram is not drawn to scale*

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[2]

*(d)* Given that point $O$ is the centre of the circle, find the size of the angle marked $z$.
You **must** give a reason for your answer.

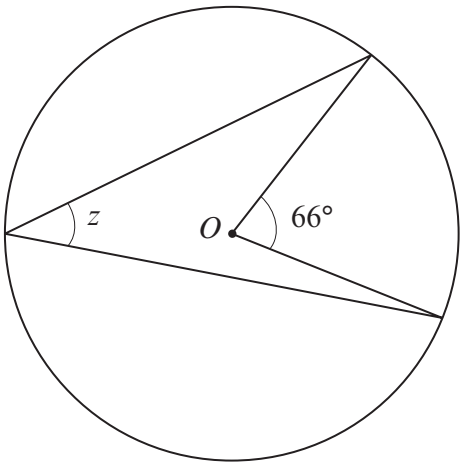



*Diagram is not drawn to scale*

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[2]



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Examiner only

**15.**




Five cards are numbered 2, 3, 5, 7, 11 respectively.
The cards are shuffled and two cards are chosen at random.

*(a)* Calculate the probability that at least one of the numbers is odd.

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[2]

*(b)* Calculate the probability that the **sum** of the numbers on the chosen cards is odd.

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[3]

*(c)* Calculate the probability that the **product** of the numbers on the chosen cards is odd.

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[3]



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# GCSE MARKING SCHEME

## METHODS IN MATHEMATICS (LINKED PAIR PILOT)

## SUMMER 2011

## INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2011 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 | 4 |

# GCSE METHODS IN MATHEMATICS

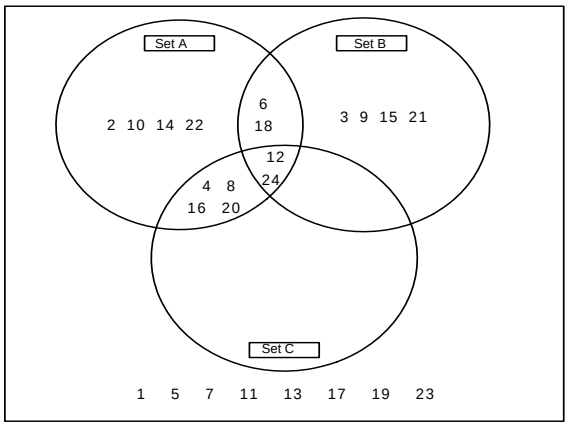
## UNIT 1 - FOUNDATION TIER

| Methods in Mathematics<br>June 2011 Unit 1 Foundation Tier | Mark | Comments<br>Post Conference |
|---|---|---|
| 1. (a) (i) 6047<br>(ii) twenty eight million<br>(b) (i) 32 & 28<br>(ii) 53 & 23<br>(iii) 39<br>(iv) 54<br>(c) 1, 3, 9, 27<br><br><br>(d) multiple | B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B2<br><br><br>B1<br>9 | <br><br><br><br><br><br>B1 for 2 or 3 correct factors with no incorrect factors OR 4 correct factors and only 1 incorrect, Ignore duplicates.<br> |
| 2. Square<br>Rhombus<br>Parallelogram<br>Kite<br>Trapezium<br><br><br> | B1<br>B1<br>B1<br>B1<br>B1<br><br>5 | <br><br><br><br><br><br> |
| 3. (a) Eg. Unequal number of boys and girls<br>**and**<br>Conclusion incorrect (stated or implied)<br><br>(b) A at or near $^1/_6$<br>B at ½<br>C at 0<br>(c) (i) **(H,1)** (H,2) (H,3) (H,4) (H,5) (H,6)<br>(T,1) (T,2) (T,3) (T,4) (T,5) (T,6)<br>(ii) $^1/_{12}$ or equivalent<br>(d) 1 – (0.2 + 0.5) or equivalent<br>= 0.3 or equivalent<br><br><br> | E2<br><br><br><br><br>B1<br>B1<br>B1<br>B2<br><br>B1<br>M1<br>A1<br><br>10 | E1 for partial explanation or eg just 11/30<br>Do not award E1 for statement incorrect only.<br><br><br><br>For position of 'A' accept >0 but <1/4<br><br><br>B1 for 7 correct. Order unimportant. Ignore duplicates.<br><br>Accept only fractions, decimals or percentages for probability.<br><br><br> |
| 4. (a) 29<br>(b) 64<br>Multiply (previous term) by 2 (to get the next term)<br>(c) Subtract 1, multiply by 3<br>(d) (i) correct pattern drawn<br>(ii) 5, 9, 13, 17<br>(iii) 33<br>(e) $a = 21 + 5$<br><br>= 26<br>(f) $13y$<br>(g) $4x + 7y$<br><br>(h) (i)Point plotted at (-2,-3)<br>(ii) (3, -1) | B1<br>B1<br>B1<br><br>B1<br>B1<br>B2<br>B1<br>M1<br><br>A1<br>B1<br>B2<br><br>B1<br>B1<br>15 | <br><br>Accept times by 2, doubling or × 2<br>Award B0 for 'it's the 2 times table'<br>Accept -1 × 3<br><br>B1 for 3 correct entries<br><br>Accept 3 × 7 + 5 for M1 if an attempt to multiply. For 37 + 5 award M0.<br><br><br><br>Award B1 for either $4x$ or + $7y$ within an expression<br>Award B0 if reversed coordinates<br>Award B0 if reversed coordinates |



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|---|---|---|
| 5. (a) For 2 correct in a form which allows comparison.<br>For all 3 correct in a form which allows comparison<br>$^{70}/_{100}$, 0.65, $^{3}/_{5}$<br>(b) 200 × 12<br>= 2400<br>60 × 4<br>= 240<br>2640 | B1<br><br>B1<br><br>B1<br>M1<br>A1<br>M1<br>A1<br>B1<br>8 | <br><br><br><br>**CAO**<br><br><br><br><br>FT from 1 error if both M marks are awarded. |
| 6. (a) (180 – 90) ÷ 2<br>= 45(°)<br>(b) 39°<br>360 – 115 – 142 - 39<br>$y$ = 64 (°) | M1<br>A1<br>B1<br>M1<br>A1<br>5 | <br><br>Look at diagram.<br>FT 'their 39(°)' but not given 141(°) |
| 7. (a) 225<br>(b) 4<br>(c) Explanation eg multiplication carried out 1st followed by addition<br>**And**<br>Simon is correct or implied by their calculations | B2<br>B1<br>E2<br><br><br><br>5 | B1 for either 9 or 25<br>Award B0 for 4×4×4 or $4^3$ or 16 × 4<br>Award E1 for statements such as Carly has done them in the wrong order.<br>Do not award E1 for 'Simon' only. |
| 8. x = 135°<br>y = 45°<br>z = 45° | B1<br>B2<br>B1<br>4 | <br>B1 for sight of 180–135. FT y = 180 – x<br>FT z = y or z = 180 - x |
| 9. Any 3 comparisons **and** conclusions, e.g.<br>• For comparison of numbers asked with implication that sample size matters.<br>• For place survey carried out with implication that Harry's survey maybe biased.<br>• For may not be quite the same question asked with implication that answers cannot be compared.<br>• For Jasmine asked women, implication survey biased to gender.<br><br>**QWC**<br>• Relevance to surveys<br>• spelling<br>• clarity of text explanations<br><br>QWC2: Candidates will be expected to<br>• present relevant work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in spelling, punctuation and grammar<br><br>QWC1: Candidates will be expected to<br>• present work clearly which is mostly relevant, with words explaining process or steps<br>OR<br>• make few if any mistakes in spelling, punctuation and grammar and include units in their final answer | B3<br><br><br><br><br><br><br><br><br>QWC<br>2<br><br><br><br><br><br><br><br><

| Methods in Mathematics<br>June 2011 Unit 1 Foundation Tier | Mark | Comments<br>Post Conference |
|---|---|---|
| 10. Method to find primes<br>3, 5, 5, 7<br>$3 \times 5^2 \times 7$ | M1<br>A1<br>B1<br><br>3 | At least 1 prime found before second error<br>Ignore 1s<br>Correct FT with no 1s and at least one power >1<br>Allow inclusion of power 1 shown |
| 11. All numbers 1 to 24 correctly placed<br><br> | B5<br><br>5 | **<u>First look for duplicates, then cross out the correct ones.</u>**<br>B4 4 or 5 of the 6 regions which should contain numbers are correct, ignore the other regions, OR<br><br>B3 3 of the 6 regions which should contain numbers are correct, ignore the other regions, OR<br><br>B2 2 of the 6 regions which should contain numbers are correct, ignore the other regions, OR<br><br>B1 1 of the 6 regions which should contain numbers is correct, ignore the other regions.<br><br>*If B5 awarded and zero placed in an empty region then -1* |
| 12. $69 \times \ldots = 345$ OR $345 \div 69$<br>5<br>Zinc 150 (kg) and Tin 5 (kg) | M1<br>A1<br>A1<br><br>3 | <br><br>FT provided M1 awarded<br>Answer only with reversed answers, then allow M1, A1 |
| 13. Strategy, e.g. to look at equations in the same form<br>OR focus on coefficient of x<br>Selecting $y = 3x + 8$ and $2y = 6x + 15$ as parallel<br>Explanation, e.g. the coefficient of x is the same in 2 equations, so these 2 lines are parallel | S1<br><br><br>B1<br>B1<br><br>3 | Idea to focus on x term, may not have realised to consider like with like with y coefficient<br><br><br><br>Only award if the correct lines selected<br>Only accept 'same gradient' if the correct lines are selected |



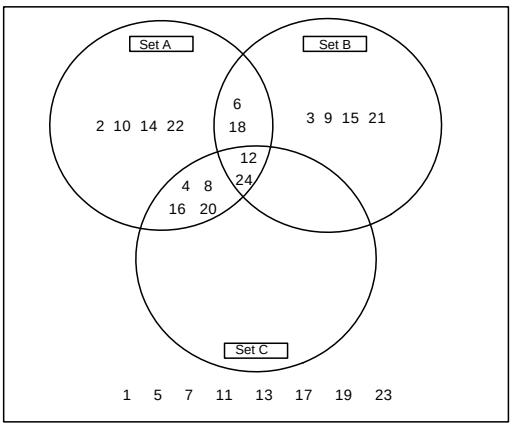
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# UNIT 1 - HIGHER TIER

| Methods in Mathematics<br>June 2011 Unit 1Higher Tier | | Comments<br>Post conference |
|---|---|---|
| 1. (2 , n) where n≠1 nor n≠8 (but must be on the grid given) | B2<br>2 | B1 for an unambiguous correct plot(s) (irrespective of coordinates given or no coordinates given) |
| 2. (a) x = 135°<br>y = 45°<br>z = 45°<br>(b) Either 360÷5 or 3×180 or equivalent appropriate first step<br>Interior angle sum 540(°)<br>540 – ( 110 + 120 + 170)<br>= 140<br>70(°) | B1<br>B2<br>B1<br>B1<br>B1<br>M1<br>A1<br>A1<br>9 | B1 for sight of 180–135. FT y = 180 – x<br>FT z = y or z = 180 - x<br>FT their 540 provided this follows from 1 arithmetic error only. Intention maybe implied by the answer<br>FT provided M1 awarded |
| 3. Any 3 comparisons **and** conclusions, e.g.<br>• For comparison of numbers asked with implication that sample size matters.<br>• For place survey carried out with implication that Harry's survey maybe biased.<br>• For may not be quite the same question asked with implication that answers cannot be compared.<br>• For Jasmine asked women, implication survey biased to gender.<br><br>**QWC**<br>• Relevance to surveys<br>• spelling<br>• clarity of text explanations<br><br>QWC2: Candidates will be expected to<br>• present relevant work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in spelling, punctuation and grammar<br><br>QWC1: Candidates will be expected to<br>• present work clearly which is mostly relevant, with words explaining process or steps<br>OR<br>• make few if any mistakes in spelling, punctuation and grammar and include units in their final answer | B3<br><br>QWC<br>2<br><br>5 | B1 for each comparison and conclusion, maximum B3<br>*For B marks, ignore extra information given provided it is not contradicting.*<br><br>A conclusion maybe flagged by the word 'but'.<br>If no conclusions, but comparisons given then:<br>B2 for any 3 reasonable comparisons, or<br>B1 for an 1 or 2 reasonable comparisons<br><br>**Do not penalise 'no conclusion' in QWC**<br><br>QWC2 Presents relevant material in a coherent and logical manner, using<br>acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar.<br><br>**Notes:**<br>• If very little text (e.g. 2 lines) insufficient to check/award SPG, hence check the flow for meaning, if okay then QW1 if not QWC0.<br>• Ignore some change in tense if generally the text flows okay.<br>• Mutations in Welsh: follow the same guidance as tense in English medium. |
| 4. (a) 15<br>(b) 72<br><br>(c) Two fractions correctly written in a form that allows for comparison<br>For all three correctly written in a form that allows for comparison<br>2/5, 4/15 and 1/6 in this order or equivalent<br>(d) Method to find primes<br>3, 5, 5, 7<br>$3 \times 5^2 \times 7$ | B1<br>B2<br><br>B1<br>B1<br>B1<br>M1<br>A1<br>B1<br>9 | B1 for finding some multiples for both numbers, or for working with products of factors for both numbers<br>Allow reasonably accurate diagrammatic form<br><br>E.g. 8/30, 5/30, 12/30 or 1/3.75, 1/6, 1/ 2.5, or …<br><br>CAO. Answer only allow final B1 only<br>At least 1 prime found before second error<br>Ignore 1s<br>Correct FT with no 1s and at least one power >1<br>Allow inclusion of power 1 shown |



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| Methods in Mathematics<br>June 2011 Unit 1Higher Tier | | Comments<br>Post conference |
|---|---|---|
| 5.(a) All numbers 1 to 24 correctly placed<br><br> | B5 | **First look for duplicates, then cross out the correct ones.**<br>B4 4 or 5 of the 6 regions which should contain numbers are correct, ignore the other regions, OR<br><br>B3 3 of the 6 regions which should contain numbers are correct, ignore the other regions, OR<br><br>B2 2 of the 6 regions which should contain numbers are correct, ignore the other regions, OR<br><br>B1 1 of the 6 regions which should contain numbers is correct, ignore the other regions.<br><br>*If B5 awarded and zero placed in an empty region then -1*<br><br>**FT from their Venn diagram or as if restarted a fresh**<br>Do not accept incorrect notation.<br>In (b) penalise incorrect cancelling of fractions once only, -1<br>An answer of 0.3 is incorrect cancelling of fractions. Accept 0.33 |
| (b)(i) 8/24 (=1/3) or equivalent<br>(ii) 12/24 (=0.5) or equivalent<br>(iii) 12/24 (=0.5) or equivalent | B1<br>B1<br>B1<br>8 | |
| 6. $69 \times \ldots = 345$ OR $345 \div 69$<br>5<br>Zinc 150 (kg) and Tin 5 (kg) | M1<br>A1<br>A1<br>3 | <br><br>FT provided M1 awarded<br>Answer only with reversed answers, then allow M1, A1 |
| 7. Strategy, e.g. to look at equations in the same form<br>OR focus on coefficient of x<br>Selecting $y = 3x + 8$ and $2y = 6x + 15$ as parallel<br>Explanation, e.g. comparing m in $y = mx + c$ | S1<br><br>B1<br>B1<br><br>3 | Idea to focus on x term, may not have realised to consider like with like with y coefficient<br><br>Only award if the correct lines selected<br>Only accept 'same gradient' if the correct lines are selected |
| 8.(a) (i) 6, 9, 14<br><br>(ii) 10th (term) or 105<br>(b) $x(x + 4)$<br>(c) $3y = h + 4$<br>$y = (h + 4)/3$ ISW<br>(d) $24y + 18 + 15y - 40$<br>$= 39y - 22$<br>(e) $3w^4 - 5w$<br>(f) 23<br>(g) $(x - 5)(x + 2)$<br>$x = 5$ and $x = -2$ | B2<br><br>B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B2<br>B2<br>B2<br>B1<br>15 | B1 any 2 terms correct in correct position, or for 5, 6, 9, or for $1^2 + 5$, $2^2 + 5$, $3^2 + 5$<br>Do not accept '10'<br>FT until 2nd error in parts (c) and (d)<br><br><br><br><br>B1 for each term<br>B1 for 20 or +3<br>B1 for $(x \ldots 5)(x \ldots 2)$<br>FT from their pair of brackets |
| 9. Initial strategy, e.g. multiplying hours by pay per hour<br>The idea of algebraic form which equates……..<br>rate of pay ×hours + different rate of pay×different hours = total pay<br>$8 \times x + 2 \times 8 \times t = W$<br>$2 \times 8 \times t = W - 8 \times x$<br><br><br>$t = (W - 8 \times x) / 16$ | S1<br><br>M1<br><br>A1<br>A1<br><br><br><br>A1<br>5 | Sight of $8 \times x$ or $2 \times 8 \times t$ or $16 \times t$<br><br>Or equivalent, maybe rearranged from this.<br>Needs to be in terms of $x$, $t$ and $W$<br><br>This maybe implied by rearranged form<br>FT provided S1 and M1 awarded and equivalent difficulty<br>Some candidates may start with this form, if algebra incorrect possible S1 M1, algebra correct S1 M1 A1 A1 so far<br><br>CAO |
| 10. $5(.0) \times 10^4$ | B2<br>2 | B1 for $0.5 \times 10^5$ or 50000, i.e. correct answer but incorrect format |
| 11. Strategy, e.g. Square + number (maybe numeric) OR attempt to look at second difference<br><br>$(n + 1)^2 + \ldots\ldots$ OR second difference 2<br>$(n + a)^2 + n$ OR $n^2 + ..n + 1$ or $n^2 + 3n + \ldots$<br>$(n+1)^2 + n$ OR $n^2 + 3n + 1$ | S1<br><br><br>M1<br>M1<br>A1<br>4 | OR break down into square + number of rectangles for a couple of patterns.<br>Maybe implied by $n^2 + \ldots..$<br><br><br>CAO. Mark their final answer<br>Allow 3 marks for $n+1 \times n + 1 + n$ |



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| Methods in Mathematics<br>June 2011 Unit 1Higher Tier | | Comments<br>Post conference |
|---|---|---|
| 12.<br>(a) $((n+1)^2 =)$ $n^2 + 2n + 1$ or $n^2 + n + n + 1$<br>Conclusion that $n^2 + 2n + 2$ greater | <br>M2<br>A1 | *In (a) & (b) answer only without working gets no marks*<br>M1 if 1 error in expansion. $n^2 + 1$ is 2 errors<br>CAO<br>If no marks, then SC1 for correct choice based on 1 trial value correctly evaluated |
| (b) $x = 0.121212\ldots$ and $100x = 12.1212\ldots$ with intention to subtract<br>$x = 12/99$<br>Conclusion that 0.1212… (120/990) is greater | M1<br>M1<br>A1<br>6 | Or 119/990 = 0.120 ( final zero needs to be shown)<br>Or 119/990 = 0.1202(…) |
| 13. (a) (i) 4<br>(ii) 1/5 or 0.2<br>(b) $70 - 10\pi - 7\pi + \pi^2$<br>$= 70 - 17\pi + \pi^2$<br>(c) $\sqrt{32} = \sqrt{(2 \times 16)}$ or $4\sqrt{2}$<br>$\{ (\sqrt{32} - \sqrt{2})^2 \} = (4\sqrt{2} - \sqrt{2})^2 \{= (3\sqrt{2})^2 \}$<br>$= 18$<br>(d) $77\sqrt{2}$ | B2<br>B2<br>B2<br>B1<br>M1<br>M1<br>A1<br>B2<br>12 | B1 for correct first stage of working, e.g. $2^2$ or $\sqrt[3]{8}^2$<br>B1 for correct first stage of working, e.g. $1/25^{1/2}$, $5^{-1}$, sight of $(\pm)5$<br>B1 for 3 of the 4 terms correct<br>CAO. Penalise further incorrect simplification.<br>**OR** M2 for $32 - \sqrt{2}\sqrt{32} - \sqrt{2}\sqrt{32} + 2$,<br>or award M1 for 3 of the 4 terms correct<br>CAO<br>B1 for $154 = 2 \times 7 \times 11$ or correct partial simplification |
| 14.<br>(a) $8 \times 12 = 6 \times w$<br>$w = 16$ (cm)<br>Intersecting chords<br>(b) $x = 45°$<br>Alternate segment theorem<br>(c) $y = 62°$<br>Cyclic quadrilateral sum of opposite angles 180°<br>(d) $z = 33°$<br>Angle at the centre is twice the angle at the circumference | <br>M1<br>A1<br>E1<br><br>B1<br>E1<br><br>B1<br>E1<br><br>B1<br>E1<br>9 | **Allow E marks as independent marks**<br><br><br>Calculation alone without reason does not gain E1<br>Accept ‘product of chords (is equal)’<br>Calculation alone without reason does not gain E1<br>Accept ‘angle in opposite segment (is equal)’, ‘angle between tangent and chord is equal to the angle opposite’<br><br>Calculation alone without reason does not gain E1<br>Do not accept ‘opposite angles sum 180’<br><br>Calculation alone without reason does not gain E1 |
| 15.<br>(a) 1 - P (even, even) OR “only 1 even, other must be odd”<br>1<br>(b) P(odd, even) + P(even, odd)<br>$= 4/5 \times 1/4 + 1/5 \times 4/4$<br>$= 8/20$ ( $= 2/5$)<br>(c) P(odd, odd)<br>$= 4/5 \times 3/4$<br>$= 12/20$ $(= 3/5)$ | <br>M1<br>A1<br><br><br><br>M1<br>M1<br>A1<br>M1<br>M1<br>A1<br>8 | *Penalise incorrect cancelling of fractions once only,-1*<br><br>Accept 20/20 or 10/10, or … only if not incorrectly cancelled.<br>Accept “certain” as M1 only<br>For correct answers, check it comes from a correct method<br><br><br>*SC1 for a correct answer from 10 possibilities*<br><br><br>*SC1 for a correct answer from 10 possibilities* |



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| Candidate Name | Centre Number | Candidate Number |
|---|---|---|
| | | 0 |

# GCSE LINKED PAIR PILOT

4363/02

# METHODS IN MATHEMATICS

## UNIT 1: METHODS (NON-CALCULATOR)

## HIGHER TIER

P.M. FRIDAY, 21 January 2011

2 hours

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

**CALCULATORS ARE NOT TO BE USED 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 $\pi$ as 3·14.

### INFORMATION FOR CANDIDATES

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

Unless stated, diagrams are not drawn to scale.

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

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

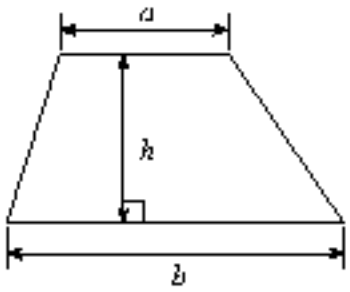
You are reminded that assessment will take into account the quality of written communication (including mathematical communication) used in your answer to question **5**.



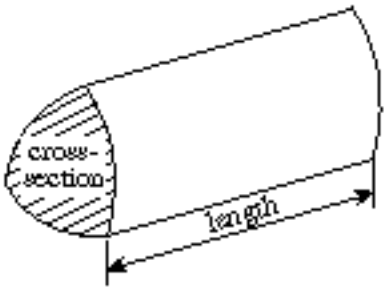
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## Formula List

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




Volume of prism = area of cross-section × length



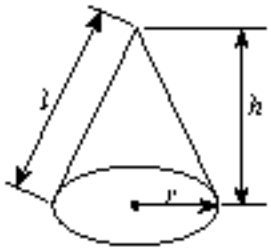

Volume of sphere $= \frac{4}{3}\pi r^3$

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




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

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

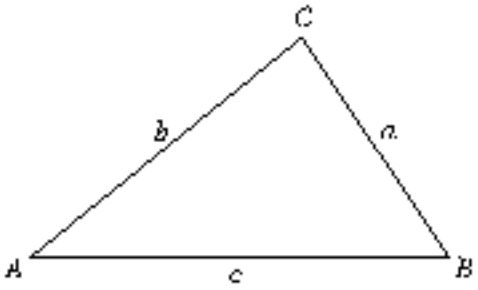



In any triangle $ABC$

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

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

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




### The Quadratic Equation

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

where $a \neq 0$ are given by

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



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Examiner only

**1.** *(a)* (i) Use the formula below to find the value of $g$ when $f = 9$ and $h = -3$.

$$g = \frac{f(5 - h)}{3}$$

.....

.....

.....

.....

.....

[3]

(ii) Find the value of $d^2 - 7$ when $d = -4$.

.....

.....

[1]

*(b)* Make $q$ the subject of the formula below.

$$q + 5t = u$$

.....

.....

[1]

*(c)* Factorise $7p + 21$.

.....

[1]

*(d)* Simplify $4f + 5f - 17f - f + 6f$.

.....

.....

[1]

*(e)* Expand $6(x + 2)$.

.....

.....

[1]



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Examiner only

**2.** Find the angles marked *a, b, c* and *d*.

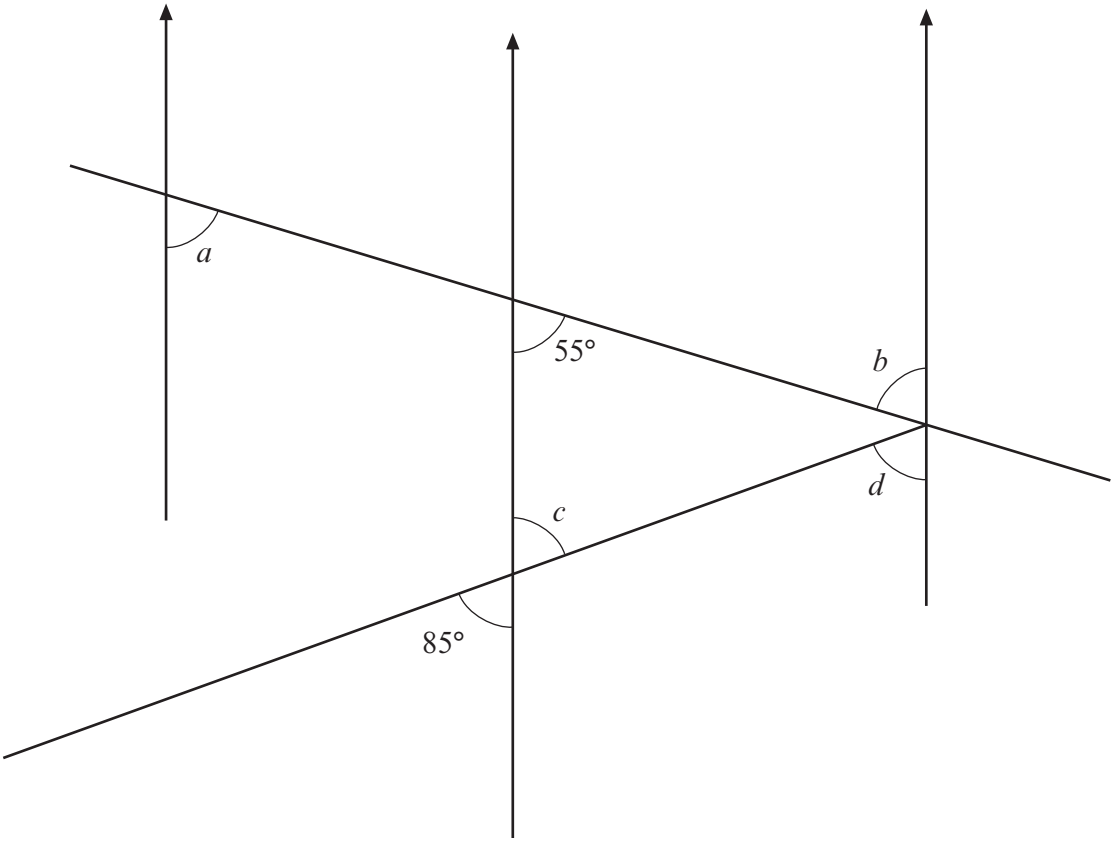



*Diagram not drawn to scale*

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.....

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.....

.....

$a$ = .....° $b$ = .....° $c$ = .....° $d$ = .....°

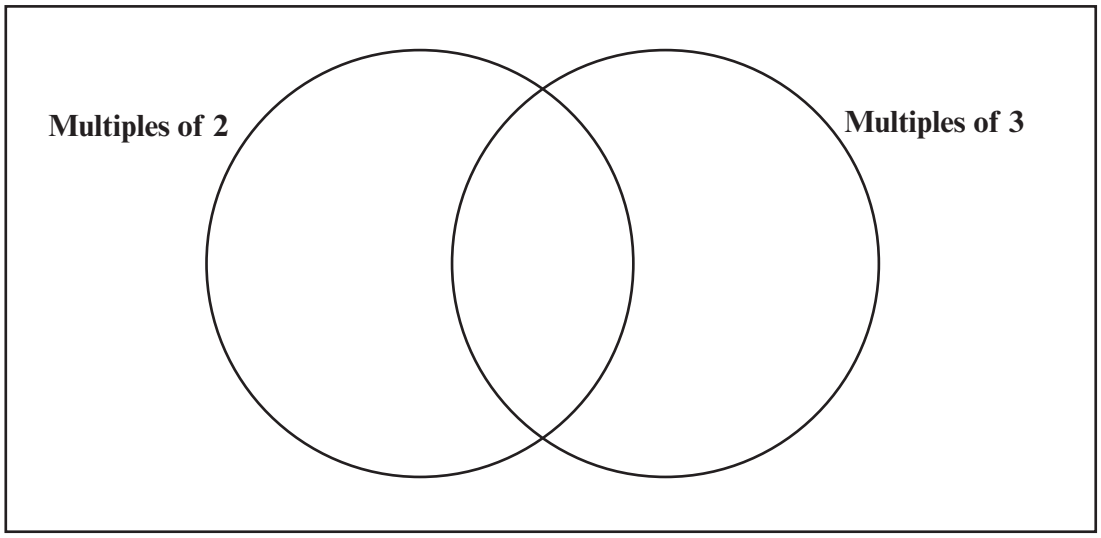
[4]



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Examiner only

**3.** *(a)* (i) Place **each** of the whole numbers 1, 2, 3, 4, 5, 6, 7, 8 in the correct positions in the Venn diagram.




[2]

(ii) A whole number is selected at random from the set {1, 2, 3, 4, 5, 6, 7, 8}.

Find the probability that the number selected is

a multiple of 3, .....

a multiple of both 2 and 3. .....

[2]

*(b)* A biased coin is thrown 50 times; the coin shows Heads on 15 of these occasions. The coin is thrown another 50 times; the coin shows Heads on 20 of these occasions.

Find the best estimate for the probability of the biased coin showing Head when thrown. How could the estimate be improved?

.....

.....

.....

.....

.....

.....

.....

[3]



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Examiner only

**4.** *(a)* Three sisters, Ruth, Joanne and Sharon share a prize in the ratio 2 : 5 : 8 respectively.
Sharon receives £1 760 which is the largest share.
Find how much Ruth and Joanne each receive.

.....

.....

.....

.....

.....

Ruth £ .....

Joanne £ .....

[4]

*(b)* The following fractions can be converted into decimals.

$$\frac{1}{4} \qquad \frac{5}{6} \qquad \frac{1}{9} \qquad \frac{3}{10}$$

Sort them into two groups: terminating decimals **or** recurring decimals.
Show **all** your working.

.....

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Complete the table **using decimal notation.**

| Terminating decimals | Recurring decimals |
|---|---|
| | |

[4]



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Examiner only

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

**Square numbers: 1 4 9 16** .....

Investigate whether square numbers have an odd number of factors.
Show all your working.
You must give a conclusion with an explanation for your answer.

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[8]



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Examiner only

**6.** A robot moves 6 steps forward, and then turns left through 12°.
This movement is then repeated many times, with the robot moving another 6 steps forward and then turning left through 12° each time.
Will the robot's path form a polygon?
Give an explanation for your answer and show all your working.

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[5]



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Examiner only

**7.** *(a)* Express 1764 as a product of prime factors using index notation.

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[3]

*(b)* Write down the *n*th term of the sequence 13, 19, 25, 31, .....

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[2]

*(c)* Write down the *n*th term of the sequence 2, 5, 10, 17, 26, 37, .....

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[2]

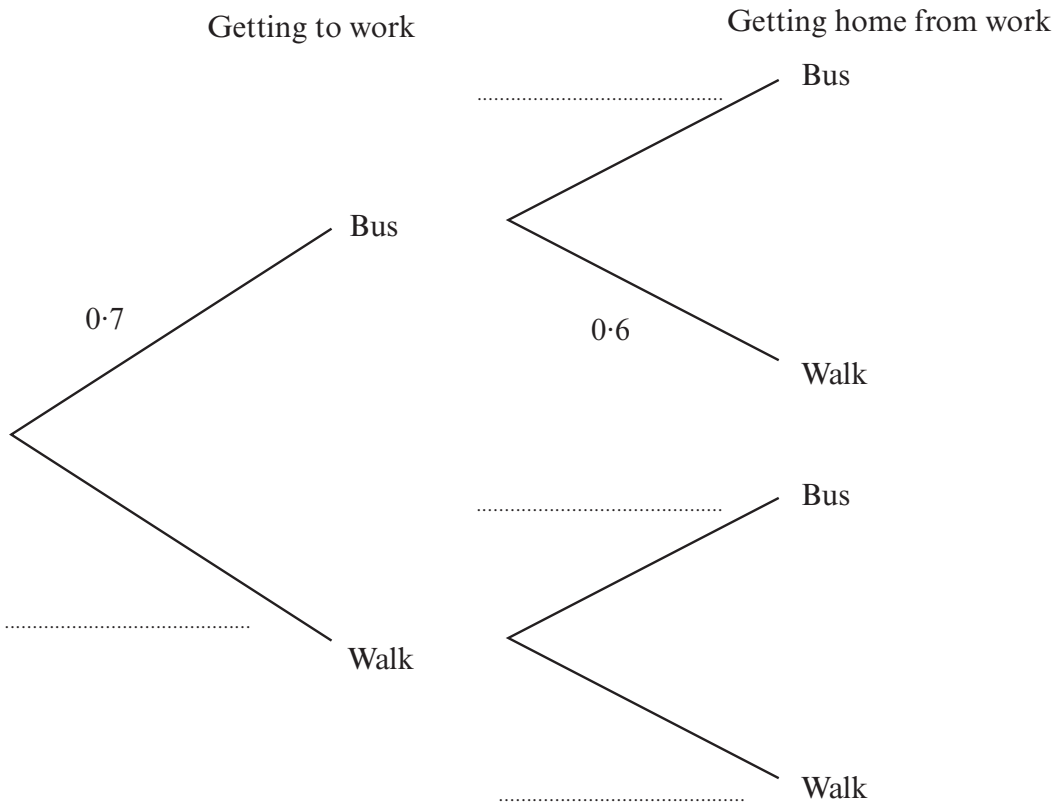


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**8.** Roger sometimes uses the bus to get to and from work.
When Roger does not take the bus he walks.
The probability that he takes the bus to work is 0·7.
The probability that he walks home from work is 0·6.
Getting to work and getting home from work are two independent events.

*(a)* Complete the following tree diagram.




[2]

*(b)* Calculate the probability that Roger takes the bus to work and walks home.

[2]

*(c)* Which is the most unlikely way of Roger getting to and from work?
Show your working and give a reason for your answer.

[2]



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Examiner only

**9.** *(a)* Evaluate $\sqrt{5} \times \sqrt{5}$.

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[1]

*(b)* Write 0·000093 in standard form.

.....

[1]

*(c)* Evaluate $\dfrac{8{\cdot}8 \times 10^{4}}{2{\cdot}2 \times 10^{-3}}$ giving your answer in standard form.

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[2]

*(d)* Evaluate $4^{-2} \times 8^{\frac{1}{3}} \times 2^{4}$.

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[3]



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Examiner only

**10.** *(a)* Use the graph paper below to draw the graph of the straight line $y = 5x + 2$.

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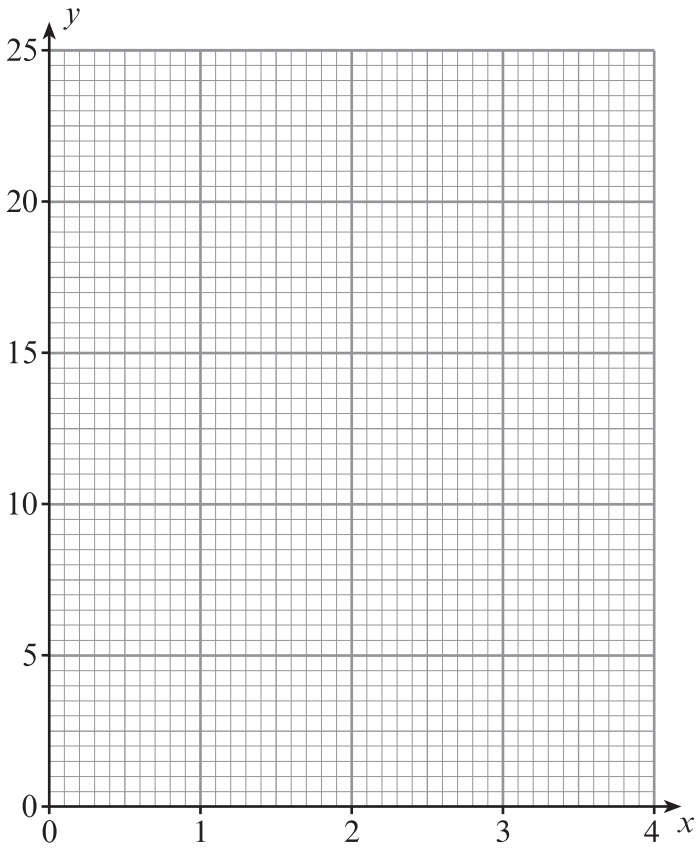
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[3]




*(b)* Write down the equation of a straight line that is parallel to $6x + 3y - 8 = 0$.

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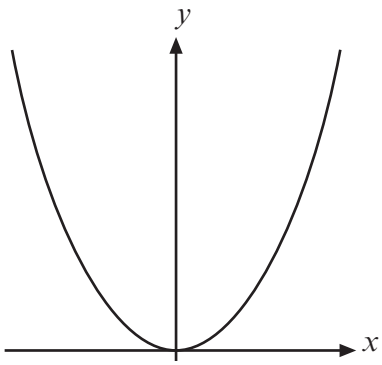
[3]



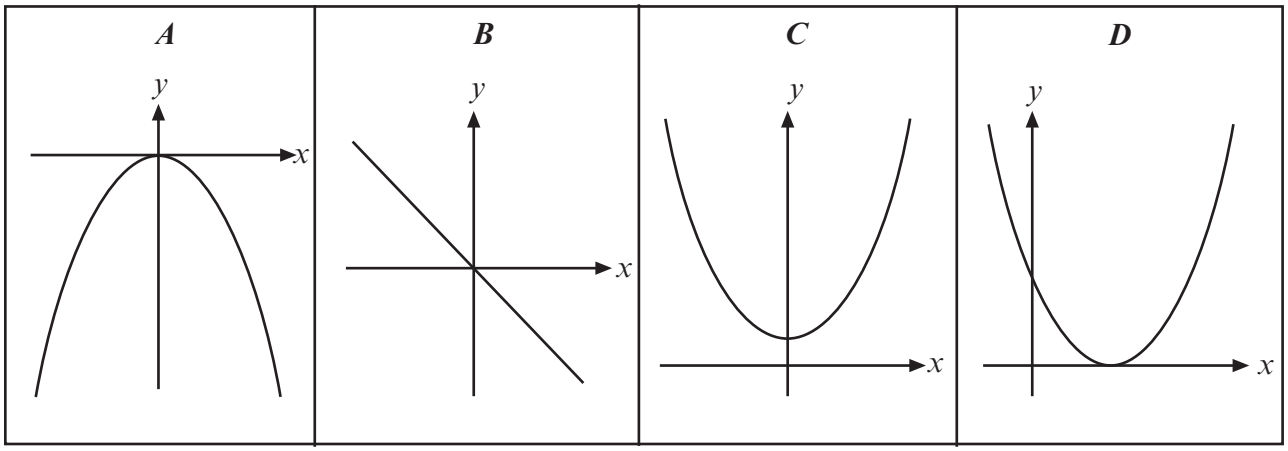
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Examiner only

*(c)* This is a sketch of $y = x^2$.



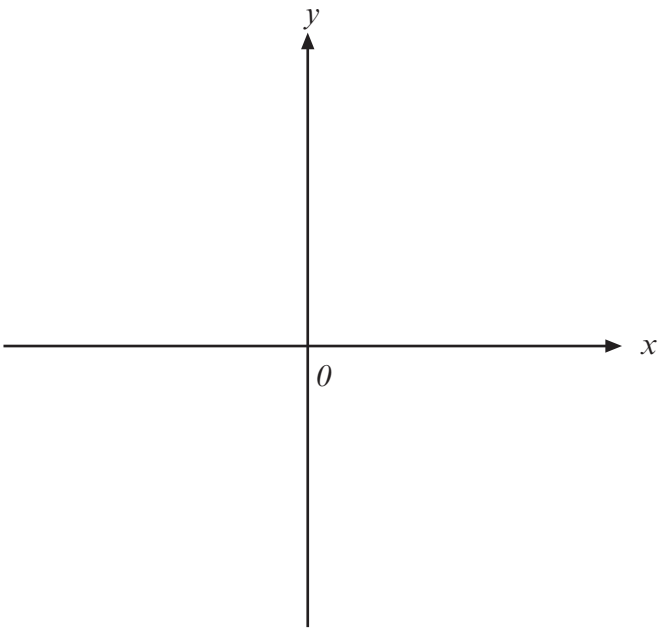

Write down which of the following sketches ***A***, ***B***, ***C*** or ***D*** could be a sketch of $y = x^2 + 3$.




Sketch .....

[1]

*(d)* Use the axes below to sketch the graph of $y = \frac{1}{x}$.




[2]

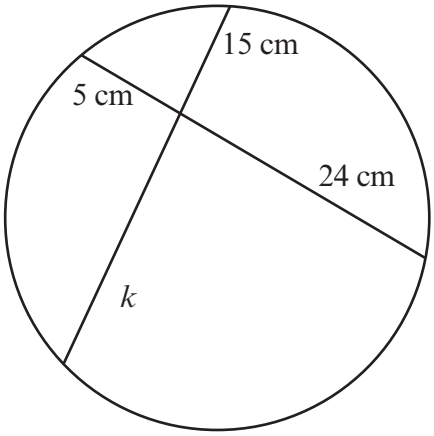


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**11.** The diagrams in this question are **not** drawn to scale.

*(a)* Find the length of the line marked $k$. Give a reason for your answer.




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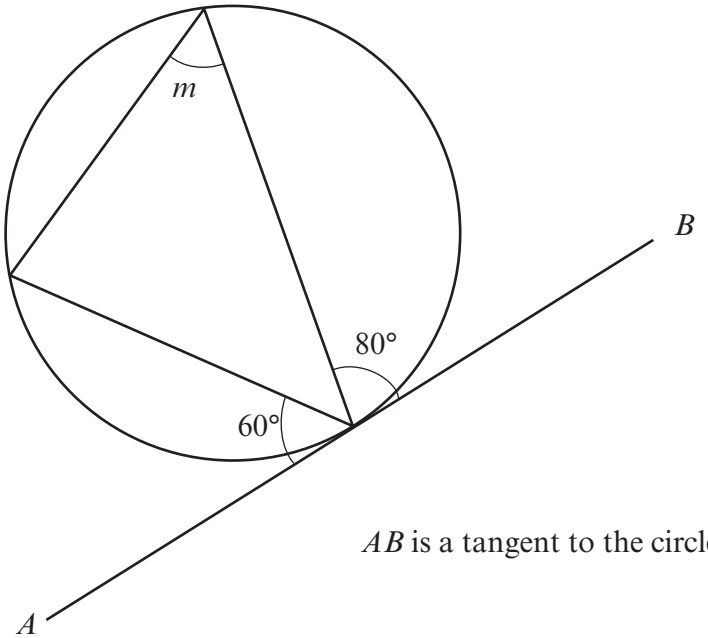
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$k =$ ..... cm [3]

*(b)* Find the size of the angle marked $m$. Give a reason for your answer.




$AB$ is a tangent to the circle.

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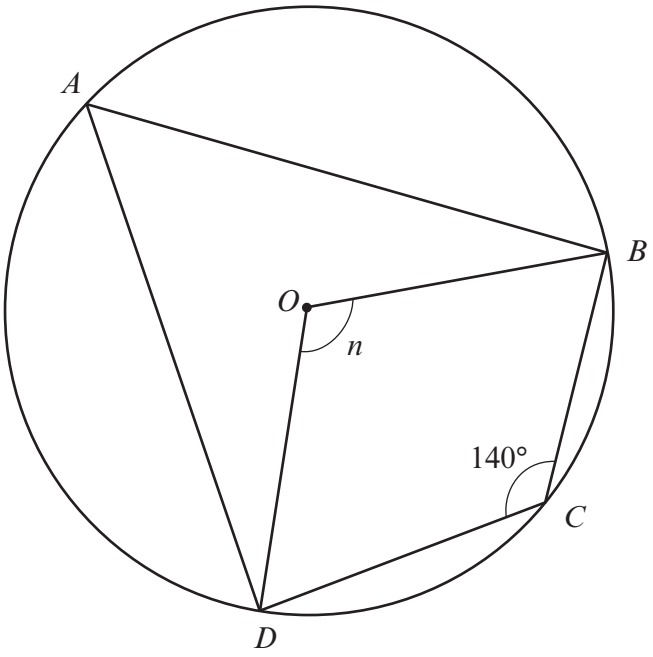
$m =$ ..... ° [2]



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Examiner only

*(c)* Find the size of the angle marked $n$. Give reasons for your answer.




The point $O$ is the centre of the circle.

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.....

$n =$ ..... °

[3]



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Examiner only

**12.** *(a)* Expand and simplify $(3x - 2)(5x + 7)$.

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[2]

*(b)* Factorise the expression $121d^2 - 25$.

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[2]

*(c)* Factorise the expression $20y^2 + 7y - 6$ and hence solve the equation $20y^2 + 7y - 6 = 0$.

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[3]

*(d)* Express $x^2 + 14x + 47$ in the form $(x + a)^2 + b$ where $a$ and $b$ are values to be found.

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[2]



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Examiner only

*(e)* Express the following as a single fraction in its simplest form.

$$\frac{8}{f-4} - \frac{5}{3f-2}.$$

[4]



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*(f)* Prove that $\frac{3x}{11} + \frac{x-3}{3} + \frac{4x+5}{2} \equiv \frac{172x+99}{66}$.

[4]



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Examiner only

**13.** Robbie sits a multiple choice examination.
For each question in the examination, four possible answers are given, only one of these answers is correct.
Robbie knows 80% of the facts tested in the examination and for each question based on these facts he selects the correct answer.
On all other questions he selects at random one of the four possible answers.

*(a)* A question is selected at random from the paper.
Calculate the probability that Robbie correctly answers the question.

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[4]

*(b)* The examination has 40 questions.
Calculate how many questions you might expect Robbie to answer correctly.

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[2]



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WJEC
CBAC

# GCSE MARKING SCHEME

## METHODS IN MATHEMATICS
## (LINKED PAIR PILOT)

## JANUARY 2011

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## INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2011 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.

**METHODS UNIT 1**
**FOUNDATION TIER**

| Methods in Mathematics<br>January 2011 Unit 1<br>Foundation Tier | Mark | Comments |
|---|---|---|
| 1. (a) 9608<br>fifteen million<br>(b) 135<br>27<br>63<br>6<br>(c) 10,11,20,30<br><br><br>(d) 850 | B1<br>B1<br>B1<br>B1<br>B1<br>B1<br>B2<br><br><br>B1<br>9 | <br>Accept 15 million<br><br><br><br><br>B1 for 2 or 3 correct answers with no incorrect factors of 24, or B1 for 4 correct with 1 incorrect<br> |
| 2. B<br>D<br>A<br>C<br>E | B1<br>B1<br>B1<br>B1<br>B1<br>5 | |
| 3. (a) A(3,2) plotted<br>B(-3,-4) plotted<br>(b) ( 0, -1 ) | B1<br>B1<br>B1<br>3 | Reverse coordinates no marks<br><br>FT for A and B in their diagram |
| 4. (a) A at 0<br>(b) B at or near $^1/_3$<br>(c) $^1/_{200}$<br>(d) 1 - x | B1<br>B1<br>B1<br>B1<br>4 | |
| 5. (a) For 2 correct in a form which allows comparison.<br>For all 3 correct in a form which allows comparison<br>¾, 70/100, 0.6<br>(b) total ticket cost (£)18.4(0)<br>Each ticket 18.4(0) ÷ 4<br>= (£)4.6(0)<br>total from friends = (£)13.8(0) | B1<br><br>B1<br><br>B1<br>B1<br>M1<br>A1<br>A1<br><br>7 | <br><br><br><br>CAO<br><br>FT their 18.4(0)<br><br>FT their correct evaluation of 3 × their 4.6(0) or 18.40 – 4.60 |
| 6. (a) 33<br>(b) 30<br>Subtract three (from previous term)<br>(c) (i) 68<br>(ii) 7<br>(d) (31 – 7) × 4<br>= 16 | B1<br>B1<br>B1<br><br>B1<br>B1<br>M1<br>A1<br>7 | <br><br>Accept subtract 3 (from previous term). B0 for -3. |



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| Methods in Mathematics<br>January 2011 Unit 1<br>Foundation Tier | Mark | Comments |
|---|---|---|
| 7. (a) $x = 46(^{\circ})$<br>(b) $360 - 110 - 153 - 54$<br>$= 43$<br>$m = 137\ (^{\circ})$<br>(c) 90 (rectangle) + (180 – 30 – 90=60)<br>$= 150(^{\circ})$<br>(d) sight of $60(^{\circ})$<br>Attempt to use $180 - 72 - 60$<br>$= 48\ (^{\circ})$ | B1<br>M1<br>A1<br>B1<br>E2<br><br>S1<br>M1<br>A1<br>9 | <br><br><br>180 – 'their 43'<br>E2 for full explanation, E1 for partial.<br><br><br><br><br> |
| 8. (a) $21y$<br>$13x + 18$<br><br>(b) $a = 11$<br>(c) $95x$(pence) | B1<br>B2<br><br>B1<br>B1<br>5 | <br>B1 for $13x$. B1 for +18. Penalise further work -1 if B2 awarded.<br><br><br> |
| 9. (a) 9 11 12<br>8 10 11<br>7 9 10<br>(b) $^{13}/_{24}$<br><br>(c) Sight of $^{3}/_{24}$<br>$^{3}/_{24} \times 480$<br>60 | B2<br><br><br><br>B2<br><br>B1<br>M1<br>A1<br>7 | B1 for correct row or column<br><br><br><br>B1 for denominator 24 or B1 for numerator 13 in a fraction less than 1.<br>FT their table<br>FT 'their $^{3}/_{24}$' |
| 10. 2 more hexagons drawn with at least one that meets given hexagon.<br>At least 4 hexagons tessellating correctly.<br>Yes & reason given, e.g. shapes fit together with no gaps | M1<br><br>A1<br>E1<br><br>3 | <br><br><br> |
| 11. a = 55<br>b = 55<br>c = 85<br>d = 85 | B1<br>B1<br>B1<br>B1<br>4 | NO FT in this question<br><br><br> |
| 12. (a) The numbers 1 to 8 placed correctly<br><br><br>(b) $^{2}/_{8}$ ($=^{1}/_{4}$)<br><br>$^{1}/_{8}$ | B2<br><br><br>B1<br><br>B1<br><br><br>4 | B1 for 6 of the 8 placed correctly, hence up to 2 omitted or incorrectly positioned<br>FT from their Venn diagram. Ignore incorrect cancelling<br>FT from their Venn diagram. Ignore incorrect cancelling<br>*Penalise incorrect notation once only, -1* |



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| Methods in Mathematics<br>January 2011 Unit 1<br>Foundation Tier | Mark | Comments |
|---|---|---|
| 13. Strategy to start to find factors, e.g. at least 2 for one of the square numbers given | S1 | |
| Complete set of factors for a sq. number other than 1, seen or implied | B1 | E.g. 1, 2 and 4 or 1, 3 and 9 (or 1, 5, 25)<br>E.g. 1, 2, 4, 8, 16 (or 1, 2, 3, 4, 6, 9, 12, 18, 36) |
| Complete set of factors for a sq. number with more than 3 factors, seen or implied | B1 | *SC1 if neither B1 award due to forgetting 1 and itself as factors* |
| Conclusion from working that the square numbers (given) have an odd number of factors | E1 | Not FT, correct conclusion needed, i.e. odd number of factors |
| A complete set of factors for a square number >16 | B1 | |
| Explanation of why, e.g. "middle factor used twice" or "pairs of factors but also the square root of the number' | E1 | |
| Must be relevant work for the problem given, otherwise QWC0<br>However, for an incorrect strategy but well expressed, then maximum QWC1<br><br>Look for<br>• relevance<br>• spelling<br>• clarity of text explanations,<br>• the use of notation (watch for the use '=' being appropriate)<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer | Q<br>W<br>C<br>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.<br><br>QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| | 8 | |



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| Methods in Mathematics<br>January 2011 Unit 1<br>Foundation Tier | Mark | Comments |
|---|---|---|
| 14. (a) Method of finding a prime factor<br><br>2, 2, 3, 3, 7 and 7<br>$2^2 \times 3^2 \times 7^2$<br>(b) 6n + 7 | M1<br><br>A1<br>B1<br>B2<br><br>5 | Need to see two correct prime factors before an error<br>Ignore ones<br>FT provided at least one index>1<br>B1 for 6n + … |



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# METHODS UNIT 1
# HIGHER TIER

| Methods Unit 1 January 2011 Higher Tier<br>Mark scheme | | Post Conference |
|---|---|---|
| 1.(a)(i) 9( 5 - -3) / 3<br>= 72/3 or 3×8<br>= 24<br>(ii) 9<br>(b) q = u – 5t<br>(c) 7(p + 3)<br>(d) -3f<br>(e) 6x + 12 | M1<br>M1<br>A1<br>B1<br>B1<br>B1<br>B1<br>B1<br>8 | Allow an error in signs, maybe implied by an answer of 18/3<br>Correct substitution, with one correct step in evaluation<br>CAO. (*M1 M0 A0 is awarded for an answer of 18/3 or 6)* |
| 2. a = 55<br>b = 55<br>c = 85<br>d = 85 | B1<br>B1<br>B1<br>B1<br>4 | NO FT in this question |
| 3.(a) (i) The numbers 1 to 8 placed correctly<br>(ii) 2/8 (=1/4)<br>1/8<br>(b) (15+20) / (50+50)<br>= 35/100<br>E.G. "Improved by more throws" | B2<br>B1<br>B1<br>M1<br>A1<br>E1<br>7 | B1 for 6 of the 8 placed correctly,<br>hence up to 2 omitted or incorrectly positioned<br>FT from their Venn diagram. Ignore incorrect cancelling<br>FT from their Venn diagram. Ignore incorrect cancelling<br>*Penalise incorrect notation once only, -1*<br>Ignore incorrect cancelling<br>Allow SC1 for an answer of 35/100 from 15/50 + 20/50,<br>i.e. correct answer from incorrect notation.<br>35/100 without working is M1 A1,<br>35/100 from 15/50 and 20/50 is M1 A1 |
| 4.(a) 1760/8<br>= 220<br>Ruth (£) 440 and Joanne (£)1100<br>(b) 0.25 and 0.3 entered as terminating decimals<br>$1/9 = 0.11(111\ldots.) \text{ or } 0.\dot{1}$<br>$5/6 = 0.83(333..) \text{ or } 0.8\dot{3}$<br>0.11(111…) and 0.83(333…) entered as recurring decimals | M1<br>A1<br>A2<br>B1<br>B1<br>B1<br>B1<br>8 | A1 for either correct. If answers reversed A1<br><u>Must</u> be written as decimals<br>Accept as fraction notation |



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| Methods Unit 1 January 2011 Higher Tier<br>Mark scheme | | Post Conference |
|---|---|---|
| 5. Strategy to start to find factors, e.g. at least 2 for one of the square numbers given | S1 | |
| Complete set of factors for a sq. number other than 1, seen or implied | B1 | E.g. 1, 2 and 4 or 1, 3 and 9 (or 1, 5, 25)<br>E.g. 1, 2, 4, 8, 16 (or 1, 2, 3, 4, 6, 9, 12, 18, 36) |
| Complete set of factors for a sq. number with more than 3 factors, seen or implied | B1 | *SC1 if neither B1 award due to forgetting 1 and itself as factors* |
| Conclusion from working that the square numbers (given) have an odd number of factors | E1 | Not FT, correct conclusion needed, i.e. odd number of factors |
| A complete set of factors for a square number >16 | B1 | |
| Explanation of why, e.g. "middle factor used twice" or "pairs of factors but also the square root of the number' | E1 | |
| Must be relevant work for the problem given, otherwise QWC0<br>However, for an incorrect strategy but well expressed, then maximum QWC1 | Q<br>W<br>C<br>2 | QWC2 Presents relevant material in a coherent and logical manner, using<br>acceptable mathematical form, and with few if any errors in spelling, punctuation and grammar. |
| Look for<br>• relevance<br>• spelling<br>• clarity of text explanations,<br>• the use of notation (watch for the use '=' being appropriate)<br><br>QWC2: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>AND<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer<br><br>QWC1: Candidates will be expected to<br>• present work clearly, with words explaining process or steps<br>OR<br>• make few if any mistakes in mathematical form, spelling, punctuation and grammar in their final answer | 8 | QWC1 Presents relevant material in a coherent and logical manner but with some errors in use of mathematical form, spelling, punctuation or grammar<br>OR<br>evident weaknesses in organisation of material but using acceptable mathematical form, with few if any errors in spelling, punctuation and grammar.<br><br>QWC0 Evident weaknesses in organisation of material, and errors in use of mathematical form, spelling, punctuation or grammar. |
| 6. Initial strategy, e.g. an appropriate diagram or considering 360° or 168° | S1 | |
| 360/12 | M1 | OR M1 for angle at centre is $180 - 2\times168/2$ followed by 360/12 |
| = 30 (or equivalent) | A1 | |
| Explanation,<br>e.g. repeated 30 times, 30 sides, 30 angles, regular polygon | B1 | FT their findings. This must be an interpretation, not implied |
| Conclusion, "Yes" it will from suitable working | B1<br>5 | FT Yes or No from logic of working |
| 7. (a) Method of finding a prime factor<br>2, 2, 3, 3, 7 and 7 | M1<br>A1 | Need to see two correct prime factors before an error<br>Ignore ones |
| $2^2\times3^2\times7^2$ | B1 | FT provided at least one index>1 |
| (b) 6n + 7 | B2 | B1 for 6n + … |
| (c) $n^2$ + …<br>$n^2$ + 1 | M1<br>A1<br>7 | Second difference of 2 |
| 8. (a) 0.3, 0.4, 0.4 and 0.6 on the correct branches | B2 | B1 for one correct entry |
| (b) $0.7 \times 0.6$ | M1 | |
| = 0.42 | A1 | |
| (c) Walking to work, bus home | B1 | FT most unlikely from their tree. Accept sight of $0.3 \times 0.4$ or 0.12 |
| Statement, e.g. '$0.3 \times 0.4$ (= 0.12) which is the smallest (probability)' or 'only 0.12' | E1<br>6 | FT most unlikely probability <1 from their tree.<br>For E1 accept they are the smaller (or smallest) probabilities (in each case). $0.3 \times 0.4$ or 0.12 without a statement is E0 |



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| Methods Unit 1 January 2011 Higher Tier<br>Mark scheme | | Post Conference |
|---|---|---|
| 9.(a) 5<br>(b) $9.3 \times 10^{-5}$<br>(c) $4 \times 10^{7}$<br>(d) 2 | B1<br>B1<br>B2<br>B3<br>7 | <br><br>B1 for 40 000 000 or …. $\times 10^{7}$<br>B2 for sight of $4^{-2} = 1/16$ and $8^{1/3} = 2$ OR B1 for either of these |
| 10. (a) Attempt substitution of one value of x between 0 & 4<br>Two correct points on the line given (or plotted)<br>Correct straight line drawn<br>(b) For rearrangement y = -6x/3 +8/3 or other strategy to find m<br>Gradient of given line is -2 (or -6/3)<br>Any equation equivalent to $y = -2x \pm c$ where $c \neq 8/3$<br>(c) C<br>(d) Appropriate sketch, in the two required quadrants | M1<br>A1<br>A1<br>M1<br>A1<br>A1<br>B1<br>B2<br>9 | <br><br>CAO *SC1 for a straight line with correct gradient of 5*<br><br>Do not award A1 if M1 awarded but rearrangement is incorrect<br>FT from their gradient provided M1 awarded<br><br>B1 for sketch correct in one quadrant |
| 11. (a) $k \times 15 = 5 \times 24$<br>$k = 8$ (cm)<br>Intersecting chords<br>(b) $m = 60°$<br>Alternate segment theorem<br>(c) Angle at A is 40°<br>$n = 80°$<br>Cyclic quadrilateral AND angle at the centre twice that at the circumference | M1<br>A1<br>E1<br>B1<br>E1<br>B1<br>B1<br>E1<br>8 | **All E marks are dependent on M1 or B1 mark in each section**<br>Accept "rectangle property of a circle"<br><br>Or similar description<br><br>FT 2×angle A<br>Or full description of an alternative method |
| 12.(a) $15x^2 + 21x - 10x - 14$<br>$= 15x^2 + 11x - 14$<br>(b) $(11d + 5)(11d - 5)$<br>(c) $(4y + 3)(5y - 2)$<br>-3/4 and 2/5<br>(d) $(x + 7)^2 - 2$<br>(e) Numerator $8(3f - 2) - 5(f - 4)$<br>Denominator $(f - 4)(3f - 2)$<br>$\frac{19f + 4}{(f - 4)(3f - 2)}$<br>(f) Attempt to use a common denominator<br>$3 \times 2 \times 3x + 22(x-3) + 3 \times 11(4x+5)$ ( /66)<br>$\frac{(18x+22x-66+132x+165)}{66}$ Convincing $\frac{172x + 99}{66}$ | B1<br>B1<br>B2<br>B2<br>B1<br>B2<br>M1<br>M1<br>A2<br><br><br>M1<br>A1<br>A2<br>17 | <br>FT from one error in the 4 terms<br>B1 for (11d … 5)(11d … 5)<br>B1 for (4y - 3)(5y + 2) or split mid term and 1st step factor<br>FT from a pair of brackets<br>B1 for a=7 and B1 for b=-2<br><br><br>FT 1 error to allow A1 or for incorrect expansion of the denominator. If A2, penalise further incorrect work -1<br>*SC1 for sight of 19f + 4 if no other marks awarded*<br>Or × both sides by 66<br><br>A1 for 1 slip or no conclusion to the identity |
| 13.(a) 0.8 x 1 or equivalent, AND an attempt to consider the other 20%<br>0.2 x 0.25 or equivalent<br>Showing the need to add (0.8 + 0.05)<br>0.85 or equivalent<br>(b)Probability from part (a)×40<br>34 | M1<br>M1<br>M1<br>A1<br>M1<br>A1<br>6 | Not for sight of 80% alone<br><br>Method considers 80% + 25% of 1/4<br><br>FT from part (a), apart from 80% giving an answer of 32, this is M0 A0<br>FT from part (a), apart from 80% |



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