EDEXCEL GCSE METHODS IN MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT 1 HIGHER TIER 5MM1H PAPERS

STEMUP

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Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Tuesday 13 June 2017 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

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- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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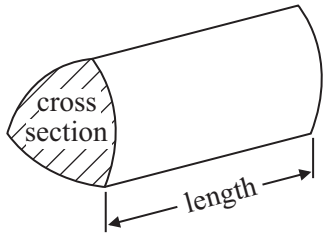
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GCSE Mathematics 2MM01

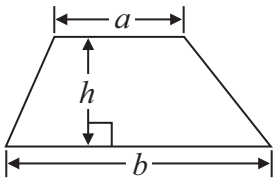
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

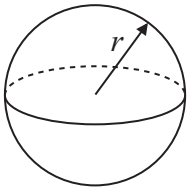


Area of trapezium = $\frac{1}{2}(a + b)h$



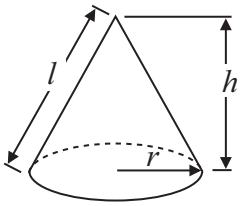
Volume of sphere = $\frac{4}{3}\pi r^3$

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

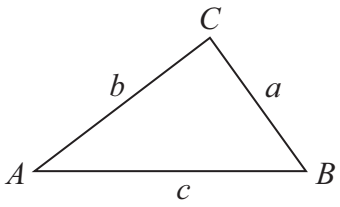


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



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

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

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 = $\frac{1}{2}ab \sin C$

DO NOT WRITE IN THIS AREA
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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 There are 20 counters in a box.

6 of the counters are red.
5 of the counters are green.
The rest of the counters are blue.

Lethna takes at random one of the counters from the box.

Find the probability that she takes

(i) a blue counter,

.....

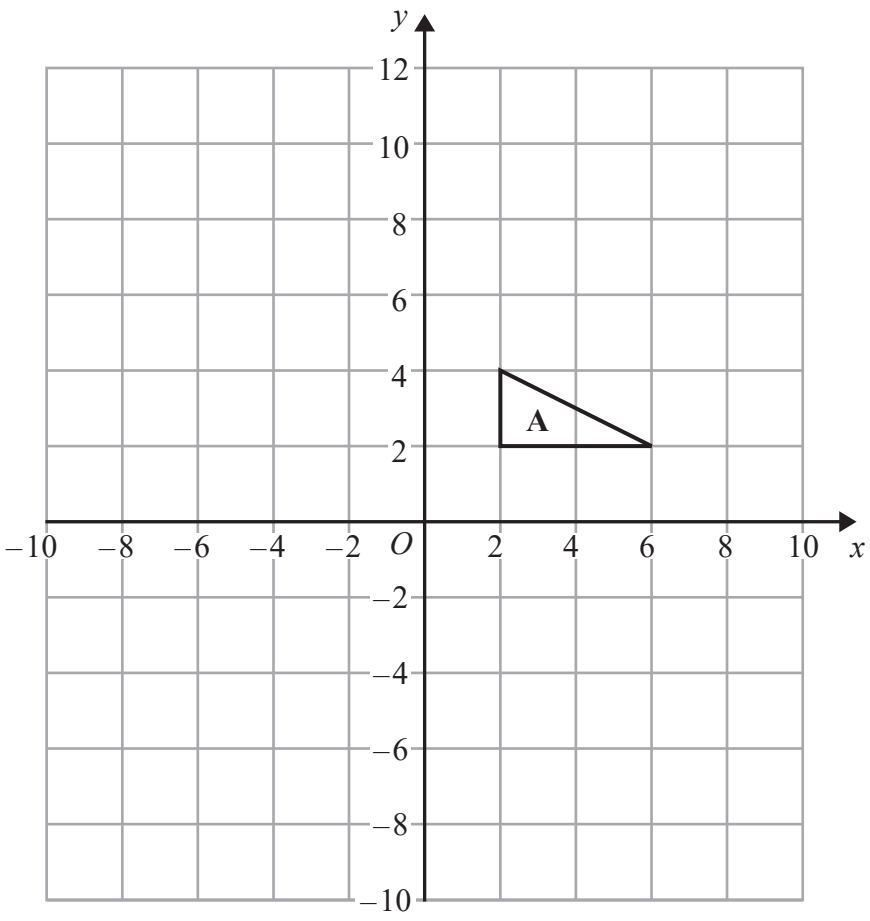
(ii) a counter that is **not** green.

.....

(Total for Question 1 is 4 marks)

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2

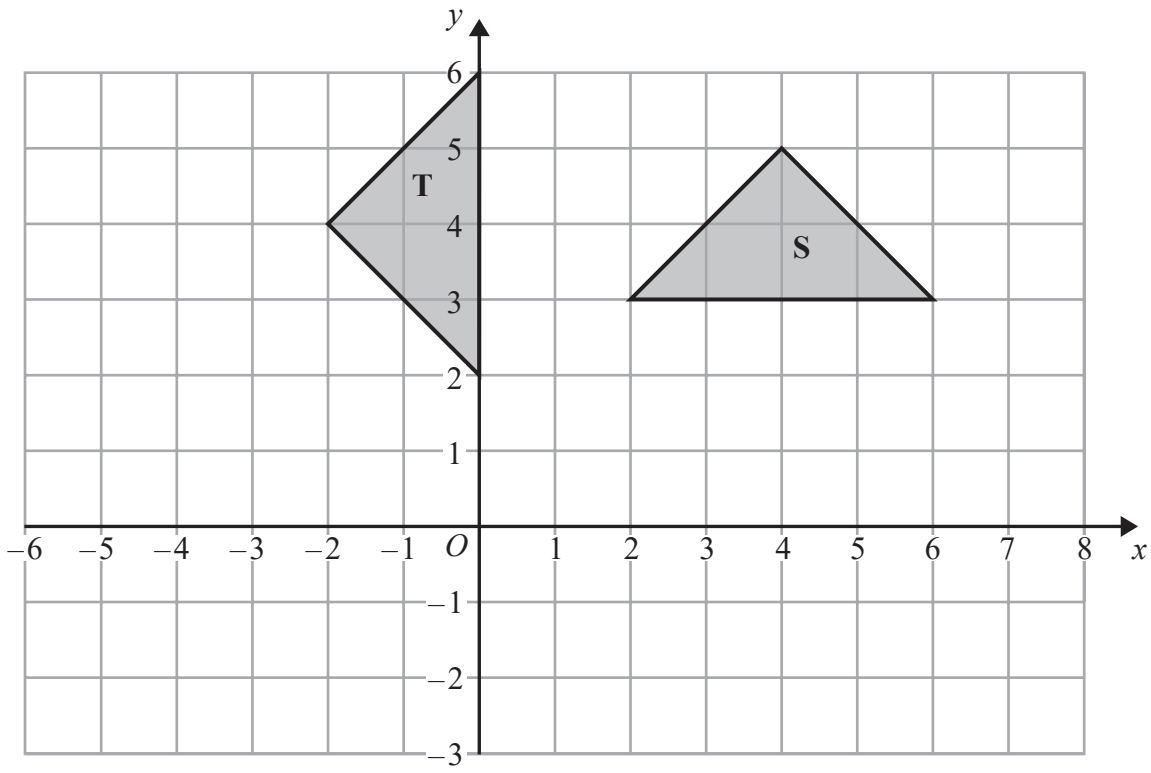


(a) Enlarge triangle **A** with scale factor 2 and centre (2, 2).

(2)

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Shape **S** can be transformed to shape **T** by the translation $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ followed by a rotation.

(b) Describe the rotation.

.....

.....

(3)

(Total for Question 2 is 5 marks)

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3

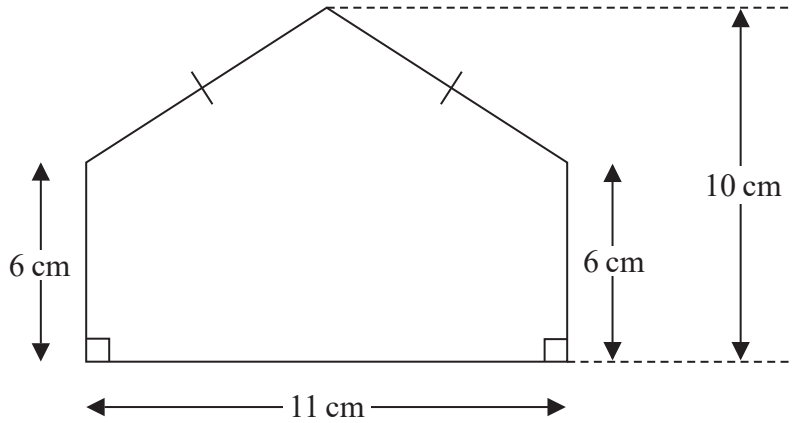


Diagram **NOT** accurately drawn

Work out the area of the shape.

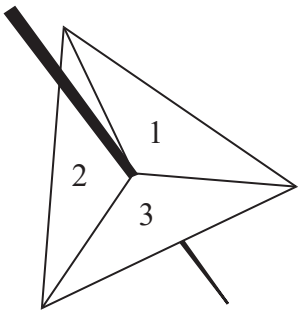
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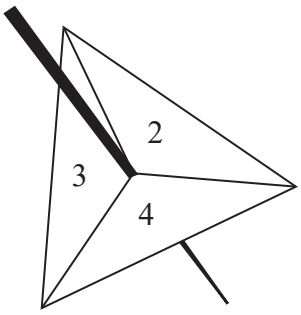
(Total for Question 3 is 5 marks)

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4 Michelle has two fair 3-sided spinners.





Michelle spins each spinner once.
Each spinner lands on a number.

Michelle multiplies these two numbers together to get her score.

(i) Work out the probability that Michelle's score is 4

.....

(ii) Work out the probability that Michelle's score is at least 8

.....

(Total for Question 4 is 5 marks)

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***5**

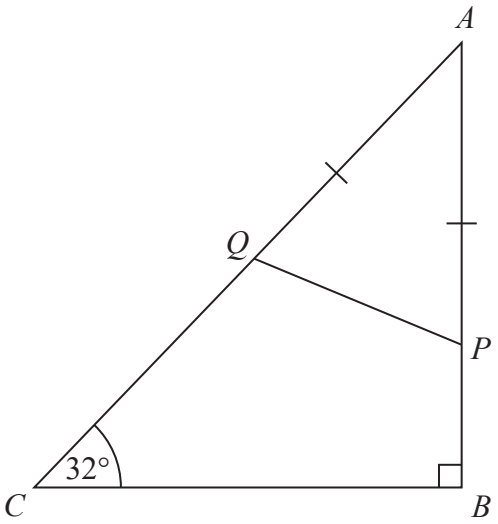


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
Angle *ABC* = 90°
Angle *ACB* = 32°

P is a point on *AB*.
Q is a point on *AC*.
AP = *AQ*

Work out the size of angle *APQ*.
Give reasons for each stage of your working.

(Total for Question 5 is 5 marks)

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6 Given that $372 \times 68 = 25\,296$

find the value of

(a) 3720×68

.....

(1)

(b) 3.72×0.68

.....

(1)

(c) $252.96 \div 34$

.....

(2)

(Total for Question 6 is 4 marks)

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7 Here is a rectangle.

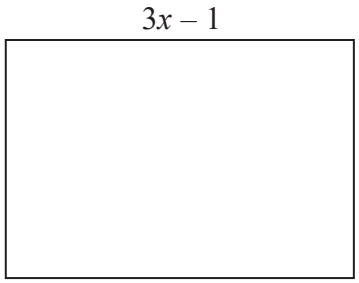


Diagram **NOT** accurately drawn

All measurements are in centimetres.

The perimeter of the rectangle is 39 cm.

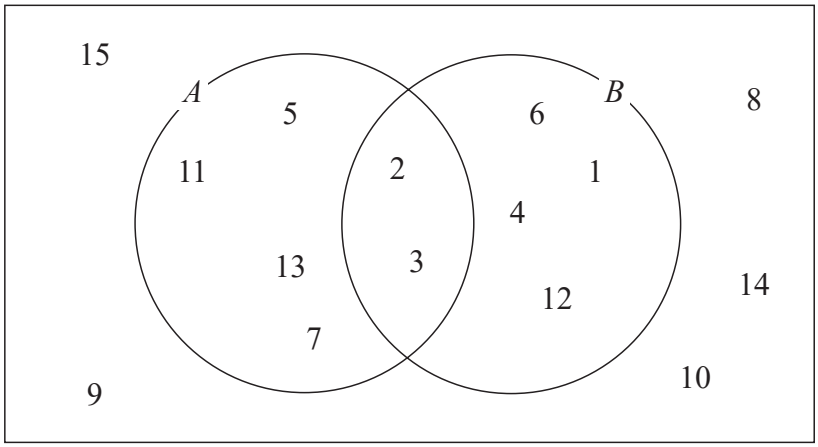
Work out the area of the rectangle.
You must show all your working.

..... cm^2

(Total for Question 7 is 5 marks)

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8 The Venn diagram shows the numbers from 1 to 15



(i) Find P($A \cap B$)

.....

(ii) Find P($A \cup B$)

.....

(iii) Find P(B')

.....

(Total for Question 8 is 5 marks)

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9 Work out $4\frac{3}{8} \div 5\frac{1}{4}$

Give your answer as a fraction in its simplest form.

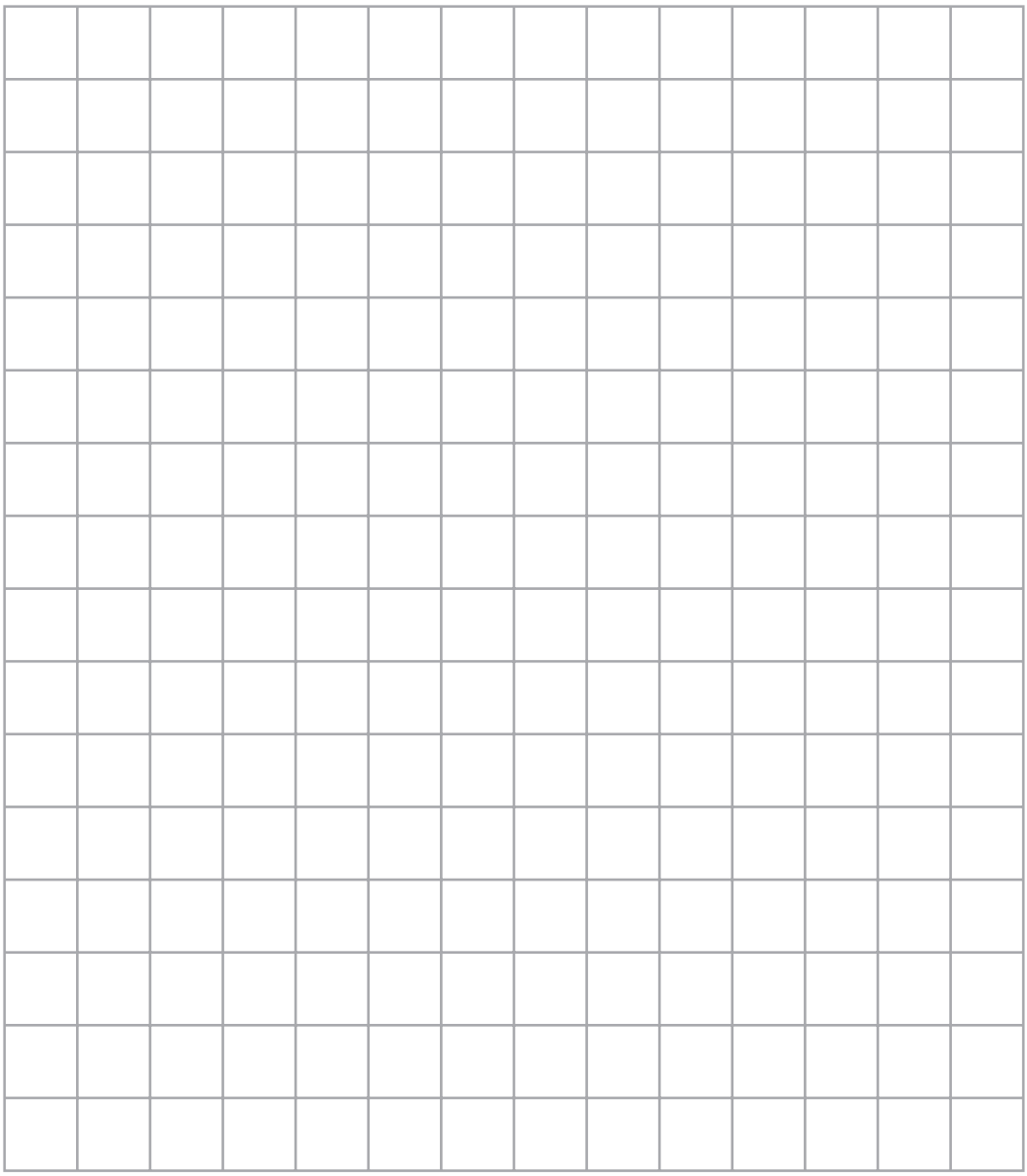
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(Total for Question 9 is 3 marks)

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10 On the grid, draw the graph of $y = 3x + 2$ for values of x from -2 to 2



(Total for Question 10 is 4 marks)

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11 (a) Write 140 as a product of its prime factors.

.....

(2)

(b) Find the Highest Common Factor (HCF) of 140 and 110

.....

(2)

(c) Find the Lowest Common Multiple (LCM) of 140 and 110

.....

(2)

(Total for Question 11 is 6 marks)

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12 The nth term of a quadratic sequence is $n^2 - 4n + 5$

(a) Find the third term of this sequence.

.....

(2)

Here are the first five terms of a different quadratic sequence.

5 11 21 35 53

(b) Find, in terms of n, an expression for the nth term of this sequence.

.....

(3)

(Total for Question 12 is 5 marks)

13 (a) Write the number 28 000 000 in standard form.

.....

(1)

(b) Write 8.32×10^{-4} as an ordinary number.

.....

(1)

(c) Work out $(1.2 \times 10^4) + (2.5 \times 10^3)$
Give your answer in standard form.

.....

(2)

(Total for Question 13 is 4 marks)

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14

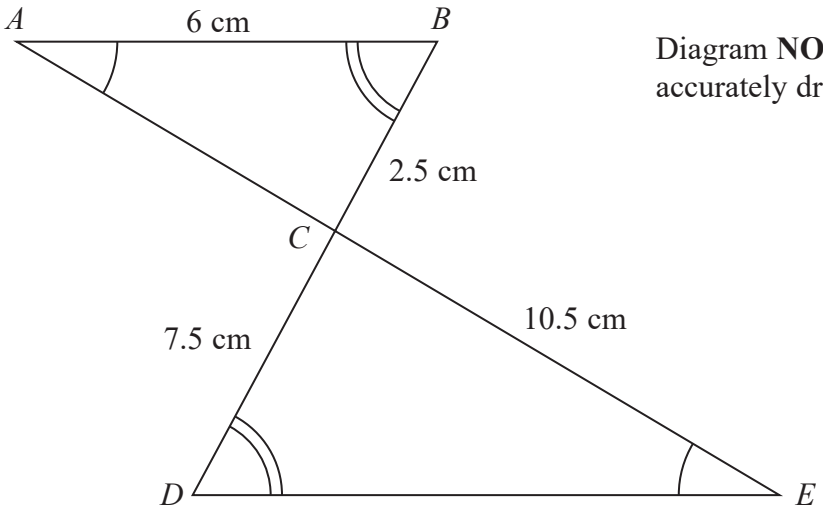


Diagram **NOT** accurately drawn

Triangles *ABC* and *EDC* are similar.

ACE and *BCD* are straight lines.

Angle *BAC* = angle *DEC*
Angle *CBA* = angle *CDE*

AB = 6 cm, *BC* = 2.5 cm, *CD* = 7.5 cm and *CE* = 10.5 cm.

(a) Work out the length of *DE*.

.....cm

(2)

(b) Work out the length of *AE*.

.....cm

(2)

(Total for Question 14 is 4 marks)

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15 (a) Solve $9 = 4(c - 2)$

$c =$ .....

(3)

(b) Solve $x^2 - x - 12 = 0$

.....

(3)

(Total for Question 15 is 6 marks)

16 (a) Find the value of $36^{\frac{1}{2}}$

.....

(1)

(b) Find the value of 4^{-2}

.....

(1)

(c) Write down the value of 10^0

.....

(1)

(Total for Question 16 is 3 marks)

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17 (a) Factorise $9p^2 - 1$

.....

(1)

(b) Factorise fully $4(x + y)^2 - 2(x + y)$

.....

(2)

(c) Expand and simplify $(3a - 5b)(2a + 3b)$

.....

(2)

(d) Simplify fully $\dfrac{2w - 1}{2w^2 - 9w + 4}$

.....

(2)

(Total for Question 17 is 7 marks)

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***18**

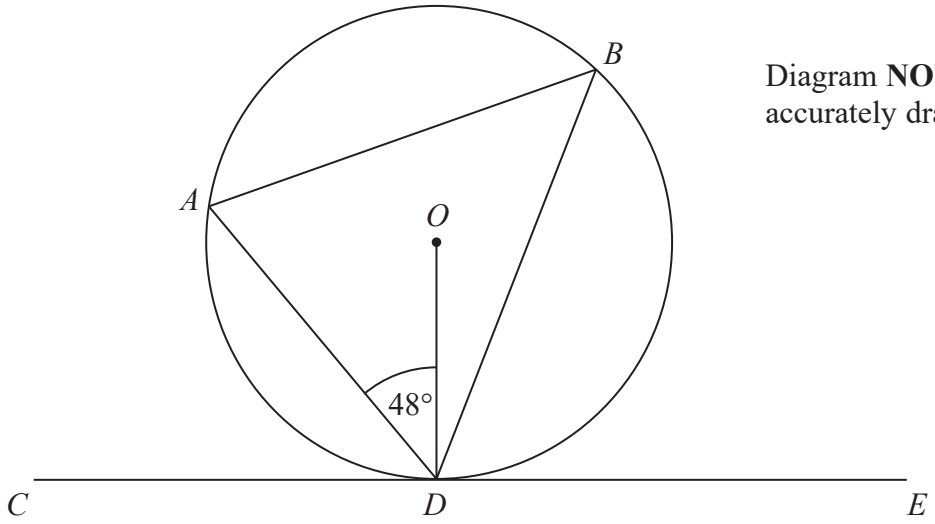


Diagram **NOT** accurately drawn

A, *B* and *D* are points on a circle, centre *O*.
CDE is a tangent to the circle.
Angle *ADO* = 48°

Work out the size of angle *ABD*.
Give reasons for your answer.

(Total for Question 18 is 4 marks)

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***19** Given that p and r are two consecutive even numbers, prove algebraically that

$\frac{p^2 + r^2}{2}$ is always 1 more than $\left(\frac{p + r}{2}\right)^2$

(Total for Question 19 is 5 marks)

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20 There are only 5 black counters, 4 red counters and 2 white counters in a bag.

Charlie takes at random two counters from the bag.

Work out the probability that Charlie takes at least one red counter.

.....

(Total for Question 20 is 4 marks)

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21 Write $\frac{1}{1-x} - \frac{2}{1+x}$

as a single fraction in its simplest form.

.....

(Total for Question 21 is 3 marks)

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22

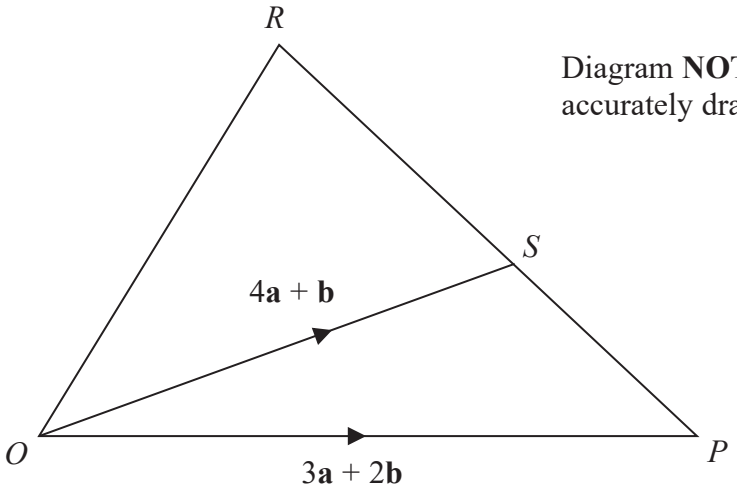


Diagram **NOT** accurately drawn

OPR is a triangle.
PSR is a straight line.

$\overrightarrow{OP} = 3\mathbf{a} + 2\mathbf{b}$
$\overrightarrow{OS} = 4\mathbf{a} + \mathbf{b}$

(a) Show that $\overrightarrow{SP} = \mathbf{b} - \mathbf{a}$

(1)

$\overrightarrow{OR} = 7\mathbf{a} - 2\mathbf{b}$

(b) Find the ratio $RS : SP$ in its simplest form.

.....

(3)

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

END

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Monday 10 November 2014 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

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Total Marks

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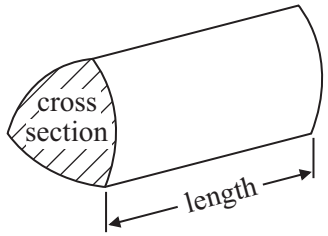
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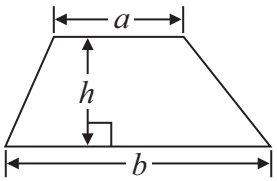
Formulae: Higher Tier

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Volume of prism = area of cross section × length

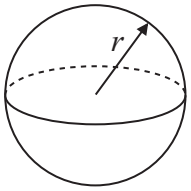


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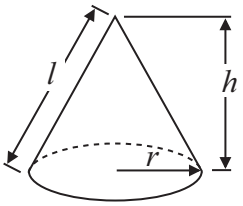
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Surface area of sphere = $4\pi r^2$

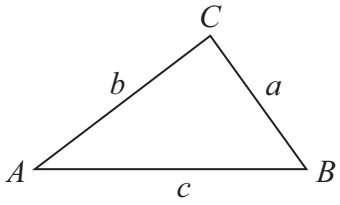


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



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

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

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 = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 (a) Work out 24.5×1.8

.....

(3)

(b) Work out $46.08 \div 1.2$

.....

(3)

(Total for Question 1 is 6 marks)

2 Using the information that $15.6 \times 28 = 436.8$

(i) write down the value of 156×2.8

.....

(ii) find the value of 15.6×29

.....

(Total for Question 2 is 2 marks)

***3**

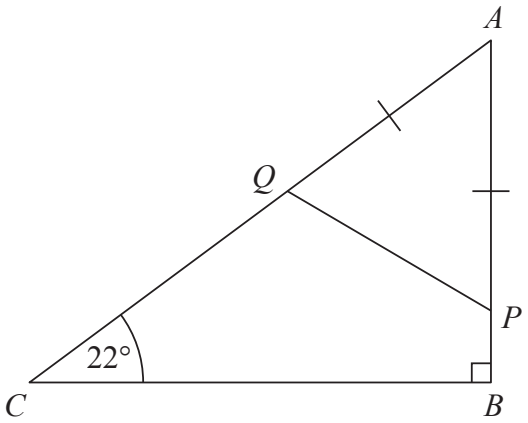


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.
Angle *B* = 90°
Angle *ACB* = 22°

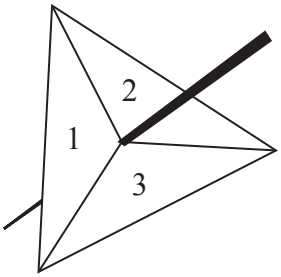
P is a point on *AB*.
Q is a point on *AC*.
AP = *AQ*.

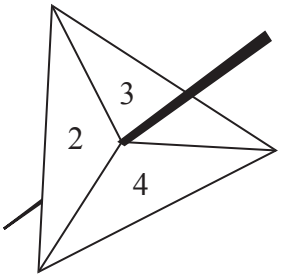
Work out the size of angle *APQ*.
Give reasons for each stage of your working.

(Total for Question 3 is 5 marks)

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4 Here are two fair 3-sided spinners.





Lottie spins each of the spinners once.
Each spinner lands on a number.
Lottie multiplies the two numbers together to get the score.

(i) Find the probability that the score is 12

(ii) Find the probability that the score is less than 8

(Total for Question 4 is 5 marks)

5 There are 30 children in a class.

21 of the children sing in the choir.
10 of the children play in the band.
6 of the children sing in the choir **and** play in the band.

(a) Draw a Venn diagram to show this information.

(4)

One of the children from the class is chosen at random.

(b) Work out the probability that this child plays in the band, but does **not** sing in the choir.

(2)

(Total for Question 5 is 6 marks)

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6 (a) Simplify $m \times m \times m \times m$

.....

(1)

(b) Simplify $p^9 \div p^3$

.....

(1)

(c) Simplify $4x^2y \times 7x^3y^2$

.....

(2)

(d) Expand and simplify $3(x - 2y) + 5(x + y)$

.....

(2)

(Total for Question 6 is 6 marks)

7 There are 50 counters in a bag.

The counters are blue or yellow or black or white.
A counter is taken at random from the bag.

The table shows each of the probabilities that the counter will be blue or black or white.

Colour	blue	yellow	black	white
Probability	0.4		0.3	0.16

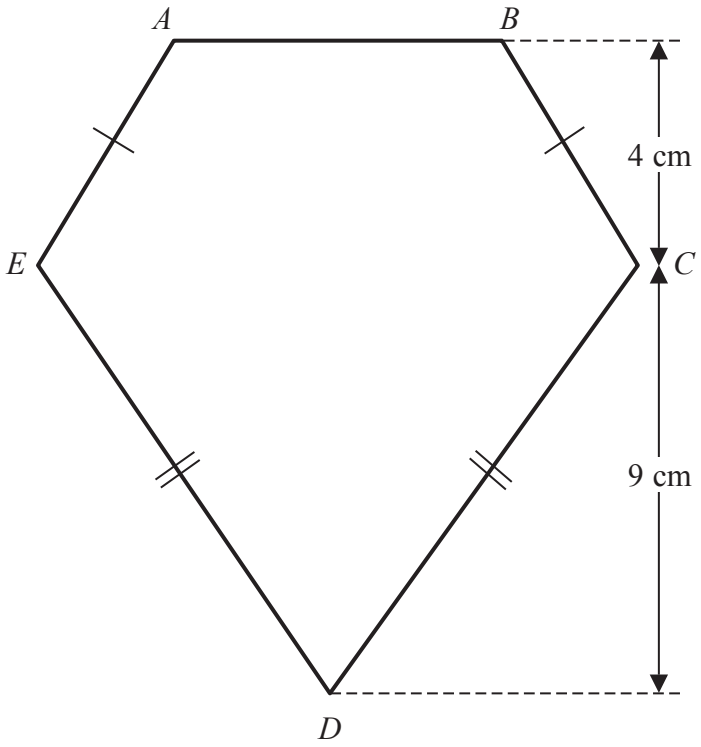
Work out the number of yellow counters in the bag.

.....

(Total for Question 7 is 4 marks)

8 The diagram shows a pentagon *ABCDE*.
The pentagon has one line of symmetry.

Diagram **NOT** accurately drawn



In *ABCDE*,

AB = 6 cm
EC = 10 cm

AB is parallel to *EC*

Work out the area of the pentagon *ABCDE*.

.....

(Total for Question 8 is 5 marks)

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***9** *PQRS* is a square.

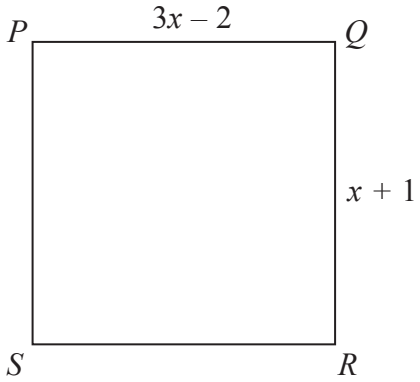


Diagram **NOT** accurately drawn

All measurements are in centimetres.

Show that the perimeter of the square is 10 cm.

(Total for Question 9 is 4 marks)

10 The diagram shows a cuboid on a 3-D grid.

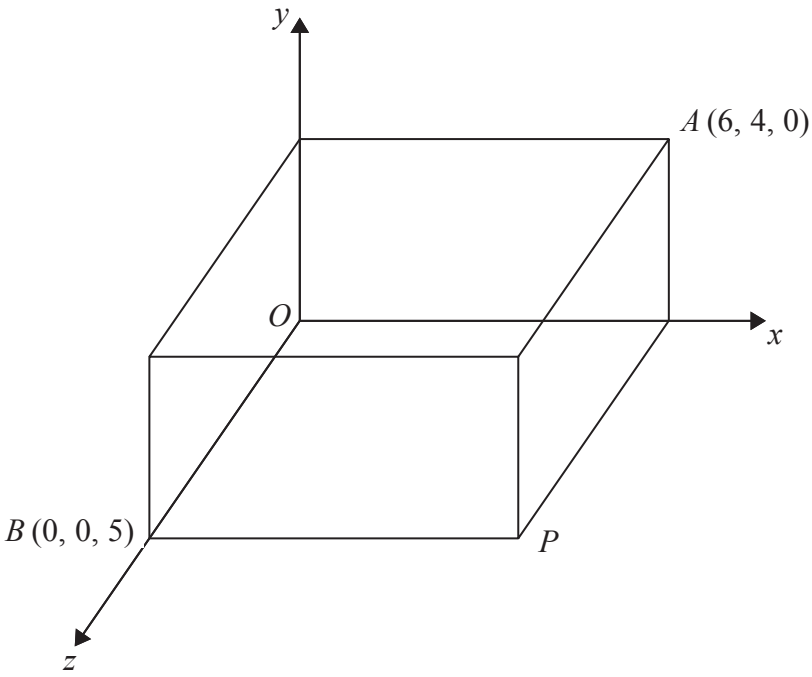


Diagram **NOT** accurately drawn

The point A has coordinates (6, 4, 0).

The point B has coordinates (0, 0, 5).

(a) Write down the coordinates of the point P.

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

(1)

(b) Find the coordinates of the midpoint of AB.

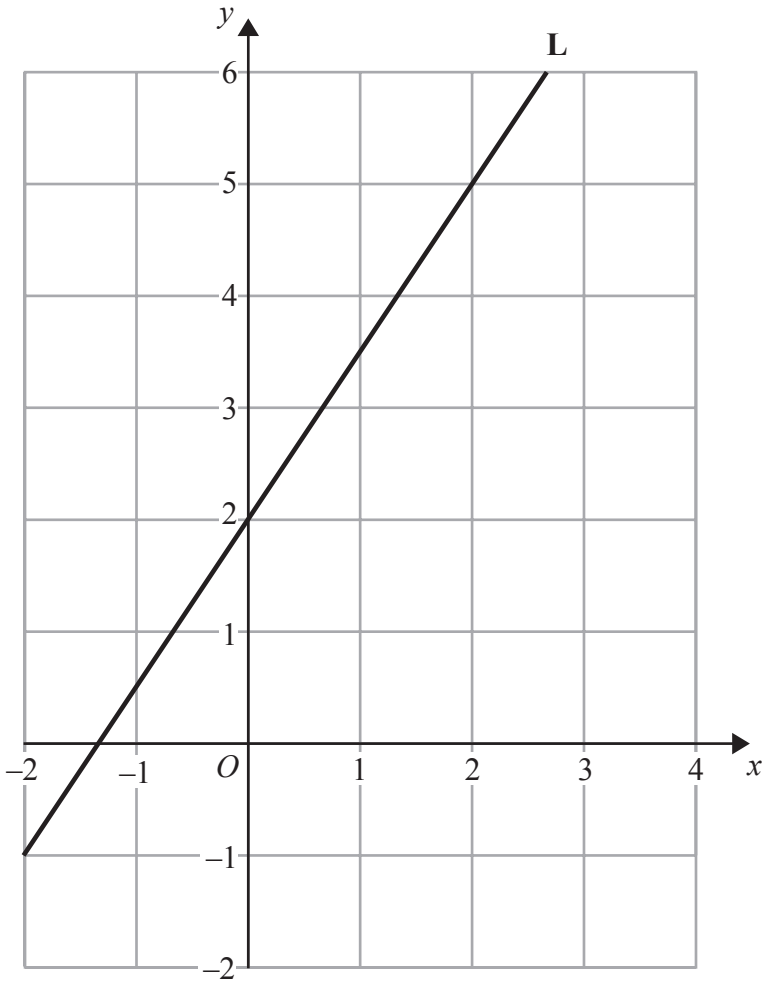
(....., ..., ...)

(2)

(Total for Question 10 is 3 marks)

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***11** The diagram shows a straight line **L** drawn on a grid.

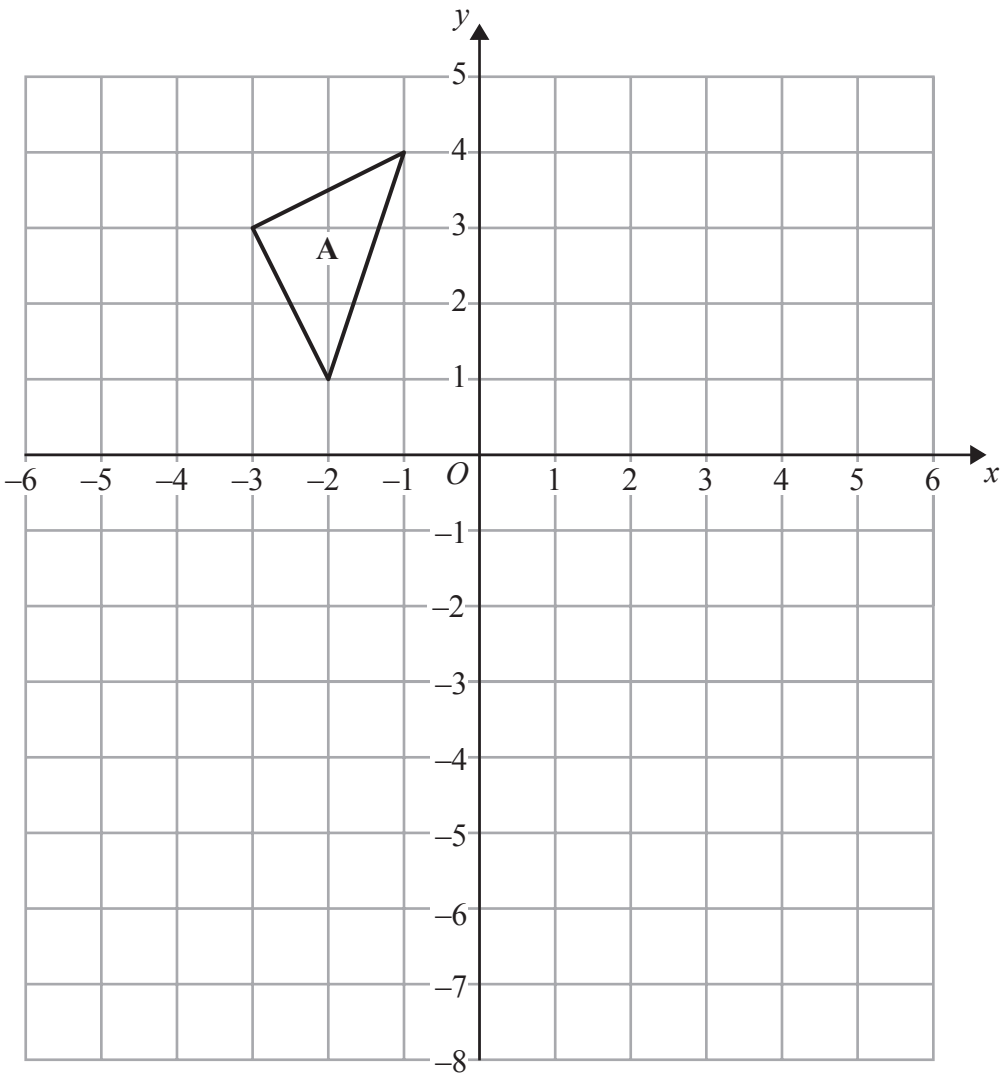


$y = 2x - 1$ is the equation of a different straight line.

Which straight line has the greater gradient?
Show how you get your answer.

(Total for Question 11 is 4 marks)

12



Triangle **A** is mapped onto triangle **B** by a reflection in the y-axis.
Triangle **B** is mapped onto triangle **C** by a reflection in the line $y = -1$

Describe a **single** transformation that maps triangle **A** onto triangle **C**.

(Total for Question 12 is 3 marks)

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13 The universal set is {a, b, c, d, e, f, g, h, i, j, k}

Set X = {a, e, g, k}
Set Y = {a, b, c, d, f, g, j}

A letter is to be chosen at random from the universal set.

(a) Work out P(X)

.....

(2)

(b) Work out P($X \cap Y$)

.....

(2)

(c) Work out P(Y')

.....

(1)

(Total for Question 13 is 5 marks)

14 (a) Write in standard form 250×10^3

.....

(1)

(b) Write as an ordinary number 3.59×10^{-2}

.....

(1)

(c) Work out $1.5 \times 10^4 + 6.3 \times 10^3$

Give your answer in standard form.

.....

(2)

(Total for Question 14 is 4 marks)

15 The diagram shows two similar triangles.

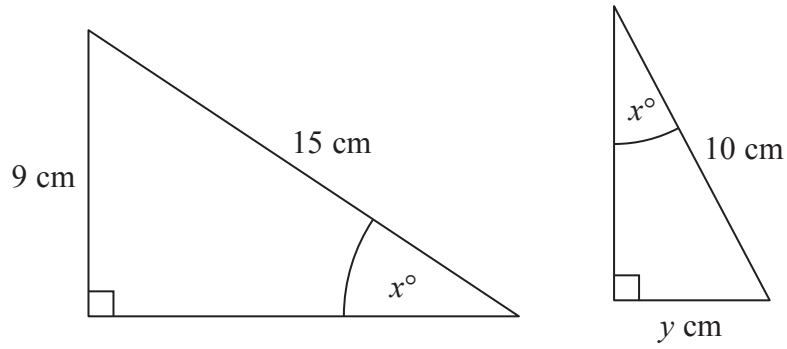


Diagram **NOT** accurately drawn

Find the value of y.

.....

(Total for Question 15 is 2 marks)

16 (a) Factorise fully $5 - 80x^2$

.....

(2)

(b) Expand and simplify $(2x - 5y)(3x - 4y)$

.....

(2)

(Total for Question 16 is 4 marks)

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17 (a) Write down the value of $9^{\frac{1}{2}}$

.....

(1)

(b) Write down the value of $8^{-\frac{1}{3}}$

.....

(1)

$2^k = 16$

(c) Write down the value of k.

.....

(1)

(d) Solve $8^5 = 2^{2m+3}$

.....

(3)

(Total for Question 17 is 6 marks)

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

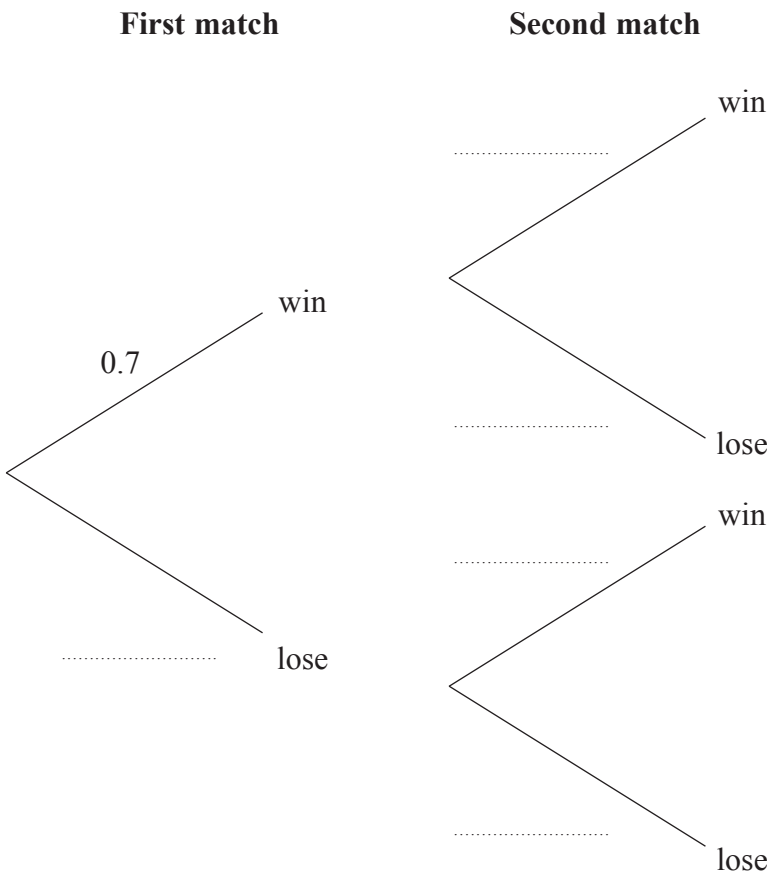
(Total for Question 18 is 4 marks)

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19 Whenever Finlay plays a tennis match the probability that he wins is 0.7

Finlay plays two tennis matches.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Finlay wins both matches.

.....

(2)

(c) Work out the probability that Finlay loses at least one match.

.....

(2)

(Total for Question 19 is 6 marks)

20 Solve $(x - 1)^2 - 2(x - 1) - 3 = 0$

.....

(Total for Question 20 is 4 marks)

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***21**

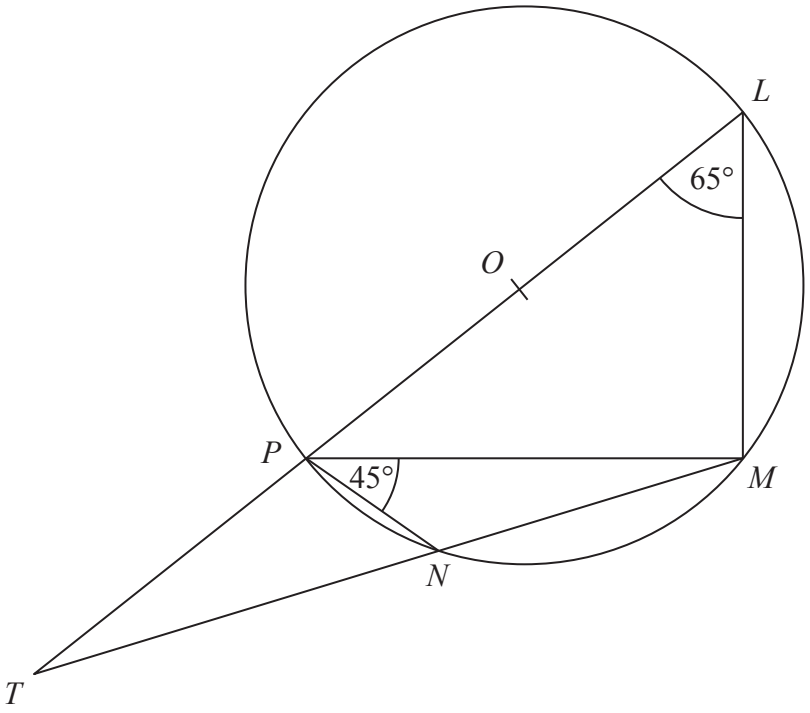


Diagram **NOT** accurately drawn

L, *M*, *N* and *P* are points on the circumference of a circle, centre *O*.
LOPT and *MNT* are straight lines.

Angle *MLP* = 65°.
Angle *NPM* = 45°.

Work out the size of angle *NTP*.
Give a reason for each stage of your working.

(Total for Question 21 is 5 marks)

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22 Simplify fully $\dfrac{2x^2 + 9x - 5}{6x^2 - 5x + 1}$

.....

(Total for Question 22 is 3 marks)

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23

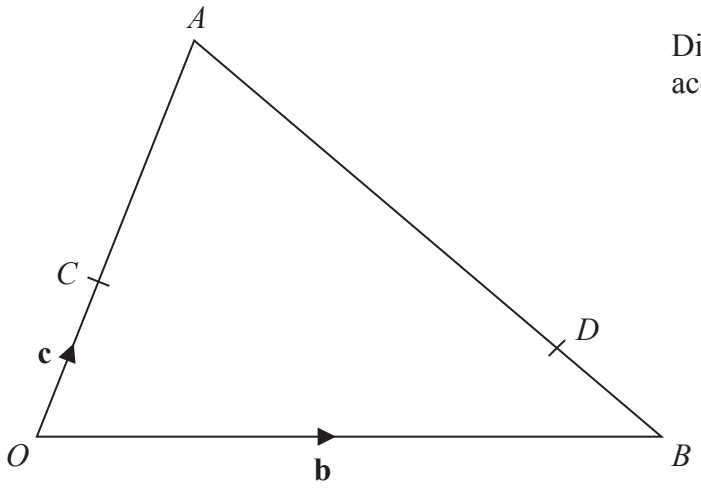


Diagram **NOT** accurately drawn

In the diagram,

$\overrightarrow{OB} = \mathbf{b}$

$\overrightarrow{OC} = \mathbf{c}$

$\overrightarrow{OC} = \frac{1}{3}\overrightarrow{OA}$

$\overrightarrow{BD} = \frac{1}{4}\overrightarrow{BA}$

Find $\overrightarrow{CD}$ in terms of **b** and **c**.
Give your answer in its simplest form.
You must show all your working.

.....

(Total for Question 23 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Methods in Mathematics
Higher: (Non-Calculator) Unit 1

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Note that in some cases a correct answer alone will not score marks unless supported by working; these situations are made clear in the mark scheme. Examiners should be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will award marks for the quality of written communication (QWC).
The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Partial answers shown (usually indicated in the ms by brackets) can be awarded the method mark associated with it (implied).
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks; transcription errors may also gain some credit. Send any such responses to review for the Team Leader to consider.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded (embedded answers).

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

14 The detailed notes in the mark scheme, and in practice/training material for examiners, should be taken as precedents over the above notes.

Guidance on the use of codes within this mark scheme
M1 – method mark for appropriate method in the context of the question A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 5MM1H_01

Question		Working	Answer	Mark	Notes
1	(a)	245 18 × 1960 2450 4410 10 × 245 = 2450 8 × 245 = 1960 4410	44.1	3	M1 for a complete method for multiplying 245 by 8 and 10; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **O**R M1 for a complete method for multiplying 2, 4 and 5 by 1 and 8; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **O**R M1 for a complete method for multiplying 200, 40 and 5 by 8 and 10; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **O**R M1 for a complete method for multiplying 20, 4 and 0.5 by 1 and 0.8; condone one error in multiplication M1 (dep) for addition; condone one addition error A1 cao **OR** M1 for a complete method for multiplying 24.5 by 2 and 0.2; condone one error in multiplication M1 (dep) for subtraction; condone one subtraction error A1 cao

	2	4	5	×
	0 2	0 4	0 5	1
	1 6	3 2	4 0	8
4	4	1	0	

	200	40	5
10	2000	400	50
8	1600	320	40

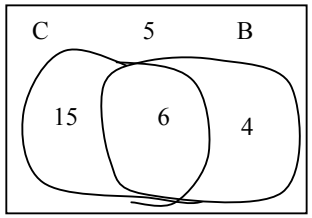
2000 + 1600 + 400 + 320 + 50 + 40 = 4410

24.5 × 2 = 49
24.5 × 0.2 = 4.9
49 – 4.9

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(b)	38.4 12 ⟌ 460.8 36 100 96 48 1.2 × 10 = 12 1.2 × 10 = 12 1.2 × 10 = 12 1.2 × 30 = 36 46.08 – 36 = 10.08 1.2 × 9 = 10.8 1.2 × 8 = 9.6 10.08 – 9.6 = 0.48 0.48 =1.2 × 0.4 30 + 8 + 0.4	38.4	3	M1 for intention to divide 46.08 or 460.8 or 4608 by 12 or 120 M1 for a fully correct method A1 for 38.4 **OR** M1 for an attempt at a build-up method (eg. 1.2 × 10 = 12 seen) M1 for a complete method to build-up to 46.08 A1 for 38.4

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
2	(i)		436.8	2	B1 cao
	(ii)		452.4		B1 cao
*3			Angle *APQ* = 56^o	5	M1 for 180 – 90 – 22 (= 68) M1 (180 – 68) ÷ 2 (= 56) A1 for angle *APQ* = 56 C2 (dep on M2) for "sum of the angles in a triangle is 180^o" oe and "base angles of an isosceles triangle are equal" oe (C1 (dep on M1) for one correct reason in the correct context) **OR** M1 for 360 – 22 – 90 (= 248) M1 for (360 – "248") ÷ 2 (=56) A1 for angle *APQ* = 56 C2 (dep on M2) for "sum of the angles in an quadrilateral is 360^o" and "base angles of an isosceles triangle are equal" and "sum of the angles on a straight line is 180^o" oe (C1 (dep on M1) for one correct reason in the correct context)

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(i)	× | 2 3 4 1 | 2 3 4 2 | 4 6 8 3 | 6 9 12	$\frac{1}{9}$	3	M1 for identifying 3 × 4 (= 12) M1 for 9 seen or 9 outcomes or a sample space with 9 possibilities or a list of 9 ordered pairs A1 for $\frac{1}{9}$ oe **OR** M1 for identifying 3 × 4 (= 12) M1 for $\frac{1}{3} \times \frac{1}{3}$ A1 for $\frac{1}{9}$ oe
	(ii)	× | 2 3 4 1 | **2** **3** **4** 2 | **4** **6** 8 3 | **6** 9 12	$\frac{6}{9}$	2	M1 for identifying 5 or 6 combinations under 8 (condone inclusion of 8) A1 for $\frac{6}{9}$ oe **OR** M1 for identifying the 3 combinations 8 and over and using $1 - \frac{3}{9}$ A1 for $\frac{6}{9}$ oe

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)			4	M1 for two intersecting circles with 6 labeled in the intersection M1 for 21 – 6 (=15) or 10 – 6 (=4) M1 for 30 – "15" – 6 – "4" (=5) A1 for a fully correct and labeled Venn diagram; condone a missing outer rectangle
	(b)		$\frac{4}{30}$	2	M1 (ft from (a)) for $\frac{"4"}{a}$, $a >$ "4" or $\frac{b}{30}$, $b < 30$ with $b \neq 0$ A1 for $\frac{4}{30}$ oe
6	(a)		m^4	1	B1 cao
	(b)		p^6	1	B1 cao
	(c)		$28x^5y^3$	2	M1 for 2 of 28, x^{2+3} (= x^5), y^{1+2} (= y^3) A1 for $28x^5y^3$
	(d)		$8x - y$	2	M1 for $3x - 6y$ or $5x + 5y$ A1 for $8x - y$ or $-y + 8x$ (accept $8x - 1y$)

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			7	4	M1 for 1 – 0.4 – 0.3 – 0.16 or 100 – 40 – 30 – 16 A1 for 0.14 oe M1 for "0.14" × 50 oe A1 for 7 or ft "0.14" × 50 **OR** M1 for 0.4 × 50 (= 20) or 0.3 × 50 (= 15) or 0.16 × 50 (= 8) A1 for 20 and 15 and 8 M1 for 50 – "20" – "15" – "8" A1 for 7 or ft from "20", "15" or "8"
8			77 cm^2	5	M1 for a method to find the area of any triangle that could be used to find the total area M1 for a method to find the area of any other shape, eg. trapezium or rectangle, that could be used to find the total area M1 for a fully correct method to find the total area A1 for 77 B1 (indep) for cm^2

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*9			Proof	4	M1 for setting up a correct equation in x, eg. $3x - 2 = x + 1$ M1 (dep) for a fully correct method to solve their equation or for $x = 1.5$ M1 (dep) for ("1.5" + 1) × 4 or (3 × "1.5" – 2) × 4 or (3 × "1.5" – 2) × 2 + ("1.5"+ 1) × 2 C1 (dep on M3) for completing the proof resulting in a perimeter of 10 **OR** M1 for setting up a correct equation in x, eg. $2(3x - 2) + 2(x + 1) = 10$ M1 (dep) for a fully correct method to solve their equation or for $x = 1.5$ M1 (dep) for "1.5" + 1 and 3 × "1.5" – 2 C1 (dep on M3) for completing the proof resulting in a justification that the shape is a square
10	(a)		(6, 0, 5)	1	B1 cao
	(b)	$\frac{6+0}{2}, \frac{4+0}{2}, \frac{0+5}{2}$	(3, 2, 2.5)	2	M1 for a correct method to find the midpoint or (a, 2, 2.5) or (3, b, 2.5) or (3, 2, c) A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*11			$y = 2x - 1$ has the greater gradient	4	M1 for plotting at least 2 unambiguous correct points satisfying $y = 2x - 1$; ignore any incorrect points M1 for correct points plotted with no incorrect points A1 for a single straight line segment of $y = 2x - 1$ C1 (dep on M1) for "$y = 2x - 1$ has the greater gradient" or ft their single line **(Alternative method)** M1 for a correct method to find gradient of **L** A1 for gradient of 1.5 M1 for gradient of $y = 2x - 1$ is 2 C1 (dep on M1) for "$y = 2x - 1$ has the greater gradient" oe or ft their gradients [SC: B1 for a single line segment drawn of gradient 2 if M0 scored]
12			Rotation of 180° about (0, –1) **OR** Enlargement, scale factor –1 about (0, –1)	3	B1 for a rotation B1 for an angle of 180° B1 for centre the point (0, –1) [SC: If no marks scored, award B1 for a correct reflection C drawn] **OR** B1 for a enlargement B1 for a scale factor of –1 B1 for centre the point (0, –1) [SC: If no marks scored, award B1 for a correct reflection C drawn]

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		$\frac{4}{11}$	2	M1 for $\frac{4}{q}$ where q > 4 or for $\frac{p}{11}$ where $p < 11$ A1 cao
	(b)		$\frac{2}{11}$	2	M1 for intersection with 2 letters or {a, g} A1 for $\frac{2}{11}$ oe
	(c)		$\frac{4}{11}$	1	B1 for $\frac{4}{11}$ oe
14	(a)		2.5×10^5	1	B1 cao
	(b)		0.0359	1	B1 cao
	(c)		2.13×10^4	2	M1 for 15000 + 6300 (= 21300) oe or $1.5 \times 10^4 + 0.63 \times 10^4$ oe or 2.13×10^n where $n > 0$ A1 cao
15			6	2	M1 for 15 ÷ 10 (= 1.5) or 10 ÷ 15 (= 0.66..) or $\frac{10}{15}$ or $\frac{15}{10}$ seen A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		$5(1 - 4x)(1 + 4x)$	2	M1 for $5(1 - 16x^2)$ or $5(1 \pm 4x)(1 \pm 4x)$ A1 for $5(1 - 4x)(1 + 4x)$ or $5(1 + 4x)(1 - 4x)$
	(b)		$6x^2 - 23xy + 20y^2$	2	M1 for any 3 of: $6x^2$, $-8xy$, $-15xy$, $20y^2$ or $6x^2$ and $8xy$ and $15xy$ and $20y^2$, ignoring signs A1 for $6x^2 - 23xy + 20y$
17	(a)		3	1	B1 for 3 (accept ±3, but not -3 alone)
	(b)		$\frac{1}{2}$	1	B1 for $\frac{1}{2}$ (= 0.5)
	(c)		4	1	B1 cao
	(d)		6	3	M1 for using $8 = 2^3$ M1 for deriving a correct equation in m A1 cao
18			$\frac{3}{8}$	4	M1 for $3(2x - 3) + 2(x + 6)$ (= 6) or $\frac{3(2x-3)+2(x+6)}{6}$ (=1) M1 for a correct method to get $6x - 9 + 2x + 12 = 6$ M1 (dep on M2) for a correct method to isolate terms in x A1 for $\frac{3}{8}$ oe

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19	(a)		0.3 0.7, 0.3, 0.7, 0.3	2	B1 for 0.3 for the 1st match B1 for fully correct probs. for the 2nd match
	(b)		0.49	2	M1 for 0.7 × "0.7" A1 for 0.49 ft their diagram
	(c)		0.51	2	M1 for 1 – "0.49" A1 ft for 0.51 **OR** M1 for 0.7 × "0.3" + "0.3" × "0.7" + "0.3" × "0.3" A1 for 0.51 or ft their tree diagram provided all probabilities are less than 1
20			$x = 4,\ x = 0$	4	M1 for $x^2 - 2x + 1 - 2x + 2 - 3 = 0$; condone one sign error in the complete expansion M1 for $x^2 - 4x = 0$ M1 (dep on M1) for a correct method to solve their quadratic equation; eg. $x(x - 4) = 0$ A1 cao for $x = 4$ and $x = 0$ **OR** M1 for $y = x - 1$ M1 for a correct method to solve their quadratic equation; eg. $(y - 3)(y + 1) = 0$ M1 (dep on M1) for correct substitution of their two solutions eg. $x = 3 + 1$ or $-1 + 1$ A1 cao for $x = 4$ and $x = 0$

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*21			Angle $NTP = 5^o$	5	M1 for angle $PNM = 180^o - 65^o$ ($= 115^o$) or angle $LMP = 90^o$ M1 for "$180^o - 65^o - 90^o$" – ("$180^o - 45^o - 115^o$") A1 for Angle $NTP = 5^o$ C2 (dep on M2) for "opposite angles of a cyclic quad add up to 180^o" and "angles in a semicircle are equal to 90^o" and "angles in a triangle sum to 180^o" (C1 (dep on M1) for either "opposite angles of a cyclic quad add up to 180^o" or "angles in a semicircle are equal to 90^o") **OR** M1 for angle $PNT = 65^o$ or angle $LMP = 90^o$ M1 for '$180^o - 65^o - 90^o$' + $45^o - 65^o$ A1 for Angle $NTP = 5^o$ C2 (dep on M2) for "ext. angle of a cyclic quad is equal to int. opposite angle" and "angles in a semicircle are equal to 90^o" and "angles in a triangle sum to 180" and "ext angle of a triangle is equal to the sum of the two opp int angles" (C1(dep on M1) for either "ext. angle of a cyclic quad is equal to int. opposite angle" or "angles in a semicircle are equal to 90^o")

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		$\frac{(2x-1)(x+5)}{(2x-1)(3x-1)}$	$\frac{x+5}{3x-1}$	3	M1 for factorizing the numerator correctly M1 for factorizing the denominator correctly A1 for $\frac{x+5}{3x-1}$
23			$\frac{3\mathbf{b}-\mathbf{c}}{4}$	4	M1 for $\overrightarrow{CD} = \overrightarrow{CO} + \overrightarrow{OB} + \overrightarrow{BD}$ M1 (indep) for $\overrightarrow{CO} + \overrightarrow{OB} = -\mathbf{c} + \mathbf{b}$ or $\overrightarrow{BA} = -\mathbf{b} + 3\mathbf{c}$ M1 for $-\mathbf{c} + \mathbf{b} + \frac{1}{4}(-\mathbf{b} + 3\mathbf{c})$ A1 for $\frac{3\mathbf{b}-\mathbf{c}}{4}$ **OR** M1 for $\overrightarrow{CD} = \overrightarrow{CA} + \overrightarrow{AD}$ M1 (indep) for $\overrightarrow{CA} = 2\mathbf{c}$ or $\overrightarrow{AB} = -3\mathbf{c} + \mathbf{b}$ M1 for $2\mathbf{c} + \frac{3}{4}(-3\mathbf{c} + \mathbf{b})$ A1 for $\frac{3\mathbf{b}-\mathbf{c}}{4}$

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 5AM1H_01			
Question		**Modification**	**Notes**
Q04		Spinners straightened up. Spike removed.	
Q06	(c)	MLP x changed to e y changed to f	
Q06	(d)	MLP: x changed to w	
Q08		Wording added: AE = BC ED = CD EC joined with a dashed line.	
Q09		MLP: x changed to y	
Q10		Model provided for all. AB joined with a dashed line. Diagram for MLP only.	
Q11		Grid enlarged.	

PAPER: 5AM1H_01			
Question		**Modification**	**Notes**
Q12		2 cm grid. x axis stopped at 5	
Q18		MLP: x changed to y	
Q19		Diagram enlarged. MLP wording added: These are five spaces to fill. Braille roman numerals (i) to (v) put in spaces.	
Q23		Vectors larger than other print.	

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Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Tuesday 17 June 2014 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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5/5/6/

P 4 3 4 0 2 A 0 1 2 8

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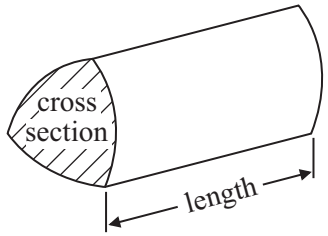
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GCSE Mathematics 2MM01

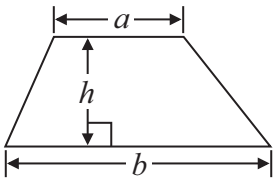
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

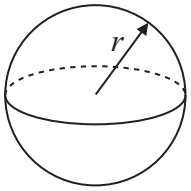


Area of trapezium = $\frac{1}{2}(a + b)h$



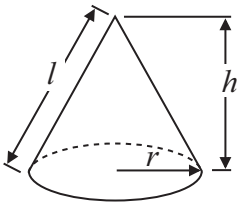
Volume of sphere = $\frac{4}{3}\pi r^3$

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

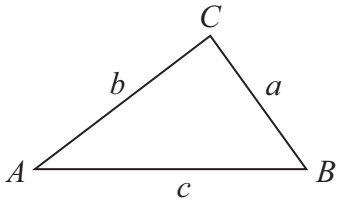


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



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

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

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 = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 Given that $563 \times 48 = 27\,024$

find the value of

(a) 5630×48

.....

(1)

(b) 5.63×0.048

.....

(1)

(c) $270.24 \div 24$

.....

(2)

(Total for Question 1 is 4 marks)

2 There are 11 counters in a bag.
6 of these counters are green.
5 of these counters are red.

Some more red counters are put into the bag.

A counter is then taken at random from the bag.

The probability that the counter is red is $\frac{3}{5}$

How many red counters were put into the bag?

.....

(Total for Question 2 is 3 marks)

3 Work out an estimate for the value of $\frac{298 \times 41}{19}$

.....

(Total for Question 3 is 2 marks)

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***4** Here is a shape.

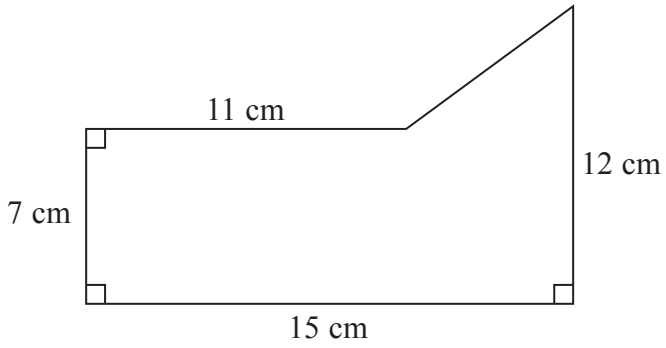


Diagram **NOT** accurately drawn

Work out the area of this shape.

(Total for Question 4 is 4 marks)

5 Graham has a 4-sided spinner.

The sides of the spinner are labelled 1, 2, 3 and 4

The table shows each of the probabilities that the spinner will land on 1, on 3 and on 4

Number	**1**	**2**	**3**	**4**
Probability	0.3		0.15	0.2

Graham spins the spinner once.

(a) Work out the probability that the spinner will land on 2

.....

(2)

Graham then spins the spinner 60 times.

(b) Work out an estimate for the number of times the spinner will land on 4

.....

(2)

(Total for Question 5 is 4 marks)

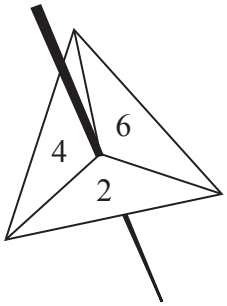
6 Work out 63.2×54

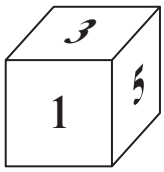
.....

(Total for Question 6 is 3 marks)

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7 Sue has a fair 3-sided spinner numbered 2, 4 and 6
She also has a fair 6-sided dice numbered 1, 2, 3, 4, 5 and 6





Sue spins the spinner once and rolls the dice once.
She adds the two numbers together to get the total score.

(i) Work out the probability that the total score will be 7

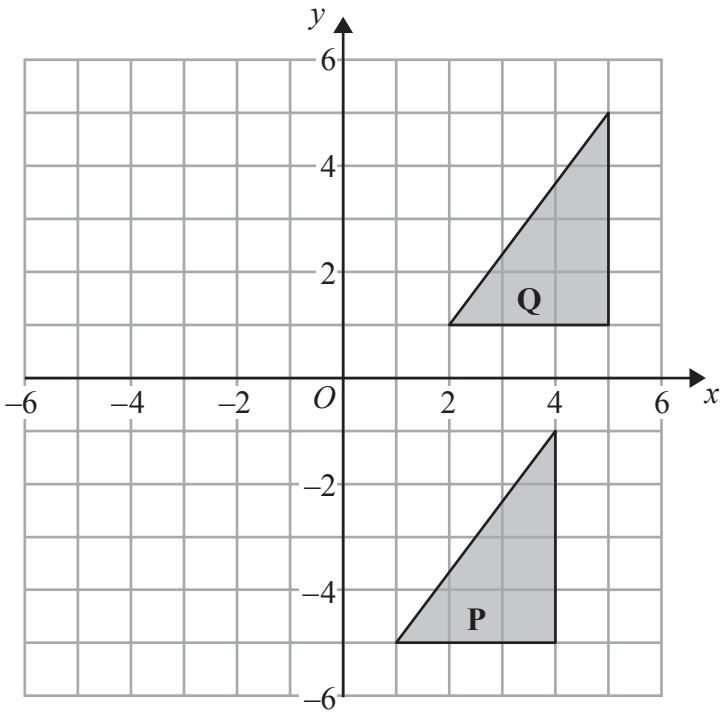
.....

(ii) Work out the probability that the total score will be less than 6

.....

(Total for Question 7 is 5 marks)

8



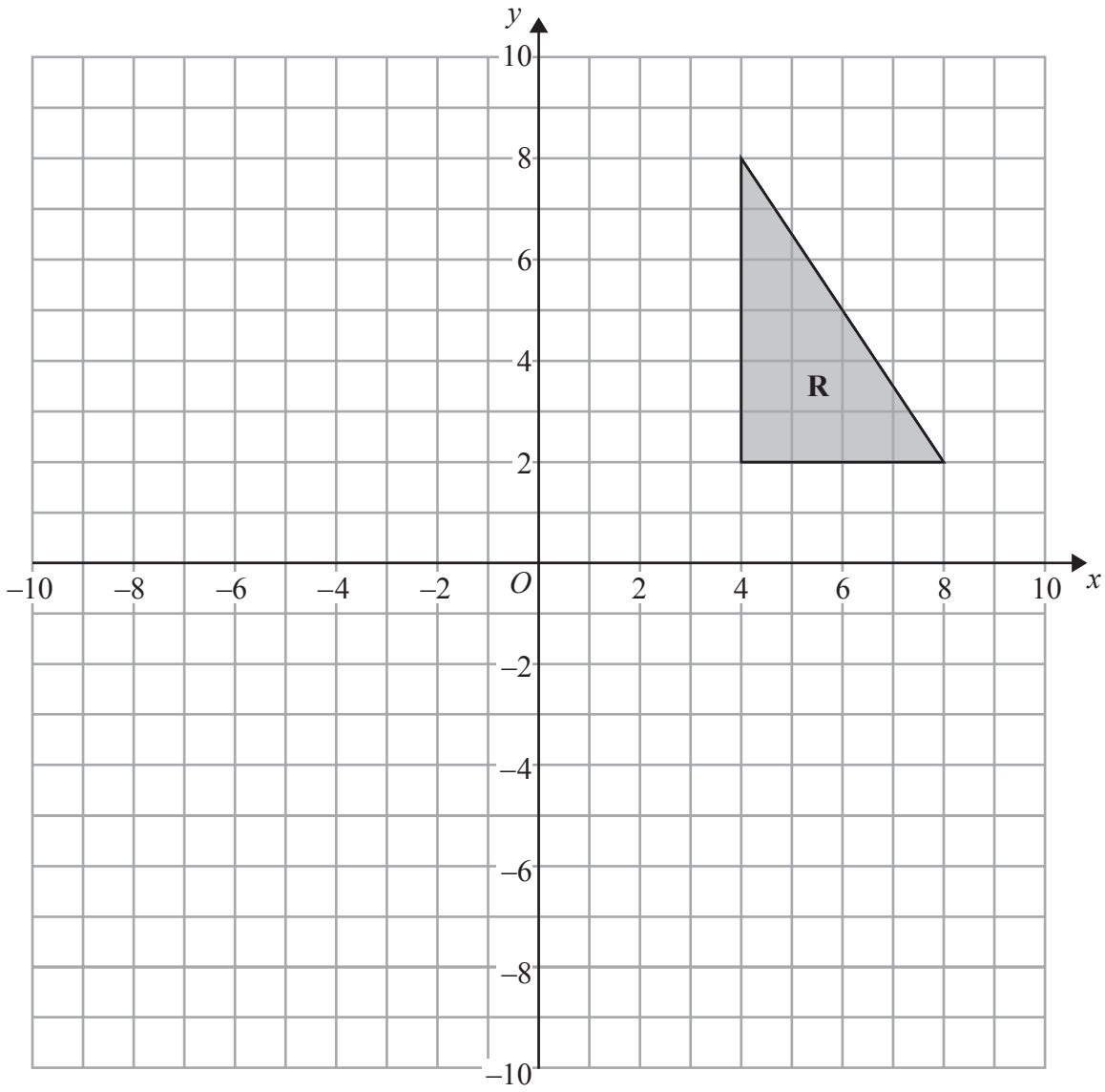
(a) Describe fully the single transformation that maps shape **P** onto shape **Q**.

.....

.....

(2)

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(b) Enlarge triangle **R** by scale factor $-\frac{1}{2}$, centre (0, 0).

(3)

(Total for Question 8 is 5 marks)

9 (a) Simplify $\dfrac{e^7 \times e^8}{e^2}$

.....

(2)

(b) Simplify $(g^4)^{-5}$

.....

(1)

(Total for Question 9 is 3 marks)

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10 Here is a rectangle.

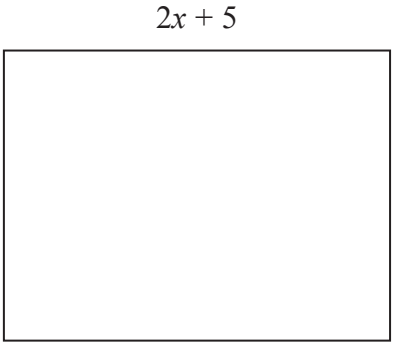


Diagram **NOT** accurately drawn

All the measurements are in centimetres.

The perimeter of the rectangle is 46 cm.

Work out the area of the rectangle.
You must show all your working.

..... cm^2

(Total for Question 10 is 5 marks)

11 Express 168 as a product of its prime factors.

.....

(Total for Question 11 is 3 marks)

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12 Here is some information about the students in Year 10

There are 60 students in Year 10
34 of the students study French.
25 of the students study German.
18 of the students study both French and German.

(a) Draw a suitable diagram for this information.

(4)

A teacher chooses at random one of the 60 students.

(b) Work out the probability that this student does **not** study French or German.

.....

(2)

(Total for Question 12 is 6 marks)

13 (a) Expand $h(h - 3)$

.....

(1)

(b) Factorise fully $6x^2y^2 + 9xy^3$

.....

(2)

(c) Expand and simplify $(m + 8)(m + 5)$

.....

(2)

(Total for Question 13 is 5 marks)

---

14 (a) Find the value of $64^{\frac{1}{2}}$

.....

(1)

(b) Find the value of 3^{-2}

.....

(1)

(c) Write down the value of 8^0

.....

(1)

(Total for Question 14 is 3 marks)

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15 (a) Work out $\frac{1}{3} + \frac{2}{5}$

.....

(2)

(b) Work out $2\frac{3}{4} \times 1\frac{3}{5}$

Give your answer in its simplest form.

.....

(3)

(Total for Question 15 is 5 marks)

16 (a) Solve $6x + 5 = 2x + 3$

(2)

(b) Solve $\frac{3y - 5}{4} = 2y + 1$

(3)

(c) Solve $p^2 - 6p - 55 = 0$

(3)

(Total for Question 16 is 8 marks)

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17 (a) Write 806 000 in standard form.

.....

(1)

(b) Write 4×10^{-3} as an ordinary number.

.....

(1)

(c) Work out $(6 \times 10^{9}) \times (2 \times 10^{-4})$
Give your answer in standard form.

.....

(2)

(Total for Question 17 is 4 marks)

18

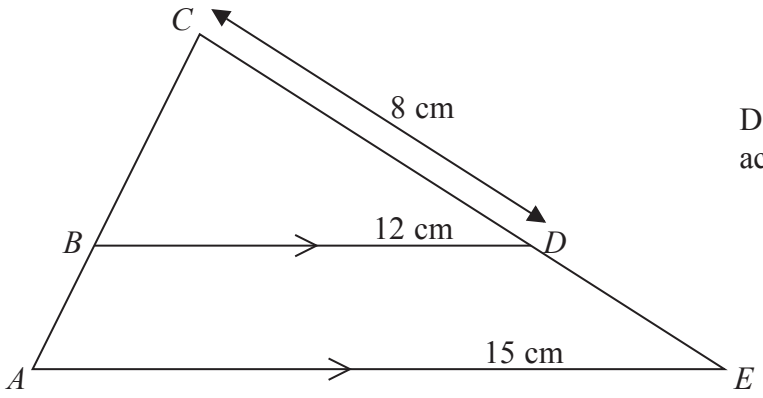


Diagram **NOT** accurately drawn

ACE is a triangle.
B is a point on *CA* and *D* is a point on *CE*.
BD is parallel to *AE*.

CD = 8 cm.
BD = 12 cm.
AE = 15 cm.

Work out the length of *CE*.

..... cm

(Total for Question 18 is 2 marks)

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19 A and B are two arithmetic sequences.

The first four terms of sequence A are −8, −5, −2, 1
The nth term of sequence B is $109 - 2n$

The rth term of sequence A has the same value as the rth term of sequence B.
Work out the value of r.

.....

(Total for Question 19 is 4 marks)

***20**

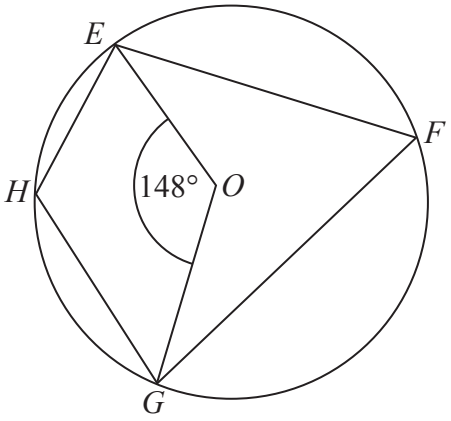


Diagram **NOT** accurately drawn

E, *F*, *G* and *H* are points on the circumference of a circle, centre *O*.

Angle *EOG* = 148°

Work out the size of angle *EHG*.
Give a reason for each stage in your working.

(Total for Question 20 is 4 marks)

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21

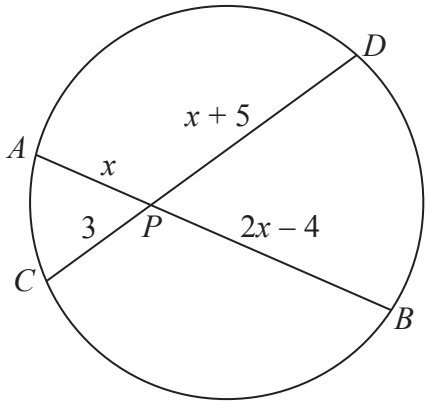


Diagram **NOT** accurately drawn

All measurements are in centimetres.
APB and *CPD* are chords of the circle.

Work out the value of x.

(Total for Question 21 is 5 marks)

22

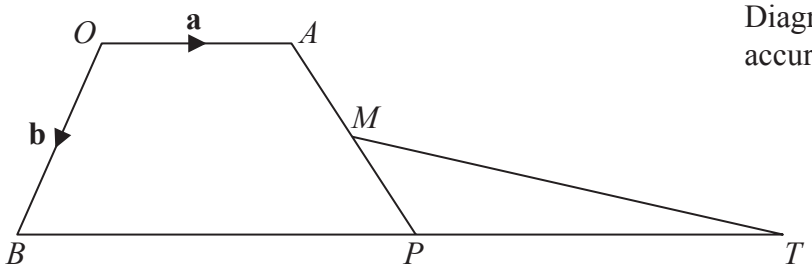


Diagram **NOT** accurately drawn

OAPB is a trapezium.
BPT is a straight line with $BP = PT$.
M is the midpoint of *AP*.

$\overrightarrow{OA} = \mathbf{a}$
$\overrightarrow{BP} = 2\mathbf{a}$
$\overrightarrow{OB} = \mathbf{b}$

Find, in terms of **a** and **b**, the vector $\overrightarrow{MT}$.
Give your vector in its simplest form.

.....

(Total for Question 22 is 3 marks)

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23 Write $\dfrac{3}{x-5} - \dfrac{2}{x+1}$

as a single fraction in its simplest form.

.....

(Total for Question 23 is 3 marks)

24 There are 9 counters in a box.

4 of the counters are red.
2 of the counters are blue.
3 of the counters are yellow.

Pavinder takes at random two counters from the box.

Work out the probability that he takes at least one yellow counter.

.....

(Total for Question 24 is 4 marks)

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***25**

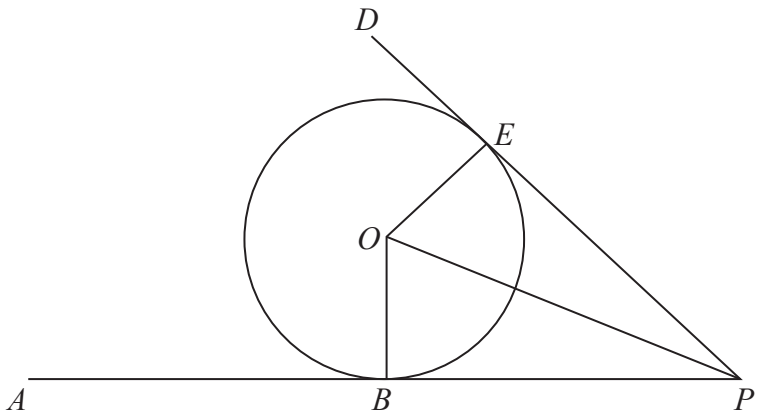


Diagram **NOT** accurately drawn

B and *E* are points on the circumference of a circle, centre *O*.
ABP and *DEP* are tangents to the circle.

Prove that triangle *BOP* and triangle *EOP* are congruent.

(Total for Question 25 is 3 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

Summer 2014

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Methods in Mathematics (2MM01)
Higher Paper 1H

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		270 240	1	B1 cao
	(b)		0.27024	1	B1 cao
	(c)		11.26	2	M1 for 48 ÷ 24 (=2) or 270.24 ÷ 48 or 5.63 or 27024 ÷ 48 × 2 or 563 × 2 or digits 1126 A1 cao
2			4	3	M1 for any fraction equivalent to $\frac{3}{5}$, eg $\frac{9}{15}$ M1 for calculation to work out number of additional counters eg. '15' − 6 − 5 A1 cao **OR** M1 for $\frac{5}{11}$ or 6 : 5 M1 for $\frac{5+n}{11+n}$ or 6 : 5 + *n*, where *n* is a number A1 cao **OR** M1 for $\frac{5+x}{6+5+x}=\frac{3}{5}$ M1 for correct method to solve equation as far as isolating terms in *x* A1 cao **OR** M1 for p(green) = $\frac{2}{5}=\frac{6}{n}$ M1 for (*n* =) 5 × (6 ÷ 2) (=15) A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3		$\frac{300 \times 40}{20}$	600	2	M1 for at least 2 of 300, 40 , 20 seen A1 for 596 – 615
*4			115 cm^2	4	M1 for correct method to find area of one part of shape M1 for a complete method to find area A1 for 115 C1 (dep on M1) for '115' cm^2 with the answer clearly identified
5	(a)	1 − (0.3 + 0.15 + 0.2)	0.35	2	M1 for 1 − (0.3 + 0.15 + 0.2) **or** 1 − 0.65 A1 for 0.35 oe
	(b)	60 × 0.2	12	2	M1 for 60 × 0.2 A1 cao (SC B1 for $\frac{12}{60}$)

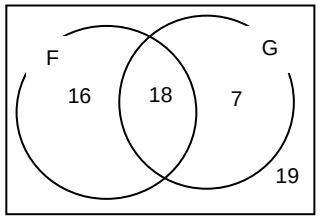
PAPER: 5MM1H_01

Question		Working	Answer	Mark	Notes
6		632 54 × 2528 31600 34128 Eg × | 60 | 3 | 0.2 50 | 3000 | 150 | 10 4 | 240 | 12 | 0.8 3000 + 150 + 10 + 240 + 12 + 0.8 = 3412.8 | | 6 | 3 | 2 | | 5 | 30 | 15 | 10 | 5 4 | 24 | 12 | 08 | 4 | 1 | 2 | 8 | |	3412.8	3	M1 for complete method for multiplying 632 by 4 and 50 condone one error in multiplication M1 (dep) for addition, condone one addition error A1 cao **OR** M1 for complete method for multiplying 600, 30 and 2 by 4 and 50 condone one error in multiplication M1 (dep) for addition, condone one addition error A1 cao **OR** M1 for complete method for multiplying 6, 3 and 2 by 5 and 4 condone one error in multiplication M1 (dep) for addition, condone one addition error A1 cao

PAPER: 5MM1H_01

Question		Working	Answer	Mark	Notes
7	(i)	<table><tr><th>+</th><th>2</th><th>4</th><th>6</th></tr><tr><th>1</th><td>3</td><td>5</td><td>7</td></tr><tr><th>2</th><td>4</td><td>6</td><td>8</td></tr><tr><th>3</th><td>5</td><td>7</td><td>9</td></tr><tr><th>4</th><td>6</td><td>8</td><td>10</td></tr><tr><th>5</th><td>7</td><td>9</td><td>11</td></tr><tr><th>6</th><td>8</td><td>10</td><td>12</td></tr></table>	$\frac{3}{18}$	5	M1 for identifying 1+6 (=7) and 3+4 (=7) and 5+2 (=7) M1 for 18 seen **or** 18 outcomes **or** sample space with 18 possibilities **or** list of 18 ordered pairs A1 for $\frac{3}{18}$ oe **OR** M1 for $\frac{1}{6}\times\frac{1}{3}$ oe seen M1 for $3\times\frac{1}{6}\times\frac{1}{3}$ oe A1 for $\frac{3}{18}$ oe
	(ii)		$\frac{4}{18}$		M1 ft from their ordered list in part (i) for identifying all four possible of 2+1(=3), 2+2(=4), 2+3(=5) and 4+1(=5), condone inclusion of 2+4(=6) and/or 4+2(=6) A1 for $\frac{4}{18}$ oe [SC If M0 scored B1 for $\frac{6}{18}$]

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	(a)		Translation $\begin{pmatrix}1\\6\end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix}1\\6\end{pmatrix}$ NB: no marks awarded for a combination of transformations
	(b)		Vertices at (−2, −1) (−2, −4) (−4, −1)	3	B3 fully correct (B2 correct orientation **and** correct size **or** 2 out of 3 vertices correct) (B1 correct size **or** correct orientation)
9	(a)	$\frac{e^7 \times e^8}{e^2} = \frac{e^{15}}{e^2}$	e^{13}	2	M1 for one correct simplification, eg $e^7 \times e^8 = e^{15}$ or $e^7 \div e^2 = e^5$ or $e^8 \div e^2 = e^6$ A1 cao
	(b)		g^{-20}	1	B1 for g^{-20} **or** $\frac{1}{g^{20}}$
10		$2 \times (4x - 3 + 2x + 5) = 46$ $2 \times (6x + 2) = 46$ $6x + 2 = 23$ $6x = 21$ $x = 3.5$ $4 \times 3.5 - 3 = 11$ $2 \times 3.5 + 5 = 12$ $11 \times 12 =$	132	5	M1 for $2 \times (4x - 3 + 2x + 5)$ oe **or** $4x - 3 + 2x + 5$ oe M1 for $2 \times (4x - 3 + 2x + 5) = 46$ oe **or** $4x - 3 + 2x + 5 = 23$ oe M1 (dep on M2) for correct processes to isolate terms in x or (x=) 3.5 oe M1 (dep on M1) for substituting '3.5' into $4x - 3$ **or** $2x + 5$ **or** 12 seen as length **or** 11 seen as width A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		168 = 2 × 84 = 2 × 2 × 42 = 2 × 2 × 2 × 21 =2 × 2 × 2 × 3 × 7	2 × 2 × 2 × 3 × 7	3	M1 for at least two correct divisions by a prime number, (maybe seen on a factor tree) M1 for full process with at most one calculation error **or** digits 2, 2, 2, 3, 7 seen A1 for 2 × 2 × 2 × 3 × 7 **or** $2^3 \times 3 \times 7$
12	(a)		Correct Venn diagram	4	M1 for two overlapping ovals M1 for 18 shown in the intersection M1 for 34 −18 (=16) **or** 25 − 18(=7) A1 for fully correct Venn diagram with correct labels
	(b)		$\frac{19}{60}$	2	M1 (ft part a) for $\frac{'19'}{a}$, $a >$ '19' or $\frac{b}{60}$, $b < 60$ A1 for $\frac{19}{60}$ oe or ft part a provided $b \neq 0$

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		$h^2 - 3h$	1	B1 cao
	(b)		$3xy^2(2x + 3y)$	2	B2 cao (B1 for correct partial factorisation with at least two common factors, eg $3x(2xy^2 + 3y^3)$ **or** $xy^2(6x + 9y)$ **or** $3y^2(2x^2 + 3xy)$ **or** $xy(6xy + 9y^2)$ **or** $3y(2x^2y + 3xy^2)$ **or** $y^2(6x^2 + 9xy)$ **or** $3xy(2xy + 3y^2)$)
	(c)	$m^2 + 5m + 8m + 40$	$m^2 + 13m + 40$	2	M1 for all 4 terms correct (condone incorrect signs) **or** 3 out of 4 terms correct with correct signs A1 cao
14	(a)		8	1	B1 for 8 (accept ±8)
	(b)		$\frac{1}{9}$	1	B1 cao
	(c)		1	1	B1 cao
15	(a)	$\frac{5}{15} + \frac{6}{15}$	$\frac{11}{15}$	2	M1 for common denominator with at least one numerator correct A1 for $\frac{11}{15}$ oe (B2 for 0.73 recurring)
	(b)	$\frac{11}{4} \times \frac{8}{5} = \frac{88}{20}$	$\frac{22}{5}$	3	M1 for $\frac{11}{4}$ or $\frac{8}{5}$ M1 for $\frac{11}{4} \times \frac{8}{5}$ or $\frac{88}{20}$ oe A1 for $\frac{22}{5}$ or $4\frac{2}{5}$ or 4.4

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)	$6x + 5 = 2x + 3$ $6x - 2x = 3 - 5$ $4x = -2$	$-\frac{1}{2}$	2	M1 for correct processes to isolate terms in x A1 for $-\frac{1}{2}$ oe
	(b)	$\frac{3y-5}{4} = 2y+1$ $3y-5 = 4(2y+1)$ $3y-5 = 8y+4$ $-9 = 5y$	$-\frac{9}{5}$	3	M1 for intention to multiply all terms by 4 M1 (ft a four term linear equation) for correct processes to isolate terms in y A1 for $-\frac{9}{5}$ oe
	(c)	$(p - 11)(p + 5)$ $\frac{--6 \pm \sqrt{(-6)^2 - 4\times1\times-55}}{2\times1}$ $= \frac{6 \pm \sqrt{256}}{2}$	11, −5	3	M1 for $(p \pm 11)(p \pm 5)$ M1 for $(p - 11)(p + 5)$ A1 cao **Alternative method** M1 for $\frac{--6 \pm \sqrt{(-6)^2 - 4\times1\times-55}}{2\times1}$ condone one sign error in substitution M1 for $\frac{6 \pm \sqrt{256}}{2}$ A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17	(a)		8.06×10^5	1	B1 cao
	(b)		0.004	1	B1 cao
	(c)	$12 \times 10^{9+-4} = 12 \times 10^5$	1.2×10^6	2	M1 for $12 \times 10^{9+-4}$ oe **or** 1 200 000 **or** 1.2×10^n A1 cao
18		$\frac{15}{12} \times 8$	10	2	M1 for $\frac{15}{12}$ oe **or** $\frac{12}{15}$ oe seen **or** a correct proportionality equation, eg $\frac{CE}{15} = \frac{8}{12}$ A1 cao
19		$3r - 11 = 109 - 2r$ $5r = 120$ $r = 24$ 107, 105, 103, 101, 99, ..., 63, 61	24	4	B1 for $3r - 11$ M1 for or $3r - 11 = 109 - 2r$ or '$3r + k$' = $109 - 2r$, $k \neq 0$ M1 for correct processes to isolate terms in r A1 cao (accept different letter in place of r) **OR** (Listing terms) M1 for at least 3 correct terms in sequence B M1 for at least 20 correct terms in either sequence M1 for two correct sequences each up to and including 24th terms (61) A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*20		angle *EFG* = 148÷2 (=74) angle *EHG* = 180 − '74' **OR** reflex angle *EOG* = 360 − 148 (=212) angle *EHG* = '212'÷2	106	4	M1 for angle *EFG* = 148÷2 (=74) M1 for angle *EHG* = 180 − '74' (=106) C2 for *EHG* = 106° with full reasons angle at centre is twice angle at circumference; opposite angles in a cyclic quadrilateral sum to 180° (C1 (dep on M1) for one circle theorem stated and used correctly) **OR** M1 for reflex angle *EOG* = 360 − 148 (=212) M1 for angle *EHG* = '212' ÷ 2 C2 for *EHG* = 106° with full reasons angle at centre is twice angle at circumference; angles at a point sum to 360° (C1 (dep on M1) for circle theorem stated and used correctly)

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		$x(2x - 4) = 3(x + 5)$ $2x^2 - 4x = 3x + 15$ $2x^2 - 7x - 15 = 0$ $(2x + 3)(x - 5) = 0$	5	5	M1 for $x \times (2x - 4) = 3 \times (x + 5)$ condone omission of brackets A1 for correct simplified quadratic, eg $2x^2 - 7x - 15(=0)$ or $2x^2 = 7x + 15$ oe M1 (dep on M1) for correct method to solve their 3 term quadratic, eg $(2x \pm 3)(x \pm 5)$ M1 for $(2x + 3)(x - 5)$ A1 for 5 **Alternative method** M1 (dep on M1) for $\frac{--7\pm\sqrt{(-7)^2-4\times2\times-15}}{2\times2}$ condone one sign error in substitution M1 for $\frac{7\pm\sqrt{169}}{4}$ A1 for 5
22			$\frac{1}{2}(5\mathbf{a} + \mathbf{b})$	3	M1 for a correct vector equation for MT eg $\overrightarrow{MT} = \overrightarrow{MP} + \overrightarrow{PT}$ (may be partially in terms of **a** and/or **b**) M1 for $\overrightarrow{AP} = -\mathbf{a} + \mathbf{b} + 2\mathbf{a}$ $(= \mathbf{a} + \mathbf{b})$ **or** $\overrightarrow{AM} = \frac{1}{2}(-\mathbf{a} + \mathbf{b} + 2\mathbf{a})$ oe **or** $\overrightarrow{MP} = \frac{1}{2}(-\mathbf{a} + \mathbf{b} + 2\mathbf{a})$ oe A1 for $\frac{1}{2}(5\mathbf{a} + \mathbf{b})$ oe simplified form

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
23		$\frac{3(x+1)-2(x-5)}{(x-5)(x+1)}$ $=\frac{3x+3-2x+10}{(x-5)(x+1)}$ $=\frac{x+13}{(x-5)(x+1)}$	$\frac{x+13}{(x-5)(x+1)}$	3	M1 for common denominator of $(x-5)(x+1)$ oe M1 for $\frac{3(x+1)-2(x-5)}{(x-5)(x+1)}$ oe (may be as two separate fractions) A1 for $\frac{x+13}{(x-5)(x+1)}$ **or** $\frac{x+13}{x^2-4x-5}$
24		**yy + yy′ + y′y** $\frac{3}{9}\times\frac{2}{8}+\frac{3}{9}\times\frac{6}{8}+\frac{6}{9}\times\frac{3}{8}$ **OR** **yy + yr + yb + ry + by** $\frac{3}{9}\times\frac{2}{8}+\frac{3}{9}\times\frac{4}{8}+\frac{3}{9}\times\frac{2}{8}+\frac{4}{9}\times\frac{3}{8}+\frac{2}{9}\times\frac{3}{8}$ **OR** **1 - y′ y′** $1-\frac{6}{9}\times\frac{5}{8}$	$\frac{42}{72}$	4	B1 for $\frac{2}{8}$ **or** $\frac{3}{8}$ **or** $\frac{4}{8}$ **or** $\frac{6}{8}$ **or** $\frac{5}{8}$ seen as 2nd probability M1 for any one appropriate product (see working column) M1 for a complete method A1 for $\frac{42}{72}$ oe, eg $\frac{7}{12}$ **With replacement** B0 M1 for any one appropriate product M1 for a complete method A0

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*25 QWC		*BP* = *EP* (tangents from an external point are equal) *OP* is common (to both triangles) oe angle *OBP* = angle *OEP* = 90^{o} (angle between tangent and radius is 90^{o}) **RHS** oe so triangles *BOP* and *EOP* are congruent **OR** *BP* = *EP* (tangents from an external point are equal) *OP* is common (to both triangles) oe *OB* = *OE* as both radii (of the circle) **SSS** oe so triangles *BOP* and *EOP* are congruent **OR** *BP* = *EP* (tangents from an external point are equal) *OB* = *OE* as both radii (of the circle) angle *OBP* = angle *OEP* = 90^{o} (angle between tangent and radius is 90^{o}) **SAS** oe so triangles *BOP* and *EOP* are congruent **OR** angle *OBP* = angle *OEP* = 90^{o} angle between tangent and radius is 90^{o}) *OB* = *OE* as both radii (of the circle) *OP* is common (to both triangles) oe **RHS** oe so triangles *BOP* and *EOP* are congruent	Proof with reasons	3	C3 for fully correct proof with all reasons and statement for congruence present (C2 for any two correct statements (that together could be part of a proof) with reasons) (C1 for any one correct statement (that could be part of a proof) with reasons)

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5°
Measurements of length: ±5 mm

PAPER: 5MM1H_01			
Question		**Modification**	**Notes**
Q8	(a)	2 cm grid. P & Q labelled as shape P, shape Q	B1 for translation B1 for $\begin{pmatrix}1\\6\end{pmatrix}$ NB: no marks awarded for a combination of transformations
	(b)	Transformation given. Triangle S at (−2, −1), (−4, −1) and (−2, −4). Candidates asked to describe the transformation	B1 for enlargement B1 for scale factor $-\frac{1}{2}$ oe B1 centre (0. 0) oe
Q10		*x* changed to *y*. Diagram labels top and left	M1 for $2 \times (4y - 3 + 2y + 5)$ oe **or** $4y - 3 + 2y + 5$ oe M1 for $2 \times (4y - 3 + 2x + 5) = 46$ oe **or** $4y - 3 + 2y + 5 = 23$ oe M1 (dep on M2) for correct processes to isolate terms in *y* or (*y*=) 3.5 oe M1 (dep on M1) for substituting '3.5' into $4y - 3$ **or** $2y + 5$ **or** 12 seen as length **or** 11 seen as width A1 cao
Q12		Diagram sheet put in Diagram Book instead of answer space in the paper.	Standard mark scheme

PAPER: 5MM1H_01			
Question		**Modification**	**Notes**
Q16	(a)	MLP *x* changed to *y*	M1 for correct processes to isolate terms in *y* A1 for $-\frac{1}{2}$ oe
Q21		MLP *x* changed to *y*	M1 for $y \times (2y - 4) = 3 \times (y + 5)$ condone omission of brackets A1 for correct simplified quadratic, eg $2y^2 - 7y - 15 (=0)$ or $2y^2 = 7y + 15$ oe M1 (dep on M1) for correct method to solve their 3 term quadratic, eg $(2y \pm 3)(y \pm 5)$ M1 for $(2y + 3)(y - 5)$ A1 for 5 **Alternative method** M1 (dep on M1) for $\frac{--7\pm\sqrt{(-7)^2-4\times2\times-15}}{2\times2}$ condone one sign error in substitution M1 for $\frac{7\pm\sqrt{169}}{4}$ A1 for 5
Q23		MLP *x* changed to *y*	M1 for common denominator of $(y - 5)(y + 1)$ oe M1 for $\frac{3(y+1)-2(y-5)}{(y-5)(y+1)}$ oe (may be as two separate fractions) A1 for $\frac{y+13}{(y-5)(y+1)}$ **or** $\frac{y+13}{y^2-4y-5}$

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Monday 11 November 2013 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/5/5/5/

P 4 3 6 0 6 A 0 1 2 8

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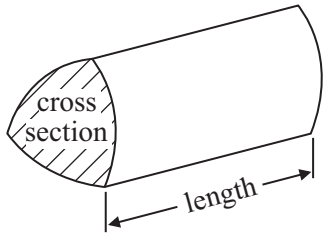
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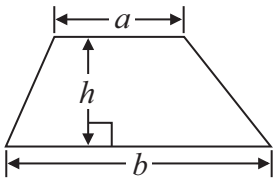
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

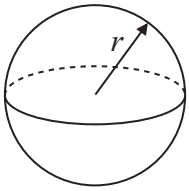


Area of trapezium = $\frac{1}{2}(a + b)h$



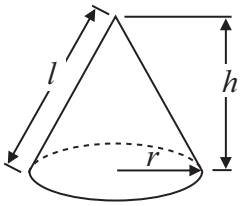
Volume of sphere = $\frac{4}{3}\pi r^3$

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

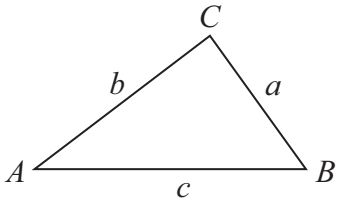


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



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

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

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 = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 Given that

$$374 \times 85 = 31\,790$$

write down the value of

(i) 3740×850

.....

(ii) 37.4×8.5

.....

(iii) $31790 \div 0.85$

.....

(Total for Question 1 is 3 marks)

2 Here are some letters.

A B C A A B D

Andy is going to take at random one of these letters.

(a) What is the probability that Andy will take a letter A?

.....

(1)

Here are some numbers.

3 1 1 2 1 3 4 4 2

Samantha is going to take at random one of these numbers.

(b) What is the probability that Samantha will take a number 1 or a number 3?

.....

(1)

(Total for Question 2 is 2 marks)

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3

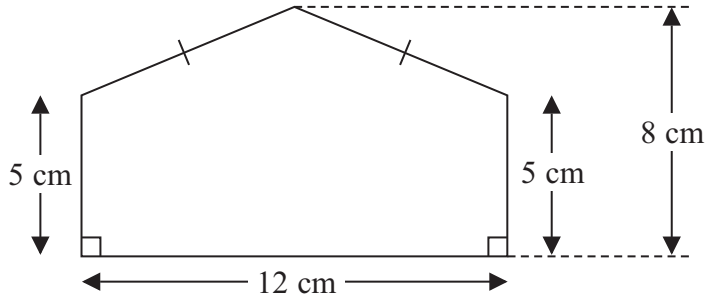


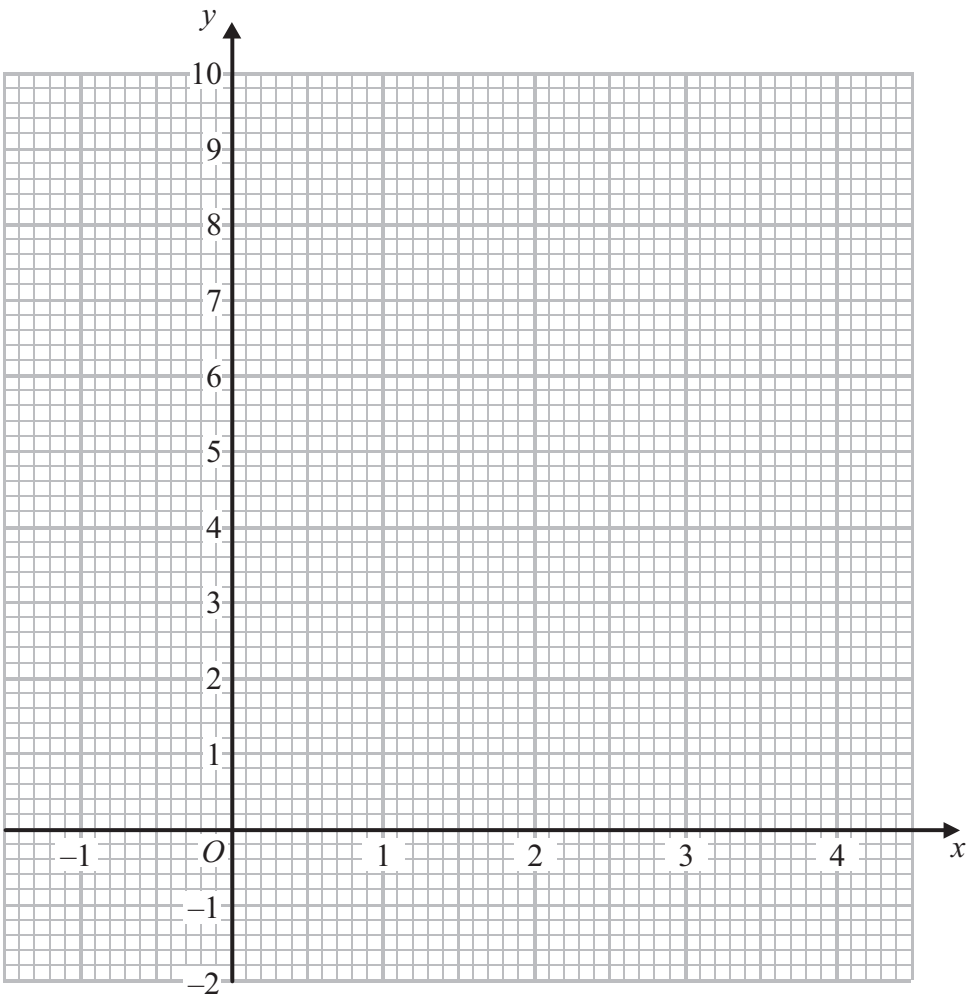
Diagram **NOT** accurately drawn

Work out the area of the shape.

..... cm^2

(Total for Question 3 is 4 marks)

4 On the grid, draw the graph of $y = 7 - 2x$ for values of x from $x = -1$ to $x = 4$



(Total for Question 4 is 3 marks)

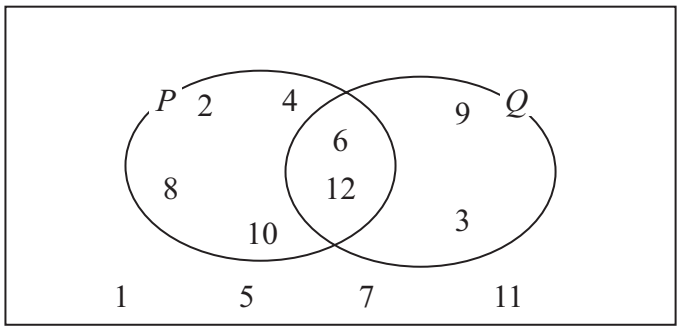
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5 Work out an estimate for the value of $\frac{195.6}{0.495}$

.....

(Total for Question 5 is 2 marks)

6 Here is a Venn diagram.



A student chooses at random a number from the Venn diagram.

Write down the probability that this number is **not** in set Q.

.....

(Total for Question 6 is 2 marks)

7 (a) Write 220 as a product of its prime factors.

.....

(2)

(b) Work out the Lowest Common Multiple (LCM) of 165 and 220

.....

(2)

(Total for Question 7 is 4 marks)

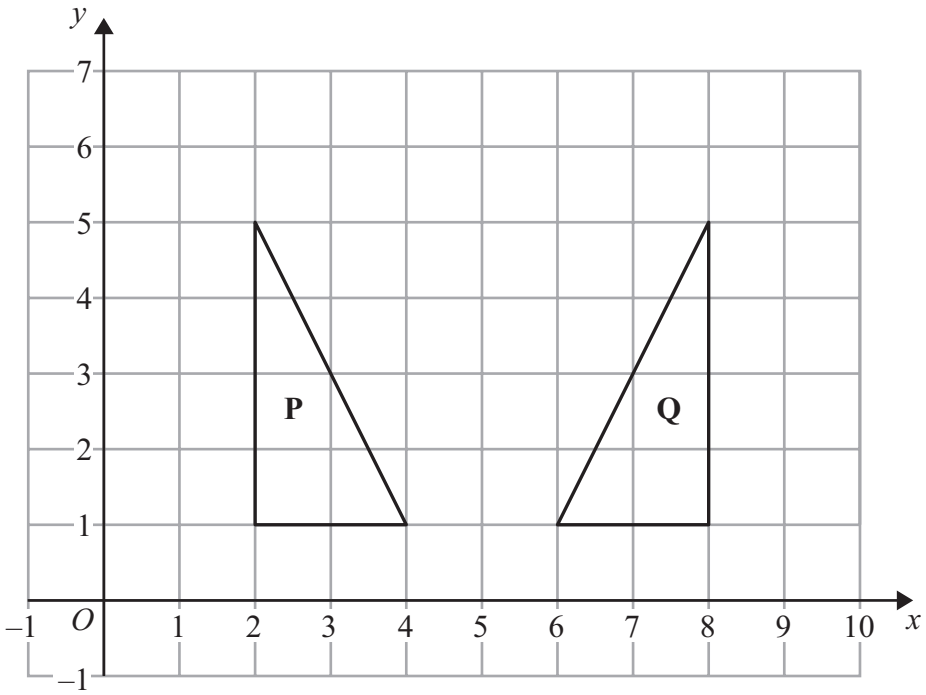
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8 Solve $7x + 2 = 3(x - 4)$

.....

(Total for Question 8 is 3 marks)

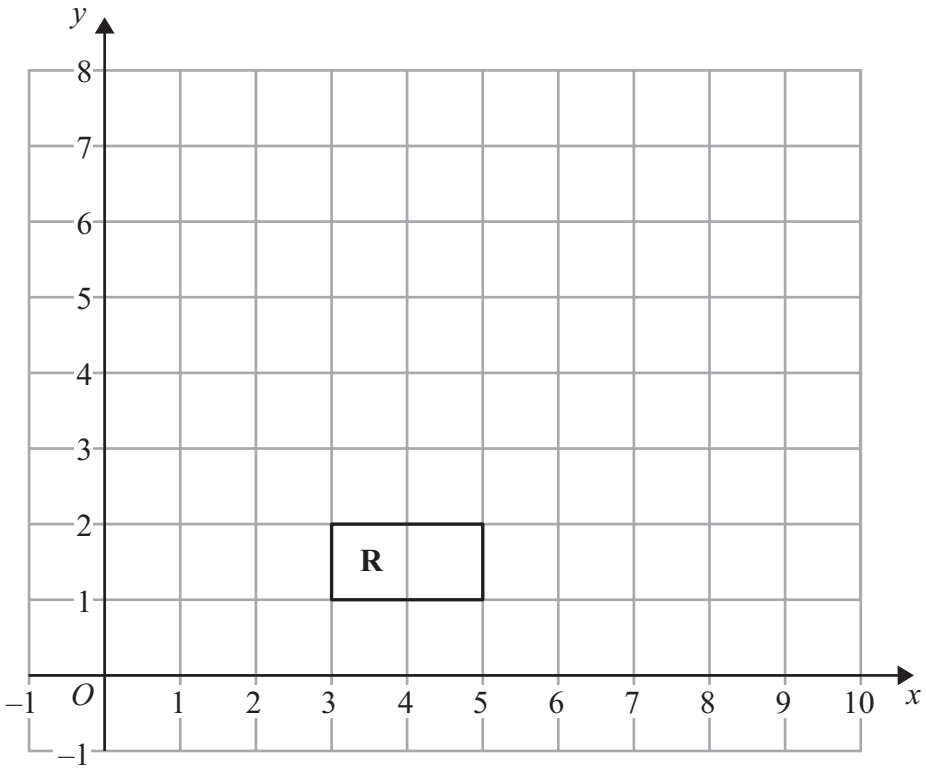
9



(a) Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

.....

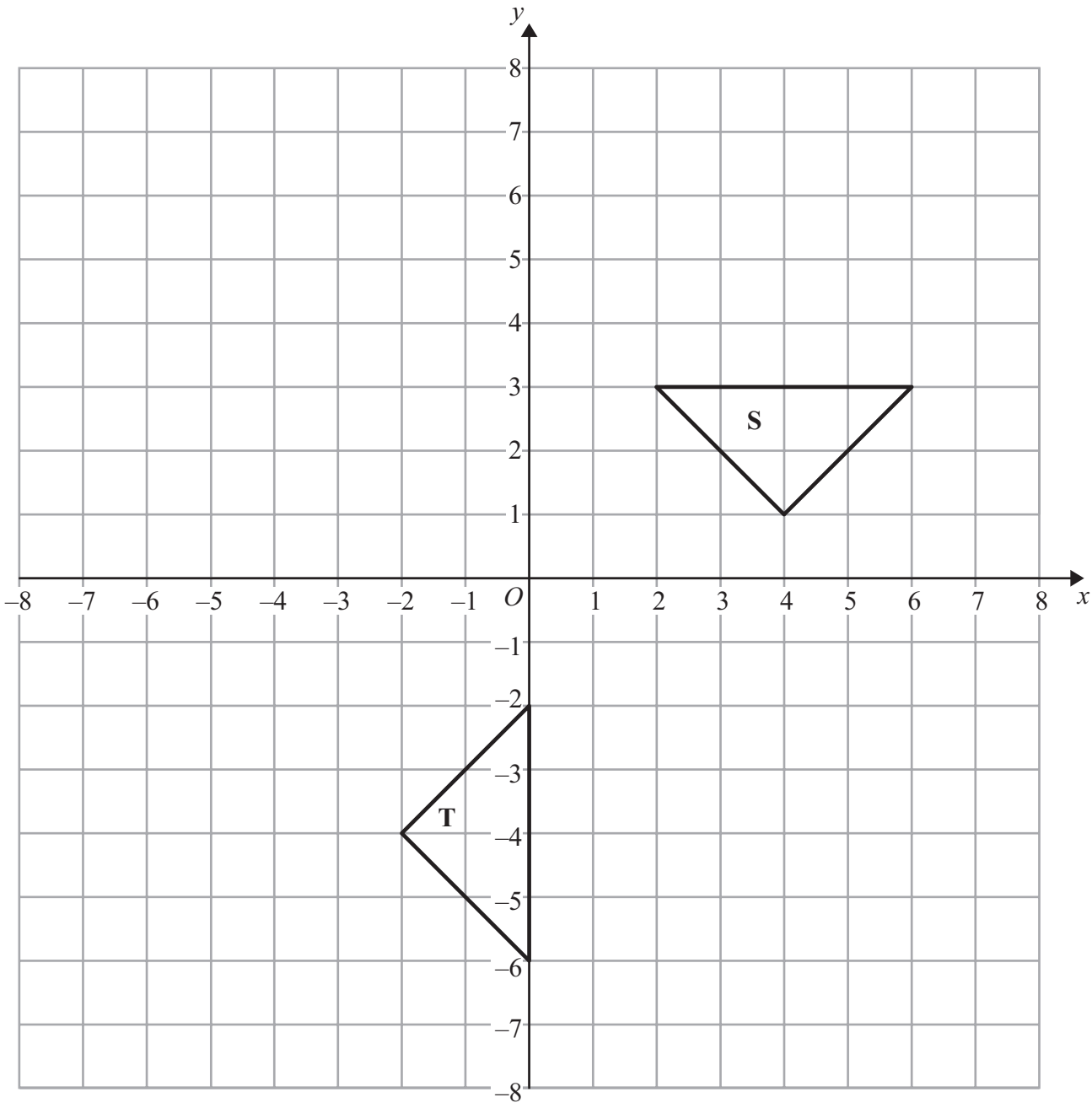
(2)



(b) Enlarge rectangle **R**, with scale factor 3 and centre (4, 0).

(2)

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Shape **S** can be transformed to shape **T** by the translation $\begin{pmatrix} 0 \\ -3 \end{pmatrix}$ followed by a rotation.

(c) Describe the rotation.

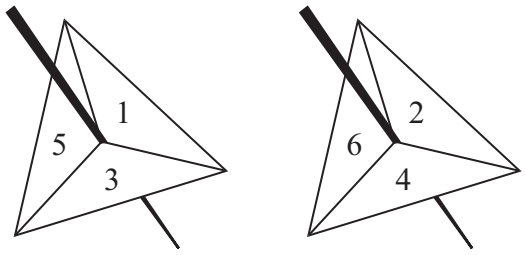
.....

.....

(3)

(Total for Question 9 is 7 marks)

10 Jack has two fair 3-sided spinners.



Jack spins each spinner once.
Each spinner lands on a number.

Jack multiplies these two numbers together to get his score.

(i) Work out the probability that Jack's score is 6

.....

(ii) Work out the probability that Jack's score is at least 10

.....

(Total for Question 10 is 5 marks)

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11 A and B are vertices of a cuboid.

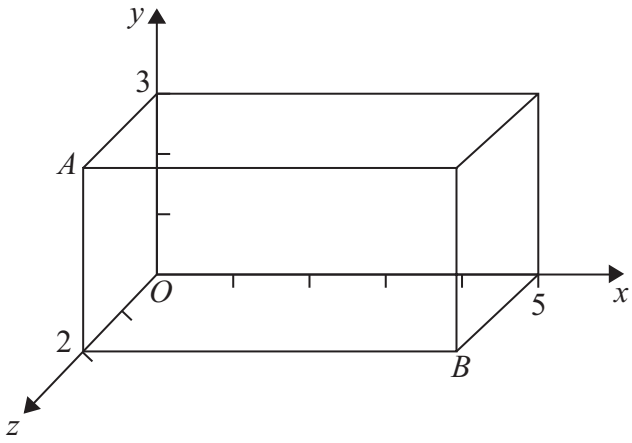


Diagram **NOT** accurately drawn

Work out the coordinates of the midpoint of AB.

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

(Total for Question 11 is 3 marks)

12 (a) Simplify $a \times a^2$

.....

(1)

(b) Simplify $\frac{b^7}{b^3}$

.....

(1)

(c) Simplify $(c^3)^4$

.....

(1)

(d) Expand and simplify $5(x^2 + 2) + 2(3x^2 + 4)$

.....

(2)

(e) Expand and simplify $(x - 6)(x + 1)$

.....

(2)

(Total for Question 12 is 7 marks)

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13 (a) Work out $\frac{2}{5} + \frac{1}{4}$

.....

(2)

(b) Work out $3\frac{1}{8} \times 2\frac{2}{5}$

Give your answer as a fraction in its simplest form.

.....

(3)

(Total for Question 13 is 5 marks)

14 The nth term of a quadratic sequence is $n^2 + 3n - 2$

(a) Find the fourth term of this sequence.

.....

(2)

Here are the first five terms of a different quadratic sequence.

1 7 17 31 49

(b) Find, in terms of n, an expression for the nth term of this sequence.

.....

(3)

(Total for Question 14 is 5 marks)

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15 (a) Write as an ordinary number 7.4×10^5

.....

(1)

(b) Write in standard form 0.00000035

.....

(1)

(c) Work out $(4 \times 10^{-6}) \div (8 \times 10^5)$
Give your answer in standard form.

.....

(2)

(Total for Question 15 is 4 marks)

16 (a) Factorise $10x^2 + 5x$

.....

(2)

(b) Factorise $x^2 - 7x + 12$

.....

(2)

(Total for Question 16 is 4 marks)

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17 Here is some information about 100 students.

60 students study French.
36 students study Spanish.
14 students **do not** study either French or Spanish.

(a) Draw a Venn diagram to show this information.

(4)

One of the 100 students is picked at random.

(b) Work out the probability that this student studies French or Spanish or both.

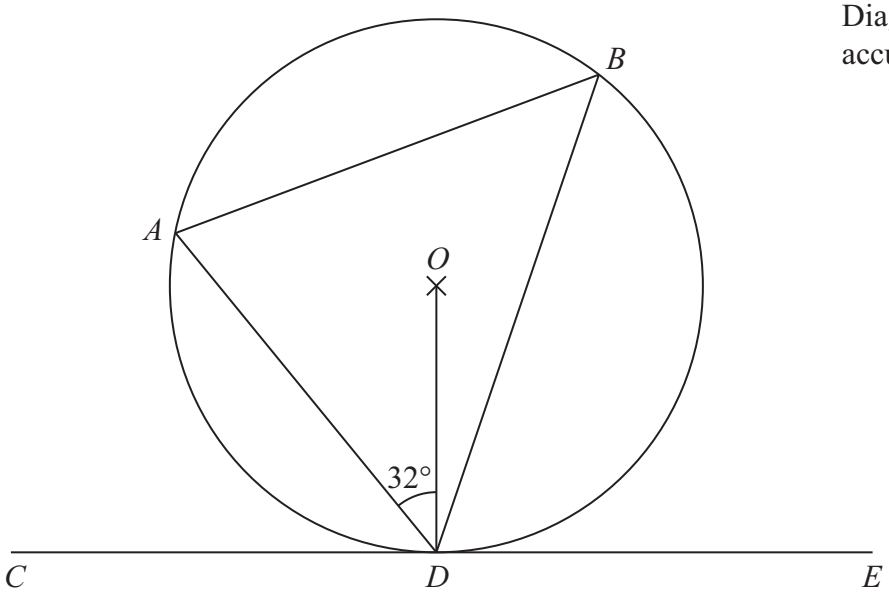
.....

(2)

(Total for Question 17 is 6 marks)

***18**

Diagram **NOT** accurately drawn



A, *B* and *D* are points on a circle, centre *O*.
CDE is a tangent to the circle.
Angle *ADO* is 32°

Work out the size of angle *ABD*.
Give reasons for your answer.

(Total for Question 18 is 4 marks)

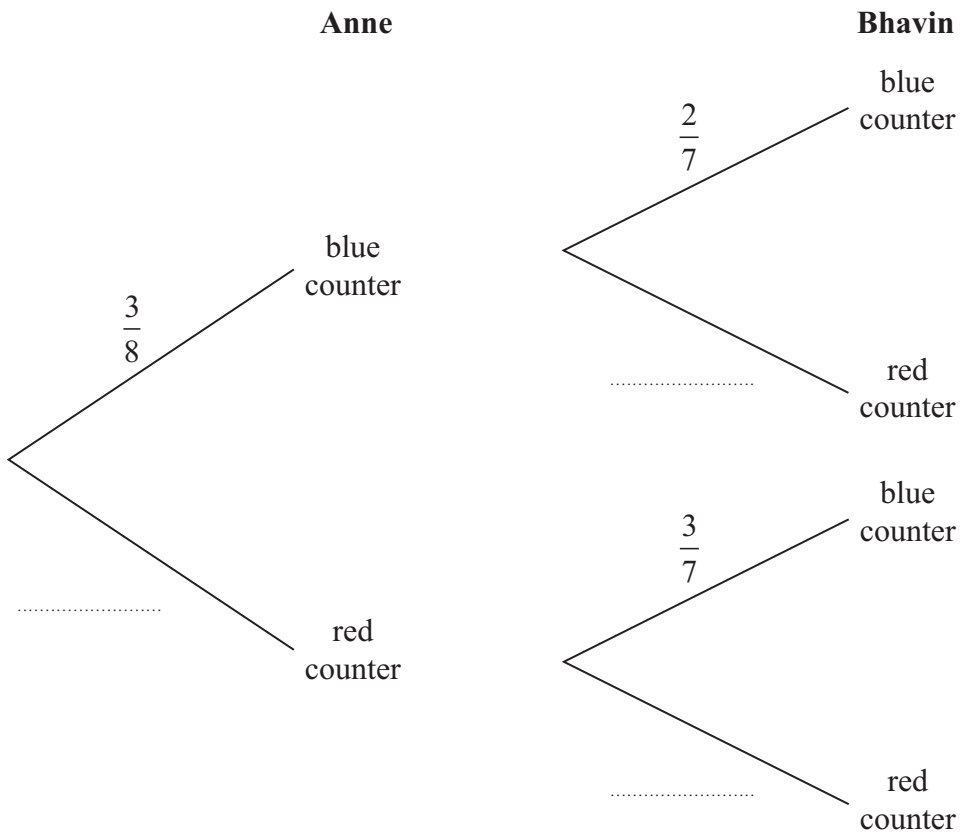
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19 There are 8 counters in a bag.

3 of the counters are blue.
5 of the counters are red.

Anne takes at random a counter from the bag.
Bhavin then takes at random a counter from the bag.

(a) Complete the probability tree diagram below.



(2)

(b) Work out the probability that Anne and Bhavin each take a blue counter.

.....

(2)

(Total for Question 19 is 4 marks)

20 (a) Write the following five numbers in order of size.
Start with the smallest number.

$$2^0 \qquad \sqrt{2} \qquad \frac{1}{2} \qquad 2^{-2} \qquad \frac{1}{\sqrt{2}}$$

.....

(2)

(b) Simplify $\left(\frac{2}{\sqrt{2}}\right)^3$

Give your answer in the form $a\sqrt{2}$ where a is an integer.

.....

(3)

(Total for Question 20 is 5 marks)

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***21**

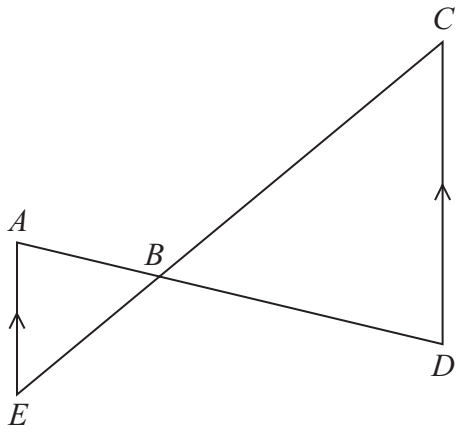


Diagram **NOT** accurately drawn

AE is parallel to *CD*.
ABD and *EBC* are straight lines.

Prove that triangle *ABE* is similar to triangle *DBC*.
Give reasons for each stage of your proof.

(Total for Question 21 is 4 marks)

22 A is an event such that $P(A) = \frac{1}{4}$

(a) Write down the value of $P(A')$.

.....

(1)

B is an event such that $P(B) = \frac{3}{5}$

A and B are independent.

(b) Work out the value of $P(A' \cap B)$.

.....

(2)

(Total for Question 22 is 3 marks)

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***23** Given that a and b are two consecutive even numbers, prove algebraically that

$$\left(\frac{a+b}{2}\right)^2 \text{ is always 1 less than } \frac{a^2+b^2}{2}$$

(Total for Question 23 is 5 marks)

24

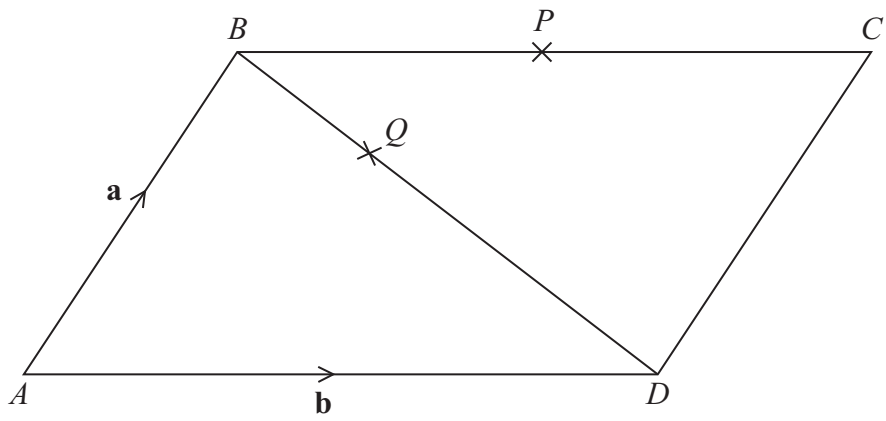


Diagram **NOT** accurately drawn

ABCD is a parallelogram.

$\overrightarrow{AB} = \mathbf{a}$

$\overrightarrow{AD} = \mathbf{b}$

P is the midpoint of *BC*.

(a) Express in terms of **a** and/or **b**

(i) $\overrightarrow{BP}$

.....

(ii) $\overrightarrow{BD}$

.....

(2)

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Q is a point on BD such that $BQ : QD = 1 : 2$

(b) Express in terms of **a** and **b**

(i) $\overrightarrow{AP}$

.....

(ii) $\overrightarrow{AQ}$

.....

(3)

(c) Explain what your answers to part (b) tell you about the position of the point Q.

.....

.....

(1)

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2013

Pearson Edexcel GCSE
Linked Pair Pilot in Mathematics
Methods in Mathematics (2MM01)
Higher Paper 1H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.
If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.
If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.
If there is no answer on the answer line then check the working for an obvious answer.
Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.
If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.
Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct
It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.
Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).
Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.
If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.
If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(i)		3179000	1	B1 cao
	(ii)		317.9(0)	1	B1
	(iii)		37400	1	B1 cao
2	(a)		$\frac{3}{7}$	1	B1 for $\frac{3}{7}$ oe
	(b)	$\frac{3}{9}+\frac{2}{9}$	$\frac{5}{9}$	1	B1 for $\frac{5}{9}$ oe
3			78	4	M1 for a correct method to find the area of a relevant rectangle. M1 for a correct method to find the area of a relevant triangle M1 for a complete and correct method to find the total area A1 cao Or M2 for splitting the shape into two trapeziums and using a correct method to find the area of the trapezium M1 for 2 ×'area of trapezium' A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		<table><tr><td>−1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>9</td><td>7</td><td>5</td><td>3</td><td>1</td><td>−1</td></tr></table>	correct line drawn	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x. M1 ft for plotting at least 2 of their points (any points plotted from their table must be correct) A1 for correct line between -1 and 4 **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 7 - 2x$ drawn (ignore any additional incorrect segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between -1 and 4 **(Use of y=mx+c)** M2 line segment of $y = 7 - 2x$ drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of −2 OR line drawn with a y intercept of 7 and a negative gradient) A1 for correct line between -1 and 4
5		$\frac{200}{0.5}$	400	2	M1 for rounding to 200 or 0.5 A1 cao

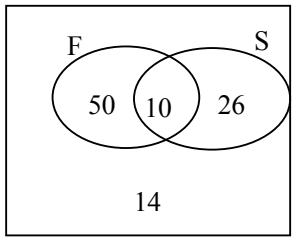
PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6			$\frac{8}{12}$	2	M1 for $\frac{x}{12}, x \neq 8$, x < 12 or $\frac{8}{x}, x \neq 12$, x > 8 A1 for $\frac{8}{12}$ oe
7	(a)	2)220 2)110 5) 55 11	$2^2 \times 5 \times 11$	2	M1 for a systematic method of at least two correct divisions by a prime number or 2 correct division stages on a factor tree or a full process with one calculation error A1 for $2 \times 2 \times 5 \times 11$ or $2^2 \times 5 \times 11$
	(b)	165, 330, 495, 660 220, 440, 660 $220 = 2^2 \times 5 \times 11$ $165 = 3 \times 5 \times 11$ $2^2 \times 5 \times 11 \times 3$	660	2	M1 for listing multiples, at least 3 of each, condone one addition error 165, 330, 495, 660 220, 440, 660 A1 cao or M1 for $3 \times 5 \times 11$ and $2^2 \times 5 \times 11$ (accept $4 \times 5 \times 11$) Could be seen in part a. A1 cao
8		$7x + 2 = 3x - 12$ $7x - 3x = -12 - 2$ $4x = -14$ $x = \frac{-14}{4}$	$\frac{-7}{2}$	3	M1 for $3 \times x - 3 \times 4$ oe or $\frac{7x+2}{3}$ oe M1(dep) for correct method to isolate terms in x or numbers on one side of the equation A1 for $\frac{-7}{2}$ oe

<table>
<tr><th colspan="5">PAPER: 5MM1H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>9</td><td>(a)</td><td></td><td>reflection in $x = 5$</td><td>2</td><td>B1 for reflection
B1 for $x = 5$</td></tr>
<tr><td></td><td>(b)</td><td></td><td>rectangle with vertices (1, 3),(1, 6), (7, 6), (7, 3)</td><td>2</td><td>M1 for enlargement sf 3
A1 for fully correct answer</td></tr>
<tr><td></td><td>(c)</td><td></td><td>90° clockwise, centre (0, 0)</td><td>3</td><td>B2 90˚ clockwise or 270˚ anticlockwise
(B1 90˚ or 270˚ stated without direction or with incorrect direction or correct translation of S shown)
B1 centre (0,0)</td></tr>
<tr><td>10</td><td>(i)</td><td>$(\frac{1}{3}\times\frac{1}{3})+(\frac{1}{3}\times\frac{1}{3})$</td><td>$\frac{2}{9}$</td><td>5</td><td>M1 for identifying there are 9 possible outcomes or $(\frac{1}{3}\times\frac{1}{3})$
M1 for clearly identifying the two outcomes (1, 6) and (3, 2)
or $(\frac{1}{3}\times\frac{1}{3})+(\frac{1}{3}\times\frac{1}{3})$
A1 for $\frac{2}{9}$ oe</td></tr>
<tr><td></td><td>(ii)</td><td><table><tr><td>×</td><td>1</td><td>3</td><td>5</td></tr><tr><td>2</td><td>2</td><td>6</td><td>10</td></tr><tr><td>4</td><td>4</td><td>12</td><td>20</td></tr><tr><td>6</td><td>6</td><td>18</td><td>30</td></tr></table></td><td>$\frac{5}{9}$</td><td></td><td>M1 for identifying the 5 correct outcomes or at least 4 correct with no more than one incorrect
A1 for $\frac{5}{9}$ oe</td></tr>
</table>

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		$\frac{0+5}{2}, \frac{3+0}{2}, \frac{2+2}{2}$	(2.5, 1.5, 2)	3	B1 2.5 B1 1.5 B1 2 (SCB1 if no previous mark awarded, for A (0,3,2) or B (5,0,2))
12	(a)		a^3	1	B1 cao
	(b)		b^4	1	B1 cao
	(c)		c^{12}	1	B1 cao
	(d)		$11x^2 + 18$	2	M1 for correct expansion of one bracket $5x^2 + 10$ or $6x^2 + 8$ A1 cao
	(e)	$x^2 - 6x + x - 6$	$x^2 - 5x - 6$	2	M1 for 4 terms correct with or without signs or 3 out of exactly 4 fully correct terms (the terms may be in an expression or table) A1 cao

PAPER: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)	$\frac{8}{20} + \frac{5}{20}$	$\frac{13}{20}$	2	M1 for both fractions expressed with a suitable common denominator (multiple of 20) and at least one of the two fractions correct A1 for $\frac{13}{20}$ oe or M1 for 0.4 + 0.25 A1 for 0.65 or M1 for table structure, all cells correct A1 for $\frac{13}{20}$ oe
		<table><tr><td></td><td>2</td><td>5</td></tr><tr><td>1</td><td></td><td>5</td></tr><tr><td>4</td><td>8</td><td>20</td></tr></table>			
	(b)	$\frac{25}{8} \times \frac{12}{5}$	$\frac{15}{2}$	3	M1 for a correct method to convert to improper fractions eg $\frac{3\times8+1}{8}$ or $\frac{2\times5+2}{5}$ M1 (dep) for $\frac{'25'\times'12'}{8\times5}$ A1 for $\frac{15}{2}$ or $7\frac{1}{2}$ (SCB2 for 7.5)

Paper 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	$4^2 + 3 \times 4 - 2$	26	2	M1 for substituting 4 into the expression eg $4^2 + 3 \times 4 - 2$ A1 cao
	(b)	1 7 17 31 49 6 10 14 18 4 4 4 $2n^2 + c$	$2n^2 - 1$	3	M1 for correct method to find second differences M1(dep) for $2n^2 + bn + c$ A1 for $2n^2 - 1$ or M1 for identifying general expression, nth term$=an^2 + bn + c$ M1 for 3 equations in a, b, c, $a \times 1^2 + b \times 1 + c = 1$ $a \times 2^2 + b \times 2 + c = 7$ $a \times 3^2 + b \times 3 + c = 17$ A1 for $2n^2 - 1$ Or M1 for listing the first 5 square numbers M1 for doubling the first five square numbers A1 for $2n^2 - 1$
15	(a)		740000	1	B1 cao
	(b)		3.5×10^{-7}	1	B1 cao
	(c)	$\frac{4}{8} \times 10^{-6-5}$ 0.5×10^{-11}	5×10^{-12}	2	M1 for $\frac{4}{8} \times 10^{-6-5}$ or $a \times 10^{-11}$ or 5×10^{b}, $b \neq -12$ or 0.000000000005 A1 cao

Paper 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		$5x(2x + 1)$	2	B2 $5x(2x + 1)$ (B1 for $x(10x + 5)$ or $5(2x^2 + x)$ or $(5x + 0)(2x + 1)$)
	(b)		$(x - 3)(x - 4)$	2	M1 for $(x \pm 3)(x \pm 4)$ A1 for $(x - 3)(x - 4)$
17	(a)	$100 - 14 = 86$ $60 + 36 - 86 = 10$ $60 - 10 = 50$ $36 - 10 = 26$		4	M1 for two overlapping labelled circles B1 for 14 shown outside the circles M1 for 60-'10' or 36-'10' ('10'≠0) A1 for a fully correct and labelled Venn diagram (condone omission of surrounding rectangle)
	(b)	$\frac{100-14}{100}$	$\frac{86}{100}$	2	M1 for '50' + '10' + '26' or 100 − '14' A1 ft $\frac{'86'}{100}$

Paper 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$90 - 32$	58° with reasons	4	M1 for angle $CDA = 90 - 32$ or 180 - 90 - 32 A1 for ABD is 58 C2 for complete reasons ('the tangent to a circle is perpendicular (90^o) to the radius (diameter)' and 'Alternate segment theorem') and degrees sign (C1 for one reason) or M1 for angle $AOD = 180 - 2 \times 32$ A1 for ABD is 58 C2 for complete reasons (angles in an isosceles triangle are equal, angles in a triangle add up to 180^o' and Angle at centre is twice angle at circumference) and degrees sign (C1 for Angle at centre is twice angle at circumference)
19	(a)		$\frac{5}{8}$, $\frac{5}{7}$ and $\frac{4}{7}$	2	B2 for $\frac{5}{8}$, $\frac{5}{7}$ and $\frac{4}{7}$ in correct positions (B1 for 1 or 2 in correct positions)
	(b)	$\frac{3}{8} \times \frac{2}{7}$	$\frac{6}{56}$	2	M1 for $\frac{3}{8} \times \frac{2}{7}$ A1 for $\frac{6}{56}$ oe

Paper 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20	(a)	$\frac{1}{2} = 2^{-1}$ $\frac{1}{\sqrt{2}} = 2^{-0.5}$ $\sqrt{2} = 2^{0.5}$	2^{-2}, $\frac{1}{2}$, $\frac{1}{\sqrt{2}}$, 2^{0}, $\sqrt{2}$	2	M1 for changing to powers of 2, eg sight of $2^{0.5}$ or 2^{-1} or $2^{-0.5}$ A1 for correct order (accept alternative equivalent forms eg all powers of 2) (SCB1 if M0 scored, for all in correct reverse order)
	(b)	$\frac{2}{\sqrt{2}} \times \frac{2}{\sqrt{2}} \times \frac{2}{\sqrt{2}} = \frac{8}{2\sqrt{2}}$ $\frac{8}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ $\frac{8\sqrt{2}}{4}$	$2\sqrt{2}$	3	M1 for cubing eg $\frac{2}{\sqrt{2}} \times \frac{2}{\sqrt{2}} \times \frac{2}{\sqrt{2}} = \left(= \frac{8}{2\sqrt{2}}\right)$ M1 for a correct method to rationalise eg $\frac{8}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ or $\frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ A1 for $2\sqrt{2}$ (accept a=2) or M1 for $\frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ (= $\sqrt{2}$) oe M1 for $(\sqrt{2})^3$ A1 for $2\sqrt{2}$ (accept a=2)

Paper 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*21		*ABE* = angle *CBD* (vertically opposite angles) angle *EAB* = angle *CDB* (alternate angles) angle *AEB* = angle *BCD* (alternate angles) Or angle *EAB* = angle *CDB* (alternate angles) angle *AEB* = angle *BCD* (alternate angles) *ABE* = angle *CBD* (angles in a triangle sum to 180°)	proof	4	M1 for any 2 pairs of angles correctly matched A1 for all 3 pairs correctly matched C2 (dep on M1)for full reasons and concluding statement (C1(dep on M1) for at least one reason)
22	(a)	$1 - \frac{1}{4}$	$\frac{3}{4}$	1	B1 for $\frac{3}{4}$ oe
	(b)	$\frac{3}{5} \times \frac{3}{4}$	$\frac{9}{20}$	2	M1 for $\frac{3}{5} \times$ ‘$\frac{3}{4}$’ A1 for $\frac{9}{20}$ oe or ft from (a)

Paper 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*23		$\left[\frac{2n+2n+2}{2}\right]^2$ $= (2n+1)^2 = 4n^2 + 4n + 1$ $\frac{(2n)^2 + (2n+2)^2}{2}$ $= \frac{8n^2 + 8n + 4}{2}$ $= 4n^2 + 4n + 2$ $\frac{a^2 + b^2}{2} - \frac{a^2 + 2ab + b^2}{4}$ $\frac{a^2 - 2ab + b^2}{4}$ $\left[\frac{b-a}{2}\right]^2$	Proof	5	M1 for expressions for 2 consecutive even numbers, eg $2n$, $2n + 2$ M1 for $\left[\frac{'2n'+'2n+2'}{2}\right]^2$ M1 for $\frac{('2n')^2 + ('2n+2')^2}{2}$ A1 for $4n^2+4n+1$ or for $4n^2+4n+2$ oe C1 for $4n^2+4n+1$oe and $4n^2+4n+2$ oe and correct conclusion from correct working or M1 for realisation that $b - a = 2$ (or $a - b = -2$) M1 for correct method to expand $\left[\frac{a+b}{2}\right]^2$ (= $\frac{a^2 + 2ab + b^2}{4}$) M1 for $\frac{a^2 + b^2}{2} - $ ‘$\frac{a^2 + 2ab + b^2}{4}$’, A1 for $\frac{a^2 - 2ab + b^2}{4}$ C1 for $\left[\frac{b-a}{2}\right]^2$ oe and correct conclusion from correct working

Paper 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
24	(a)(i)	$\vec{BP} = \frac{1}{2}\vec{BC}$	$\frac{1}{2}\underset{\sim}{b}$	2	B1 for $\frac{1}{2}\underset{\sim}{b}$ oe
	(ii)	$\vec{BD} = \underset{\sim}{b} - \underset{\sim}{a}$	$\underset{\sim}{b} - \underset{\sim}{a}$		B1 for $\underset{\sim}{b} - \underset{\sim}{a}$ oe
	(b)(i)	$\vec{AB} + \vec{BP}$	$\underset{\sim}{a} + \frac{1}{2}\underset{\sim}{b}$	3	B1 for $\underset{\sim}{a} + \frac{1}{2}\underset{\sim}{b}$ oe
	(ii)	$\vec{AB} + \vec{BQ}$ $\underset{\sim}{a} + \frac{1}{3}(\underset{\sim}{b} - \underset{\sim}{a})$	$\underset{\sim}{a} + \frac{1}{3}(\underset{\sim}{b} - \underset{\sim}{a})$		M1 for $\vec{AB} + \vec{BQ}$ or $\vec{AB} + \frac{1}{3}\vec{BD}$ A1 for $\underset{\sim}{a} + \frac{1}{3}(\underset{\sim}{b} - \underset{\sim}{a})$ $(= \frac{2}{3}\underset{\sim}{a} + \frac{1}{3}\underset{\sim}{b})$ oe
	(c)	$AQ = \frac{2}{3}\underset{\sim}{a} + \frac{1}{3}\underset{\sim}{b}$	Q is on AP $AQ:QP = 2:1$	1	B1 for Q lies on the line AP or for $AQ = \frac{2}{3}AP$ oe

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 5MM1H_01			
Question		**Modification**	**Notes**
Q4		2cm grid.	Standard mark scheme
Q6		1, 5, 7, 11 moved above P and Q.	Standard mark scheme
Q8		*x* changed to *y*.	Standard mark scheme
Q9	(a)	2cm grid. .	Standard mark scheme
	(b)	2cm grid. Rectangle R changed to rectangle E. Enlargement drawn on graph and labelled rectangle F coordinates (1, 3) (1, 6) (7, 3) (7, 6). Wording changed to "Describe fully the single transformation that maps rectangle E onto rectangle F."	B1 Enlargement by a scale factor of 3 B1 Centre (4,0)
	(c)	1½cm grid. *y* axis -1 to -8 labels put on right side of *y* axis	Standard mark scheme
Q11		Model given as well as diagram. AB joined.	Standard mark scheme

PAPER: 5MM1H_01			
Question		**Modification**	**Notes**
Q12		(a) *a* changed to *e*. (b) *b* changed to *e*. (d) *x* changed to *y*. (e) *x* changed to *y*.	Standard mark scheme
Q16		(a) and (b) *x* changed to *y*.	Standard mark scheme
Q19		Tree diagram size enlarged and solid answer lines.	Standard mark scheme
Q20		(b) *a* changed to *x*.	M1 for cubing eg $\frac{2}{\sqrt{2}} \times \frac{2}{\sqrt{2}} \times \frac{2}{\sqrt{2}}$ ($= \frac{8}{2\sqrt{2}}$) M1 for a correct method to rationalise eg $\frac{8}{2\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ or $\frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ A1 for $2\sqrt{2}$ (accept x=2) or M1 for $\frac{2}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$ ($= \sqrt{2}$) oe M1 for $(\sqrt{2})^3$ A1 for $2\sqrt{2}$ (accept $x = 2$)







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Surname	Other names

Edexcel GCSE

Centre Number	Candidate Number

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Monday 17 June 2013 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/6/8/

P 4 0 6 5 1 A 0 1 2 4

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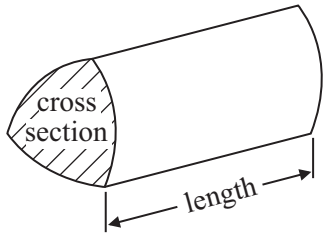
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GCSE Mathematics 2MM01

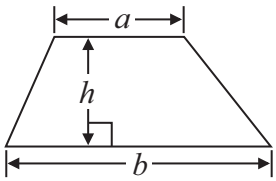
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

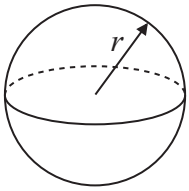


Area of trapezium = $\frac{1}{2}(a + b)h$



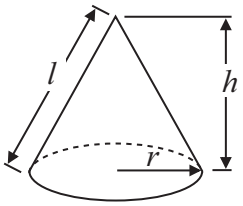
Volume of sphere = $\frac{4}{3}\pi r^3$

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

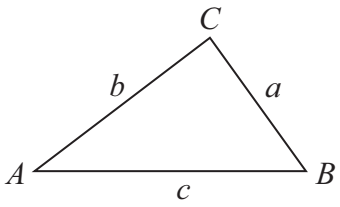


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



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

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

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 = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 $e = 5$

$f = -2$

(a) Work out the value of $2e + 3f$

.....

(2)

$h = 5$

(b) Work out the value of $2h^2$

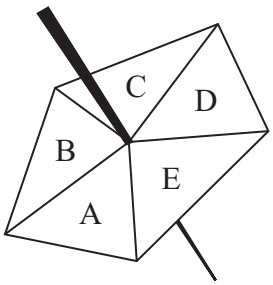
.....

(2)

(Total for Question 1 is 4 marks)

2 Here is a 5-sided spinner.
The sides of the spinner are labelled A, B, C, D and E.

Izrah spins the spinner 40 times.



The table shows the number of times the spinner lands on A, on B, on C, on D and on E.

Outcome (letter)	A	B	C	D	E
Frequency	18	13	3	4	2

(a) Is the spinner biased? .....

Use the numbers in the table to explain your answer.

.....

.....

.....

(1)

Thomas spins the spinner once.

(b) Using the information in the table find an estimate for the probability that the spinner will land on E.

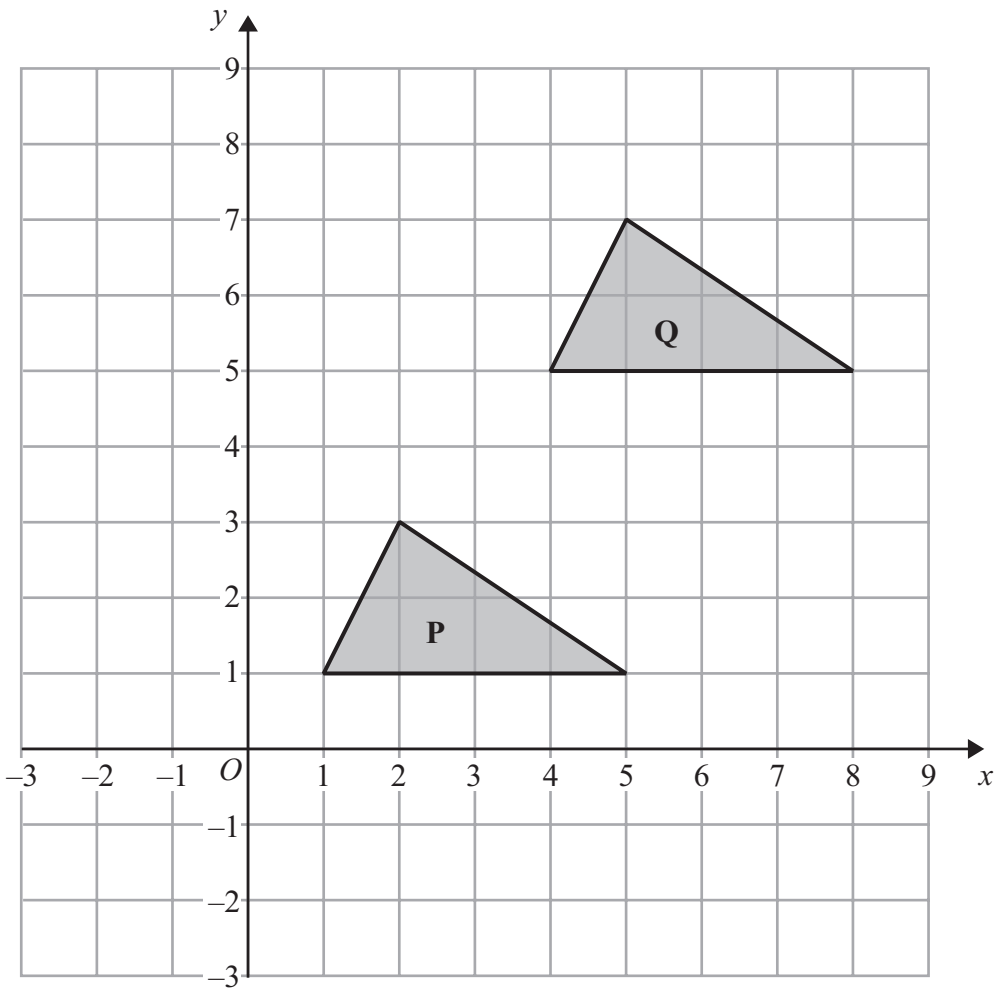
.....

(2)

(Total for Question 2 is 3 marks)

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3



Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

.....

.....

.....

(Total for Question 3 is 2 marks)

4 (a) Simplify $3x \times 4y$

.....

(1)

(b) Expand $2(c - 2d)$

.....

(1)

(c) Simplify $a^5 \times a^4 \div a^3$

.....

(2)

(d) Expand and simplify $(2x + 3)(x - 4)$

.....

(2)

(e) Factorise fully $6ef + 9e^2$

.....

(2)

(Total for Question 4 is 8 marks)

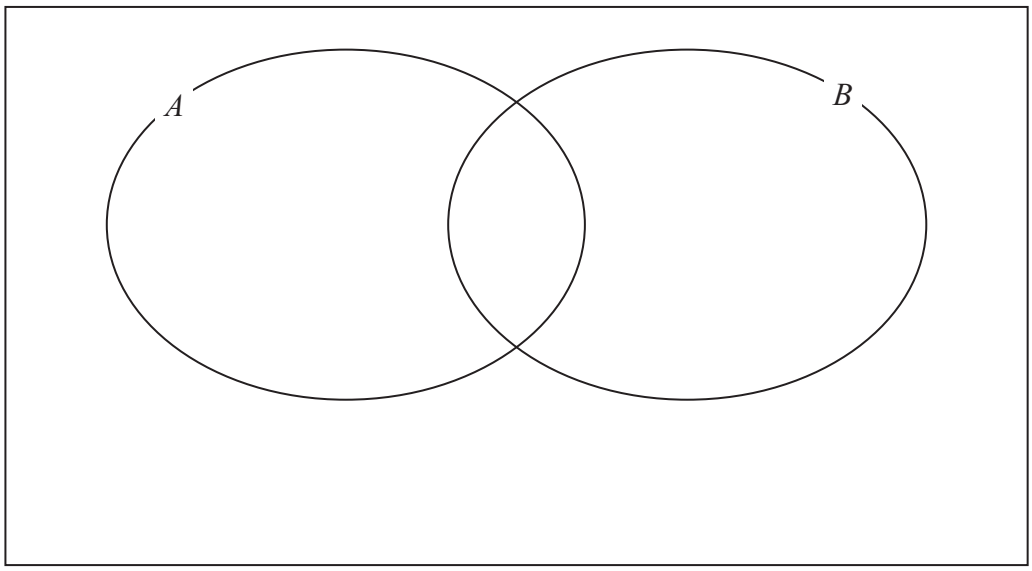
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5 Here is a list of numbers.

30 31 32 33 34 35 36 37 38 39 40

set $A = \{30, 33, 36, 39\}$
set $B = \{31, 33, 35, 37, 39\}$

(a) Write each number from the list in the correct place in the Venn diagram.



(4)

A number is chosen at random from the numbers in the list.

(b) Find the probability that the number is in both set A and set B.

$P(A \cap B) =$ .....

(1)

(c) Find the probability that the number is **not** in set A.

$P(A') =$ .....

(1)

(Total for Question 5 is 6 marks)

6 Sam rolls a fair dice 150 times.

Work out an estimate for the number of times the dice will land on 4

.....

(Total for Question 6 is 2 marks)

7 Given that

$$124 \times 68 = 8432$$

work out the value of

(a) 1.24×6.8

.....

(1)

(b) 124×34

.....

(1)

(Total for Question 7 is 2 marks)

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8 Here is a symmetrical shape.

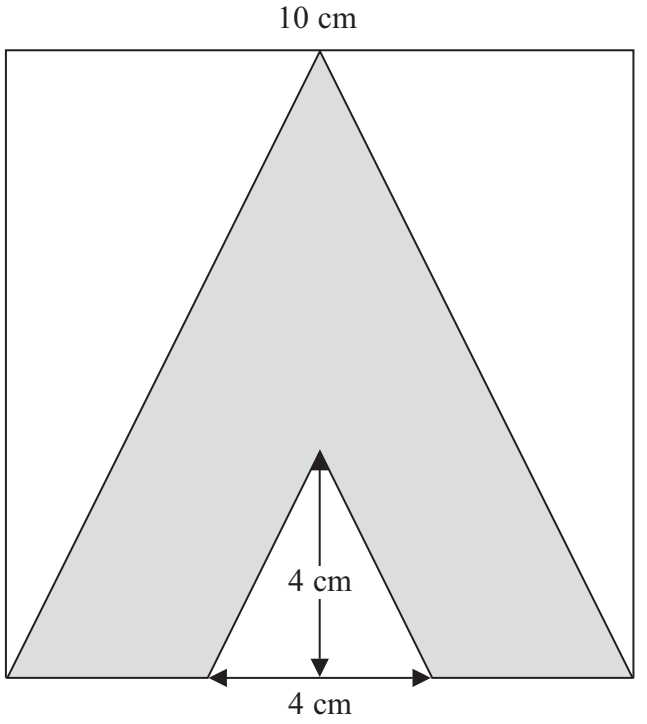


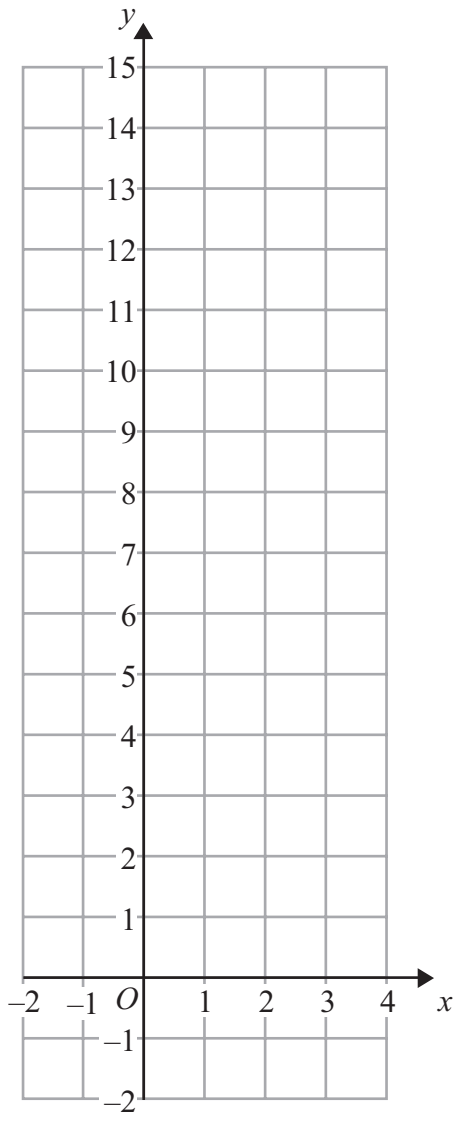
Diagram **NOT** accurately drawn

Work out the area of the shape that is shaded.

.....

(Total for Question 8 is 4 marks)

9 (a) On the grid, draw the graph of $y = 3x + 5$ for values of x from –2 to 3



(3)

*(b) Explain why the point (6, 24) does **not** lie on the line $y = 3x + 5$

(2)

(Total for Question 9 is 5 marks)

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10 Work out 42.7×5.6

.....

(Total for Question 10 is 3 marks)

***11** The diagram shows a triangle.

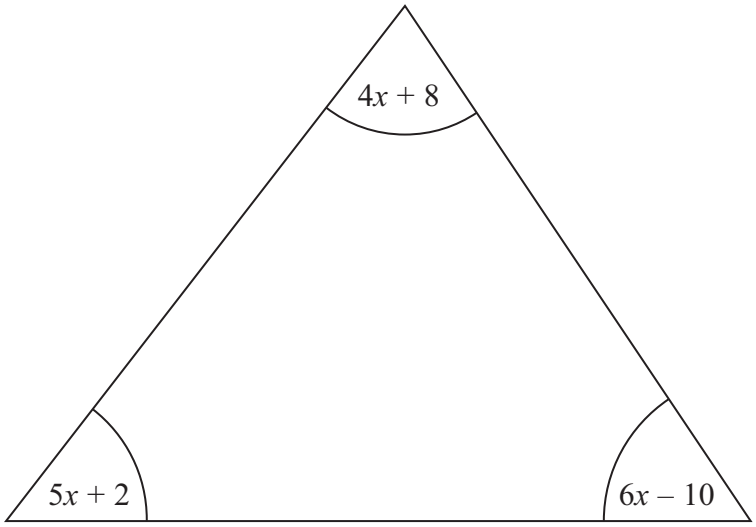


Diagram **NOT** accurately drawn

All the angles are measured in degrees.

Show that the triangle is isosceles.

(Total for Question 11 is 5 marks)

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12 (a) Express 80 as a product of its prime factors.

.....

(3)

(b) Find the Highest Common Factor (HCF) of 80 and 32

.....

(2)

(Total for Question 12 is 5 marks)

13 Here are the first five terms of an arithmetic sequence.

11 19 27 35 43

(a) Find an expression, in terms of n, for the nth term of this sequence.

.....

(2)

The nth term of another sequence is given by $46 - 3n$

(b) Find the first three terms of this sequence.

.....

(2)

(Total for Question 13 is 4 marks)

---

14 Find the value of

(a) 6^0

.....

(1)

(b) 4^{-2}

.....

(1)

(c) $64^{\frac{1}{3}}$

.....

(1)

(Total for Question 14 is 3 marks)

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15 The diagram shows two identical squares placed side by side to form a rectangle.

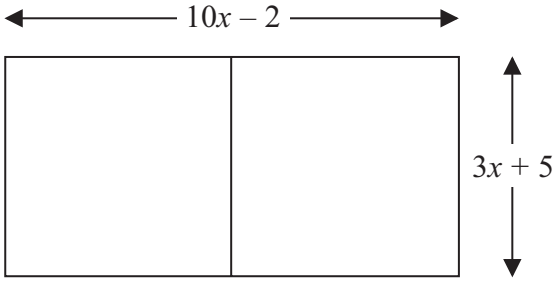


Diagram **NOT** accurately drawn

All measurements are in centimetres.

Calculate the numerical value of the length of the rectangle.

..... cm

(Total for Question 15 is 4 marks)

16

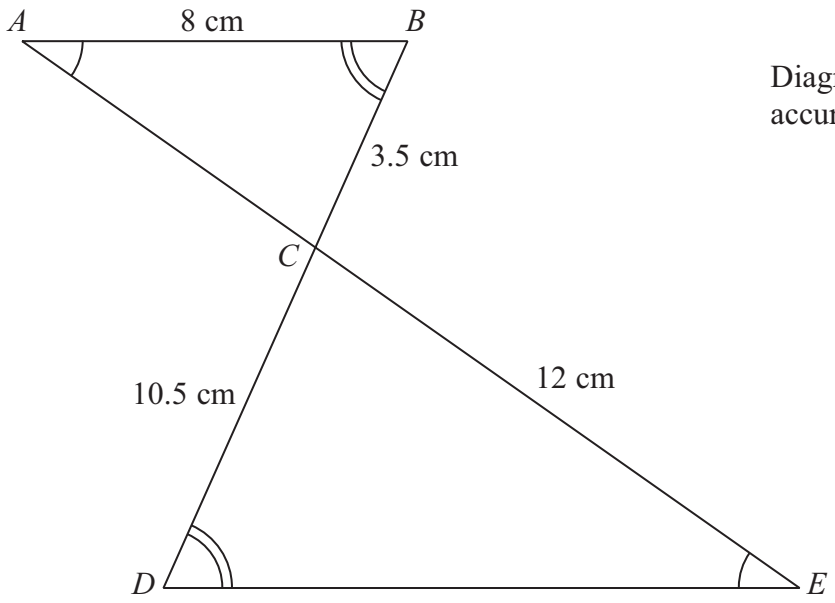


Diagram **NOT** accurately drawn

Triangles *ABC* and *EDC* are similar.

ACE and *BCD* are straight lines.

Angle *BAC* = Angle *DEC*
Angle *CBA* = Angle *CDE*

AB = 8 cm, *BC* = 3.5 cm, *CD* = 10.5 cm and *CE* = 12 cm

(a) Work out the length of *DE*.

..... cm

(2)

(b) Work out the length of *AE*.

..... cm

(2)

(Total for Question 16 is 4 marks)

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17 Solve $x^2 - 2x - 24 = 0$

.....

(Total for Question 17 is 3 marks)

18 (a) Write the number 12 000 000 in standard form.

.....

(1)

(b) Write 2.57×10^{-3} as an ordinary number.

.....

(1)

(c) Work out $(1.56 \times 10^4) + (4.9 \times 10^3)$
Give your answer in standard form.

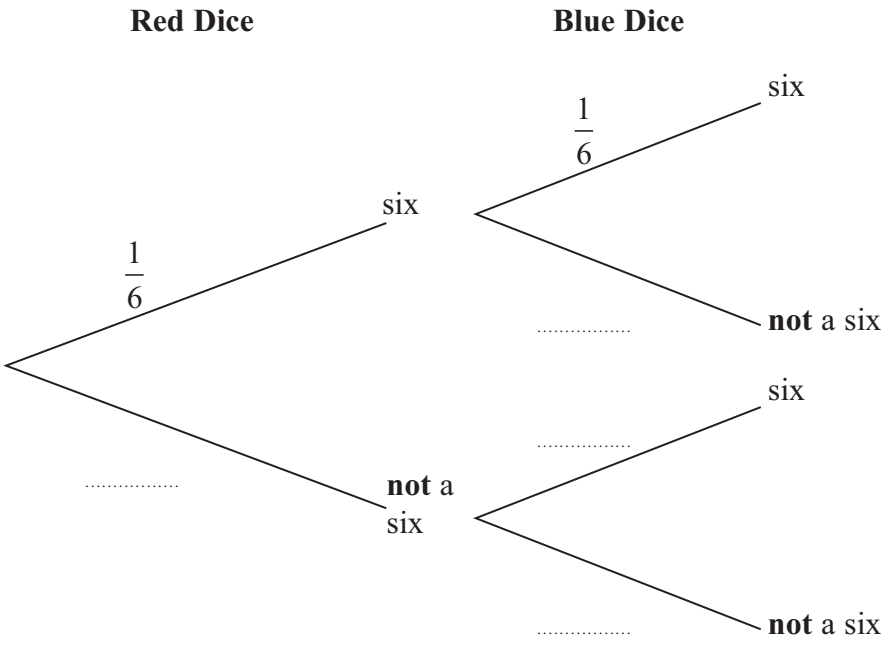
.....

(2)

(Total for Question 18 is 4 marks)

19 A fair red dice and a fair blue dice are going to be thrown.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that exactly one dice will land on a six.

.....

(3)

(Total for Question 19 is 5 marks)

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***20**

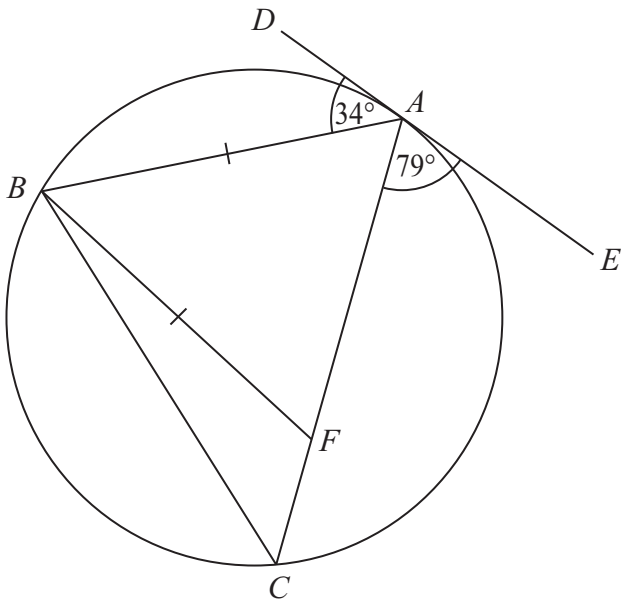


Diagram **NOT** accurately drawn

A, B and C are points on the circumference of a circle.
DAE is a tangent to the circle.
F is the point on AC such that triangle ABF is isosceles.

$AB = BF$
Angle $DAB = 34°$
Angle $EAC = 79°$

Work out the size of angle CBF.
You must give reasons for your answer.

(Total for Question 20 is 5 marks)

21 A and B are two independent events.

$P(A) = 0.7$
$P(B) = 0.4$

(a) Find the value of $P(A')$

$P(A') =$ .....

(1)

(b) Work out the value of $P(A \cap B)$

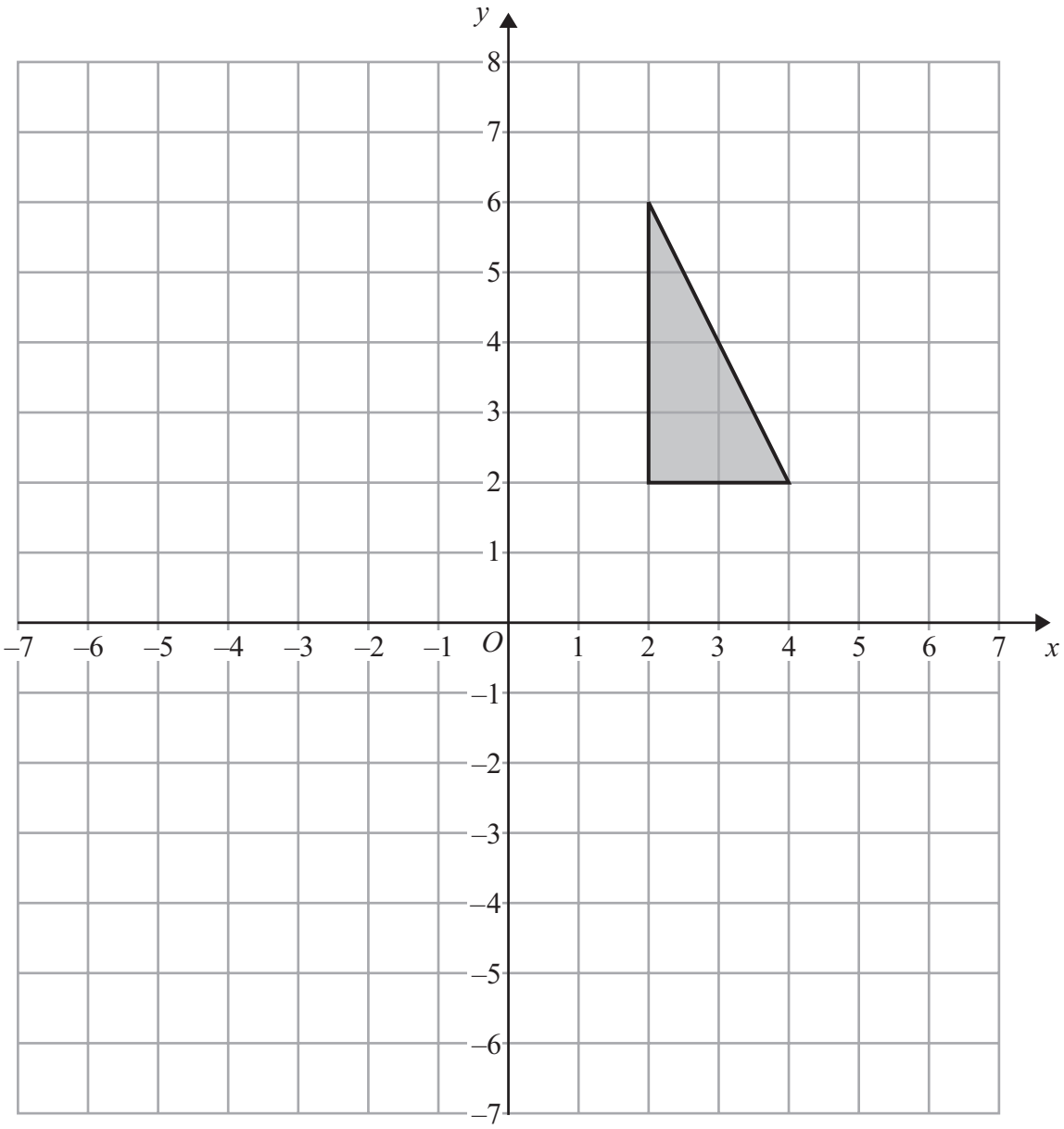
$P(A \cap B) =$ .....

(2)

(Total for Question 21 is 3 marks)

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22



Enlarge the shaded shape by a scale factor of $-1\frac{1}{2}$, centre (0, 4).

(Total for Question 22 is 3 marks)

***23** n is an integer greater than 1

Use algebra to show that $(n^2 - 1) + (n - 1)^2$ is always equal to an even number.

(Total for Question 23 is 4 marks)

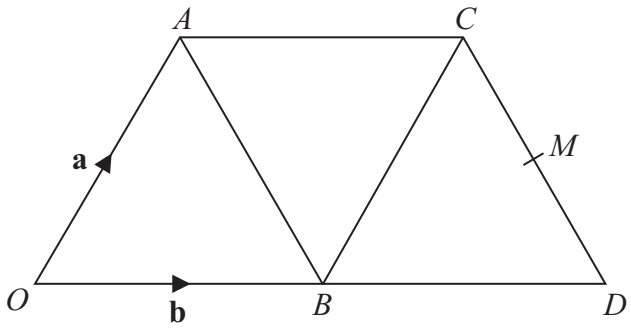
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24 $OACD$ is a trapezium made from three equilateral triangles.

$\overrightarrow{OA} = \mathbf{a}$

$\overrightarrow{OB} = \mathbf{b}$

M is the midpoint of CD.



(a) Write $\overrightarrow{AB}$ in terms of **a** and **b**.

.....

(1)

(b) Show that $\overrightarrow{OC}$ is parallel to $\overrightarrow{BM}$.

(4)

(Total for Question 24 is 5 marks)

Turn over for Question 25

25 There are 3 black counters, 5 grey counters and 2 white counters in a bag.

Susie takes at random two counters from the bag.

Calculate the probability that Susie takes at least one black counter.

.....

(Total for Question 25 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

Summer 2013

GCSE Mathematics Linked Pair Pilot
Methods in Mathematics (2MM01)
Foundation (Non Calculator) Paper 1H

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Summer 2013
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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labelling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect cancelling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

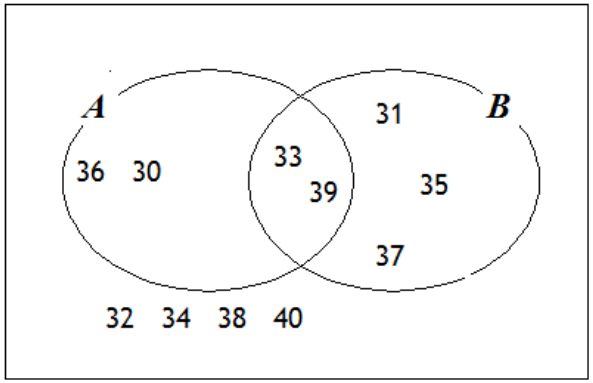
13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		4	2	M1 $2 \times 5 + 3 \times -2$ or $10 - 6$ A1 cao
	(b)		50	2	M1 $2 \times 5 \times 5$ or 2×25 A1 cao
2	(a)		reason	1	B1 Eg. **yes** and any sentence that indicates that the number of outcomes for each letter is not evenly distributed **or** **no** and any sentence that indicates that the number of outcomes for each letter could have come from a fair spinner as there are only 40 outcomes **or** **don't know** and any sentence that indicates that there are insufficient outcomes (only 40) to be able to tell or don't know if the sides of the spinner are the same length
	(b)		$\frac{2}{40}$	2	M1 for $\frac{2}{n}$ for $n > 2$ or $\frac{n}{40}$ for $n < 40$ A1 $\frac{2}{40}$ oe

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3			translation $\begin{pmatrix}3\\4\end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix}3\\4\end{pmatrix}$ NB more than one transformation described scores no marks
4	(a)		$12xy$	1	B1 or $12yx$
	(b)		$2c - 4d$	1	B1 $2c - 4d$
	(c)	$a^9 \div a^3$ **or** $a^5 \times a^1$ **or** $a^2 \times a^4$	a^6	2	M1 a^{5+4-3} or a^{5+4} or a^9 seen A1 cao or M1 a^{4-3} or a or a^1 seen A1 cao or M1 a^{5-3} or a^2 seen A1 cao
	(d)	$2x^2+3x-8x-12$	$2x^2-5x-12$	2	M1 for 3 out of no more than 4 terms correct with correct signs **or** the 4 terms $2x^2$, $3x$, $8x$ and 12 seen, ignoring signs A1 cao
	(e)		$3e(2f+3e)$	2	M1 $3(2ef+3e^2)$ or $e(6f+9e)$ A1 $3e(2f+3e)$ cao

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)			4	B1 33 and 39 and no other numbers placed in the intersection B1 30 and 36 in set *A* or 31, 35 and 37 in set *B* B1 at least two of 32, 34, 38, 40 placed correctly B1 fully correct diagram
	(b)		$\frac{2}{11}$ oe	1	B1 ft from candidate's Venn diagram
	(c)		$\frac{7}{11}$ oe	1	B1 ft from candidate's Venn diagram

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		$150 \div 6$ or $\frac{1}{6} \times 150$	25	2	M1 $150 \div 6$ or $\frac{1}{6} \times 150$ A1 cao NB $\frac{25}{150}$ scores M1 A0
7	(a)		8.432	1	B1 cao
	(b)		4216	1	B1 cao
8			$42cm^2$	4	M1 for a correct method to find area of one triangle M1 for a fully correct method to find the shaded area A1 cao B1 (indep) for cm^2

<table>
<tr><th colspan="6">Paper: 5MM1H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>9</td><td>(a)</td><td>$y = 3x + 5$
<table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y</td><td>-1</td><td>2</td><td>5</td><td>8</td><td>11</td><td>14</td></tr></table></td><td>Correct line
from (-2,-1) to (3,14)</td><td>3</td><td>(Table of values / calculation of values)
M1 for at least 2 correct attempts to find points by substituting values of x.
M1 ft for plotting at least 2 of their points (any points plotted from their table must be correctly plotted)
A1 for correct line between $x = –2$ and $x = 3$

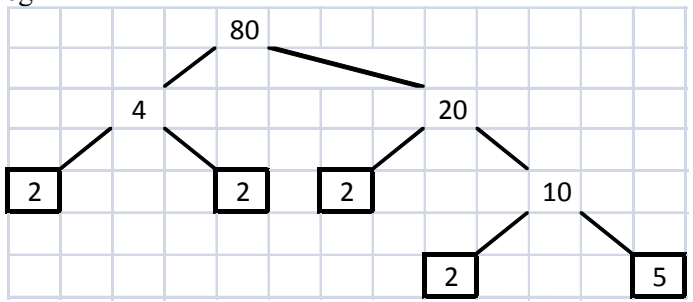
(No table of values)
M1 for at least 2 correct points with no more than 2 incorrect points
M1 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 3x + 5$ drawn
A1 for correct line between $x = –2$ and $x = 3$

(Use of y=mx+c)
M1 for line drawn with gradient of 3 OR line drawn with a y intercept of 5
M1 for line drawn with gradient of 3 AND line drawn with a y intercept of 5
A1 for correct line between $x = –2$ and $x = 3$

SC : B2 for the correct line from $x = 0$ to $x = 3$</td></tr>
<tr><td></td><td>(*b)</td><td>$3 \times 6 + 5$
$= 18 + 5$
or
$24 – 5=19$
$19 \div 3$</td><td>Correct explanation</td><td>2</td><td>M1 $3 \times 6 + 5$ or “18” + 5 or (6, 23)
C1 for 23 seen and correct conclusion
or
M1 $24 – 5$ or “19” $\div 3$
C1 for $\frac{19}{3}$ oe or 6.3... seen and correct conclusion</td></tr>
</table>

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10		427 56 × 2562 21350 + 23912 4 2 7 2 | 2 0 | 1 0 | 3 5 | 5 3 | 2 4 | 1 2 | 4 2 | 6 9 1 2 400 20 7 × 20 000 | 1 000 | 350 | 50 2 400 | 120 | 42 | 6 20 000 2 400 1 000 120 350 42 + 23912	239.12	3	M1 for a complete method with relative place value correct. Condone 1 arithmetic error. Final addition not necessary. OR M1 for a complete grid with not more than 1 arithmetic error. Final addition not necessary (inside numbers) OR M1 for sight of a complete partitioning method. Condone 1 arithmetic error. Final addition not necessary. M1 (dep) for addition of all the appropriate elements of the calculation or digits 23912 . A1 cao

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*11			"**two** angles are **equal** so the triangle is **isosceles**"	5	M1 for $6x - 10 + 4x + 8 + 5x + 2$ **or** $15x$ M1 for $6x - 10 + 4x + 8 + 5x + 2 = 180$ **or** $15x = 180$ **or** $(x =) 180 \div 15$ A1 $x = 12$ M1 (ft from '12' if M2 scored) for $5\times$'12'$+2$ **or** $6\times$'12'-10 **or** $62(^o)$ **or** $4\times$'12'$+8$ **or** $56(^o)$ C1 both base angles as 62 **and two** angles are **equal** so the triangle is **isosceles** NB. $x = 12$ with no working scores M0M0A0 ; correct value of x from clear trial and improvement could gain M1M1A1 **OR** M1 $5x + 2 = 6x - 10$ **or** $2 + 10 = 6x - 5x$ A1 $x = 12$ M1 $5\times12+2$ **or** $6\times12-10$ **or** $62(^o)$ **or** $4\times12+8$ **or** $56(^o)$ M1 checking their angles add to 180^o, "62"+"62"+"56"=180 C1 both base angles as 62 **and two** angles are **equal** so the triangle is **isosceles** **OR** M1 $4x + 8 = 5x + 2$ oe or $4x + 8 = 6x - 10$ A1 $x = 6$ **or** $x = 9$ M1 (dep) for substituting 'x' into one of the angles oe M1 for showing their angles do not sum to 180^o C0

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)	eg  	$2^4 \times 5$	3	M1 for continual prime factorisation (at least first 2 steps correct) **or** first two stages of a factor tree correct. M1 for a fully correct factor tree or list 2,2,2,2,5 A1 for $2 \times 2 \times 2 \times 2 \times 5$ or $2^4 \times 5$ oe
	(b)		16	2	M1 for correct prime factorisation of 32 showing 2,2,2,2,2 (may be on factor tree) or 2^5 A1 cao OR List of all factors of 32 (1 and 32 may be omitted) (1),2,4,8,16,(32) **and** list of all factors of 80 (1 and 80 may be omitted) (1),2,4,5,8,10,16,20,40,(80) (may be shown as factor pairs) A1 cao SC B1 for 8 given as the final answer if M0 scored

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Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		$8n + 3$	2	B2 $8n+3$ oe (B1 $8n \pm k$ where $k \neq 3$)
	(b)	$46 - 3\times1$, $46 - 3\times2$, $46 - 3\times3$ $46 - 3$, $46 - 6$, $46 - 9$	43, 40, 37	2	M1 for correct substitution for any value of n, can be implied by one correct value of the sequence from 43, 40, 37 A1 for 43, 40, 37
14	(a)		1	1	B1
	(b)		$\frac{1}{16}$	1	B1
	(c)		4	1	B1

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15			28	4	M1 for forming a correct equation , eg $2(3x + 5) = 10x - 2$ oe $3x + 5 = \frac{1}{2}(10x - 2)$ oe or $10x - 2 - (3x + 5) = 3x + 5$ oe M1 (dep) for dealing with brackets correctly **or** correct method to isolate all x terms on one side. A1 $x = 3$ B1 ft (dep on M1) for 28 SC: B3 for an answer of 14 if no previous marks scored
16	(a)		24	2	M1 for a correct method to calculate a scale factor or multiplier eg $10.5 \div 3.5 (=3)$ or $3.5 \div 10.5$ (= 0.33...) or $8 \times 10.5 \div 3.5$ oe A1 cao
	(b)		16	2	M1 for a fully correct method to use a scale factor or multiplier to find AC or AE eg $12 \div 3$ (=4) or $12 \times 0.33...$ or $12 \times \frac{1}{3}$ (=4) or $12 \div 10.5 \times 3.5$ or $12 \times 1.33...$

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$(x - 6)(x + 4) = 0$ $(x - 6) = 0$ or $(x + 4) = 0$ OR $x = \frac{--2 \pm \sqrt{(-2)^2 - 4 \times 1 \times (-24)}}{2 \times 1}$ $= \frac{2 \pm \sqrt{100}}{2}$ OR $(x - 1)^2 - 25 = 0$ $(x - 1)^2 = 25$ $x - 1 = \pm 5$ $x = 1 \pm 5$	6, –4	3	M2 for $(x - 6)(x + 4)$ (M1 for $(x \pm 6)(x \pm 4)$) A1 cao 6 and –4 OR M1 for substitution into formula (condone incorrect signs) M1 $\frac{2 \pm \sqrt{100}}{2}$ oe A1 cao 6 and –4 OR M1 for $(x - 1)^2 - 1^2 - 24$ (= 0) M1 for $x = 1 \pm \sqrt{25}$ A1 cao 6 and –4 OR Using Trial and Improvement: B3 Both solutions correct (B1 One solution correct)

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)		1.2×10^7	1	B1
	(b)		0.00257	1	B1
	(c)	15600 + 4900 = 20500 OR $1.56 \times 10^4 + 0.49 \times 10^4$	2.05×10^4	2	M1 15600 + 4900 or 20500 or digits 205 seen A1 cao OR M1 $1.56 \times 10^4 + 0.49 \times 10^4$ or $15.6 \times 10^3 + 4.9 \times 10^3$ A1 cao

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19	(a)		$\frac{5}{6}$ $\frac{5}{6}, \frac{1}{6}, \frac{5}{6}$	2	B1 $\frac{5}{6}$ B1 $\frac{5}{6}, \frac{1}{6}$ and $\frac{5}{6}$
	(b)		$\frac{10}{36}$	3	M1 $\frac{1}{6} \times \frac{"5"}{6}$ or $\frac{"5"}{6} \times \frac{"1"}{6}$ M1 $\frac{1}{6} \times \frac{"5"}{6} + \frac{"5"}{6} \times \frac{"1"}{6}$ or $\frac{"5"}{36} + \frac{"5"}{36}$ A1 oe or M1 $\frac{"5"}{6} \times \frac{"5"}{6}$ or $\frac{1}{6} \times \frac{1}{6}$ M1 $1 - (\frac{"5"}{6} \times \frac{"5"}{6} + \frac{1}{6} \times \frac{1}{6})$ A1 oe

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*20		180 – (34 + 79) = 67 180 – 2 × 67 = 46 79 – 46 **or** 180 – (34 + 79) = 67 180 – 67 =113 180 – 113 − 34	33°	5	B1 *BCA*=34 or *ABC*=79 or could be seen on the diagram M1 180 – (34 + 79) or 180 – 113 or 67 seen M1 for 180 – 2 × "67" (= 46) **and** 79 – "46" C2(dep on M1) *CBF* = 33° and all four reasons: **alternate segment theorem,** **angles** on a **straight line** add up to **180,** **angles** of an **isosceles** triangle are **equal** and **angles** in a **triangle** add up to **180** (C1 any one reason) **or** B1 *BCA*=34 or *ABC*=79 or could be seen on the diagram M1 180 – (34 + 79) or 180 – 113 or 67 seen M1 for 180 – "67"(=113) **and** 180 – 34 – "113" C2(dep on M1) *CBF* = 33° and all four reasons **alternate segment theorem,** **angles** on a **straight line** add up to **180,** **angles** of an **isosceles** triangle are **equal** and **angles** in a **triangle** add up to **180** (C1 any one reason)

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21	(a)		0.3	1	B1
	(b)		0.28	2	M1 0.7×0.4 A1 oe
22			Vertices at (–6, 7) (–3 , 7) (–3, 1)	3	B3 fully correct (B2 correct orientation **and** correct size **or** two correct vertices) (B1 correct size **or** correct orientation **or** one correct vertex)
*23			Correct proof	4	M1 expands $(n-1)^2$ with at least three out of four terms correct **or** $n^2 - n - n + 1$ **or** $n^2 - 2n + 1$ M1 $n^2 - 1 + n^2 - n - n + 1$ **or** $2n^2 - 2n$ A1 $2(n^2 - n)$ **or** $2n(n-1)$ C1 (dep on M1) for conclusion $2 \times$ '$(n^2 - n)$' or $2 \times n \times$ '$(n-1)$' is always even OR M1 factorises $n^2 - 1$ correctly $(n-1)(n+1)$ M1 $(n-1)(n+1+n-1)$ A1 $2n(n-1)$ C1 (dep on M1) for conclusion $2 \times$ '$(n^2 - n)$' or $2 \times n \times$ '$(n-1)$' is always even

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
24	(a)		**b** – **a**	1	B1
	(b)		$\overrightarrow{BM} = \frac{1}{2}\overrightarrow{OC}$ hence parallel	4	B1 $\overrightarrow{OC} = \mathbf{a} + \mathbf{b}$ M1 $\overrightarrow{BM} = \overrightarrow{BC} + \overrightarrow{CM}$ oe or $\overrightarrow{BM} = \mathbf{a} + \frac{1}{2}$("**b** – **a**") A1 $\frac{1}{2}(\mathbf{a} + \mathbf{b})$ C1 $\overrightarrow{BM} = \frac{1}{2}\overrightarrow{OC}$ hence parallel **or** B1 $\overrightarrow{OC} = \mathbf{a} + \mathbf{b}$ M1 $\overrightarrow{BM} = \overrightarrow{BD} + \overrightarrow{DM}$ oe or $\overrightarrow{BM} = \mathbf{b} - \frac{1}{2}$("**b** – **a**") A1 $\frac{1}{2}(\mathbf{a} + \mathbf{b})$ C1 $\overrightarrow{BM} = \frac{1}{2}\overrightarrow{OC}$ hence parallel

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25		B, not B + not B, B + BB OR 1 – not B × not B	$\frac{48}{90}$	4	B1 for $\frac{7}{9}$ or $\frac{3}{9}$ or $\frac{2}{9}$ (could be seen in working or on a tree diagram) M1 for $\frac{3}{10} \times \frac{7}{9}$ or $\frac{7}{10} \times \frac{3}{9}$ or $\frac{3}{10} \times \frac{2}{9}$ oe M1 for $\frac{3}{10} \times \frac{7}{9} + \frac{7}{10} \times \frac{3}{9} + \frac{3}{10} \times \frac{2}{9}$ oe A1 for $\frac{48}{90}$ oe **OR** B1 for $\frac{6}{9}$ M1 for $\frac{7}{10} \times \frac{6}{9}$ oe M1 for $1 - \frac{7}{10} \times \frac{6}{9}$ oe A1 for $\frac{48}{90}$ oe

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25 (cont)		OR BB + BG + BW + GB + WB			**OR** B1 for $\frac{2}{9}$ or $\frac{5}{9}$ or $\frac{3}{9}$ (could be in working or on a tree diagram) M1 for $\frac{3}{10}\times\frac{2}{9}$ or $\frac{3}{10}\times\frac{5}{9}$ or $\frac{3}{10}\times\frac{2}{9}$ or $\frac{5}{10}\times\frac{3}{9}$ or $\frac{2}{10}\times\frac{3}{9}$ oe M1 for $\frac{3}{10}\times\frac{2}{9} + \frac{3}{10}\times\frac{5}{9} + \frac{3}{10}\times\frac{2}{9} + \frac{5}{10}\times\frac{3}{9} + \frac{2}{10}\times\frac{3}{9}$ oe A1 for $\frac{48}{90}$ oe
		OR $1-(GG + GW + WG + WW)$			**OR** B1 for $\frac{4}{9}$ or $\frac{2}{9}$ or $\frac{5}{9}$ or $\frac{1}{9}$ (could be in working or on a tree diagram) M1 for $\frac{5}{10}\times\frac{4}{9} + \frac{5}{10}\times\frac{2}{9} + \frac{2}{10}\times\frac{5}{9} + \frac{2}{10}\times\frac{1}{9}$ M1 for $1-(\frac{20}{90} + \frac{10}{90} + \frac{10}{90} + \frac{2}{90})$ A1 for $\frac{48}{90}$ oe

Paper: 5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25 (cont)		OR 1 – (Not B, Not B)			**OR** M2 $1-\frac{7}{10}\times\frac{6}{9}$ or $1-\frac{"42"}{90}$ (M1 $\frac{7}{10}\times\frac{6}{9}$ or $\frac{42}{90}$) A1 $\frac{48}{90}$ oe **SC: with replacement** B2 for $\frac{51}{100}$
		B, not B + not B, B + BB			**OR** for example: B0 M1 for $\frac{3}{10}\times\frac{7}{10}$ or $\frac{7}{10}\times\frac{3}{10}$ or $\frac{3}{10}\times\frac{3}{10}$ oe M1 for $\frac{3}{10}\times\frac{7}{10}+\frac{7}{10}\times\frac{3}{10}+\frac{3}{10}\times\frac{3}{10}$ oe A0

Modifications to the mark scheme for Modified Large Print (MLP) papers.

Only mark scheme amendments are shown where the enlargement or modification of the paper requires a change in the mark scheme.

The following tolerances should be accepted on marking MLP papers, unless otherwise stated below:
Angles: ±5º
Measurements of length: ±5 mm

PAPER: 5MM1H_01			
Question		**Modification**	**Notes**
Q3		2 cm grid.	Standard mark scheme
Q4	(a)	*x* changed to *e, y* to *f* - MLP	B1 or 12*fe*
	(c)	*a* changed to *p* - MLP	M1 p^{5+4-3} or p^{5+4} or p^{9} seen A1 cao or M1 p^{4-3} or p or p^{1} seen A1 cao or M1 p^{5-3} or p^{2} seen A1 cao
	(d)	*x* changed to *y* - MLP	M1 for 3 out of no more than 4 terms correct with correct signs **or** the 4 terms $2y^2$, $3y$, $8y$ and 12 seen, ignoring signs A1 cao
Q5		Diagram enlarged	Standard mark scheme
Q9		2 cm grid	Standard mark scheme

PAPER: 5MM1H_01			
Question		**Modification**	**Notes**
Q11		*x* changed to *y* – MLP	Standard mark scheme
Q15		*x* changed to *y* - MLP	
Q19		Diagram enlarged. Answer lines on the diagram are solid. Candidates are given the information: 'There are four spaces to fill.'	Standard mark scheme
Q22		2 cm grid. Original triangle labelled Triangle A. Enlargement given and labelled Triangle B. Question changed: 'Describe fully the single transformation that maps triangle A onto triangle B.'	Standard mark scheme
Q24		Vectors **a** and **b** are a larger size.	Standard mark scheme

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Centre Number	Candidate Number

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Monday 12 November 2012 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/6/7/

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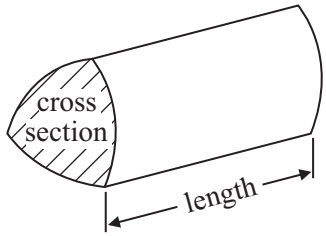
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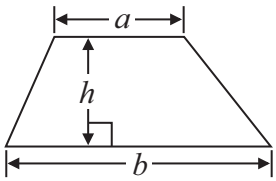
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

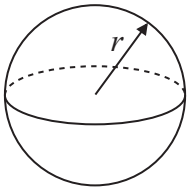


Area of trapezium = $\frac{1}{2}(a + b)h$



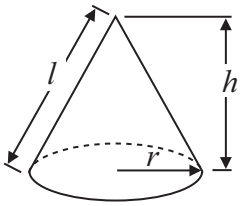
Volume of sphere = $\frac{4}{3}\pi r^3$

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

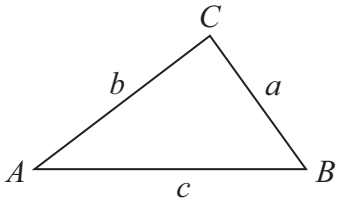


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



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

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

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 = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 Using the information that $246 \times 89 = 21\,894$ write down the value of

(i) 24.6×8.9

.....

(ii) 2.46×0.89

.....

(iii) $21\,894 \div 8.9$

.....

(Total for Question 1 is 3 marks)

2 There are red beads, green beads, blue beads and yellow beads in a bag.
Oscar is going to take at random a bead from the bag.

The table shows the probabilities that Oscar will take a red bead or a green bead.

Colour	**Red**	**Green**	**Blue**	**Yellow**
Probability	0.5	0.2		

It is equally likely that Oscar will take a blue bead or will take a yellow bead.

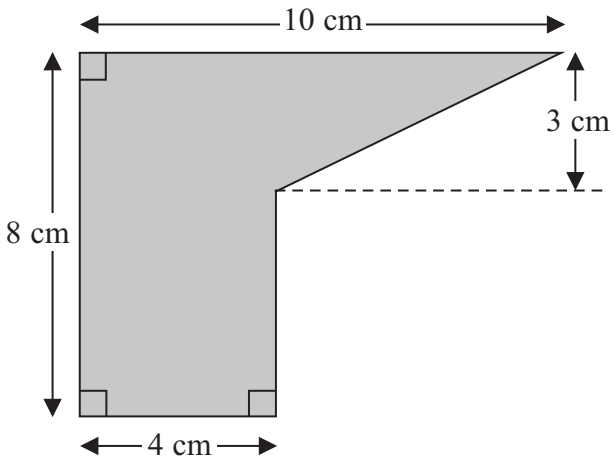
Work out the probability that Oscar will take a blue bead.

.....

(Total for Question 2 is 3 marks)

*3 Work out the area of the shaded shape.

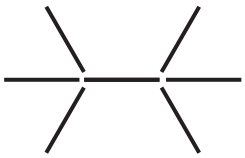
Diagram **NOT** accurately drawn



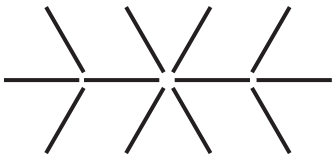
(Total for Question 3 is 4 marks)

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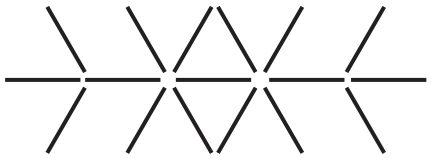
4 Here is a sequence of patterns made from sticks.



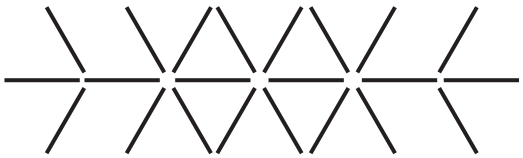
Pattern number 1



Pattern number 2



Pattern number 3



Pattern number 4

(a) Complete the table to show the number of sticks in each pattern.

Pattern number	1	2	3	4	5
Number of sticks	7	12	17	22	.....

(1)

(b) Find the number of sticks in Pattern number 8

.....

(1)

(c) Find an expression in terms of n for the number of sticks in Pattern number n.

.....

(2)

Ali has 60 sticks.
She wants to use as many sticks as possible to make a Pattern number.

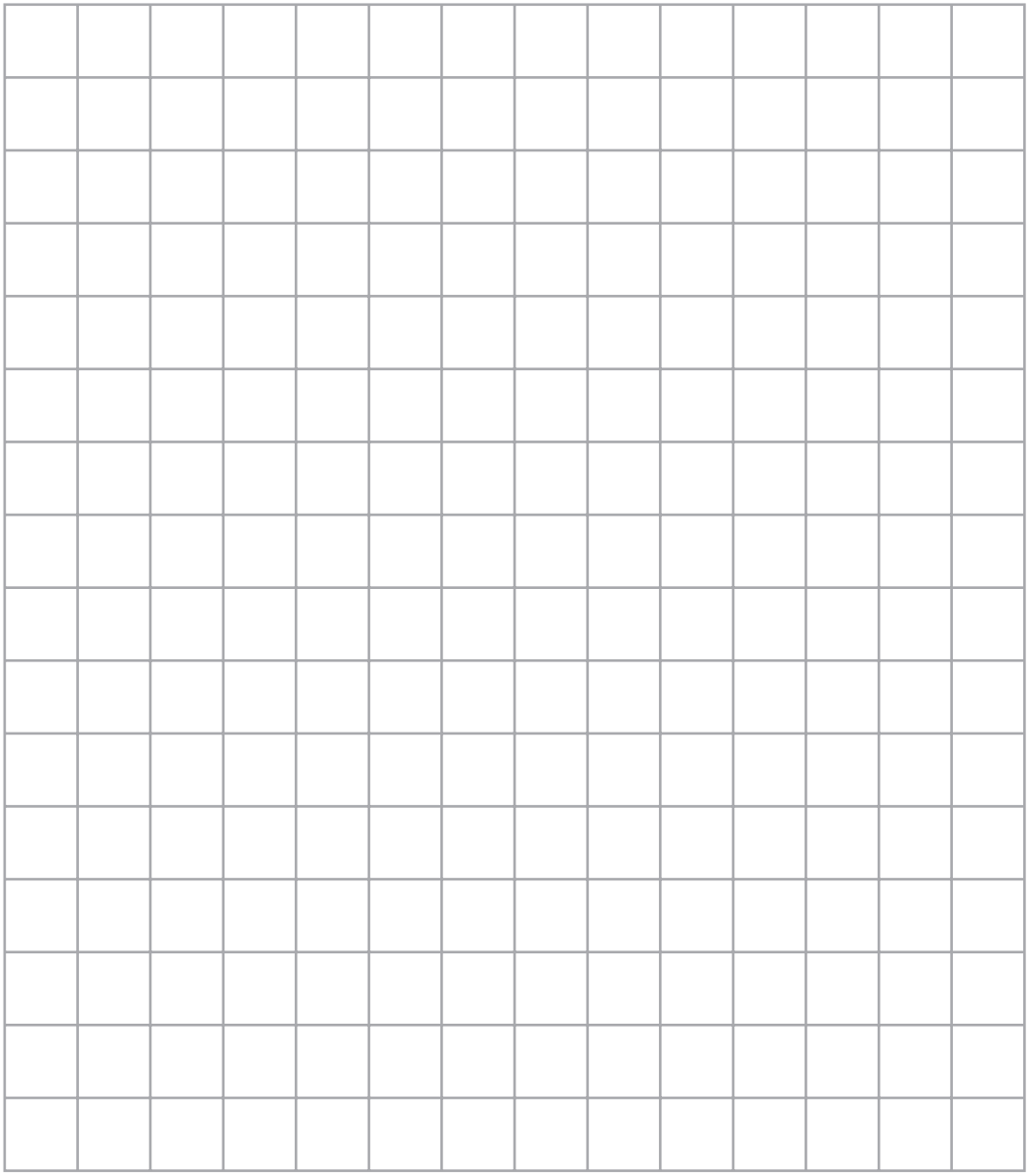
(d) What is the largest Pattern number she can make?

.....

(2)

(Total for Question 4 is 6 marks)

5 On the grid, draw the graph of $y = 2x + 3$ for values of x from -2 to 2



(Total for Question 5 is 4 marks)

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6 Work out an estimate for the value of $\dfrac{316 \times 18.6}{0.48}$

.....

(Total for Question 6 is 3 marks)

7 (a) Simplify $3w \times 4w$

.....

(1)

(b) Simplify $4h - 2r + 3h + 7r + 5$

.....

(2)

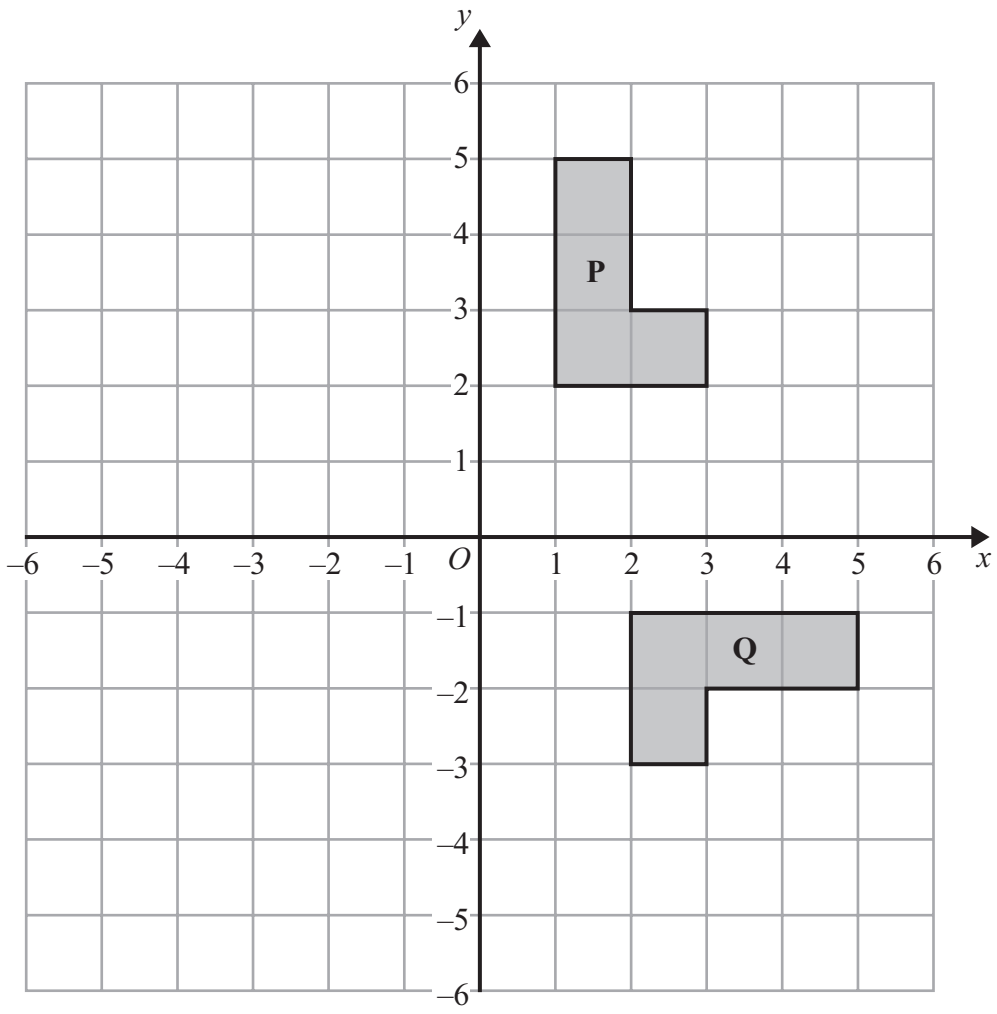
(c) Expand and simplify $(x + 7)(x - 3)$

.....

(2)

(Total for Question 7 is 5 marks)

8



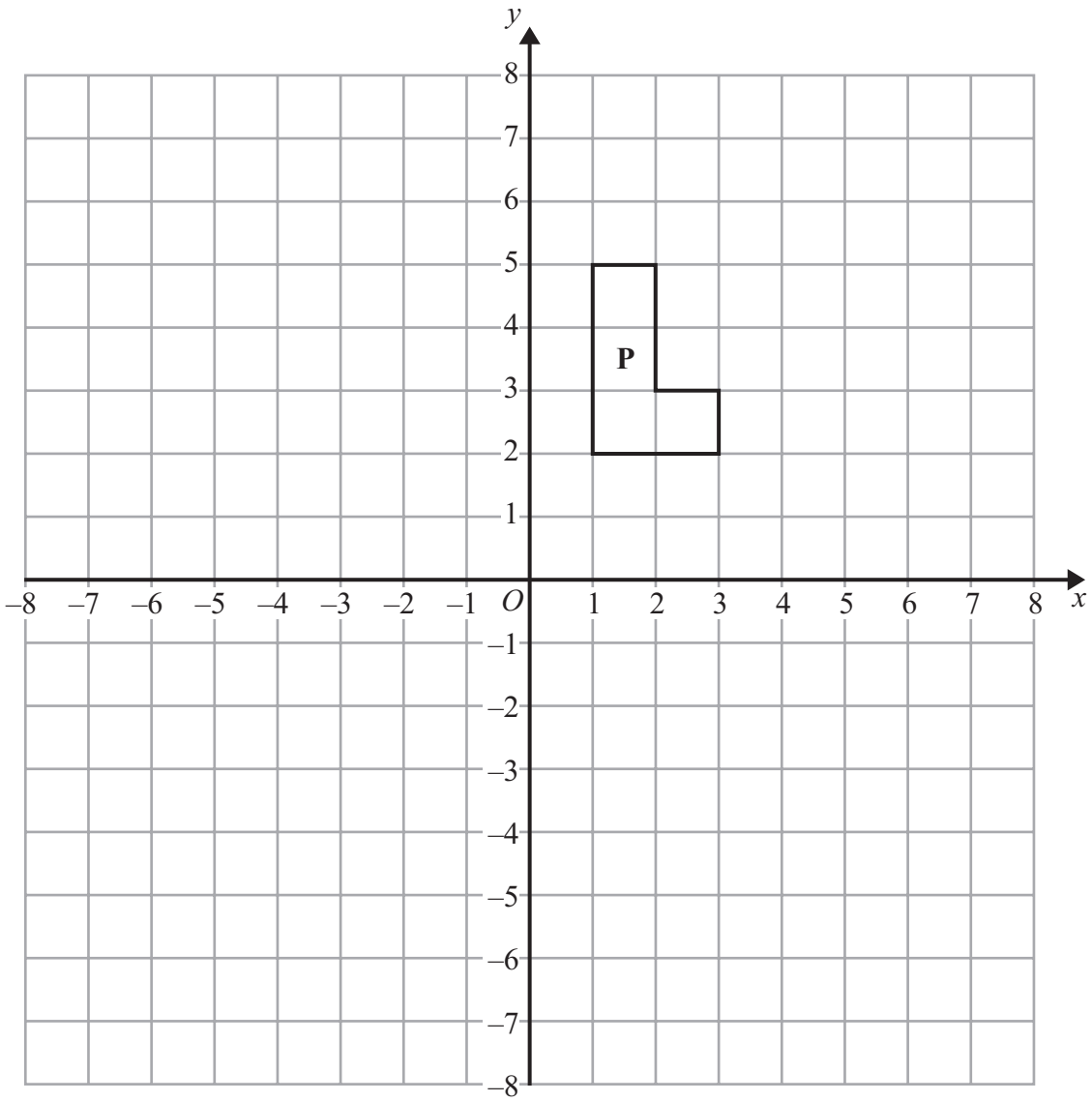
(a) Describe fully the **single** transformation that maps shape **P** onto shape **Q**.

.....

.....

(3)

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(b) Reflect shape **P** in the line with equation $x = -2$

(2)

(Total for Question 8 is 5 marks)

9 Ramesh throws a biased coin.
The probability that the coin will land on a Head is 0.37

(a) Write down the probability that the coin will land on a Tail.

.....

(1)

Ramesh is going to throw the coin 500 times.

(b) Work out an estimate for the number of times that the coin will land on a Head.

.....

(2)

(Total for Question 9 is 3 marks)

10 (a) Work out $\frac{5}{8} \div \frac{3}{4}$

.....

(2)

(b) Work out $4\frac{1}{2} \times 1\frac{3}{5}$

.....

(3)

(Total for Question 10 is 5 marks)

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11 x and y are two numbers each greater than 3

The Highest Common Factor (HCF) of x and y is 3
The Lowest Common Multiple (LCM) of x and y is 36

Find x and y.

.....

(Total for Question 11 is 2 marks)

12 Here are the equations of 5 straight lines **A**, **B**, **C**, **D** and **E**.

A $y = 3x + 4$

B $y = 2x - 3$

C $y = 2x + 3$

D $y = 5x - 4$

E $3y = x + 3$

One of the lines goes through the point (0, 3)

(a) Write down the letter of this line.

.....

(1)

Two of the lines are parallel.

(b) Write down the letters of these two lines.

....

(1)

(Total for Question 12 is 2 marks)

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13 There are some people at a bus stop.

10 of the people are wearing a hat.
16 of the people are wearing sunglasses.
7 of the people are wearing a hat **and** sunglasses.
4 of the people are **not** wearing a hat and are **not** wearing sunglasses.

(a) Draw a Venn diagram for this information.

(4)

(b) Work out how many people are at the bus stop.

.....

(2)

A person is chosen at random from the people wearing a hat.

(c) Work out the probability that this person is wearing sunglasses.

.....

(2)

(Total for Question 13 is 8 marks)

14

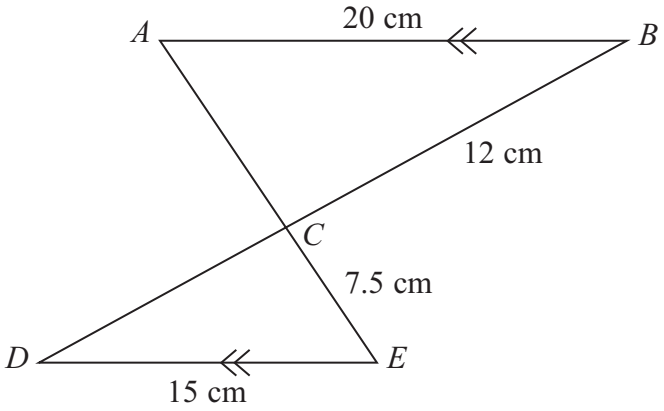


Diagram **NOT** accurately drawn

AB is parallel to *DE*.
ACE and *BCD* are straight lines.

AB = 20 cm
BC = 12 cm
CE = 7.5 cm
DE = 15 cm

(a) Work out the length of *AC*.

..... cm

(2)

(b) Work out the length of *DB*.

..... cm

(2)

(Total for Question 14 is 4 marks)

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15 (a) Solve $11 - 4y = 6y - 3$

$y =$ .....

(2)

(b) Solve $x^2 - 3x - 40 = 0$

$x =$ ....., $x =$ .....

(3)

(Total for Question 15 is 5 marks)

16 (a) Write 8.2×10^5 as an ordinary number.

.....

(1)

(b) Write 0.00076 in standard form.

.....

(1)

(c) Work out the value of $(7 \times 10^3) \times (8 \times 10^9)$
Give your answer in standard form.

.....

(2)

(Total for Question 16 is 4 marks)

17 A student rolls a fair dice four times.

Work out the probability that the dice lands on the same number each time.

.....

(Total for Question 17 is 3 marks)

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18 Find the value of n so that $\dfrac{2^6 \times 2^3}{2^n} = 2^5$

$n =$ .....

(Total for Question 18 is 2 marks)

19 Factorise fully $3xy^2 - 6x^3y$

.....

(Total for Question 19 is 2 marks)

20 Find the exact value of

(i) $9^{\frac{1}{2}}$

.....

(ii) 2^{-3}

.....

(iii) $25^{\frac{3}{2}}$

.....

(Total for Question 20 is 4 marks)

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21 There are 20 counters in a bag.

8 of the counters are yellow.
12 of the counters are green.

Asif takes at random two of the counters.

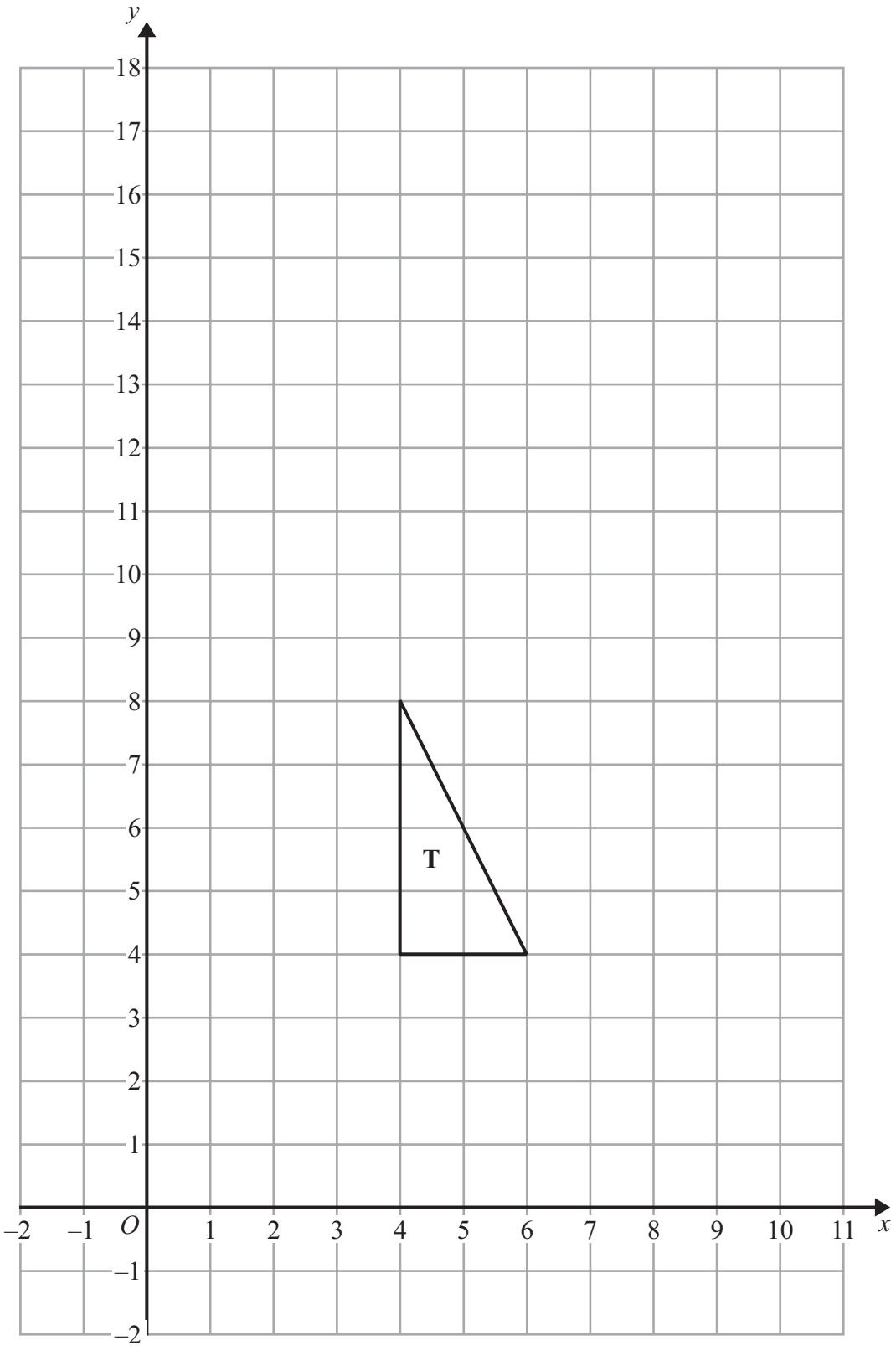
Work out the probability that the two counters are different colours.

.....

(Total for Question 21 is 4 marks)

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22



Enlarge triangle **T** by a scale factor $\frac{1}{2}$, centre (2, 0).

(Total for Question 22 is 3 marks)

23 Two events, A and B, are mutually exclusive.

$P(A) = 0.3$
$P(B) = 0.5$

(a) Work out $P(A')$

.....

(1)

(b) Work out $P(A \cup B)$

.....

(1)

$P(C) = 0.4$
$P(D) = 0.2$

$P(C \cap D) = 0.06$

(c) Are C and D independent events?
Explain your answer.

.....

.....

.....

(2)

(Total for Question 23 is 4 marks)

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*24

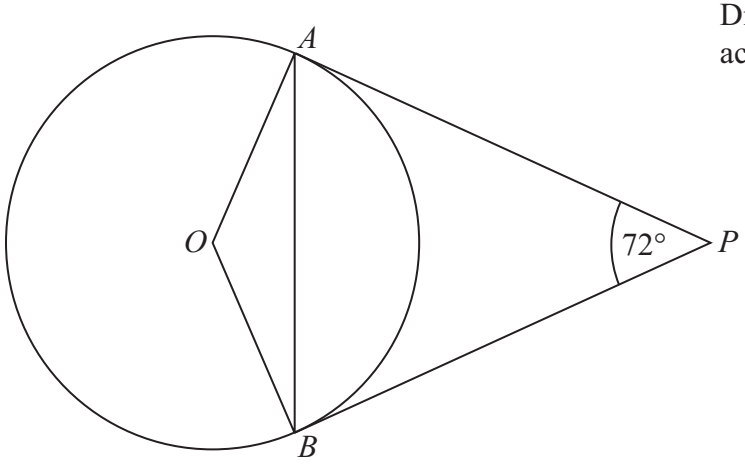


Diagram **NOT** accurately drawn

A and *B* are points on the circumference of a circle, centre *O*.

PA and *PB* are tangents to the circle.
Angle *APB* = 72°

Calculate the size of angle *OBA*.
Give a reason for each stage in your working.

(Total for Question 24 is 5 marks)

25 Simplify fully $\dfrac{2x^2 - 7x + 3}{x^2 - 9}$

.....

(Total for Question 25 is 3 marks)

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*26 Prove that the sum of the squares of two consecutive odd numbers is never a multiple of 8

(Total for Question 26 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2012

GCSE Mathematics Linked Pair Pilot
Methods in Mathematics (2MM01)
Higher (Non Calculator) Paper 1H

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(i)		218.94	3	B1 cao
	(ii)		2.1894		B1 cao
	(iii)		2460		B1 cao
2		1 – (0.5 + 0.2) 0.3 ÷ 2	0.15	3	M1 for 1 – (0.5 + 0.2) or 0.3 oe seen M1 for ”(1 – (0.5 + 0.2))” ÷ 2 A1 for 0.15 oe

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*3		$10 - 4 = 6$ $8 \times 4 = 32$ $(6 \times 3)/2 = 9$ $32 + 9$ $8 - 3 = 5$ $\frac{1}{2}(10 + 4) \times 3 = 21$ $4 \times 5 = 20$ $21 + 20$	41 cm^2	4	M1 for 8×4 (= 32) or $(6 \times 3)/2$ (= 9) M1 for 8×4 (= 32) and $(6 \times 3)/2$ (= 9) A1 for 41 C1 (dep M1) for '41' cm^2 OR M1 for 4×5 (= 20) or $\frac{1}{2}(10 + 4) \times 3$ (= 21) M1 for 4×5 (= 20) and $\frac{1}{2}(10 + 4) \times 3$ (=21) A1 for 41 C1 (dep M1) for '41' cm^2 OR M1 for 10×8 (= 80) or $\frac{1}{2}(5 + 8) \times 6$ (= 39) M1 for 10×8 (= 80) and $\frac{1}{2}(5 + 8) \times 6$ (= 39) A1 for 41 C1 (dep M1) for '41' cm^2 OR M1 for 4×5 (= 20) or 3×4 (= 12) or $(6 \times 3)/2$ (= 9) M1 for 4×5 (= 20) and 3×4 (= 12) and $\frac{1}{2}(3 \times 6)$ (= 9) A1 for 41 C1 (dep M1) for '41' cm^2

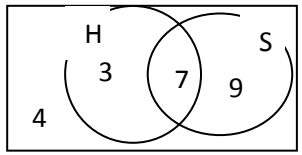
<table>
<tr><th colspan="6">5MM1H/01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>4</td><td>(a)</td><td></td><td>27</td><td>1</td><td>B1 cao</td></tr>
<tr><td></td><td>(b)</td><td></td><td>42</td><td>1</td><td>B1 cao</td></tr>
<tr><td></td><td>(c)</td><td></td><td>$5n + 2$</td><td>2</td><td>B2 for $5n + 2$ (oe, including un-simplified)
(B1 for $5n + k$, $k \neq 2$ or k absent, or $n = 5n + 2$</td></tr>
<tr><td></td><td>(d)</td><td>$60 – 2 = 58$
$58 \div 5 = 11.6$ (or 11 r 3)</td><td>11</td><td>2</td><td>M1 for $(60 – 2) \div 5$ ft evidence of using formula from part (c) or repeated addition of 5 (at least 3) or 57 seen
A1 for 11 cao</td></tr>
<tr><td>5</td><td></td><td><table><tr><td>x</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>y</td><td>-1</td><td>1</td><td>3</td><td>5</td><td>7</td></tr></table></td><td>$y = 2x + 3$ drawn</td><td>4</td><td>(Table of values)
C1 for axes scaled and labelled
M1 for at least 2 correct attempts to find points by substituting values of x.
M1 ft for plotting at least 2 of their points (any points plotted from their table must be plotted correctly)
A1 for correct line

(No table of values)
C1 for axes scaled and labelled
M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 2x+3$ drawn (ignore any additional incorrect segments)
(M1 for at least 3 correct points with no more than 2 incorrect points)
A1 for correct line

(Use of $y = mx+c$)
C1 for axes scaled and labelled
M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y = 2x+3$ drawn (ignore any additional incorrect segments)
(M1 for line drawn with gradient of 2 OR line drawn with a y intercept of 3 and a positive gradient)
A1 for correct line</td></tr>
</table>

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		$\frac{300 \times 20}{0 \cdot 5} = \frac{6000}{0.5}$	12 000 or 12 800	3	M1 for any two of 300, 20 or 0.5 M1 for $\frac{6000}{0.5}$ or 300×40 or 600×20 or $\frac{6400}{0.5}$ or 320×40 or 640×20 A1 for 12 000 or 12 800 SC: B2 for answer of 3000 or 3200 Do not accept attempts at full working out
7	(a)		$12w^2$	1	B1 cao
	(b)		$7h + 5r + 5$	2	B2 cao (B1 for $7h$ or $5r$)
	(c)	$x^2 + 7x - 3x - 21$	$x^2 + 4x - 21$	2	M1 for 3 out of 4 terms correct including signs, or 4 terms excluding signs A1 for $x^2 + 4x - 21$ cao
8	(a)		Rotation Centre (0,0) 90° clockwise	3	B1 for rotation B1 for 90°clockwise or 270° anti-clockwise B1 for (0,0) or O or origin NB: a combination of transformations gets B0
	(b)	Shape with vertices (–5,5), (–5,2), (–7,2), (–7,3), (–6,3), (–6,5)	Reflected P	2	M1 for reflection in any line parallel to y axis A1 cao
9	(a)	1 - 0.37	0.63	1	B1 for 0.63 oe
	(b)	0.37×500	185	2	M1 for 0.37×500 A1 cao SC B1 for 200

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)	$\frac{5}{8}\times\frac{4}{3}$	$\frac{20}{24}$	2	M1 for $\times\frac{4}{3}$ A1 for $\frac{20}{24}$ oe
	(b)	$\frac{9}{2}\times\frac{8}{5}$	$\frac{72}{10}$	3	M1 for $\frac{9}{2}$ or $\frac{8}{5}$ oe M1 for $\frac{9}{2}\times\frac{8}{5}$ A1 for $\frac{72}{10}$ oe
		4.5×1.6			OR M1 for 4.5 and 1.6 M1 for digits 72 A1 for 7.2 oe
11		HCF: The numbers must be 3n and 3m where n and m are co-prime and at most one is a multiple of 3 LCM: Factors of 36 are 1, 2, 3, 4, 6, 9, 12, 18, 36	9, 12	2	B2 cao (B1 for two numbers with HCF of 3 or LCM of 36)
12	(a)		C	1	B1 cao
	(b)		B and C	1	B1 cao

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)			4	B1 for 4 in correct place B1 for 7 in intersection B1 for 3 in correct place B1 for 9 in correct place
	(b)	$10 + 16 + 4 - 7$	23	2	M1 for $10 + 16 + 4 - 7$ or $4 + $ '3' $+ 7 +$ '9' (ft from 'Venn diagram' or other valid method) A1 for 23 cao
	(c)		$\frac{7}{10}$	2	M1 for $\frac{a}{10}$, $a < 10$ or $\frac{7}{b}$, $b > 7$ (ft their diagram) A1 for $\frac{7}{10}$ oe
14	(a)	$\frac{AC}{7.5} = \frac{20}{15}$ $AC = \frac{20 \times 7.5}{15}$	10	2	M1 for $\frac{20}{15}$ (= 1.33...) or $\frac{15}{20}$ (= 0. 75) or $\frac{7.5}{15}$ or $\frac{15}{7.5}$ oe A1 for 10 cao
	(b)	$\frac{DC}{15} = \frac{12}{20}$ OR $\frac{DC}{12} = \frac{7.5}{10}$ $9 + 12$	21	2	M1 for $(DC =)\ \frac{15 \times' 12}{20'}$ oe or $\frac{12 \times 7.5}{'10'}$ oe or $\frac{12 \div' 20}{15'}$ oe ft their values part (a) or 9 seen A1 for 21

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)	$11+3 = 6y + 4y$ $14 = 10y$	1.4	2	M1 for collecting the y terms or the numbers on one side of equation, eg $11 = 6y - 3 + 4y$ or $11 - 4y + 3 = 6y$ A1 for 1.4 or $\frac{14}{10}$ oe
	(b)	$(x - 8)(x + 5)$ OR $\frac{-(-3) \pm \sqrt{(-3)^2 - 4 \times 1 \times -40}}{2 \times 1}$ $\frac{3 \pm \sqrt{169}}{2} = \frac{3 \pm 13}{2}$	8, –5	3	M2 for $(x - 8)(x + 5)$ (M1 for $(x \pm 8)(x \pm 5)$ A1 cao 8 and –5 OR M1 for correct substitution in formula of $a = 1$, $b = \pm 3$ and $c = \pm 40$ M1 for reduction to $\frac{3 \pm \sqrt{169}}{2}$ A1 cao 8 and –5
16	(a)		820 000	1	B1 cao
	(b)		7.6×10^{-4}	1	B1 cao
	(c)	$7 \times 8 \times 10^{3+9}$	5.6×10^{13}	2	M1 for $56 \times 10^{3+9}$ or 5.6×10^{n}, $n \neq 13$ A1 cao (B1 for 56 000 000 000 000)
17		$6 \times \left(\frac{1}{6}\right)^4$	$\frac{1}{216}$	3	M1 for $\left(\frac{1}{6}\right)^n$, $n \geq 3$ oe M1 for or $6 \times$ their $\left(\frac{1}{6}\right)^n$, $n \geq 3$ or $\left(\frac{1}{6}\right)^3$ A1 for $\frac{6}{1296}$ oe

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$6 + 3 = n + 5$ OR $64 \times 8 = 32 \times 2^n$	4	2	M1 for $6 + 3 - n = 5$ oe or $(64 \times 8) \div 2^n = 32$ oe or 2^{6+3} oe seen A1 cao
19			$3xy(y - 2x^2)$	2	M1 for $3x \times (y^2 - 2x^2y)$ or $3y \times (xy - 2x^3)$ or $xy \times (3y - 6x^2)$ or $3xy \times$ (a 2 term expression in x and y, with just one error) A1 cao
20	(i)		3	1	B1 for 3 or ±3
	(ii)		$\frac{1}{8}$	1	B1 for $\frac{1}{8}$ or 0.125 oe
	(iii)		125	2	M1 for $25^{\frac{1}{2}}$ or $\sqrt{25}$ or 5 or 25^3 or $\left(\sqrt{25}\right)^3$ or $\sqrt{25^3}$ oe A1 for 125 cao

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		$\frac{8}{20}\times\frac{12}{19}+\frac{12}{20}\times\frac{8}{19}$	$\frac{192}{380}$	4	B1 for $\frac{8}{19}$ or $\frac{12}{19}$ M1 for $\frac{8}{20}\times\frac{12}{19}$ or $\frac{12}{20}\times\frac{8}{19}$ M1 for $\frac{8}{20}\times\frac{12}{19}+\frac{12}{20}\times\frac{8}{19}$ or $2\times\frac{8}{20}\times\frac{12}{19}$ A1 for $\frac{192}{380}$ oe
		OR $1-(\frac{8}{20}\times\frac{7}{19}+\frac{12}{20}\times\frac{11}{19})$			OR B1 for $\frac{7}{19}$ or $\frac{11}{19}$ M1 for $\frac{8}{20}\times\frac{7}{19}+\frac{12}{20}\times\frac{11}{19}$ M1 for $1-\frac{188}{380}$ A1 for $\frac{192}{380}$ oe
		$\frac{8}{20}\times\frac{12}{20}+\frac{12}{20}\times\frac{8}{20}=$ $=\frac{192}{400}\ (=0.48)$			**With replacement** M1 for $\frac{8}{20}\times\frac{12}{20}$ or $\frac{12}{20}\times\frac{8}{20}$ M1 for $\frac{8}{20}\times\frac{12}{20}+\frac{12}{20}\times\frac{8}{20}$ or $2\times\frac{8}{20}\times\frac{12}{20}$
		OR $1-(\frac{8}{20}\times\frac{7}{20}+\frac{12}{20}\times\frac{11}{20})$ $=\frac{212}{400}\ (=0.53)$			OR M1 for $\frac{8}{20}\times\frac{7}{20}+\frac{12}{20}\times\frac{11}{20}$ M1 for $1-\frac{188}{400}$

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22			Vertices at (3, 2), (3, 4) and (4, 2)	3	M1 for centre (2, 0) marked M1 for all sides × ½ A1 cao SC B2 for correct enlargement from (2, 0), sf ≠ 0.5 or for correct enlargement from (0, 2), sf = 0.5
23	(a)	1 – 0.3	0.7	1	B1 0.7 oe
	(b)	0.3 + 0.5	0.8	1	B1 0.8 oe
	(c)	0.2 × 0.4 = 0.08 0.08 ≠ 0.06	Not independent with reason	2	M1 for 0.2 × 0.4 (= 0.08) C1 for 0.08 and stating events not independent
*24		$\frac{180-72}{2}=54$ 90 – 54 OR 360 – 90 – 90 – 72 = 108 $\frac{180-108}{2}$	36	5	M1 for $\frac{180-72}{2}$ M1 (dep) for 90 –'54' A1 for 36 cao C1 for *OBP* or *OAP* = 90° as tangent to circle is perpendicular (oe) to radius C1 for *AP* = *BP* as tangents from external point are equal in length or angles in an isosceles triangle are equal OR M1 for 360 – 90 – 90 – 72 or 180 – 72 (=108) M1 (dep) for $\frac{180-'108'}{2}$ A1 for 36 cao C1 for *OBP* or *OAP* = 90° as tangent to circle is perpendicular (oe) to radius C1 for angles in an isosceles triangle are equal or *AO* = *BO* as (both) radii

5MM1H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25		$\frac{(2x-1)(x-3)}{(x+3)(x-3)}$	$\frac{(2x-1)}{(x+3)}$	3	M1 for $(2x-1)(x-3)$ M1 for $(x+3)(x-3)$ A1 cao
*26		Eg $(2n-1)^2 + (2n+1)^2$ $4n^2 - 4n + 1 + 4n^2 + 4n + 1$ $8n^2 + 2$ OR $(2n+1)^2 + (2n+3)^2$ $4n^2 + 4n + 1 + 4n^2 + 12n + 9$ $8n^2 + 16n + 10$ $8(n^2 + 2n) + 10$	Proof	4	B1 for an odd number expressed algebraically, $2n + 1$ M1 for expanding and adding the squares of two consecutive odd numbers at least one expansion correct, eg $4n^2-4n+1$ or $4n^2+4n+1$ A1 for correct simplification, eg $8n^2 + 2$ C1 (dep on M) for correct reasoning for expression not being a multiple of 8

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Edexcel GCSE

Centre Number	Candidate Number

Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Tuesday 19 June 2012 – Afternoon
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used.**



Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/6/7/

P 4 1 2 1 1 A 0 1 2 4

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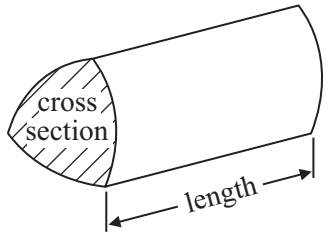
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GCSE Mathematics 2MM01

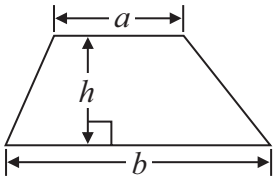
Formulae: Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

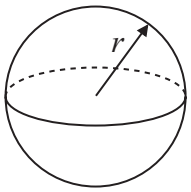


Area of trapezium = $\frac{1}{2}(a + b)h$



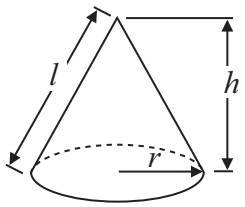
Volume of sphere = $\frac{4}{3}\pi r^3$

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

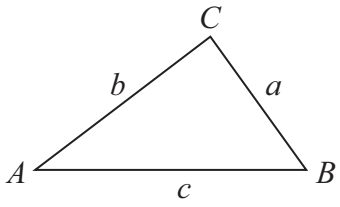


Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = πrl



In any triangle *ABC*



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

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

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 = $\frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1 (a) Work out $-2 + 3 \times 8$

.....

(1)

(b) Using the information that $176 \times 28 = 4928$
write down the value of

(i) 2.8×17.6

.....

(ii) $4.928 \div 1.76$

.....

(2)

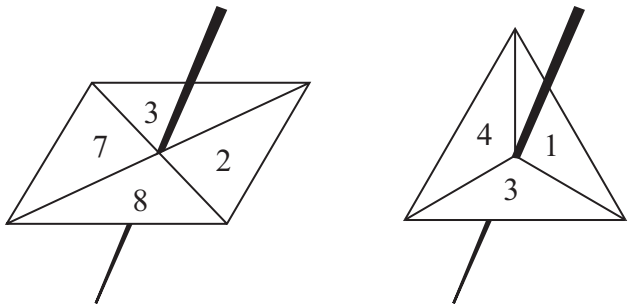
(c) Work out an estimate for the value of $\dfrac{197 \times 3.1}{58.62}$

.....

(2)

(Total for Question 1 is 5 marks)

2 Here are two fair spinners.



Mylene spins each spinner once.
Each spinner lands on a number.

Mylene adds these two numbers together to get the total score.

(i) Work out the probability that the total score will be 6

.....

(ii) Work out the probability that the total score will be more than 9

.....

(Total for Question 2 is 5 marks)

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3 (a) Simplify fully $2(x + 6) + 5(2x - 3)$

.....

(2)

(b) Factorise fully $6xy - 9y^2$

.....

(2)

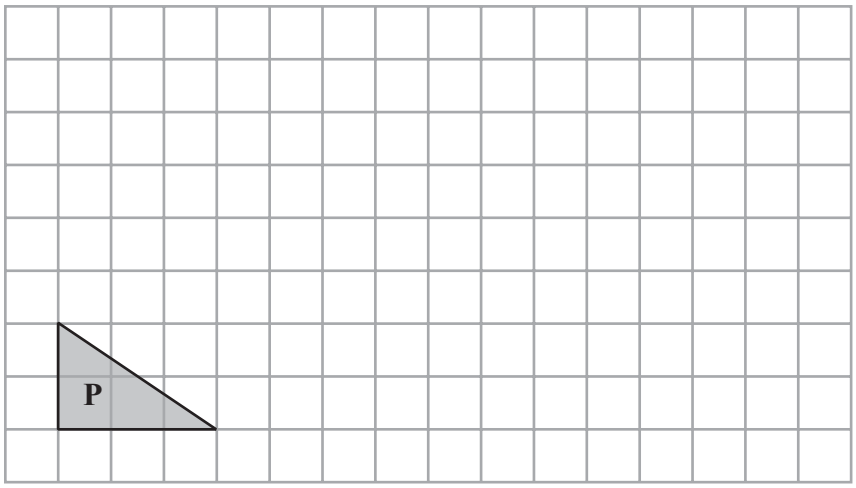
(c) Expand and simplify $(4c + 7)(3c - 1)$

.....

(2)

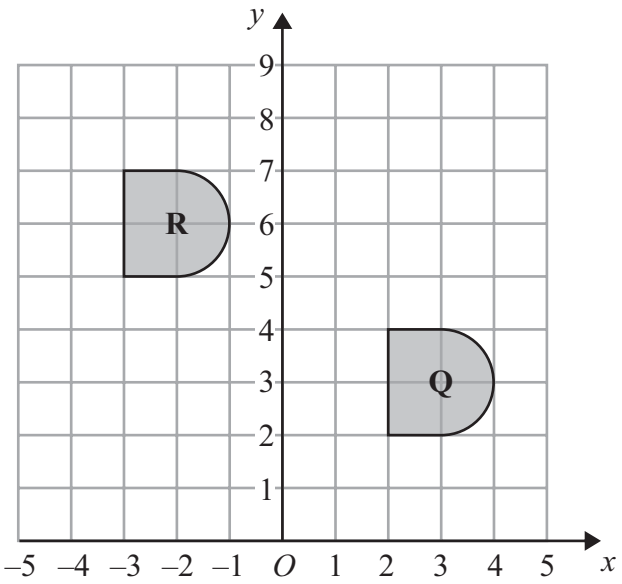
(Total for Question 3 is 6 marks)

4



(a) On the grid, draw an enlargement of triangle **P** with scale factor 3

(2)



(b) Describe fully the single transformation that maps shape **Q** onto shape **R**.

.....

.....

(2)

(Total for Question 4 is 4 marks)

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5 There are 300 beads in a box.

The beads are red or yellow or black or white or green.

The table shows each of the probabilities that a bead taken at random from the box will be red or yellow or white or green.

Colour	**Red**	**Yellow**	**Black**	**White**	**Green**
Probability	0.35	0.15		0.18	0.12

A bead is to be taken at random from the box.

(a) Work out the probability that the bead will be black.

.....

(2)

There are 300 beads in the box.

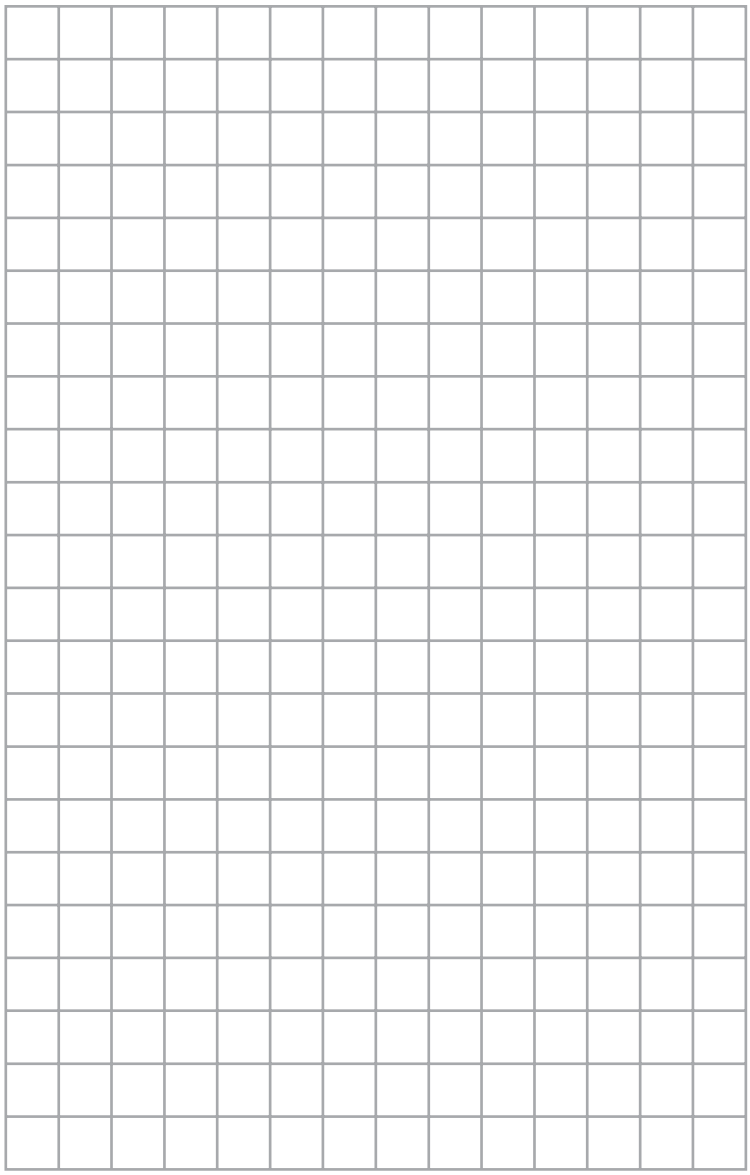
(b) Work out the number of red beads in the box.

.....

(2)

(Total for Question 5 is 4 marks)

6 On the grid, draw the graph of $y = 5x + 2$ for values of x from -2 to 2



(Total for Question 6 is 4 marks)

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7 Here are the first four terms of a number sequence.

8 14 20 26

(a) Find an expression, in terms of n, for the nth term of this number sequence.

.....

(2)

Dipen says,

'124 is a number in this sequence.'

(b) Dipen is wrong.
Explain why.

(2)

(Total for Question 7 is 4 marks)

***8**

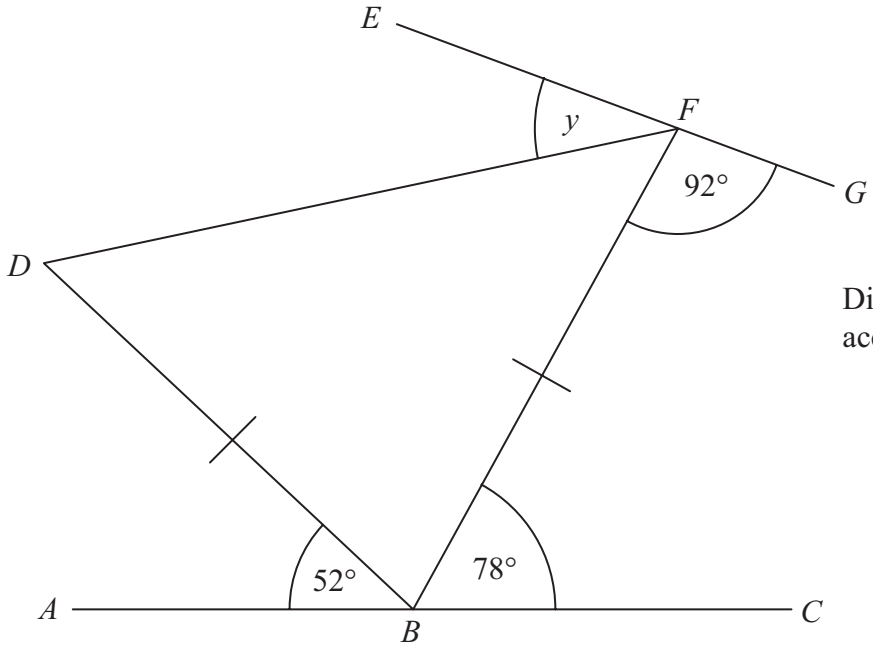


Diagram **NOT** accurately drawn

ABC and *EFG* are straight lines.
BDF is a triangle.
BD = *BF*.

Work out the size of the angle marked *y*.
Give reasons for your answer.

(Total for Question 8 is 5 marks)

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***9**

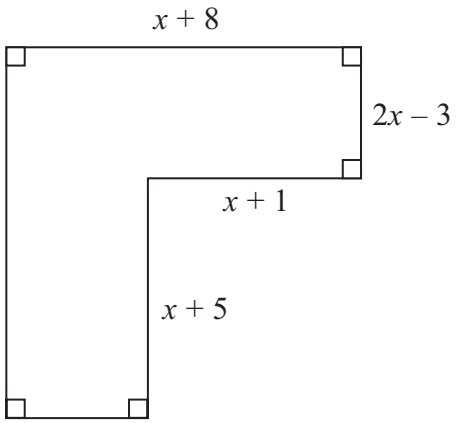


Diagram **NOT** accurately drawn

All the measurements are in centimetres.

The perimeter of this shape is 68 cm.

Use algebra to work out the value of x.
You must show all your working.

(Total for Question 9 is 5 marks)

10 The lights and brakes of 50 cars were tested.

10 of the cars failed the lights test.
4 of the cars failed both the lights test and the brakes test.
32 of the cars passed both the lights test and the brakes test.

(a) Draw a Venn diagram to show this information.

(4)

One of the 50 cars is chosen at random.

(b) Work out the probability that this car failed the brakes test.

.....

(2)

(Total for Question 10 is 6 marks)

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11 (a) Simplify $e^{12} \div e^{3}$

.....

(1)

(b) Simplify fully $5x^{3}y^{2} \times 2xy^{3}$

.....

(2)

(Total for Question 11 is 3 marks)

12 (a) Find the Highest Common Factor (HCF) of 30 and 42

.....

(2)

(b) Find the Lowest Common Multiple (LCM) of 30 and 45

.....

(2)

(Total for Question 12 is 4 marks)

13 The diagram shows a hexagon *ABCDEF*.

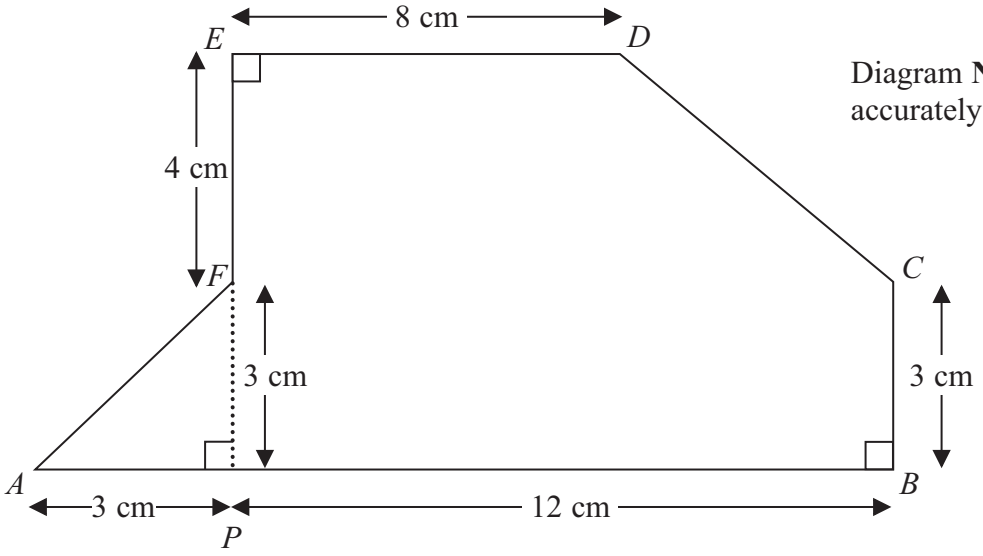


Diagram **NOT** accurately drawn

Work out the area of the hexagon *ABCDEF*.
You must show all stages in your working.

.....

(Total for Question 13 is 5 marks)

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14 (a) Write 0.537 in standard form.

.....

(1)

(b) Write 9.6×10^4 as an ordinary number.

.....

(1)

(Total for Question 14 is 2 marks)

15 Solve $\frac{5x-1}{3} + \frac{x+4}{2} = 2$

$x =$ .....

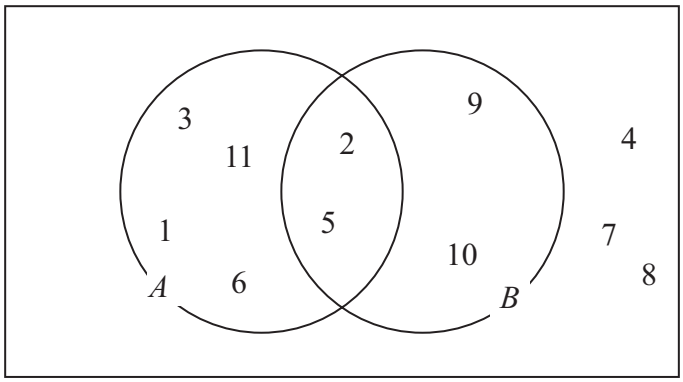
(Total for Question 15 is 4 marks)

16 Work out $3\frac{1}{8} - 1\frac{2}{3}$

.....

(Total for Question 16 is 3 marks)

17 The Venn diagram shows the numbers 1 to 11



(a) Work out P $(A \cup B)$

.....

(2)

(b) Work out P (B')

.....

(2)

(Total for Question 17 is 4 marks)

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18 (a) Write down the value of $100^{\frac{1}{2}}$

.....

(1)

(b) Write down the value of 8^0

.....

(1)

(c) Write down the value of 3^{-3}

.....

(1)

(d) $5^x = 125^{-\frac{2}{3}}$

Find the value of x.

.....

(2)

(Total for Question 18 is 5 marks)

19 Simplify fully $\dfrac{2x^2 - 7x - 4}{x^2 - 16}$

.....

(Total for Question 19 is 3 marks)

20 There are 11 pens in a box.

6 of the pens are black.
3 of the pens are red.
2 of the pens are green.

Henry takes at random two pens from the box.

Work out the probability that he takes one black pen and one green pen.

.....

(Total for Question 20 is 4 marks)

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***21**

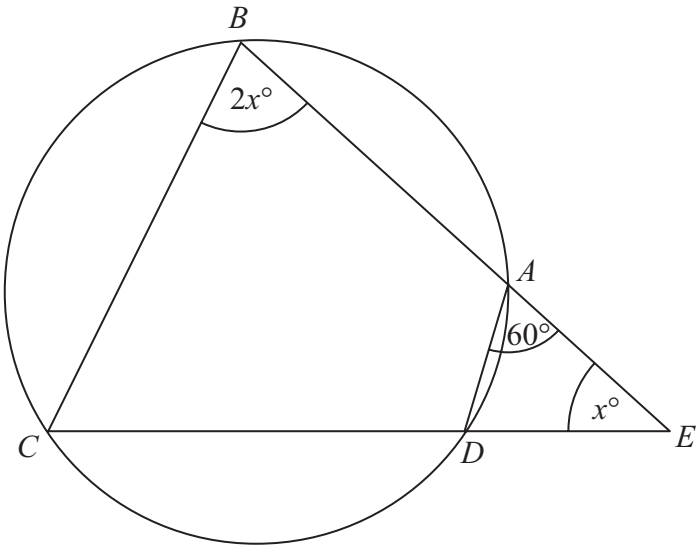


Diagram **NOT** accurately drawn

ABCD is a cyclic quadrilateral.
BAE and *CDE* are straight lines.
Angle *DAE* = 60°.

Work out the value of *x*.
Give reasons at each stage of your working.

(Total for Question 21 is 4 marks)

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22 (a) Given that $x^2 - 8x - 3 = (x - a)^2 - b$ for all values of x,

find the value of a and the value of b.

$a =$ .....

$b =$ .....

(2)

(b) Hence or otherwise, solve $x^2 - 8x - 3 = 0$

Give your answer in the form $p \pm \sqrt{q}$, where p and q are integers.

.....

(2)

(Total for Question 22 is 4 marks)

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23

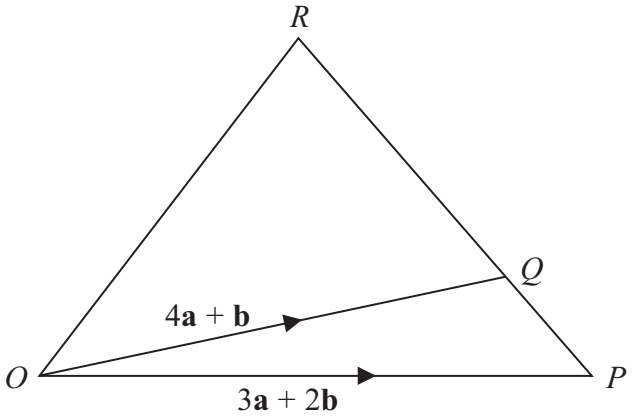


Diagram **NOT** accurately drawn

OPR is a triangle.
PQR is a straight line.

$\overrightarrow{OP} = 3\mathbf{a} + 2\mathbf{b}$

$\overrightarrow{OQ} = 4\mathbf{a} + \mathbf{b}$

(a) Show that $\overrightarrow{PQ} = \mathbf{a} - \mathbf{b}$

(1)

$\overrightarrow{OR} = 8\mathbf{a} - 3\mathbf{b}$

(b) Find the ratio $PQ : QR$ in its simplest form.

(3)

(Total for Question 23 is 4 marks)

***24** Prove algebraically that the sum of the squares of two consecutive integers is always an odd number.

(Total for Question 24 is 3 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

June 2012

Methods in Mathematics (GCSE)
Unit 1: Methods 5MM1H_01

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) selectand use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)		22	1	B1 cao
	(b)(i)		49.28	1	B1 cao
	(ii)		2.8	1	B1 cao
	(c)	$\frac{200\times 3}{60}$	10	2	M1for at least one of 200, 60 or 3 seen A1 cao

5MM1H_01

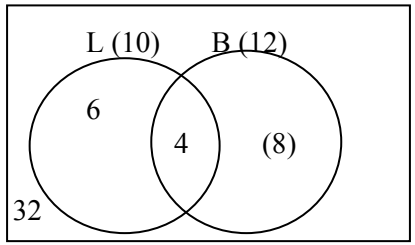
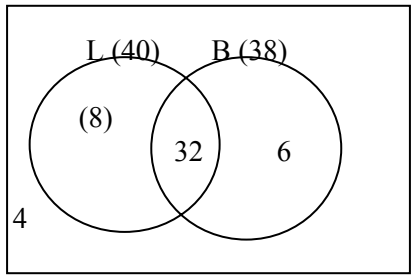
Question		Working	Answer	Mark	Notes
2	(i)	<table><tr><td>+</td><td>**2**</td><td>**3**</td><td>**7**</td><td>**8**</td></tr><tr><td>**1**</td><td>3</td><td>4</td><td>8</td><td>9</td></tr><tr><td>**3**</td><td>5</td><td>6</td><td>10</td><td>11</td></tr><tr><td>**4**</td><td>6</td><td>7</td><td>11</td><td>12</td></tr></table>	$\frac{2}{12}$	5	M1 for identifying 2,4 and 3,3 M1 for 12 seen **OR** an attempt to get the 12 outcomes or attempt at a sample space or a list of possibilities or a list of ordered pairs (at least 6 correct outcomes or possibilities or ordered pairs (ignore repeats) A1 for $\frac{2}{12}$ o.e. **OR** M1 for $\frac{1}{4}\times\frac{1}{3}$ o.e. seen M1 for $\frac{1}{4}\times\frac{1}{3} + \frac{1}{3}\times\frac{1}{4}$ A1 for $\frac{2}{12}$ o.e.
	(ii)		$\frac{4}{12}$		M1 ft from their ordered list from part (i) for identifying all 4 possible score from; 7+4(=11), 7+3(=10), 8+4(=12), 8+3(=11), (condone the inclusion of 8+1(=9) as a misread) [accept an answer of $\frac{5}{12}$ for M1 ONLY if the 5 outcomes are identified in either part (i) or part (ii)] A1 for $\frac{4}{12}$ oe

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)	$2x + 12 + 10x - 15$	$12x - 3$	2	M1 for attempt to expand one bracket or sight of $2 \times x + 2 \times 6$ or $5 \times 2x + 5 \times -3$ A1 cao
	(b)		$3y\,(2x - 3y)$	2	B2 for $3y\,(2x - 3y)$ (B1 for $3(2xy - 3y^2)$ or $y\,(6x - 9y)$ or $3y(2x + 3y)$ condone missing end bracket
	(c)	$12c^2 - 4c + 21c - 7$	$12c^2 + 17c - 7$	2	M1 for expanding brackets with four correct terms seen ignoring signs or four terms seen three of which are correct and have the correct signs A1 cao
4	(a)		Correct enlargement	2	B2 for a correct enlargement, scale factor 3 in any orientation (B1for a right angled triangle with1 line correctly enlarged or a correct enlargement by incorrect scale factor in any orientation
	(b)		translation $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$	2	B1 for translation B1 for $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$ NOTE: Combination of transformations scores B0
5	(a)	$1 - (0.35+0.15+0.18+0.12)$ $= 1 - 0.8(0)$	0.2	2	M1 for $1 - '(0.35 + 0.15 + 0.18 + 0.12)'$ o.e. A1 oe
	(b)	300×0.35	105	2	M1 for 300×0.35 A1 cao SC B1 for $\frac{105}{300}$

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6		<table><tr><td>x</td><td>–2</td><td>–1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>y</td><td>–8</td><td>–3</td><td>2</td><td>7</td><td>12</td></tr></table>	$y = 5x + 2$ drawn	4	C1 for acceptable scaling and labelling of the axes **(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x M1 ft for plotting at least 2 of their points (any points from their table must be correctly plotted) A1 for correct line **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted **OR** line segment of $y = 5x + 2$ drawn (ignore any additional incorrect line segments) (M1 for at least 3 correct points plotted with no more than 2 incorrect points) A1 for correct line **(Use of $y = mx + c$)** M2 for line segment of $y = 5x + 2$ drawn (ignore any additional incorrect line segments) (M1 for line drawn with gradient of 5 **OR** Line drawn with a y intercept of 2 **and** a positive gradient) A1 for correct line

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)		$6n + 2$	2	B2 for $6n + 2$ oe (B1 for linear expression of the form $6n + a$ where a is an integer)
	(b)	$6n + 2 = 124$ $6n = 124 – 2 = 122$ $n = 122 \div 6 = 20.3$ n is not an integer	explanation	2	M1 for '$6n + 2$' = 124 or any other valid method e.g. counting on in 6's to get a term > 110 eg 20^{th} term is 122 eg $8 + 20 \times 6 = 128$ A1 for a complete explanation eg $n = 20.3$... so n is not an integer or establishing 122 and 128 are in the sequence so 124 is not in the sequence
8		$<DBF = 180 – 52 – 78 = 50$ angles on a line = 180 $<BFD = (180 – '50') \div 2 = 65$ isosceles triangle angles in a triangle add up to 180 $x = 180 – 92 – 65 = 23$	$y = 23$ with reasons	5	M1 for $<DBF = 180 – 52 – 78$ or 50 seen or $x = 180 – 92 –$ '65' M1 for $<BFD = (180 – '50') \div 2$ (= 65) A1 for y = 23 C2(dep on M1) for correct reasons :- angles on a straight line sum to 180º, base angles in an isosceles triangle are equal, and angles in a triangle add up to 180 (C1(dep on M1) for any one correct reason used correctly)

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		$(x + 8) + (2x – 3) + (x + 1) + (x + 5) + 7 + (3x + 2)$ $8x + 20 = 68$ $8x = 68 – 20 = 48$	6 with working	5	M1 for attempt to work out missing length of vertical side or sight of $2x – 3 + x + 5$ or $3x + 2$ M1 for attempt to work out missing length of horizontal side or sight of $x + 8 – (x + 1)$ or 7 M1 adding at least 4 sides e.g. $x + 8 + 2x – 3 + x + 1 + x + 5$ M1 for attempt to add all their 6 sides and form equation e.g. '$8x + 20$' = 68 C1(dep on M1 indicating that $x = 6$ (cm) **OR** M1 for using any value for x, substituting to find lengths of at least 4 sides and clear intent to add M3 for a complete method using $x = 6$ C1 (dep on M1) indicating that $x = 6$ (cm)

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)	Fail Venn diagram  or Pass Venn diagram  	Venn diagram	4	M1 for two overlapping ovals M1 for 4 shown in the intersection M1 for attempt to show 10 – 4 or 50 – 32 – 10 A1 for 6, and 32 in the correct places. OR M1 for two overlapping ovals M1 for 32 shown in the intersection M1 for attempt to show 50 –10 – 32 or 50 – 40 – 4 A1 for 6and 4 in the correct places.
	(b)		$\frac{12}{50}$	2	M1 ft for 4 + "8" (but not 0) A1 for $\frac{12}{50}$ o.e.

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		e^{9}		B1 for e^{9} accept e^{12-3}
	(b)		$10\,x^4y^5$		B2 cao (B1 for any two from 10, x^4 or y^5 in a product)
12	(a)	30 = 2 × 3 × 5 42 = 2 × 3 × 7 HCF = 2 × 3	6	2	M1 for 30 or 42 written correctly as a product of prime factors or attempt to list the factors of 30 and 42 (at least 4 for each including 6) A1 for HCF = 6
	(b)	30 , 60, 90, ... 45, 90, 135, ...	90	2	M1 for listing multiples of 30 and 45 (at least 60 and 90) or 2 × 3 × 5 × 3 A1 for LCM = 90 SC B1 for 210
13		Area *APF* = ½ (3 × 3) = 4.5 Area *CDEF* = ½ (8 +12) × 4 or 8 × 4 +1/2 × 4 × 4 = 40 Area *BCFP* = 12 × 3 Total area = 4.5 + 40 + 36 **Or** Area *APF* = ½ (3 × 3) = 4.5 Area *DCBQ* = ½ (7 + 3) × 4 Or 3 × 4 + ½ 4 × 4 = 20 Area *EDQP* = 8 × 7 = 56 Total area = 4.5 + 20 + 56 **Or** Area *APF* = ½ (3 × 3) = 4.5 Area outer rectangle = 12 × 7 = 84 Area missing triangle ½ 4 × 4 = 8 Total area = 84 + 4.5 – 8	80.5cm^2	5	M1 for ½ (3 × 3) oe (= 4.5) M1 for ½ (8 + 12) × 4 or 8 × 4 +1/2 × 4 × 4 = (40) M1 for 12 × 3 (= 36) A1 for 80.5 or 80½ cao **Or** M1 for (3 × 3) oe (= 4.5) M1 for ½ (7 + 3) × 4 or 3 × 4 + ½ 4 × 4 (= 20) M1 for 8 × 7 (= 56) A1 for 80.5 or 80½ cao **Or** M1 for (3 × 3) oe (= 4.5) M1 for Area outer rectangle = 12 × 7 (= 84) M1 for Area missing triangle ½ 4 × 4 (= 8) A1 for 80.5 or 80½ cao B1 (indep) for cm^2

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		5.37×10^{-1}	1	B1 cao
	(b)		96000	1	B1 cao
15		$2(5x-1) + 3(x+4) = 12$ $10x - 2 + 3x + 12 = 12$ $13x + 10 = 12$ $13x = 2$	$\frac{2}{13}$	4	M1 recognising the need to multiply by 2 or 3 or 6 or any multiple of these numbers M1 for a complete method M1 (dep on M1) for isolating terms in x and constant terms for a linear equation in the form $ax + b = c$ A1 for $\frac{2}{13}$ oe
16		$\frac{25}{8} - \frac{5}{3} = \frac{75-40}{24} = \frac{35}{24}$ **Or** $2\frac{1}{8} - \frac{2}{3} = 2\frac{3-16}{24} = 1\frac{27-16}{24} =$ **Or** $2\frac{1}{8} - \frac{2}{3} = 2\frac{3-16}{24} = 2\frac{-13}{24} =$	$1\frac{11}{24}$	3	M1 for converting to improper fractions, at least one correct or $3 - 1 = 2$ and 'borrowing' or negative fraction answer M1 for putting fractions over a common denominator, at least one correct A1 for $\frac{35}{24}$ or $1\frac{11}{24}$
17	(a)	1, 2, 3, 5, 6, 9, 10, 11	$\frac{8}{11}$	2	M1 for indicating A $\cup$ B (could be by listing or shading etc) A1 for $\frac{8}{11}$
	(b)	1, 3, 4, 6, 7, 8, 11	$\frac{7}{11}$	2	M1 for indicating B' (could be by listing or shading etc) A1 for $\frac{7}{11}$

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)		10	1	B1 cao
	(b)		1	1	B1 cao
	(c)		$\frac{1}{27}$	1	B1 cao
	(d)	$5^x = 125^{-2/3} = (5^3)^{-2/3}$ $= 5^{-2}$	–2	2	M1 for showing that $125 = 5^3$ or $\sqrt[3]{125} = 5$ or $\frac{1}{5^2}$ seen oe A1 cao
19		$\frac{(2x+1)(x-4)}{(x+4)(x-4)}$	$\frac{(2x+1)}{(x+4)}$	3	M1 for $(2x \pm 1)(x \pm 4)$ M1 for $(x+4)(x-4)$ A1 cao

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20		$(\frac{6}{11} \times \frac{2}{10}) + (\frac{2}{11} \times \frac{6}{10})$ $= \frac{12}{110} + \frac{12}{110}$	$\frac{24}{110}$	4	B1 for $\frac{2}{10}$ or $\frac{6}{10}$ oe seen as the 2nd probability M1 for $(\frac{6}{11} \times \frac{2}{10})$ or $(\frac{2}{11} \times \frac{6}{10})$ oe M1 for $(\frac{6}{11} \times \frac{2}{10}) + (\frac{2}{11} \times \frac{6}{10})$ o.e. A1 for $\frac{24}{110}$ oe **Tree diagram method** B1 for $\frac{2}{10}$ or $\frac{6}{10}$ oe seen as the 2nd probability M1 for $(\text{`}\frac{6}{11}\text{'} \times \text{`}\frac{2}{10}\text{'})$ or $(\text{`}\frac{2}{11}\text{'} \times \text{`}\frac{6}{10}\text{'})$ oe M1 for $(\text{`}\frac{6}{11}\text{'} \times \text{`}\frac{2}{10}\text{'}) + (\text{`}\frac{2}{11}\text{'} \times \text{`}\frac{6}{10}\text{'})$ oe A1 for $\frac{24}{110}$ oe **Alternative scheme for replacement** B0 for $\frac{6}{11}$ or $\frac{2}{11}$ seen as the 2nd probability M1 for $(\frac{6}{11} \times \frac{2}{11})$ or $(\frac{2}{11} \times \frac{6}{11})$ oe M1 for $(\frac{6}{11} \times \frac{2}{11}) + (\frac{2}{11} \times \frac{6}{11})$ oe A0 for $\frac{24}{121}$ **Special Cases** SC: Award B2 for $\frac{24}{121}$ or $\frac{10}{110}$ oe or $\frac{20}{110}$ oe SC: Award B1 for $\frac{10}{121}$ or $\frac{20}{121}$

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		Angle $ADC = 60 + x$ $2x + 60 + x = 180$ $3x = 120$ exterior angle triangle = sum of interior opposite angles (or angles in a triangle and angles on a straight line both sum to 180) **and** opposite angles of a cyclic quad sum to 180 **Or** Angle $ADE = 2x$ opposite angles in a cyclic quadrilateral add to 180 and angles in a straight line add to 180º or exterior angle of cyclic quad = interior opposite angle $2x + x + 60 = 180$ angles in a Δ add up to 180 $3x = 120$ **Or** Angle $BCD = 60$ angles in a straight line add to 180º and opposite angles in a cyclic quadrilateral add to 180 or exterior angle of cyclic quad = interior opposite angle In Δ BCE, $2x + x + 60 = 180$ angles in a Δ add up to 180 $3x = 120$	40	4	M1 for angle $ADC = 60 + x$ M1 for $2x + 60 + x = 180$ A1 for $x = 40$ C1 (dep on M1) for exterior angle triangle = sum of interior opposite angles (or angles in a triangle and angles on a straight line both sum to 180) **and**opposite angles of a cyclic quad sum to 180 **or** M1 for angle $ADC = 180 – 2x$ M1 for $180 – 2x = 60 + x$ A1 for $x = 40$ C1 (dep on M1) for exterior angle triangle = sum of interior opposite angles (or angles in a triangle and angles on a straight line both sum to 180) **and**opposite angles of a cyclic quad sum to 180 **Or** M1 for angle $ADE = 180– 60 – x$ M1 for '$180– 60 – x$' = $2x$ A1 for $x = 40$ C1 (dep on M1) for angles in a triangle sum to 180 **and**opposite angles in a cyclic quadrilateral add to 180 and angles in a straight line add to 180º or exterior angle cyclic quad = interior opposite angle **or** M1 for Angle $BAD = 120º$ and Angle $BCD = 60º$ In Δ BCE, $2x + x + 60 = 180$ A1 for $3x = 120$ C1 (dep on M1) for angles in a straight line add to 180º and opposite angles in a cyclic quadrilateral add to 180or exterior angle of cyclic quad= interior opposite angle and angles in a triangle add up to 180

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22	(a)	$(x-4)^2 - 4^2 - 3$ $= (x-4)^2 - 16 - 3$	$a = 4$ $b = 19$	2	M1 for $(x-4)^2 - 4^2 - 3$ or $a = 4$ or $b = 19$ A1 cao
	(b)	$(x-4)^2 - 16 - 3 = 0$ $x - 4 = \pm\sqrt{19}$	$4 \pm \sqrt{19}$	2	M1 for $(x - \text{'4'})^2 = \text{'16'} + 3$ oe (or correct substitution in quadratic formula) A1 cao
23	(a)	$-(3\mathbf{a} + 2\mathbf{b}) + (4\mathbf{a} + \mathbf{b})$	Show using vector algebra	1	C1 for $-(3\mathbf{a} + 2\mathbf{b}) + (4\mathbf{a} + \mathbf{b}) = \mathbf{a} - \mathbf{b}$ OR $-3\mathbf{a} - 2\mathbf{b} + 4\mathbf{a} + \mathbf{b} = \mathbf{a} - \mathbf{b}$ OR $3\mathbf{a} + 2\mathbf{b} + \mathbf{a} - \mathbf{b} = 4\mathbf{a} + \mathbf{b}$
	(b)	$\overrightarrow{QR} = \overrightarrow{QO} + \overrightarrow{OR}$ $= -4\mathbf{a} - \mathbf{b} + 8\mathbf{a} - 3\mathbf{b}$ $= 4\mathbf{a} - 4\mathbf{b} = 4(\mathbf{a} - \mathbf{b})$ **Or** $\overrightarrow{PR} = -(3\mathbf{a} + 2\mathbf{b}) + (8\mathbf{a} - 3\mathbf{b})$ $= 5\mathbf{a} - 5\mathbf{b} = 5(\mathbf{a} - \mathbf{b})$ $= 5\overrightarrow{PQ}$	1 : 4	3	M1 for $\overrightarrow{QR} = \overrightarrow{QO} + \overrightarrow{OR} = -4\mathbf{a} - \mathbf{b} + 8\mathbf{a} - 3\mathbf{b}$ A1 for $4\mathbf{a} - 4\mathbf{b}$ A1 for 1 : 4 **Or** M1 for $\overrightarrow{PR} = -(3\mathbf{a} + 2\mathbf{b}) + (8\mathbf{a} - 3\mathbf{b})$ o.e. A1 for $5\mathbf{a} - 5\mathbf{b}$ A1 for 1 : 4

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*24		$x^2 + (x + 1)^2$ $= x^2 + x^2 + 2x + 1$ $= 2x^2 + 2x + 1$ = even + even + odd = odd or $x^2 + (x + 1)^2$ $= x^2 + x^2 + 2x + 1$ $= 2x^2 + 2x + 1$ $= 2(x^2 + x) + 1$ = even + odd = odd	proof	3	M1 for $x^2 + (x + 1)^2$ or $(x – 1)^2 + x^2$ oe M1 for correctly expanding $(x + 1)^2$ or $(x – 1)^2$ C1 for simplifying correctly and for final explanation and states x is an integer. eg $2(x^2 + x)$ is even and 1 is odd **and e**ven + odd is odd

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Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Wednesday 16 November 2011 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used**.



Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed.

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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6/6/6/3

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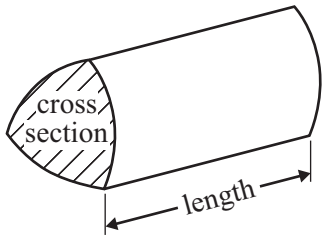
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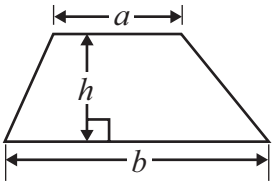
Formulae – Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

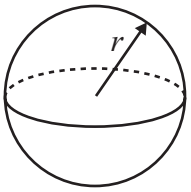


Area of trapezium $= \frac{1}{2}(a + b)h$



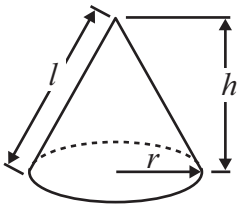
Volume of sphere $= \frac{4}{3}\pi r^3$

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

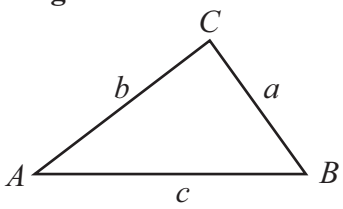


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



In any triangle *ABC*



The Quadratic Equation

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

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

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 $= \frac{1}{2}ab \sin C$

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Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

You must NOT use a calculator.

1

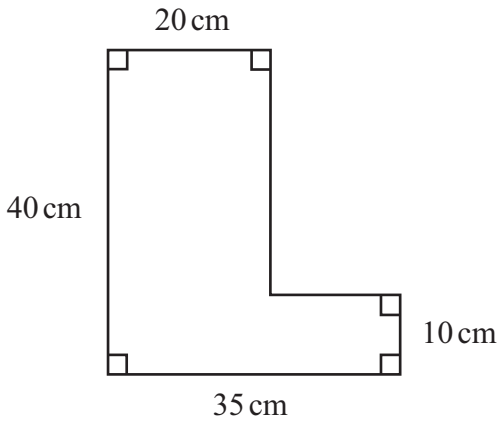


Diagram **NOT** accurately drawn

Work out the perimeter of this shape.

.....cm

(Total for Question 1 is 2 marks)

2 Given that $103.7 \times 17.5 = 1814.75$

write down the value of

(i) 10.37×1.75

.....

(ii) $1.037 \times 17\,500$

.....

(iii) $181.475 \div 175$

.....

(Total for Question 2 is 3 marks)

3 (a) Write 126 as a product of its prime factors.

.....

(2)

(b) Find the Highest Common Factor (HCF) of 126 and 70

.....

(2)

(c) Work out the Lowest Common Multiple (LCM) of 126 and 70

.....

(2)

(Total for Question 3 is 6 marks)

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4 A bag contains only red counters and blue counters.
There are 4 red counters in the bag.

The probability of taking a blue counter is the same as the probability of taking a red counter.

(a) How many blue counters are there in the bag?

.....

(1)

In another bag there are 14 counters.
The bag contains only red counters, blue counters and yellow counters.
4 of the counters are red.

The probability of taking a blue counter is twice the probability of taking a red counter.

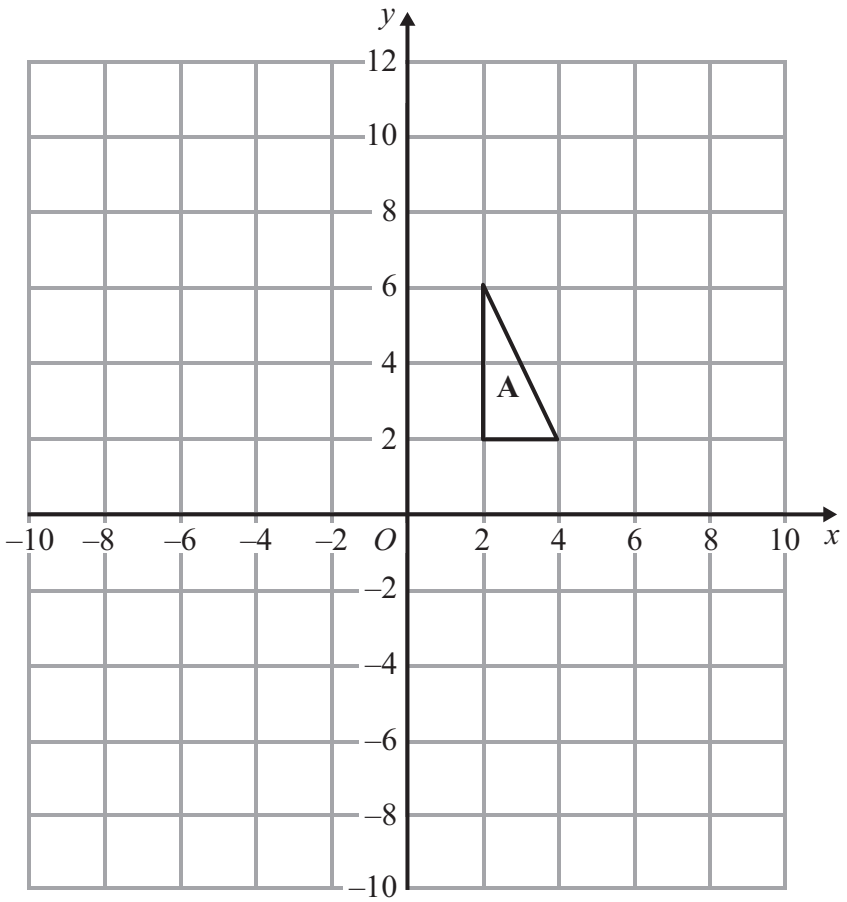
(b) How many yellow counters are there in the bag?

.....

(3)

(Total for Question 4 is 4 marks)

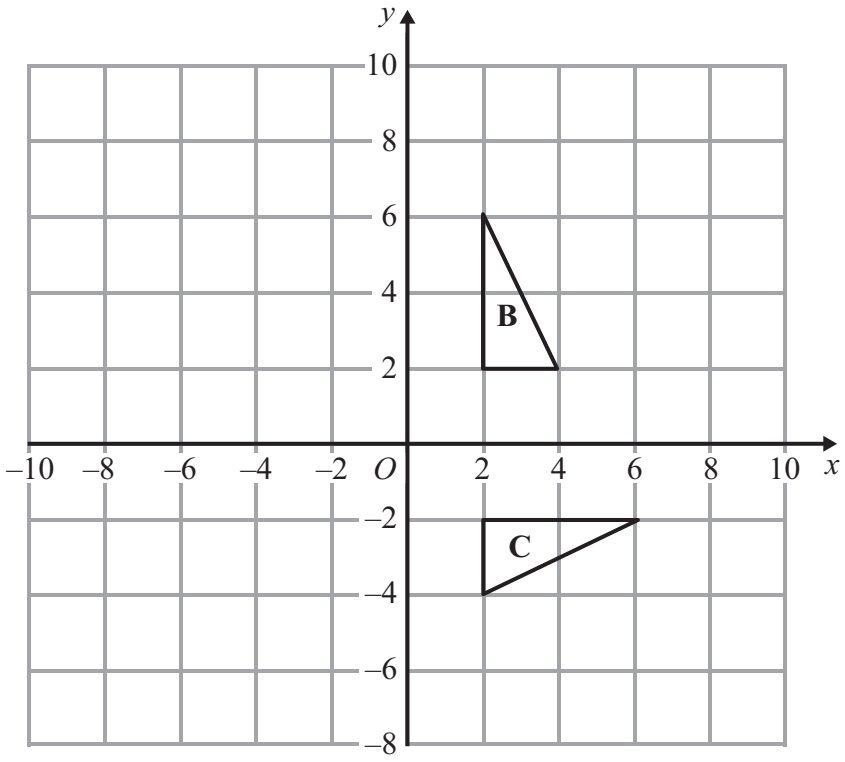
5



(a) Enlarge triangle **A**, with scale factor 2, centre (2, 2).

(2)

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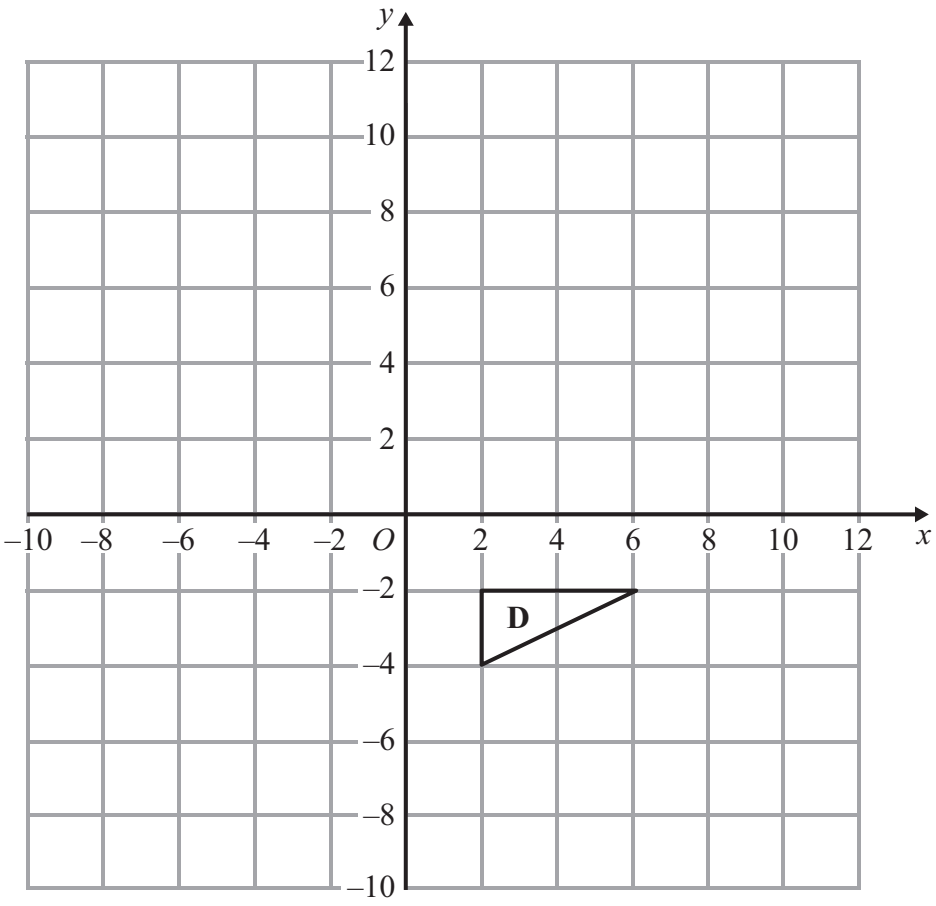


(b) Describe fully the single transformation that maps triangle **B** onto triangle **C**.

.....

.....

(3)



(c) Translate triangle **D** by $\begin{pmatrix} -4 \\ 5 \end{pmatrix}$.

(2)

(Total for Question 5 is 7 marks)

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6 Savio has two fair dice.
He throws the two dice and adds the scores together.

(i) What is the probability of getting a total of exactly 11?

.....

Savio says,

" The probability of getting a total of 5 or more is $\frac{3}{4}$ "

*(ii) Is Savio correct?
You must show your working.

(Total for Question 6 is 6 marks)

7 Here is a triangle.

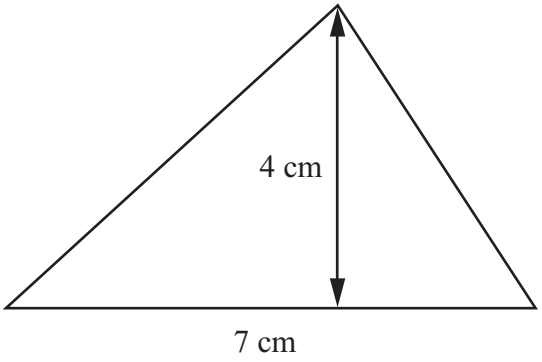


Diagram **NOT** accurately drawn

The height of the triangle is 4 cm.
The base of the triangle is 7 cm.

(a) Work out the area of the triangle.

.....cm^2

(2)

(b) Work out the length and the width of a rectangle that has the same area as this triangle.

length .....cm

width .....cm

(2)

(Total for Question 7 is 4 marks)

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8 A pizza shop sells eight types of pizzas.

This table gives information about the first 40 pizzas sold one evening.

Type of Pizza	Total
Margherita	8
Hawaiian	9
4 cheeses	4
Chicken	7
Vegetarian	8
Pepperoni	3
Farmhouse	0
Seafood	1

Using this information

(i) find an estimate for the probability that the next pizza sold will be a Margherita pizza,

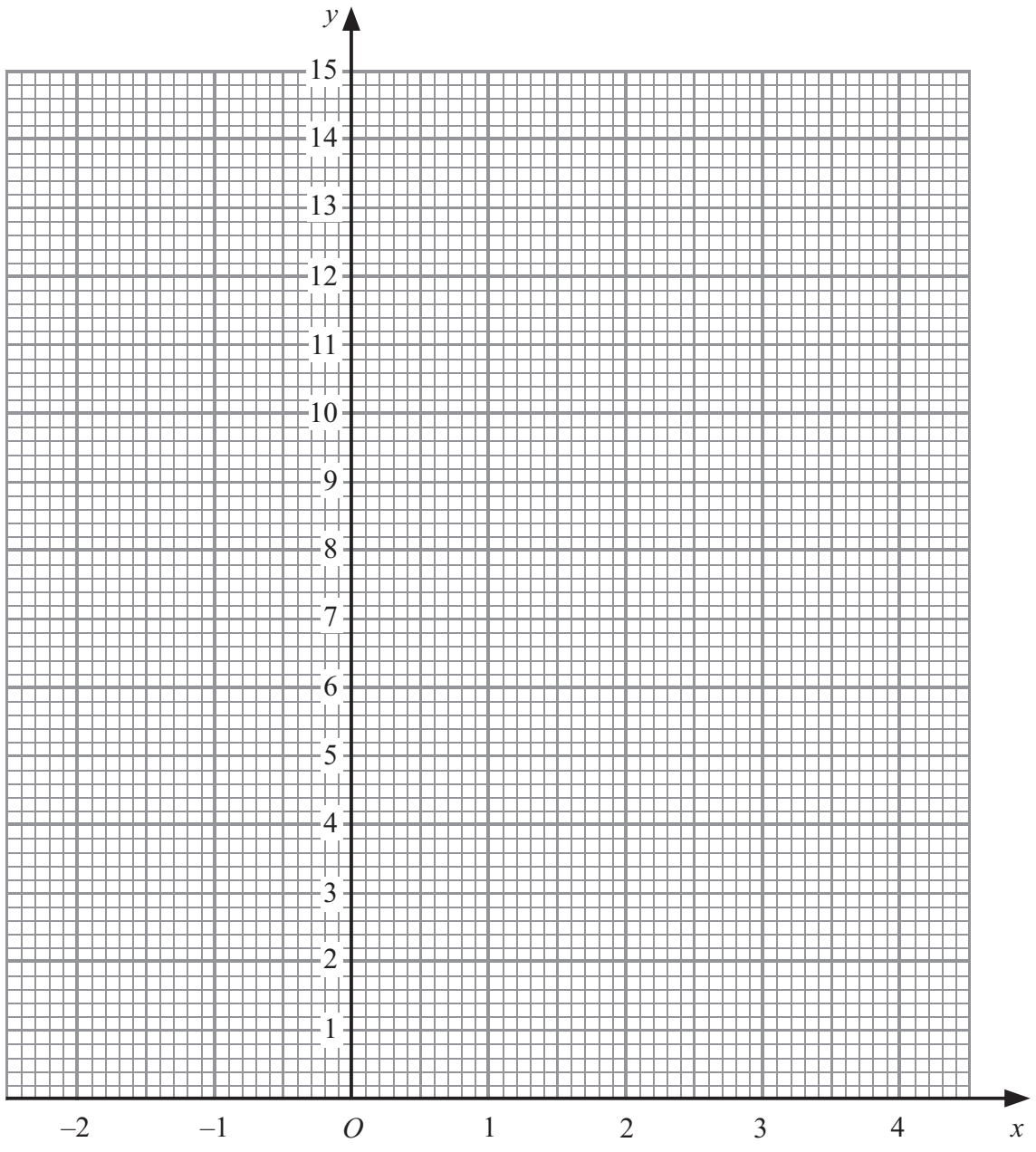
.....

(ii) find an estimate for the probability that the next pizza sold will be either a Hawaiian or a Seafood pizza.

.....

(Total for Question 8 is 4 marks)

9 (a) On the grid, draw the graph of $y - 2x = 5$ for values of x from $x = -2$ to $x = 4$



(3)

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(b) Use your graph to find

(i) the value of y when $x = -0.5$

$y =$ .....

(ii) the value of x when $y = 8.2$

$x =$ .....

(2)

(Total for Question 9 is 5 marks)

10 The equation of a straight line is $y = 4x + 7$

(a) Write down the gradient of the line.

.....

(1)

(b) Write down the y-intercept of the line.

.....

(1)

(Total for Question 10 is 2 marks)

11 The size of the obtuse angle in an isosceles triangle is $x°$.

Write an expression, in terms of x, for the size, in degrees, of one of the other two angles.

.....

(Total for Question 11 is 2 marks)

12 (a) Factorise fully $3x^2 - 6x$

.....

(2)

(b) Expand and simplify $3(2y + 7) + 4(y - 5)$

.....

(2)

(c) Solve $12 = 5(x - 2)$

.....

(3)

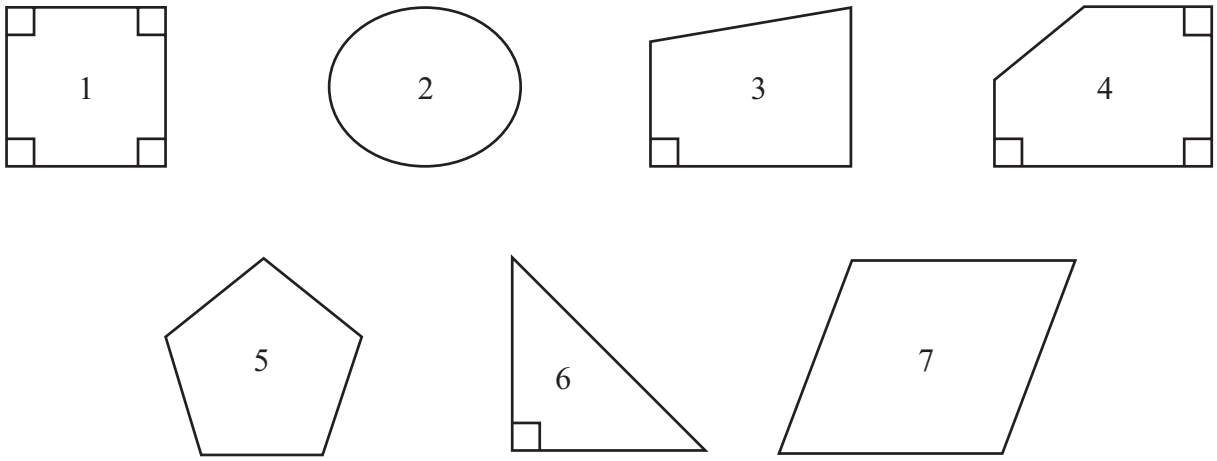
(Total for Question 12 is 7 marks)

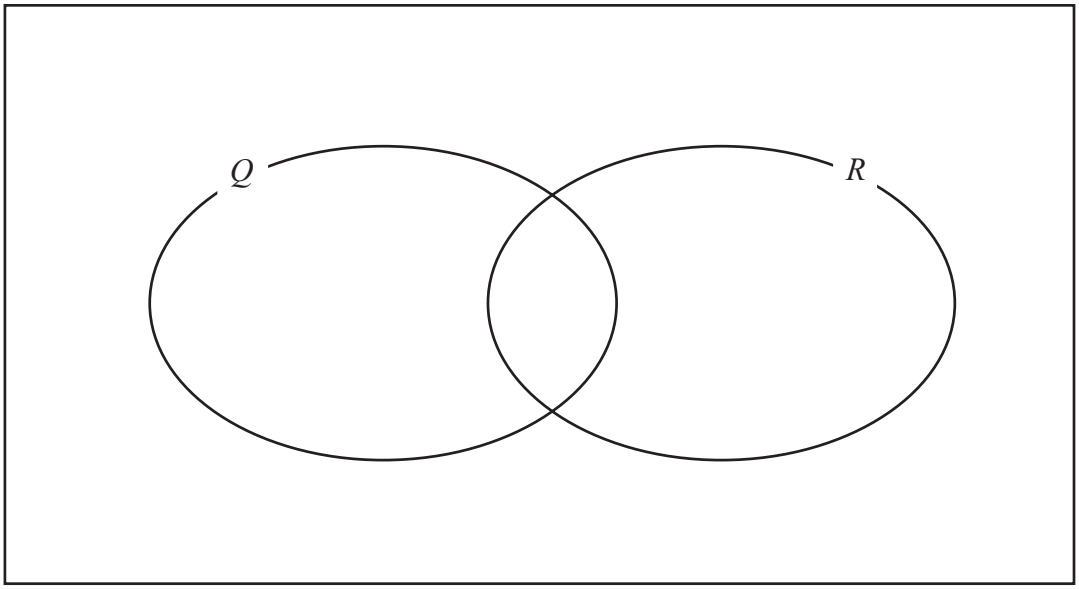
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13 Here are some shapes.
Some of the shapes are quadrilaterals and some of the shapes have at least one right angle.

Q = {quadrilaterals}.
R = {shapes which have at least one right angle}.

Write the number for each shape in the correct place in the Venn diagram.





(Total for Question 13 is 4 marks)

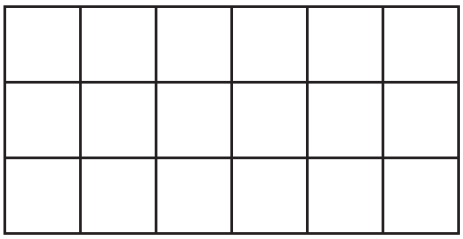
14 Here is a sequence of patterns made from centimetre squares.



Pattern Number 1



Pattern Number 2



Pattern Number 3

(a) Write down the number of centimetre squares used in Pattern Number 4

.....

(1)

(b) Find an expression, in terms of n, for the number of centimetre squares used in Pattern Number n.

.....

(2)

(c) Alex says there is a pattern in this sequence which is made from 200 centimetre squares.

Is Alex correct? .....
Explain your answer.

.....

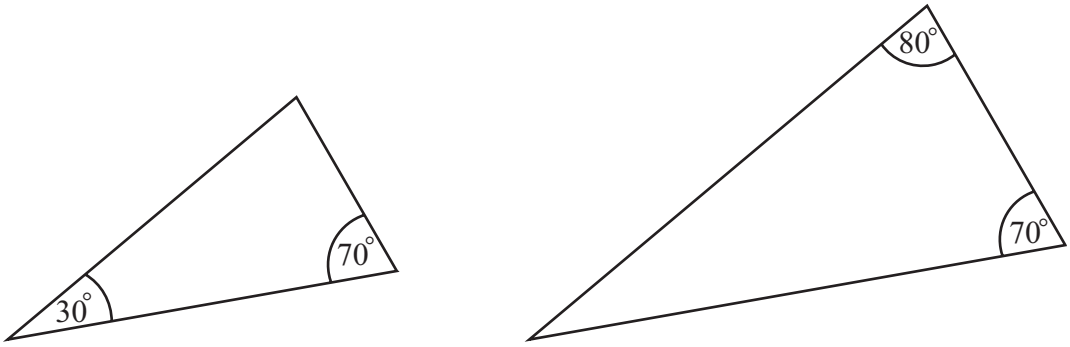
.....

(2)

(Total for Question 14 is 5 marks)

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15 (a) Here are two triangles.



Are these triangles similar?
You must give your reasons.

.....

.....

(2)

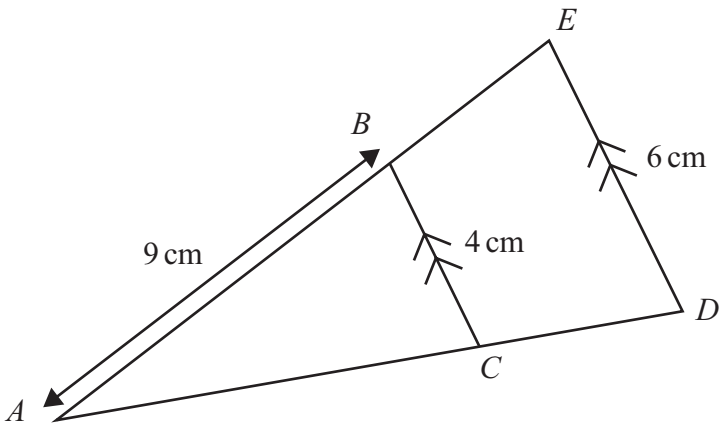


Diagram **NOT** accurately drawn

(b) Calculate the length AE.

.....cm

(2)

(Total for Question 15 is 4 marks)

16 Put the following numbers in order.
Start with the smallest number.

4.7×10^4 4700 407×10^{-3} 0.47×10^2

.....

(Total for Question 16 is 2 marks)

17 Simplify $\dfrac{x^2-9}{x^2+x-12}$

.....

(Total for Question 17 is 3 marks)

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18

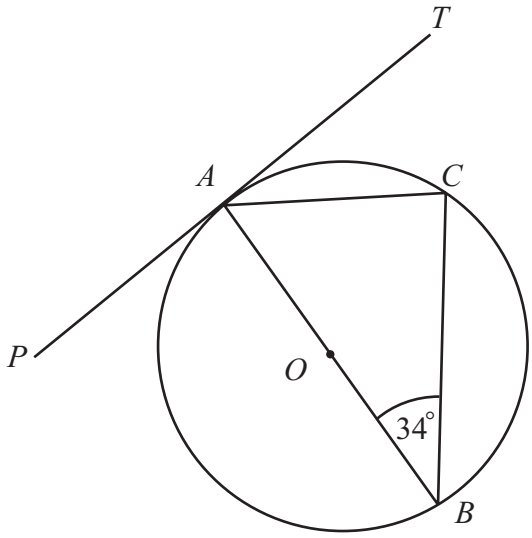


Diagram **NOT** accurately drawn

A, B and *C* are points on the circumference of a circle, centre *O*.
PAT is a tangent to the circle.
The angle *ABC* is 34°.

(a) Find the size of the angle *TAC*.
Give a reason for each stage in your working.

.....

(2)

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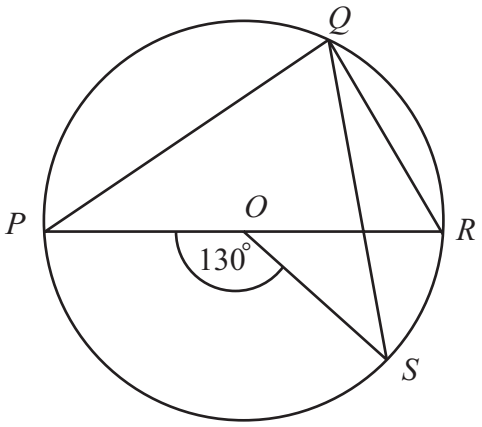


Diagram **NOT** accurately drawn

P, Q, R and *S* are points on the circumference of a circle, centre *O*.
POR is a diameter of the circle.
The angle *POS* is 130°.

*(b) Find the size of angle *SQR*.
Give reasons for your answer.

(4)

(Total for Question 18 is 6 marks)

19 (a) Write down the value of 8^0

.....

(1)

(b) Write down the value of 14^{-1}

.....

(1)

(c) Work out the value of $27^{\frac{2}{3}}$

.....

(2)

(Total for Question 19 is 4 marks)

20 Prove algebraically that the sum of any two odd numbers is even.

(Total for Question 20 is 3 marks)

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21 S is the event 'picking a red counter' and $P(S) = \frac{2}{9}$

(a) Write down the value of $P(S')$

.....

(1)

Miles puts 3 green blocks, 5 white blocks and 1 pink block in a bag.
He takes at random a block from the bag.
He writes down the colour of the block.
He puts the block back in the bag.

He then takes at random a second block from the bag and writes down its colour.

(b) Work out the probability that

(i) he takes one white block and one pink block,

.....

(ii) at least one of the blocks he takes is white.

.....

(5)

(Total for Question 21 is 6 marks)

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22 (a) Rationalise the denominator of $\frac{6}{\sqrt{5}}$

.....

(2)

(b) Expand and simplify $\left(2 + \sqrt{10}\right)\left(\sqrt{5} + \sqrt{20}\right)$

.....

(4)

(Total for Question 22 is 6 marks)

23 (a) Solve $x^2 - 6x - 16 = 0$

.....

(3)

Hence or otherwise

(b) solve $(x + 2)^2 - 6(x + 2) - 16 = 0$

.....

(2)

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2011

GCSE Mathematics (5MM1H)
Paper 01

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		40–10=30 35–20=15 20+30+15+10+35+40=150 Or (40+35) x 2 =75 x 2 =150	150	2	M1 For adding the four given side lengths and at least one of 15 or 30 40 + 20 + 35 + 10 + 30 + 15 or 135 or 120 seen Or (40+35) x 2 A1 cao
2	(i) (ii) (iii)		18.1475 18147.5 1.037	3	B1 cao B1 cao B1 cao
3	(a)	2)126 3) 63 3) 21 7 126=$2 \times 3^2 \times 7$	126 / \ 2 63 / \ 3 21 / \ 3 7 $2 \times 3^2 \times 7$	2	M1 for a systematic method of at least 2 correct divisions by a prime number or 2 correct division stages on a factor tree or a full process with one calculation error A1 $2 \times 3 \times 3 \times 7$ or $2 \times 3^2 \times 7$
	(b)	2×7	14	2	M1 for listing factors of 126 and 70 (at least 3 correct for each) or identification of one common factor or 2 x 7 A1 cao
	(c)	70, 140, 210, 280…… 630… 126, 252, 378, 504 ……630… 126 = $2 \times 3^2 \times 7$ 70 = $2 \times 5 \times 7$ $2 \times 3^2 \times 7 \times 5$	630	2	M1 for listing multiples, at least 3 of each, condone one addition error 70, 140, 210, 280…… 630 126, 252, 378, 504 ……630 A1 for 630 cao Alternative: M1 for $2 \times 7 \times 5 \times 3$ ($\times 3$) A1 for 630

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)		4	1	B1 cao
	(b)	14 – 4 – 8=2	2	3	M1 for 4 × 2 (=8) blue counters M1 for 14 – "8" – 4 or 10 – "8" A1 cao or M1 for P(B)= 2 × $\frac{4}{14}$ oe (= $\frac{8}{14}$ oe) M1 for 1 – $\frac{"8"}{14} - \frac{4}{14}$ oe or P(Y)= $\frac{2}{14}$ oe or $\frac{2}{14}$ × 14 oe A1 cao
5	(a)		Triangle at (2,2),(6,2) and (2,10)	2	B2 fully correct answer (B1 correct enlargement incorrect centre)
	(b)		A rotation about (0,0) clockwise through 90	3	B1 Rotation B1 90° clockwise or 270° (anticlockwise) B1 for (0,0) or *O* or origin NB: a combination of transformations gets B0
	(c)		Triangle at (–2,3), (2,3) and (–2,1)	2	B2 fully correct answer (B1 for any translation)

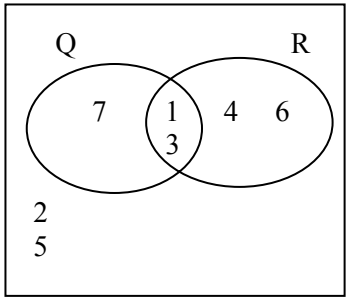
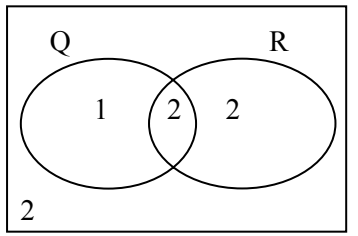
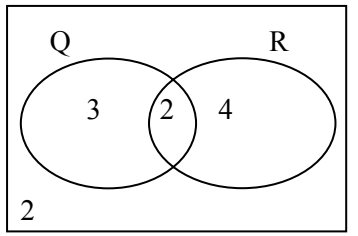
5MM1H_01

Question		Working	Answer	Mark	Notes
6	(i)	<table><tr><td>+</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr><tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr></table> $\frac{2}{36}$	$\frac{1}{18}$	6	M1 for listing / identifying the 2 outcomes (5,6) and (6,5) or $(\frac{1}{6} \times \frac{1}{6}) + (\frac{1}{6} \times \frac{1}{6})$ A1 for $\frac{2}{36}$ oe
	(ii)		Incorrect and reason		M1 for identifying there are 36 outcomes, eg 36 seen or outcomes listed or shown in a table (can be earned in (i)) M1 for attempt to list or find the number of outcomes giving a total of 5 or more (allow one error, omission or extra outcome), eg 30 (or 29 or 31) seen or outcomes listed or identified in table. A1 $\frac{30}{36}$ oe C1 (dep M2) for conclusion that Savio is incorrect with supportive evidence (including clear reference to their probability for a total of 5 or more). Alternative M1 for identifying there are 36 outcomes, eg 36 seen or outcomes listed or shown in a table (can be earned in (i)) M1 for outcomes giving a total of <u>less</u> than 5 eg 6 total outcomes, outcomes listed or identified in table A1 $\frac{30}{36}$ oe C1 (dep M2) for conclusion that Savio is incorrect with supportive evidence (including clear reference to their P(5 or more) or comparison of P(less than 5) with ¼ oe).

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)	$7 \times 4 \div 2$	14	2	M1 for 7 x 4÷2 A1 cao
	(b)		Pair of numbers with product 4 eg 1,14 or 2,7	2	ft B2 correct pair (B1 one correct dimension seen unless clearly working with perimeter not area)
8	(i)		$\frac{8}{40}$	1	B1 $\frac{8}{40}$ oe
	(ii)	$\frac{1}{40} + \frac{9}{40}$ $\frac{10}{40}$	$\frac{10}{40}$	3	M1 for $\frac{1}{40}$ or $\frac{9}{40}$ M1 for $\frac{1}{40} + \frac{9}{40}$ or 1+ 9 (=10) A1 $\frac{10}{40}$ oe Note: Award 0 marks for $\frac{2}{8}$ without working in (ii) if $\frac{2}{8}$ seen in (i)

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)	2 –1 0 1 2 3 4 1 3 5 7 9 11 13 Or Using $y = mx + c$, gradient =2, y intercept = 5		3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x M1 (dep) ft for plotting at least 2 of their points (any points plotted from their table must be correct) A1 for correct line between -2 and 4 **(No table of values)** M2 for at least 2 correct points (and no incorrect points) plotted OR line segment of $y - 2x = 5$ drawn (ignore any additional incorrect segments) (M1 for at least 3 correct points with no more than 2 incorrect points) A1 for correct line between -2 and 4 **(Use of $y=mx+c$)** M2 line segment of $y - 2x = 5$ drawn (ignore any additional incorrect segments) (M1 for line drawn with gradient of 2 OR line drawn with a y intercept of 5 and a positive gradient) A1 for correct line between -2 and 4
	(b)(i)		4		B1 Allow 3.8 to 4.2 inclusive either by substitution or ft from a straight line segment (± 2mm)
	(ii)		1.6		B1 Allow 1.4 to 1.8 inclusive either by substitution or ft from a straight line segment (± 2mm) Note: Condone alternative or additional value − 1.4 to − 1.8 inclusive ft from straight line segments

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10	(a)		4	1	B1 cao
	(b)		7 or (0,7)	1	B1 cao
11		$180 - x$	$\frac{180 - x}{2}$ Or $90 - \frac{x}{2}$	2	M1 for $180 - x$ seen (eg $180 - x \div 2$) A1 correct expression
12	(a)		$3x(x-2)$	2	B2 $3x(x-2)$ (or B1 for partial factorisation $3(x^2-2x)$ or $x(3x-6)$)
	(b)	$6y + 21 + 4y - 20 = 10y + 1$	$10y + 1$	2	M1 $3 \times 2y + 3 \times 7$ or $4 \times y - 4 \times 5$ or $10y$ A1 cao
	(c)	$12 = 5x - 10$	4.4 or $4\frac{2}{5}$ or $\frac{22}{5}$	3	M1 one correct manipulation either $5x - 10$ or $\frac{12}{5}$ M1 for intention to add 10 to both sides Or intention to add 2 to both sides eg $12 + 10 = 5x$ or $\frac{12}{5} + 2 = x$ A1 4.4 or $\frac{22}{5}$ oe

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13				4	M1 for an attempt at classification, eg by writing Q in an appropriate shape or writing an appropriate shape number next to set Q M1 for correct placement of any shape number in the Venn diagram. A1 for all shape numbers in sets Q and R correctly placed A1 for 2 and 5 outside of Q and R SC B2 for giving total number of elements in each part of Venn diagram:  SC B1 for: 

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	4 by 8	32	1	B1 cao
	(b)		$2n^2$	2	M1 for quadratic expression in n A1 for $2n^2$ oe
	(c)	$200 \div 2 = 100, \sqrt{100} = 10$	Yes and reason	2	B2 for yes and $10 \times 20 = 200$ or $2 \times 10^2 = 200$ or $\sqrt{200 \div 2} = 10$ or completes sequence up to and including 200 (B1 for using $2n^2$ oe or 50 and 72 seen or statement that 200 is 10^{th} term)
15	(a)	30+70+80=180 Angles are the same	Yes and reason	2	M1 sight of 30,70,80 (from angles in triangle add to 180) A1 (dep on award of M1) Angles are the same
	(b)	_ _	13.5	2	M1 6/4 oe scale factor seen or 4/6 oe scale factor seen A1 cao
16		47000, 4700, 0.407, 47 0.407, 47, 4700, 47000 407×10^{-3}, 0.47×10^2, 4700, 4.7×10^4	407×10^{-3}, 0.47×10^2, 4700, 4.7×10^4	2	M1 Converting all to same form A1 Fully correct ordering of numbers in standard form (SC B1 if one incorrectly placed or all 4 in reverse order)
17		$\frac{(x-3)(x+3)}{(x-3)(x+4)}$	$\frac{(x+3)}{(x+4)}$	3	B1 $(x-3)(x+3)$ B1 $(x-3)(x+4)$ B1 $\frac{(x+3)}{(x+4)}$

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)	180–90–34=56 90–56=34	x=34° Reason	2	B1 34° B1 for Alternate segment theorem Or B1 34° B1 for all reasons: Angles in a semicircle are 90° Angles in a triangle add up to 180° The tangent to a circle is perpendicular (90°) to the radius (diameter)
	(b)	130/2=65 90–65=25°	25° Reasons	4	M1 for 90 – 130/2 A1 cao C2 for both reasons The angle at the centre of a circle is twice the angle at the circumference. Angles in a semicircle are 90° (C1 for one reason)
19	(a)		1	1	B1cao
	(b)		$\frac{1}{14}$	1	B1cao
	(c)		9	2	M1 for 3^2 or $(\sqrt[3]{27})^2$ or $\sqrt[3]{27^2}$ A1 cao

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20			Proof shown	3	M1 For expressing a general pair of two odd numbers algebraically eg $2n+1$, $2m+1$ or $2n-1$, $2m-1$ or $2n-1$, $2m+1$ or For expressing a pair of two consecutive or identical odd numbers algebraically eg $2m+1$, $2m+3$ or $2n-1$, $2n+1$ or $2n+1$, $2n+1$ M1 (dep) for showing addition of 2 algebraic expressions which are a general pair of 2 odd numbers , not a consecutive pair eg $2n+1 + 2m+1$s A1 Simplified expression for sum eg $2n + 2m + 2$ and correct reasoning that it is divisible by 2 eg $2n+2m+2$ is divisible by 2 or 2 is a factor of $2n+2m+2$ or $2(n + m + 1)$ SC B1 for using 2 different variables (eg m and n) which are defined as even and then used to form expressions for 2 general odd numbers eg $n+1$ and $m+1$

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21	(a)	$1-\frac{2}{9}$	$\frac{7}{9}$	1	B1 $\frac{7}{9}$ oe
	(b)(i)	Tree diagram or $\frac{5}{9}\times\frac{1}{9}+\frac{1}{9}\times\frac{5}{9}$	$\frac{10}{81}$	5	B1 for $\frac{5}{9}$ or $\frac{1}{9}$ seen M1 Indication of correct 2 branches from a tree diagram leading to $\frac{5}{9}\times\frac{1}{9}+\frac{5}{9}\times\frac{1}{9}$ seen A1 $\frac{10}{81}$ Or B1 $\frac{5}{9}$ or $\frac{1}{9}$ seen M1 $\frac{5}{9}\times\frac{1}{9}\times 2$ A1 $\frac{10}{81}$ **Alternative Scheme - Without Replacement** B1 for $\frac{5}{9}$ or $\frac{1}{9}$ seen M1 Indication of correct 2 branches from a tree diagram leading to $\frac{5}{9}\times\frac{1}{8}+\frac{1}{9}\times\frac{5}{8}$ seen A0 for $\frac{10}{72}$
5MM1H_01					

Question		Working	Answer	Mark	Notes
21	(ii)	$\frac{1}{9} \times \frac{5}{9} + \frac{3}{9} \times \frac{5}{9} + \frac{5}{9} \times \frac{5}{9} + \frac{5}{9} \times \frac{3}{9} + \frac{5}{9} \times \frac{1}{9}$ $\frac{5}{81} + \frac{15}{81} + \frac{25}{81} \times \frac{15}{81} + \frac{5}{81}$ or $1 - \frac{4}{9} \times \frac{4}{9}$	$\frac{65}{81}$		M1 adding at least 3 of the 5 products for correct combinations with at least one white A1 for $\frac{65}{81}$ Alternative M1 $1 - \frac{4}{9} \times \frac{4}{9}$ A1 for $\frac{65}{81}$ **Alternative scheme – without replacement** M1 adding at least 3 of the 5 products for correct combinations with at least one white $\frac{1}{9} \times \frac{5}{8} + \frac{3}{9} \times \frac{5}{8} + \frac{5}{9} \times \frac{5}{8} + \frac{5}{9} \times \frac{3}{8} + \frac{5}{9} \times \frac{1}{8}$ A0 for $\frac{65}{72}$ Alternative M1 $1 - \frac{4}{9} \times \frac{3}{8}$ A0 for $\frac{60}{72}$
5MM1H_01					

Question		Working	Answer	Mark	Notes
22	(a)	$\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$	$\frac{6\sqrt{5}}{5}$	2	M1 $\frac{6}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$ A1 cao
	(b)	$2\sqrt{5}+\sqrt{10}\ \sqrt{5}+2\sqrt{20}+\sqrt{10}\ \sqrt{20}$ $2\sqrt{5}+\sqrt{50}+2\sqrt{20}+\sqrt{200}$ $2\sqrt{5}+5\ \sqrt{2}\ +4\sqrt{5}+10\sqrt{2}$	$6\sqrt{5}+15\sqrt{2}$	4	M1 for 3 of no more than 4 correct terms of expansion, (may be shown in a table or without + signs) $2\sqrt{5}\ +\ \sqrt{10}\ \sqrt{5}\ +\ 2\sqrt{20}\ +\ \sqrt{10}\ \sqrt{20}$ oe M1 or $\sqrt{50}$ or $\sqrt{(10\times5)}$ or $\sqrt{200}$ or $\sqrt{(20\times10)}$ M1 $5\ \sqrt{2}$ or $10\sqrt{2}$ or $4\sqrt{5}$ A1 cao
23	(a)	$(x–8)(x+2)$	8 or –2	3	M1 for $(x \pm 8)(x \pm 2)$ A1 for 8 A1 for –2 (Note: If trial and improvement used, both answers must be correct for award of marks)
	(b)	$x + 2 = 8$ $x + 2 = –2$ $x^2 + 4x + 4 – 6x – 12 – 16 = 0$ $x^2 – 2x – 24 = 0$ $(x–6)(x+4)$	6 and –4	2	M1 for $x + 2 = 8$ or $x + 2 = –2$ A1 both 6 and –4 cao Or M1 for multiplying out the brackets to give $x^2 + 4x + 4 – 6x – 12 – 16 = 0$ oe A1 both cao

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Methods in Mathematics

Unit 1: Methods 1

For Approved Pilot Centres ONLY

Higher Tier

Monday 13 June 2011 – Afternoon
Time: 1 hour 45 minutes

Paper Reference
5MM1H/01

You must have:
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators must not be used**.



Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed
  – *you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P38956A

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6/6/6/6/6/6

P 3 8 9 5 6 A 0 1 2 0

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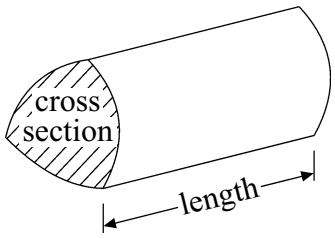
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GCSE Mathematics 2MM01

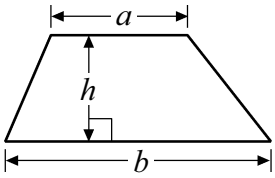
Formulae – Higher Tier

You must not write on this formulae page.
Anything you write on this formulae page will gain NO credit.

Volume of a prism = area of cross section × length

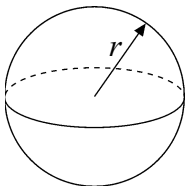


Area of trapezium $= \frac{1}{2}(a+b)h$



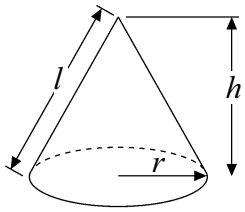
Volume of sphere $= \frac{4}{3}\pi r^3$

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

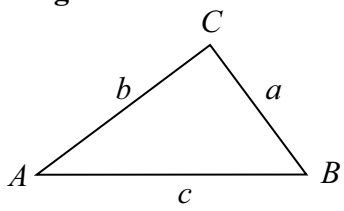


Volume of cone $= \frac{1}{3}\pi r^2 h$

Curved surface area of cone $= \pi rl$



In any triangle *ABC*



The Quadratic Equation

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

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

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 $= \frac{1}{2}ab\sin C$

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Answer ALL Twenty Four questions.

Write down your answers in the spaces provided.

You must NOT use a calculator.

You must write down all stages of your working.

1 There are 20 counters in a box.

5 counters are red.
4 counters are green.
The rest of the counters are blue.

Hajra takes at random one of the counters from the box.

What is the probability that she takes

(i) a blue counter,

.....

(ii) A counter that is not green?

.....

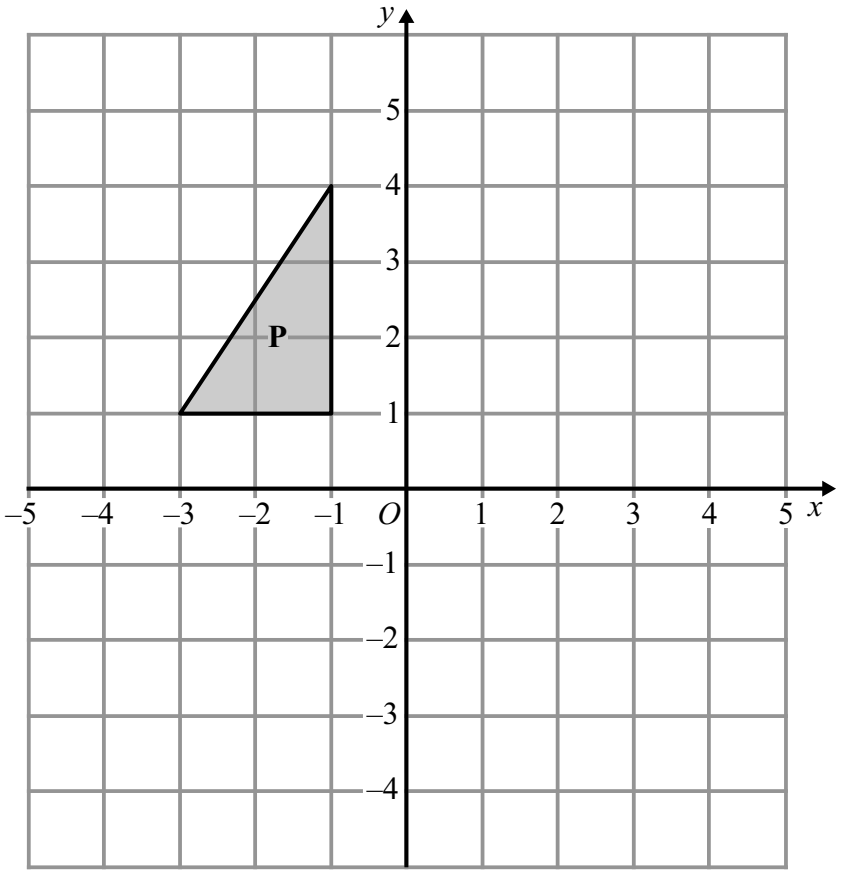
(Total for Question 1 is 4 marks)

2 Work out 374×53

.....

(Total for Question 2 is 3 marks)

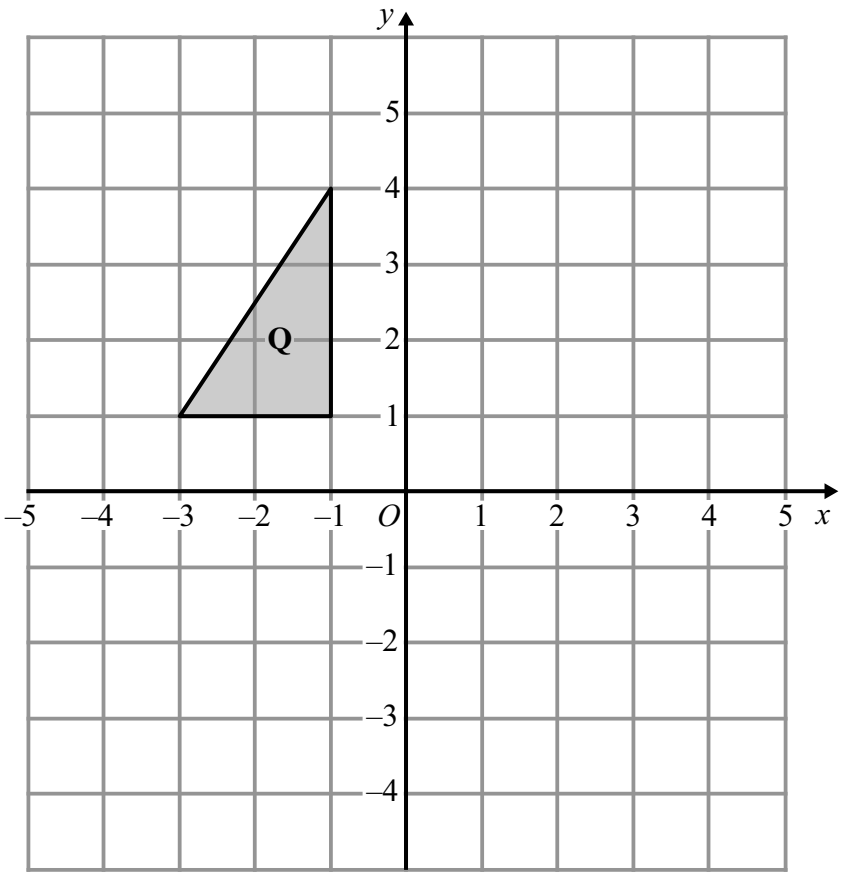
3



(a) Translate triangle **P** by vector $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$

(2)

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(b) Rotate triangle **Q** 180° centre (0, 2).

(2)

(Total for Question 3 is 4 marks)

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4 Work out $1\frac{1}{5} + 3\frac{7}{10}$

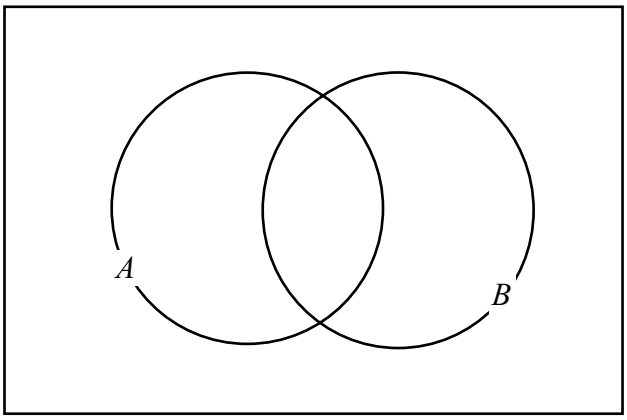
.....

(Total for Question 4 is 3 marks)

5 The universal set $\mathscr{E} = \{11, 12, 13, 14, 15, 16, 17, 18, 19\}$

Set $A = \{12, 15, 18\}$
Set $B = \{12, 14, 16, 18\}$

(a) Complete the Venn diagram.



(2)

(b) Write down the numbers that are in both set A and set B.

$A \cap B =$ .....

(1)

(c) Write down the numbers that are in the set $A \cup B$.

$A \cup B =$ .....

(1)

(d) Write down the numbers that are in set A'.

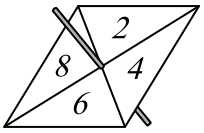
$A' =$ .....

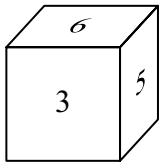
(1)

(Total for Question 5 is 5 marks)

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6 Jim has a fair 4-sided spinner numbered 2, 4, 6 and 8 and a fair 6-sided dice.





He spins the spinner once and rolls the dice once.
To get the score he **multiplies** the numbers together.

(i) Work out the probability the score will be 2

.....

(ii) Work out the probability the score will be more than 30

.....

(Total for Question 6 is 5 marks)

7 (a) Find the Highest Common Factor (HCF) of 12 and 20

.....

(2)

(b) Find the Lowest Common Multiple (LCM) of 32 and 48

.....

(2)

(Total for Question 7 is 4 marks)

8 (a) Expand and simplify $2(x + 3y) + 4(x - y)$

.....

(2)

(b) Factorise completely $8p - 12pq$

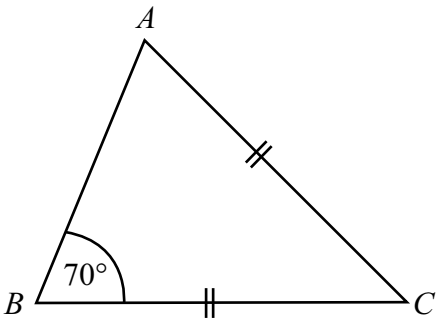
.....

(2)

(Total for Question 8 is 4 marks)

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***9**



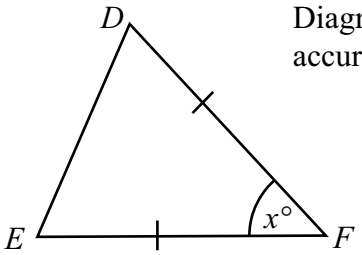


Diagram **NOT** accurately drawn

Triangle ABC is an isosceles triangle.
Angle $B = 70°$.
$AC = BC$.

Triangle ABC is similar to triangle DEF.

Find the value of the angle marked $x°$.
Give reasons for your answer.

(Total for Question 9 is 4 marks)

10 A cuboid is shown on a 3-D grid.

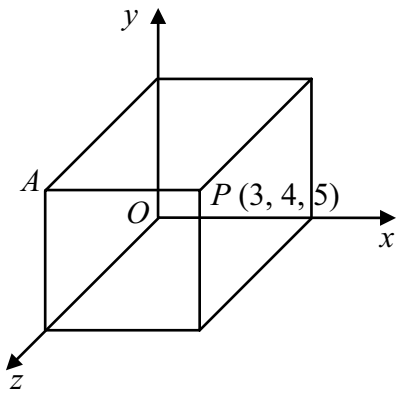


Diagram **NOT** accurately drawn

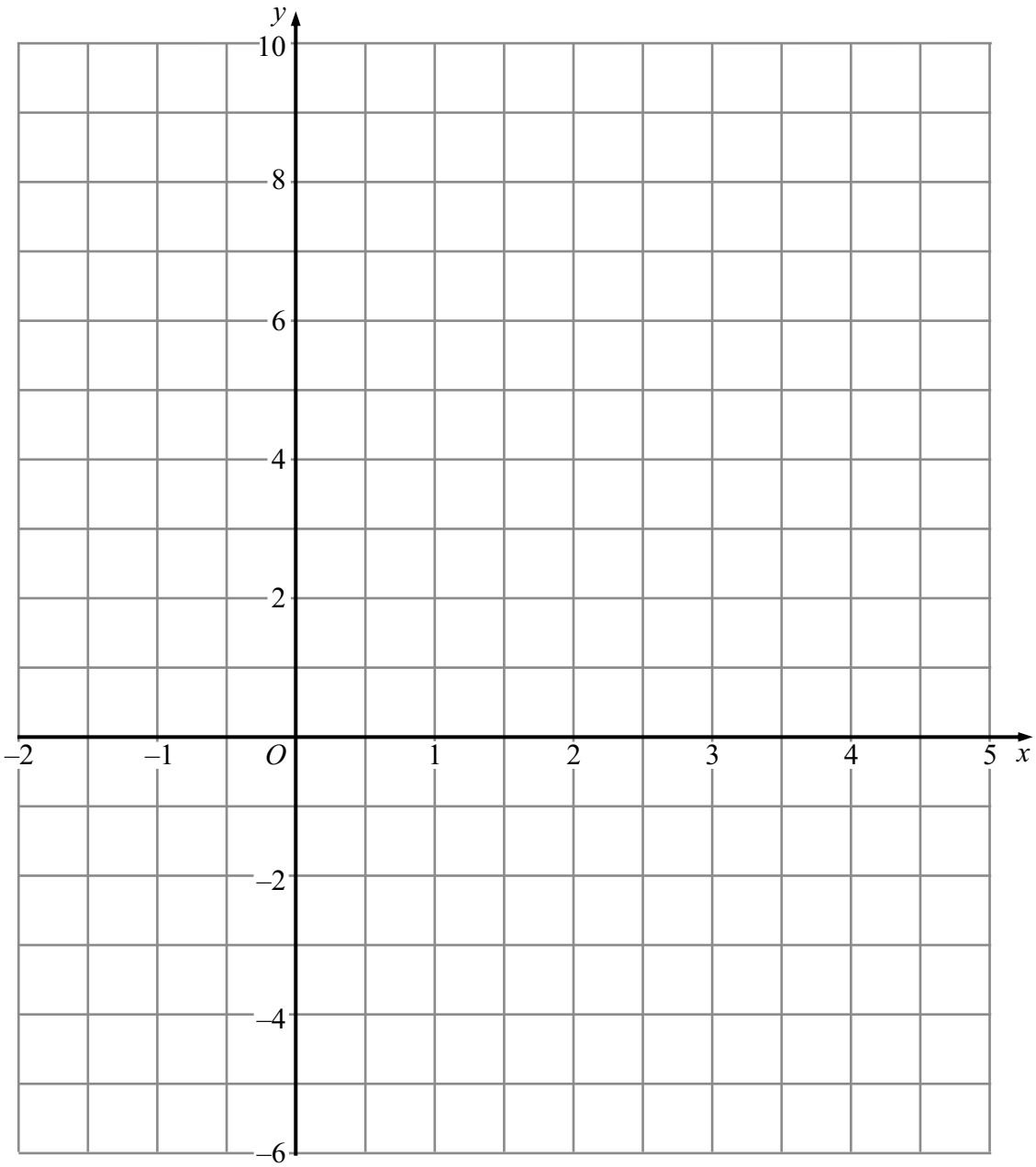
The point P has coordinates (3, 4, 5).

Write down the coordinates of the point A.

.....

(Total for Question 10 is 2 marks)

11 On the grid draw the graph of $y = 2x - 3$



(Total for Question 11 is 3 marks)

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12 (a) Write down the value of 25^0

.....

(1)

(b) Write down the value of $49^{-\frac{1}{2}}$

.....

(1)

(c) Write as a power of 2 $\dfrac{4\times 8}{16^3}$

.....

(3)

(Total for Question 12 is 5 marks)

---

13 (a) Write in standard form 96 000 000

.....

(1)

(b) Write as an ordinary number 1.2×10^{-3}

.....

(1)

(c) Work out $3.2 \times 10^{-4} \times 5 \times 10^{8}$

Give your answer in standard form.

.....

(2)

(Total for Question 13 is 4 marks)

---

14 Here is a trapezium.

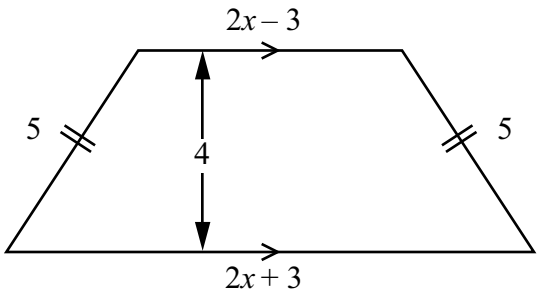


Diagram **NOT** accurately drawn

All the measurements are in cm.

The area of the trapezium is 18 cm².

Calculate the numerical value of the perimeter of the trapezium.

.....cm

(Total for Question 14 is 6 marks)

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15 Here is some information about a cricket and tennis club.

80 people belong to the club.
35 play cricket.
50 play tennis.
15 play both cricket and tennis.

(a) Draw a Venn diagram to show this information.

(4)

One of the people that belongs to the club is chosen at random.

(b) Work out the probability that this person does not play cricket or tennis.

.....

(2)

(Total for Question 15 is 6 marks)

16 (a) Expand and simplify $(2x + 3)(3x - 4)$

.....

(2)

(b) Factorise $9p^2 - 25q^2$

.....

(2)

(Total for Question 16 is 4 marks)

***17** Prove that the sum of the squares of any two odd numbers is always even.

(Total for Question 17 is 4 marks)

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18

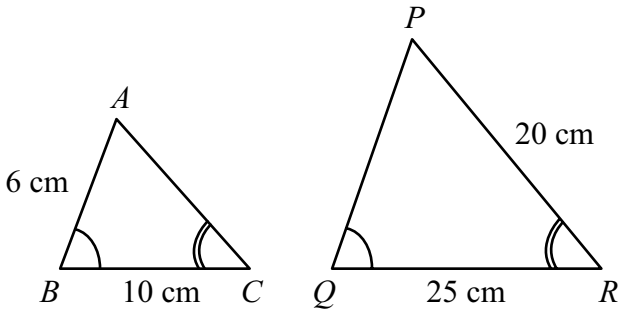


Diagram **NOT** accurately drawn

ABC and *PQR* are two similar triangles.

(a) Find the length of *PQ*.

.....cm

(2)

(b) Find the length of *AC*.

.....cm

(2)

(Total for Question 18 is 4 marks)

19 Solve the equation $\frac{x+5}{3} = 2(x-3)$

.....

(Total for Question 19 is 3 marks)

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***20**

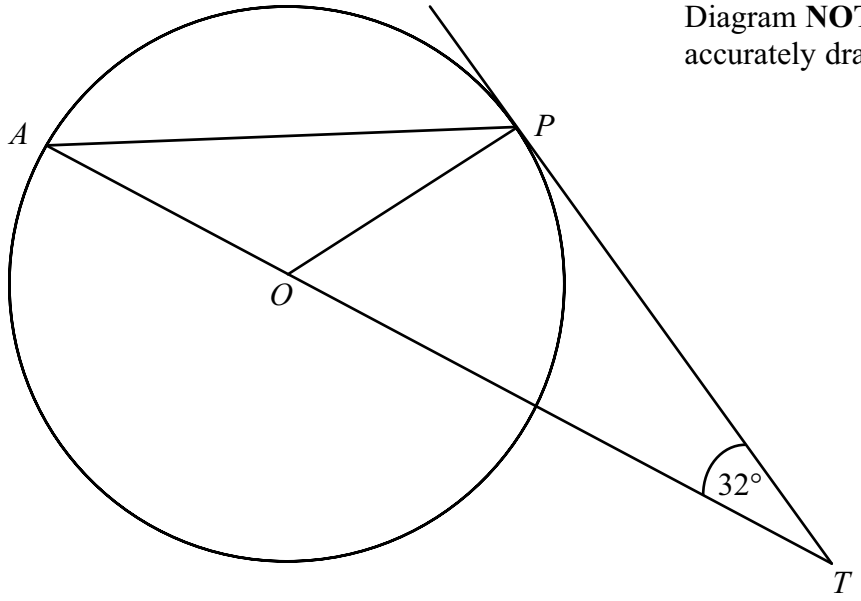


Diagram **NOT** accurately drawn

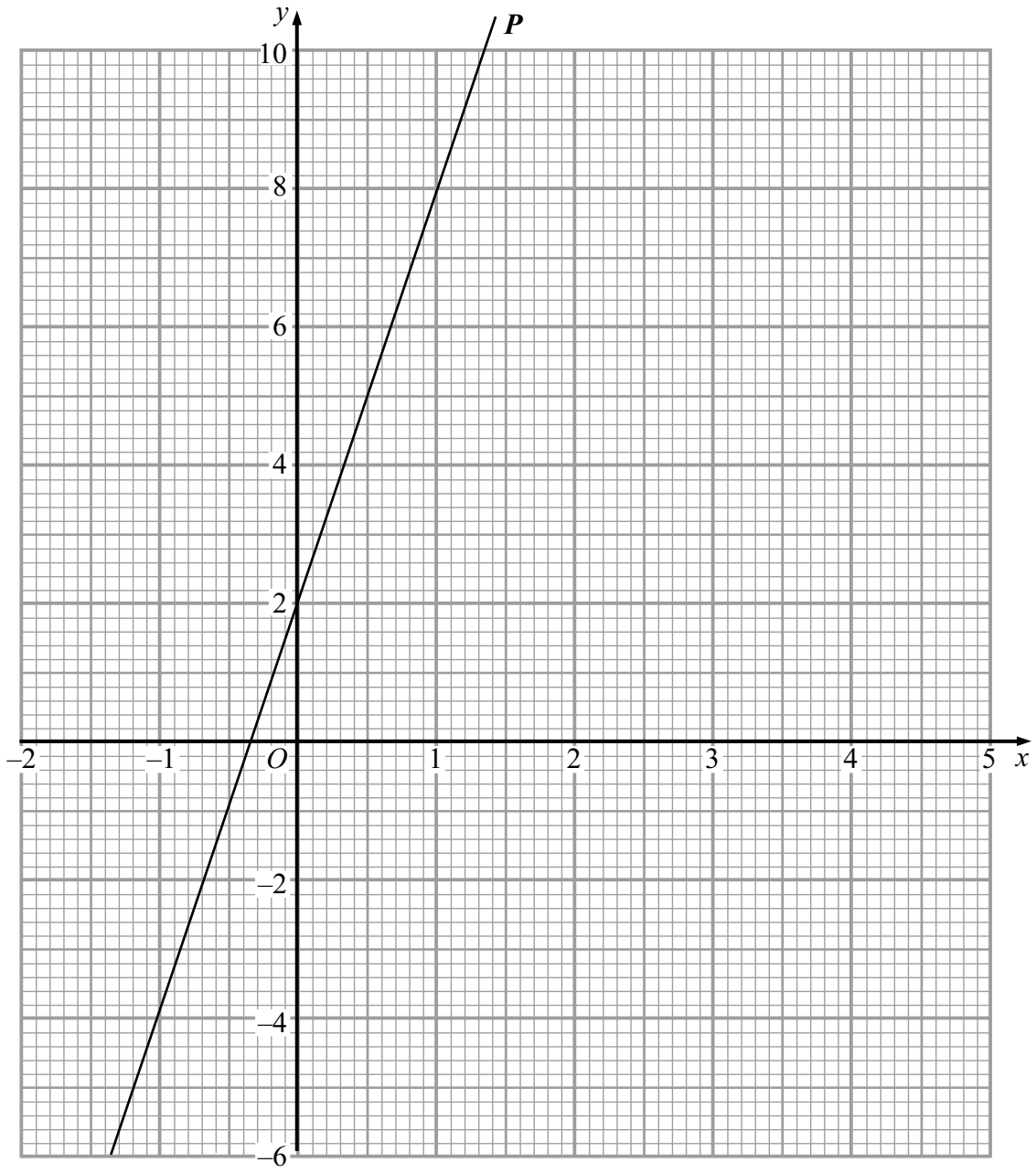
A and *P* are points on the circumference of a circle, centre *O*.
TP is a tangent to the circle.
AOT is a straight line.
Angle *PTA* = 32°.

Work out the size of angle *OAP*.
You must give reasons for your answer.

(Total for Question 20 is 5 marks)

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21 The straight line ***P*** is drawn on the coordinate grid.



Find an equation for the straight line ***P***.

.....

(Total for Question 21 is 3 marks)

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22 Solve the equation $\frac{x-1}{1} - \frac{6}{x-1} = 1$

.....

(Total for Question 22 is 5 marks)

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23

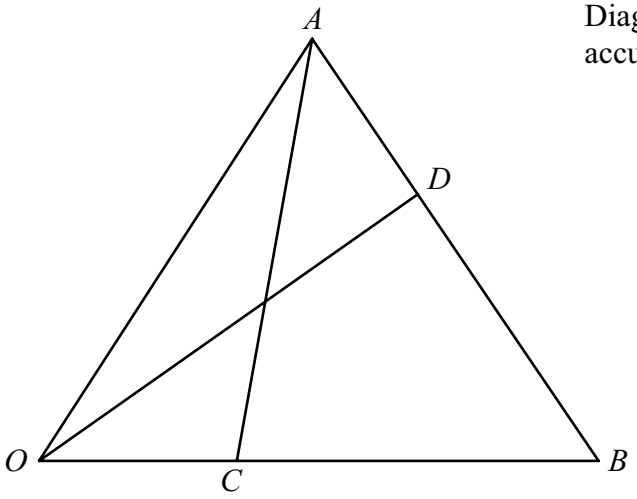


Diagram **NOT** accurately drawn

OAB is a triangle.

The point D divides the line AB in the ratio 1 : 2
The point C divides the line OB in the ratio 1 : 2

$\overrightarrow{OA} = 6\mathbf{a}$
$\overrightarrow{OB} = 6\mathbf{b}$

(a) Write down $\overrightarrow{AB}$ in terms of **a** and **b**.

.....

(1)

*(b) Show that

CD is parallel to OA **and** the length of CD is $\frac{2}{3}$ the length of OA.

(5)

(Total for Question 23 is 6 marks)

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24 There are 10 chocolates in a box.

There are 3 types of chocolates.

5 are plain chocolate.
3 are milk chocolate.
2 are white chocolate.

Gareth takes at random two chocolates from the box.

Work out the probability that both chocolates are of the same type.

.....

(Total for Question 24 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

June 2011

Methods in Mathematics (GCSE)
Unit 1: Methods 5MM1H_01

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NOTES ON MARKING PRINCIPLES

1 All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.

2 Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.

3 All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.

4 Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.

5 Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

6 Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:

i) *ensure that text is legible and that spelling, punctuation and grammar are accurate so that meaning is clear*
Comprehension and meaning is clear by using correct notation and labeling conventions.

ii*) select and use a form and style of writing appropriate to purpose and to complex subject matter*
Reasoning, explanation or argument is correct and appropriately structured to convey mathematical reasoning.

iii) *organise information clearly and coherently, using specialist vocabulary when appropriate*.
The mathematical methods and processes used are coherently and clearly organised and the appropriate mathematical vocabulary used.

7 With working

If there is a wrong answer indicated on the answer line always check the working in the body of the script (and on any diagrams), and award any marks appropriate from the mark scheme.

If working is crossed out and still legible, then it should be given any appropriate marks, as long as it has not been replaced by alternative work.

If it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks. Send the response to review, and discuss each of these situations with your Team Leader.

If there is no answer on the answer line then check the working for an obvious answer.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks. Discuss each of these situations with your Team Leader.

If there is a choice of methods shown, then no marks should be awarded, unless the answer on the answer line makes clear the method that has been used.

8 Follow through marks

Follow through marks which involve a single stage calculation can be awarded without working since you can check the answer yourself, but if ambiguous do not award.

Follow through marks which involve more than one stage of calculation can only be awarded on sight of the relevant working, even if it appears obvious that there is only one way you could get the answer given.

9 Ignoring subsequent work

It is appropriate to ignore subsequent work when the additional work does not change the answer in a way that is inappropriate for the question: e.g. incorrect canceling of a fraction that would otherwise be correct

It is not appropriate to ignore subsequent work when the additional work essentially makes the answer incorrect e.g. algebra.

Transcription errors occur when candidates present a correct answer in working, and write it incorrectly on the answer line; mark the correct answer.

10 Probability

Probability answers must be given a fractions, percentages or decimals. If a candidate gives a decimal equivalent to a probability, this should be written to at least 2 decimal places (unless tenths).

Incorrect notation should lose the accuracy marks, but be awarded any implied method marks.

If a probability answer is given on the answer line using both incorrect and correct notation, award the marks.

If a probability fraction is given then cancelled incorrectly, ignore the incorrectly cancelled answer.

11 Linear equations

Full marks can be gained if the solution alone is given on the answer line, or otherwise unambiguously indicated in working (without contradiction elsewhere). Where the correct solution only is shown substituted, but not identified as the solution, the accuracy mark is lost but any method marks can be awarded.

12 Parts of questions

Unless allowed by the mark scheme, the marks allocated to one part of the question CANNOT be awarded in another.

13 Range of answers

Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

Guidance on the use of codes within this mark scheme
M1 – method mark A1 – accuracy mark B1 – Working mark C1 – communication mark QWC – quality of written communication oe – or equivalent cao – correct answer only ft – follow through sc – special case dep – dependent (on a previous mark or conclusion) indep – independent isw – ignore subsequent working

<table>
<tr><th colspan="6">5MM1H_01</th></tr>
<tr><th colspan="2">Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr><td>1</td><td>(i)</td><td>20 – (5 + 4) = 11</td><td>$\frac{11}{20}$, 0.55, 55%</td><td>2</td><td>M1 for 20 – (5 + 4) or 11 seen or for $\frac{n}{20}$ where $n < 12$
A1 for $\frac{11}{20}$ oe (eg. 55%, 0.55, $\frac{55}{100}$)</td></tr>
<tr><td></td><td>(ii)</td><td>20 – 4 = 16
OR
$\frac{5}{20} + \frac{11}{20}$</td><td>$\frac{4}{5}$, 0.8, 80%</td><td>2</td><td>M1 for $\frac{20-4}{20}$ or $1-\frac{4}{20}$ or $\frac{5}{20} + \frac{'11'}{20}$
A1 for $\frac{16}{20}$ oe
[SC: B1 for 16 to 20 or 16:20 or 16 out of 20 oe if M0 scored]</td></tr>
<tr><td>2</td><td></td><td>374
53 ×
1122
18700
19822

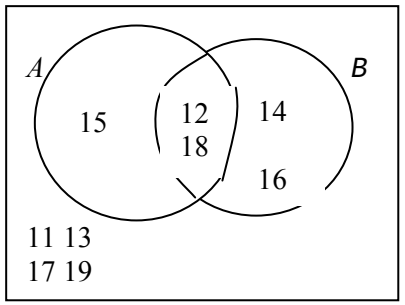
<table><tr><td>×</td><td>300</td><td>70</td><td>4</td></tr><tr><td>50</td><td>15000</td><td>3500</td><td>200</td></tr><tr><td>3</td><td>900</td><td>210</td><td>12</td></tr></table>
15 000 + 3500 + 200 + 900 + 210 + 12 = 19 822

<table><tr><td></td><td>3</td><td>7</td><td>4</td><td></td></tr><tr><td>1</td><td>1 / 5</td><td>3 / 5</td><td>2 / 0</td><td>5</td></tr><tr><td>9</td><td>/ 9</td><td>2 / 1</td><td>1 / 2</td><td>3</td></tr><tr><td></td><td>8</td><td>2</td><td>2</td><td></td></tr></table></td><td>19 822</td><td>3</td><td>M1 for complete method for multiplying 374 by 3 and 50 condone one error in multiplication
M1 (dep) for addition, condone one addition error
A1 cao

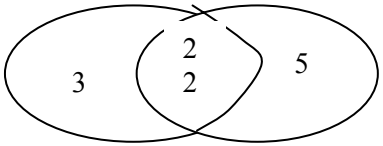
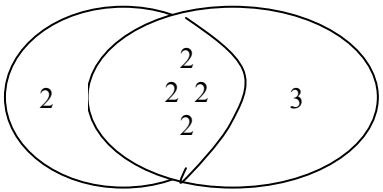
Alternative
M1 for complete method for multiplying 300, 70 and 4 by 3 and 50 condone one error in multiplication
M1 (dep) for addition, condone one addition error
A1 cao

Alternative
M1 for complete method for multiplying 3, 7 and 4 by 3 and 5 condone one error in multiplication
M1 (dep) for addition, condone one addition error
A1 cao</td></tr>
</table>

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		Triangle with vertices: (3, 1), (3, -2) and (1, -2)	2	M1 for any translation A1 for correct translation
	(b)		Triangle with vertices: (1, 3), (3, 3) and (1, 0)	2	B2 cao for a correct rotation [B1 for a rotation of of 180º about any point OR for a correct rotation of 90º clockwise or anticlockwise about the point (0, 2)]
4		$4 + \frac{2}{10} + \frac{7}{10}$ $4\frac{9}{10}$ OR $\frac{6}{5} + \frac{37}{10} = \frac{12}{10} + \frac{37}{10}$	$4\frac{9}{10}$	3	M1 for attempting to use a common denominator or obtaining $\frac{2}{10}$ oe M1 for adding $4 + \frac{2}{10} + \frac{7}{10}$ A1 for $4\frac{9}{10}$ or 4.9 or $\frac{49}{10}$ oe OR M1 for $\frac{6}{5}$ or $\frac{37}{10}$ oe M1 for $\frac{12}{10} + \frac{37}{10}$ oe A1 for $4\frac{9}{10}$ or 4.9 or $\frac{49}{10}$ oe

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5	(a)			2	M1 for writing the contents of set A or set B correctly in the correct places in a Venn diagram A1 for a fully correct Venn Diagram
	(b)		12 and 18	1	B1 for the correct answer or ft on their Venn Diagram
	(c)		12, 14, 15, 16, 18	1	B1 for the correct answer or ft on their Venn Diagram
	(d)		11, 13, 14, 16, 17, 19	1	B1 for the correct answer or ft on their Venn Diagram

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(i)	$\begin{array}{c\|cccccc} \times & 1 & 2 & 3 & 4 & 5 & 6 \\ \hline 2 & 2 & 4 & 6 & 8 & 10 & 12 \\ 4 & 4 & 8 & 12 & 16 & 20 & 24 \\ 6 & 6 & 12 & 18 & 24 & 30 & 36 \\ 8 & 8 & 16 & 24 & 32 & 40 & 48 \end{array}$ OR $\frac{1}{4} \times \frac{1}{6}$	$\frac{1}{24}$	5	M1 for identifying 2 and 1 or 2 × 1 (= 2) M1 for 24 seen OR an attempt to get the 24 outcomes or an attempt at a sample space or a list of possibilities or a list of ordered pairs [at least 12 correct; outcomes , possibilities, ordered pairs must be shown (ignore incorrect extras)] A1 for 1/24 oe OR M2 for $\frac{1}{4} \times \frac{1}{6}$ (M1 for $\frac{1}{4}$ or $\frac{1}{6}$ seen) A1 for 1/24 oe
	(ii)		$\frac{4}{24} = \frac{1}{6}$		M1 ft from their ordered list from part (i) for identifying at least one possible score from; 8×4 (=32), 6×6 (=36), 8×5 (=40) or 8×6 (=48), condone the inclusion of pairs reversed; eg. 4×8, 6×8 and 5×8 [accept the inclusion of 6×5 (=30) as a misread] [accept an answer of $\frac{5}{24}$, for M1, ONLY if the 5 outcomes are selected in either part (i) or part (ii)] A1 for 4/24 oe

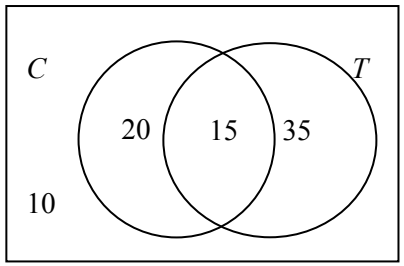
5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)	12 = 2×2×3 20 = 2×2×5 OR 12: 1, 2, 3, 4, 6, 12 20: 1, 2, 4, 5, 10, 20 OR  	4	2	M1 for dealing with both 12 **and** 20 by, Writing each number as a product of prime factors (condone one error only); or by, Listing the factors of each number (condone one error only), or by, Drawing a Venn Diagram (or two factor trees) showing all prime factors of each number (condone one error only) A1 for HCF = 4 (accept 2×2 or 2^2)
	(b)	32 = 2×2×2×2×2 48 = 2×2×2×2×3 OR 32. 64, 96, 128, … 48, 96, 144, …. OR  	96	2	M1 for dealing with both 32 **and** 48 by, Writing each number as a product of prime factors (condone one error only); or by, Listing the multiples of each number , up to at least 96 in each list (condone one error only), or by, Drawing a Venn Diagram (or two factor trees) showing all prime factors of each number (condone one error only) A1 for LCM = 96 (accept $2^5 \times 3$ or 2×2×2×2×2×3) [SC: B1 for any multiple of both 32 and 48 (eg 192) if M0 scored]
8	(a)	$2x + 6y + 4x - 4y$	$6x + 2y$	2	M1 for $2x + 6y$ or $4x - 4y$ or $6x$ or $2y$ A1 for $6x + 2y$ [accept $2(3x + y)$]
	(b)	$2 \times 4 \times p - 3 \times 4 \times p \times q$	$4p(2 - 3q)$	2	B2 cao [B1 for $2p(4 - 6q)$ or $p(8 - 12q)$ or $4(2p - 3pq)$ or $2(4p - 6pq)$ or $4p(a + bq)$ where $a \neq 0$ and $b \neq 0$]

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		180 – (70 + 70) 180 – 140	40º	4	M1 for identifying two correct equal 70º angles in either triangle M1 for 180 – (70 + 70) A1 for angle $C = 40º$ or $F(x) = 40^o$ C1 for x = "40º" 'because the ***triangles*** are ***similar***' or 'one triangle is an ***enlargement*** of the other' **and** either 'base ***angles*** of an ***isosceles*** triangle are ***equal***' or 'sum of the ***angles*** in a ***triangle*** is ***180º***' oe
10			(0, 4, 5)	2	B2 cao B1 for (x, 4, 5) or (0, 4, z) or (0, y, 5)

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		$y = 2x - 3$ x -1 0 1 2 3 4 5 y -5 -3 -1 1 3 5 7	Correct line from (–1, −5) to (4, 5)	3	**(Table of values)** M1 for at least 2 correct attempts to find points by substituting values of x M1 for plotting at least 2 of their points (if more than two points are plotted, condone one plotting error) A1 for the correct line from (–1, −5) to (4, 5) OR **(No table of values)** M2 for at least 2 correct points (and no incorrect points) correctly plotted or M2 for a line segment of the graph of $y = 2x - 3$ drawn (ignore any additional incorrect line segments) [M1 for at least 3 correct points plotted with no more than 2 incorrect points] A1 for the correct line from (–1, −5) to (4, 5) OR **(Use of $y = mx + c$)** M2 for a single straight line of gradient 2, passing through the point (0, −3) (M1 for a single straight line of gradient 2 or for a single straight line passing through the point (0, −3)) A1 for the correct line from (–1, −5) to (4, 5)

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		1	1	B1 cao
	(b)		$\frac{1}{7}$	1	B1 for $\frac{1}{7}$ (condone $\pm\frac{1}{7}$)
	(c)	$\frac{2^2\times 2^3}{2^{4^3}}=\frac{2^5}{2^{12}}$ OR $\frac{2\times 16}{16\times 16\times 16}=\frac{2}{16\times 16}=\frac{2}{2^4\times 2^4}=\frac{2}{2^8}$	2^{-7}	3	M1 for writing one of the numbers correctly as a power of 2 M1 for $2^{'2'}\times 2^{'3'}=2^{'2'+'3'}$ $(=2^5)$ or $(2^{'4'})^3=2^{'4'\times 3}$ $(=2^{12})$ or $\frac{2^{'5'}}{2^{'12'}}=2^{'5'-'12'}$ A1 for 2^{-7} or $\frac{1}{2^7}$ OR B1 for $\frac{2}{16^2}$ or an equivalent fraction with a numerator of 2 M1 for $2^{'4'}\times 2^{'4'}=2^{'4'+'4'}$ $(=2^8)$ or $\frac{2^{'1'}}{2^{'8'}}=2^{'1'-'8'}$ A1 for 2^{-7} or $\frac{1}{2^7}$ [SC: B1 for an answer of $\frac{1}{128}$ if M0 scored]
13	(a)		9.6×10^7	1	B1 cao [Do not accept 9.6^7]
	(b)		0.0012	1	B1 for 0.0012 or .0012
	(c)	16×10^4	1.6×10^5	2	M1 for '3.2×5' $\times 10^4$ $(=16\times 10^4)$ or 1.6×10^n, where n is an integer, or 160000 seen A1 cao

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		$(2x – 3 + 2x + 3) \div 2 \times 4 = 18$ $8x = 18$ $x = 2.25$ $P = 2x – 3 + 2x + 3 + 5 + 5$ $P = 4x + 10$ $P = 9 + 10$ OR $2 \times 2.25 – 3 = 1.5$ $2 \times 2.25 + 3 = 7.5$ $5 + 5 + 1.5 + 7.5$	19 cm	6	M1 for $(2x – 3 + 2x + 3) \div 2 \times 4$ oe M1 for equating "$(2x – 3 + 2x + 3) \div 2 \times 4$" = 18 A1 cao $x = 2.25$ oe (eg. $\frac{18}{8}$) M1 (indep) $2x – 3 + 2x + 3 + 5 + 5$ (= 4x + 10) oe M1 (dep) for substituting "x" into an expression for the perimeter A1 cao OR M1 for $2 \times$ '2.25' – 3 (= 1.5) or $2 \times$ '2.2'5 + 3 (= 7.5) M1 for 5 + 5 + '1.5' + '7.5' [Note: the '2.25' must be the solution of an algebraic equation for their attempt at the area of the trapezium] A1 cao

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15	(a)			4	B1 for 15 shown in the intersection of two sets M1 for an attempt to show 35 – 15 or 50 – 15 in the correct place on the Venn Diagram. M1 for 80 – [“20” + 15 + “35”] (= 10), this may be implied from their numbers in the diagram A1 for a fully correct and labelled diagram [condone omission of the surrounding box]
	(b)		$\frac{1}{8}$	2	M1 for identifying “10” outside of C and T A1 ft for $\frac{'10'}{80}$ o.e.
16	(a)	$6x^2 - 8x + 9x - 12$	$6x^2 + x - 12$	2	M1 for any three correct terms out of the four from $6x^2 - 8x + 9x - 12$ or sight of these 4 terms correct $6x^2$, $8x$, $9x$, 12, ignoring signs, (with no extra terms). A1 cao
	(b)		$(3p+5q)(3p-5q)$	2	M1 for either bracket correct or $(3p \pm 5q)(3p \pm 5q)$ A1 for both brackets correct

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$(2p \pm 1)^2 + (2n \pm 1)^2$ $4p^2 \pm 4p + 1 + 4n^2 \pm 4n + 1$ $4(p^2 \pm p + n^2 \pm n) + 2$ Formal proof of odd × odd = odd $(2p \pm 1)(2n \pm 1)$ $= 4pn \pm 2p \pm 2n + 1$ $= 2(2pn \pm p \pm n) + 1$ Formal proof of odd + odd = even $(2p \pm 1) + (2n \pm 1)$ $= 2p + 2n \pm 2$ (or 0) $= 2(p + n \pm 2(0))$		4	M1 for one number written in the form $2p \pm 1$, $2p \pm 3$, $2p \pm 5$, etc. M1 (dep) for squaring both numbers to obtain two expressions of the form $4p^2 \pm 4p + 1$ oe A1 for a correct, simplified, expression in the form $4(p^2 \pm p + n^2 \pm n) + 2$ or $2(2p^2 \pm 2p + 2n^2 \pm 2n + 1)$, where n and p are positive integers C1 (dep on at least M1 scored) for explaining that their expression $4(p^2 \pm p + n^2 \pm n) + 2$ has to be even because it has a common factor of 2 oe **OR** M1 for odd² = odd × odd = odd M1 for odd + odd = even A1 for a formal proof that : odd × odd = odd **and** odd + odd = even C1 for odd ^{2}+ odd ^{2} = odd + odd = even SC: B1 For an example showing that the sum of the squares of two different odd numbers equates to an even number
18	(a)	6 × 2.5	15	2	M1 for $\frac{10}{25}$ or $\frac{25}{10}$ oe or 0.4 seen or 2.5 seen A1 cao
	(b)	20 ÷ 2.5	8	2	M1 for 20 ÷ "$\frac{25}{10}$" or 20 × "0.4" oe A1 cao

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19		$\frac{x+5}{3} = 2x - 6$ $x + 5 = 3(2x - 6)$ $x + 5 = 6x - 18$ $23 = 5x$	4.6	3	M1 for attempting to multiplying both sides of the equation by 3 (this could be shown by equations of the form: $x + 5 = 6x - ?$ or $x + 5 = ?x - 18$ ie the LHS must be correct) M1 (dep) for a correct method for isolating terms in x and number terms A1 for 4.6 or $\frac{23}{5}$ oe
20		180 – (90 + 32) = 58 58 ÷ 2 OR 180 – (90 + 32) = 58 180 – 58 = 122 (180 – 122) ÷ 2	Angle *TPO* = 90º (angle between a tangent and a radius = 90º) Angle *TOP* = 58º (angle sum of a triangle is 180º) Angle *OAP* = 29º (angle subtended by an arc at the centre is twice the angle subtended by the same arc at the circumference	5	B1 for Angle *TPO* = 90º (could be seen on diagram) Reason **A**: angle between a ***tangent*** and a ***radius*** = 90º M1 for Angle *TOP* = 180 – (90 + 32) or 58º or complete method shown Reason **B**: ***angle*** sum of a ***triangle*** is ***180º*** A1 for 29º Reason **C**: ***angle*** subtended by an arc at the ***centre*** is ***twice*** the ***angle*** subtended by the same arc at the ***circumference*** or ***exterior angle*** of a triangle is equal to the ***sum*** of the ***interior*** opposite ***angles*** and base ***angles*** of an ***isosceles*** triangle are ***equal*** or ***angles*** on a ***straight line*** add up to ***180º*** and base ***angles*** of an ***isosceles*** triangle are ***equal*** C2 for reasons **A**, **B** and **C** seen (C1 for any 2 reason seen from **A**, **B** and **C**)

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21			$y = 6x + 2$	3	M1 for '$m = 6$' seen or for $y = 6x + c$ or for an attempt to find the gradient of the line with sight of a right angled triangle with their height divided by their base. M1 for '$c = 2$' seen or for an equation of the form $y = mx + 2$ A1 for $y = 6x + 2$ oe
22		$(x – 1)(x – 1) – 6 = x – 1$ OR $\frac{(x-1)(x-1)-6}{x-1} = 1$ $x^2 – 2x + 1 – 6 = x – 1$ $x^2 – 3x – 4 = 0$ $(x – 4)(x + 1) = 0$ $x – 4 = 0$ or $x + 1 = 0$	$x = 4$ or $x = –1$	5	M1 for multiplying LHS by $(x – 1)$ or writing LHS as a fraction(s) with a common denominator M1 for $x^2 – 2x + 1 – 6 = x – 1$ or $\frac{x^2-2x+1-6}{x-1} = 1$ oe A1 for correct quadratic equation $x^2 – 3x – 4 = 0$ M1 ft for factorizing to get $(x \pm 4)(x \pm 1) = 0$ or for correct substitution into the quadratic formula A1 cao for $x = 4$ and $x = –1$ (accept $x = 4, –1$) [SC: B1 for one correct solution if M0 scored]

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
23	(a)		$6\mathbf{b} - 6\mathbf{a}$	1	B1 cao
	(b)	$\overrightarrow{CD} = \overrightarrow{CO} + \overrightarrow{OA} + \overrightarrow{AD}$ $= -\frac{1}{3}6\mathbf{b} + 6\mathbf{a} + \frac{1}{3}(6\mathbf{b} - 6\mathbf{a})$ $= -2\mathbf{b} + 6\mathbf{a} + 2\mathbf{b} - 2\mathbf{a}$ $= 4\mathbf{a}$ **OR** $= \frac{2}{3} \times 6\mathbf{b} - \frac{2}{3} \times$ ("$6\mathbf{b}-6\mathbf{a}$") $= 4\mathbf{b} - 4\mathbf{b} + 4\mathbf{a}$ $= 4\mathbf{a}$		5	M1 for $\pm \frac{1}{3}6\mathbf{b}$ or $\pm \frac{1}{3}(6\mathbf{b} - 6\mathbf{a})$ or $\pm \frac{2}{3} \times 6\mathbf{b}$ or $\pm \frac{2}{3} \times (6\mathbf{b}-6\mathbf{a})$) [these may be just shown in the diagram, in simplified or un-simplified form] or for $\overrightarrow{CD} = \overrightarrow{CO} + \overrightarrow{OA} + \overrightarrow{AD}$ or $\overrightarrow{CB} + \overrightarrow{BD}$ M1 for $-\frac{1}{3}6\mathbf{b} + 6\mathbf{a} + \frac{1}{3}$("$6\mathbf{b} - 6\mathbf{a}$") Or $\frac{2}{3} \times 6\mathbf{b} - \frac{2}{3} \times$ ("$6\mathbf{b}-6\mathbf{a}$") A1 for $4\mathbf{a}$ (accept $\frac{2}{3}$ of $6\mathbf{a}$) from a correct vector method seen. C1 for a statement that $4\mathbf{a}$ is parallel to $6\mathbf{a}$ because they have the same vector $\mathbf{a}$ oe C1 for 4 is ⅔ of 6 so CD is ⅔ the length of OA oe

5MM1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
24		$(\frac{5}{10}\times\frac{4}{9})+(\frac{3}{10}\times\frac{2}{9})$ $+(\frac{2}{10}\times\frac{1}{9})$ $=\frac{20+6+2}{90}=\frac{28}{90}$	$\frac{14}{45}$	4	B1 for $\frac{4}{9}$ or $\frac{2}{9}$ or $\frac{1}{9}$ seen as 2nd probability (could be in a tree diagram) M1 for $(\frac{5}{10}\times\frac{4}{9})$ or $(\frac{3}{10}\times\frac{2}{9})$ or $(\frac{2}{10}\times\frac{1}{9})$ M1 for $(\frac{5}{10}\times\frac{4}{9})+(\frac{3}{10}\times\frac{2}{9})+(\frac{2}{10}\times\frac{1}{9})$ A1 for $\frac{28}{90}$ o.e. Alternative scheme for replacement B0 for $\frac{5}{10}$ or $\frac{3}{10}$ or $\frac{2}{10}$ seen as 2nd probability M1 for $(\frac{5}{10}\times\frac{5}{10})$ or $(\frac{3}{10}\times\frac{3}{10})$ or $(\frac{2}{10}\times\frac{2}{10})$ M1 for $(\frac{5}{10}\times\frac{5}{10})+(\frac{3}{10}\times\frac{3}{10})+(\frac{2}{10}\times\frac{2}{10})$ A0 for $\frac{38}{100}$ **Special cases:** [SC: B2 for $\frac{38}{100}$ or $\frac{28}{100}$ or $\frac{38}{90}$ o.e. if M0 is scored] OR [SC: B1 for $\frac{4}{10}$ and $\frac{2}{10}$ and $\frac{1}{10}$ o.e. or $\frac{5}{9}$ and $\frac{3}{9}$ and $\frac{2}{9}$ seen as second probability if M0 is scored]

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