EDEXCEL GCSE METHODS IN MATHEMATICS

MATHS



EXAM QUESTION PACK

UNIT 2 HIGHER TIER 5MM2H PAPERS

STEMUP

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Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Tuesday 20 June 2017 – Afternoon
Time: 1 hour 45 minutes

Paper Reference
5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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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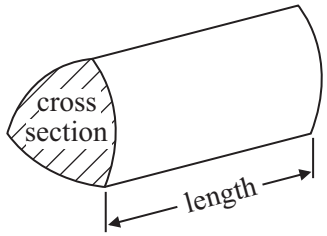
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GCSE Mathematics 2MM01

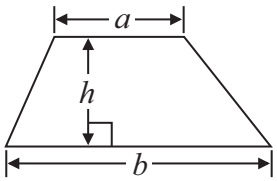
Formulae: Higher Tier

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

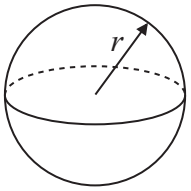


Area of trapezium = $\frac{1}{2}(a + b)h$



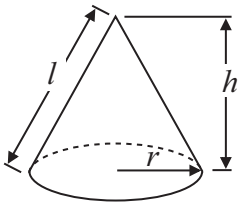
Volume of sphere = $\frac{4}{3}\pi r^3$

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

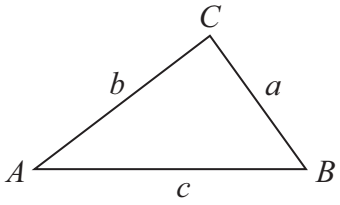


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

1 (a) Divide 468 in the ratio 4 : 5

.....

(2)

(b) Some money is shared in the ratio 7 : 13

What percentage of this money is the greater share?

..... %

(3)

(Total for Question 1 is 5 marks)

2 8 cakes of the same type have a total cost of £13.20

Work out the cost of 12 of these cakes.

£.....

(Total for Question 2 is 2 marks)

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***3**

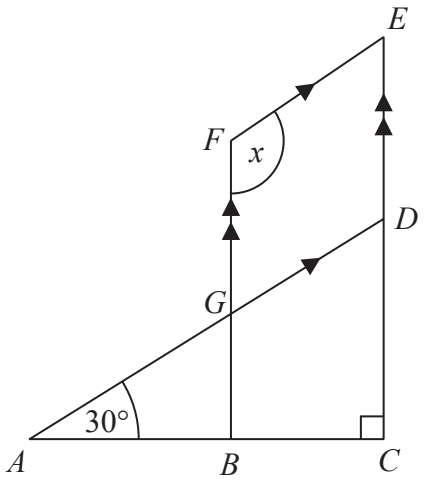


Diagram **NOT** accurately drawn

ABC is a straight line.
BGF is parallel to *CDE*.
AGD is parallel to *FE*.

Angle *CAD* = 30°
Angle *ACD* = 90°

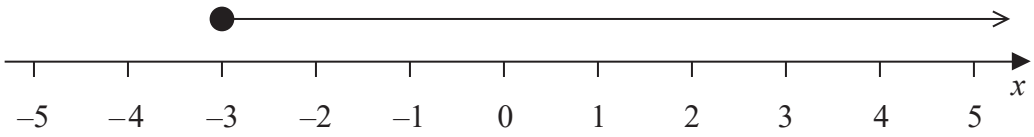
Work out the size of the angle marked *x*.
Give reasons for your answer.

(Total for Question 3 is 4 marks)

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4 Here is a number line.

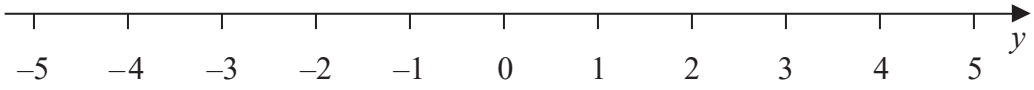


(a) Write down the inequality shown on the number line.

.....

(1)

Here is a number line.



(b) On this number line, show the inequality $-2 < y \leqslant 4$

(2)

n is an integer and $-1 \leqslant n < 5$

(c) Write down all the possible values of n.

.....

(2)

(Total for Question 4 is 5 marks)

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5 Here is a cylinder.

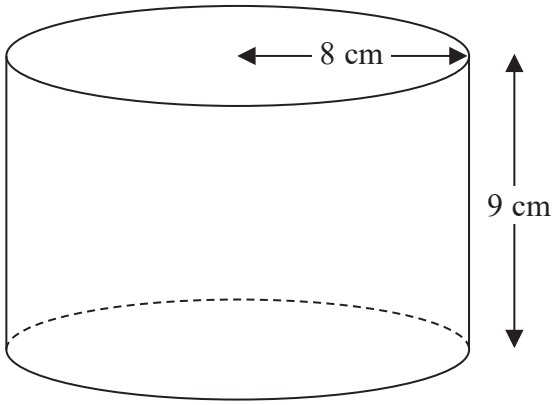


Diagram **NOT** accurately drawn

The cylinder has radius 8 cm.
It has a height of 9 cm.

Work out the volume of the cylinder.
Give your answer correct to 3 significant figures.

.....

(Total for Question 5 is 3 marks)

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6 David has x counters.

Lisa has 5 more counters than David.
Samia has 4 times as many counters as David.

The total number of counters is T.

(a) Write a formula for T in terms of x.
Give your answer in its simplest form.

.....

(3)

(b) Make w the subject of $5(w + x) = 3x + 9$

.....

(3)

(Total for Question 6 is 6 marks)

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7 The width of a rectangle is a whole number of centimetres.
The length of the rectangle is 7 cm longer than the width.

The perimeter of the rectangle is less than 152 cm.

Find the greatest possible width of the rectangle.

..... cm

(Total for Question 7 is 4 marks)

8 Here is a hexagon.

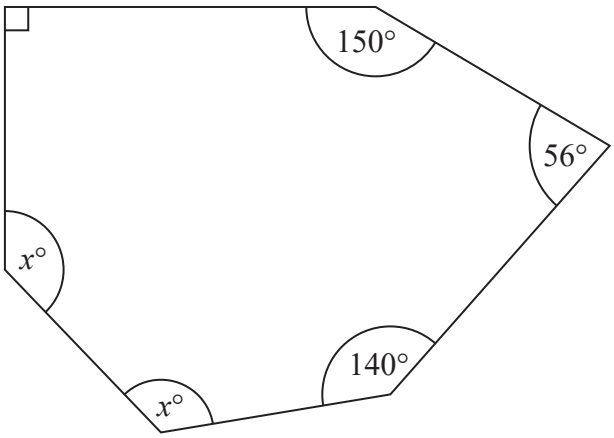


Diagram **NOT** accurately drawn

Work out the value of x.

.....

(Total for Question 8 is 4 marks)

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***9** Here is a shape.

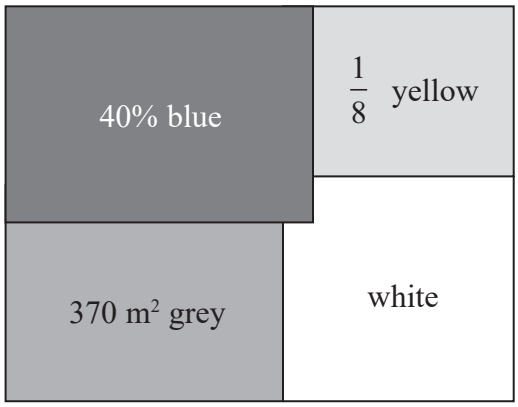


Diagram **NOT** accurately drawn

The total area of the shape is 1480 m^2.

40% of the shape is blue.

$\frac{1}{8}$ of the shape is yellow.

370 m^2 of the shape is grey.

The rest of the shape is white.

Does the white part of the shape have an area greater than 330 m^2?
You must show all your working.

(Total for Question 9 is 5 marks)

10

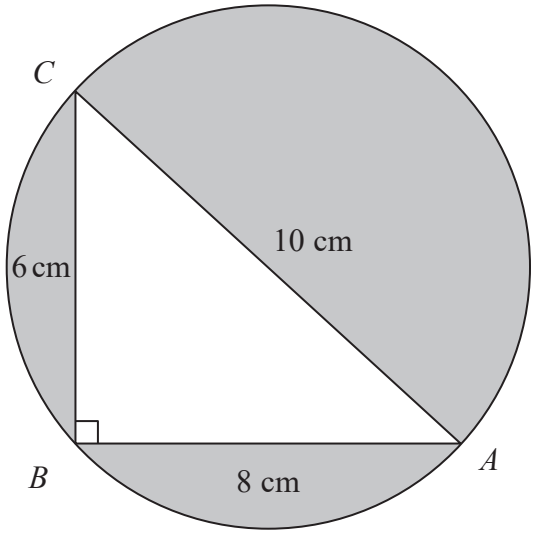


Diagram **NOT** accurately drawn

A, *B* and *C* are points on a circle with *AC* as a diameter.
ABC is a right-angled triangle.

Work out the total area of the regions shaded in the diagram.
Give your answer correct to 1 decimal place.

..... cm^2

(Total for Question 10 is 5 marks)

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11 (a) Use your calculator to work out $\dfrac{\sqrt{3.7 + 8.4}}{2.3^2}$

Write down all the figures on your calculator display.

.....

(2)

$\sqrt[3]{x} = 8$

(b) Find the value of x.

.....

(1)

(c) Calculate the value of $(\sin 45°)^2 + (\cos 135°)^2$

.....

(2)

(Total for Question 11 is 5 marks)

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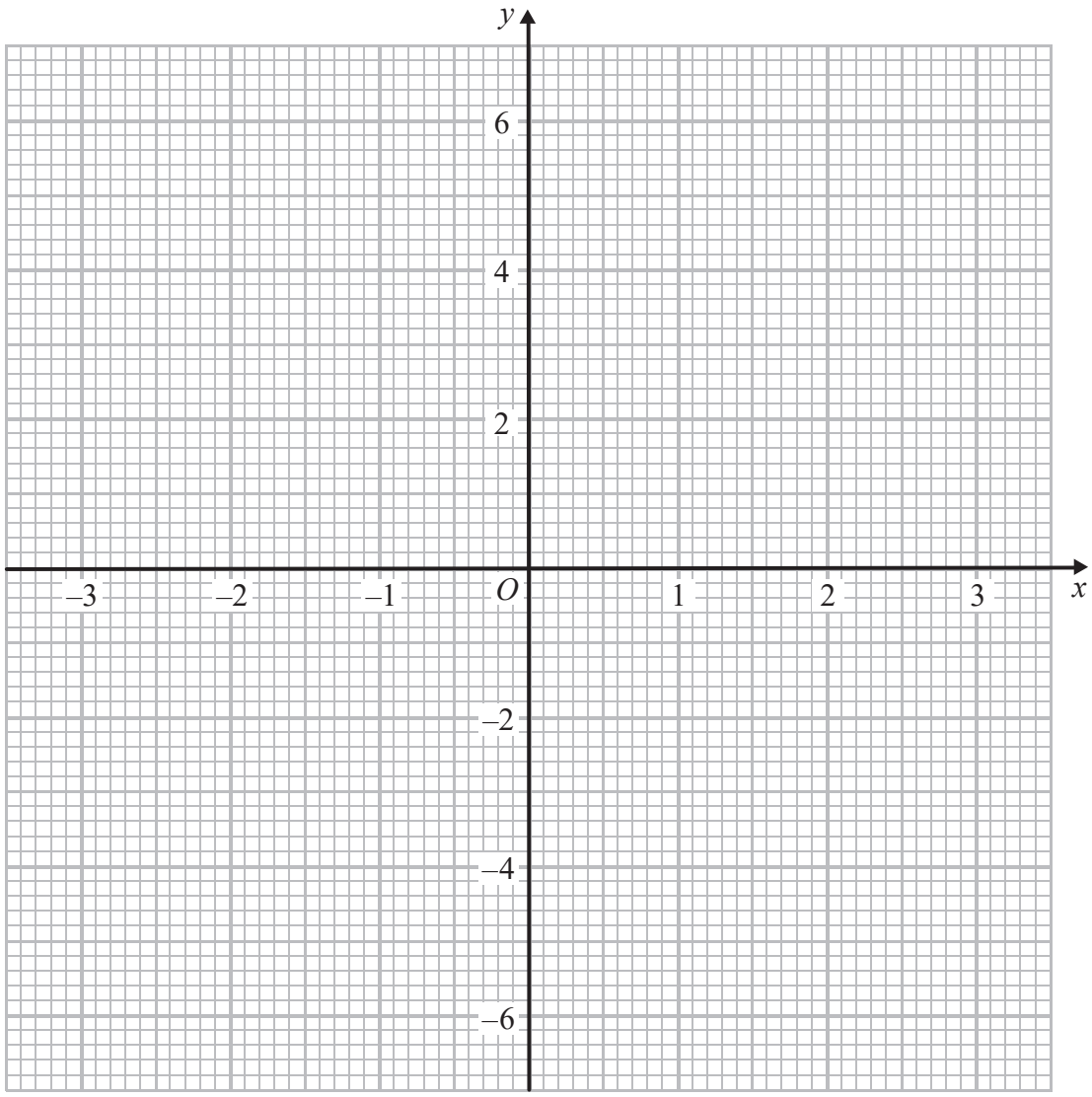
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12 (a) Complete the table of values for $y = x^2 - 5$

x	–3	–2	–1	0	1	2	3
y	4		–4			–1	

(2)

(b) On the grid, draw the graph of $y = x^2 - 5$ for values of x from –3 to 3



(2)

(c) Use the graph to find the values of x for which $x^2 - 5 = 0$

.....

(2)

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(d) Use the graph to find estimates of the values of x when $x^2 - 5 = x$

.....

(2)

(Total for Question 12 is 8 marks)

13 A number is increased by 35%.
The result is 324

Work out the number.

.....

(Total for Question 13 is 3 marks)

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14

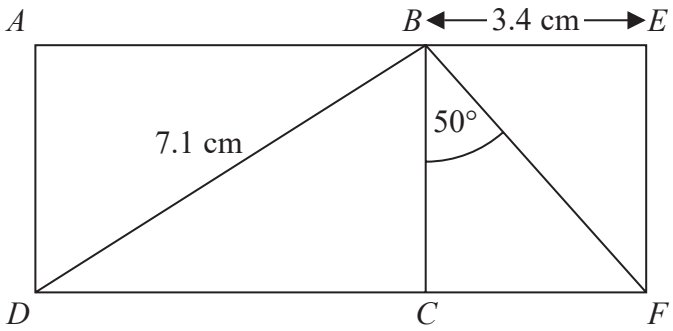


Diagram **NOT** accurately drawn

ABCD and *BEFC* are rectangles.

BD = 7.1 cm
BE = 3.4 cm
Angle *CBF* = 50°

Work out the size of angle *BDC*.
Give your answer correct to one decimal place.

.....°

(Total for Question 14 is 5 marks)

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15 Simon invested £20 000 at a compound interest rate of 2.5% per annum.
At the end of n years the investment has a value of £V.

(a) Work out the value of V when $n = 2$

$V =$ .....

(3)

(b) Write down a formula for V in terms of n.

.....

(2)

(c) Work out the least integer value of n so that the value of V is greater than 25 000

.....

(2)

(Total for Question 15 is 7 marks)

16 Work out the value of

$$\frac{(3.2 \times 10^5) + (1.8 \times 10^4)}{8.7 \times 10^3}$$

Give your answer correct to 3 significant figures.

.....

(Total for Question 16 is 2 marks)

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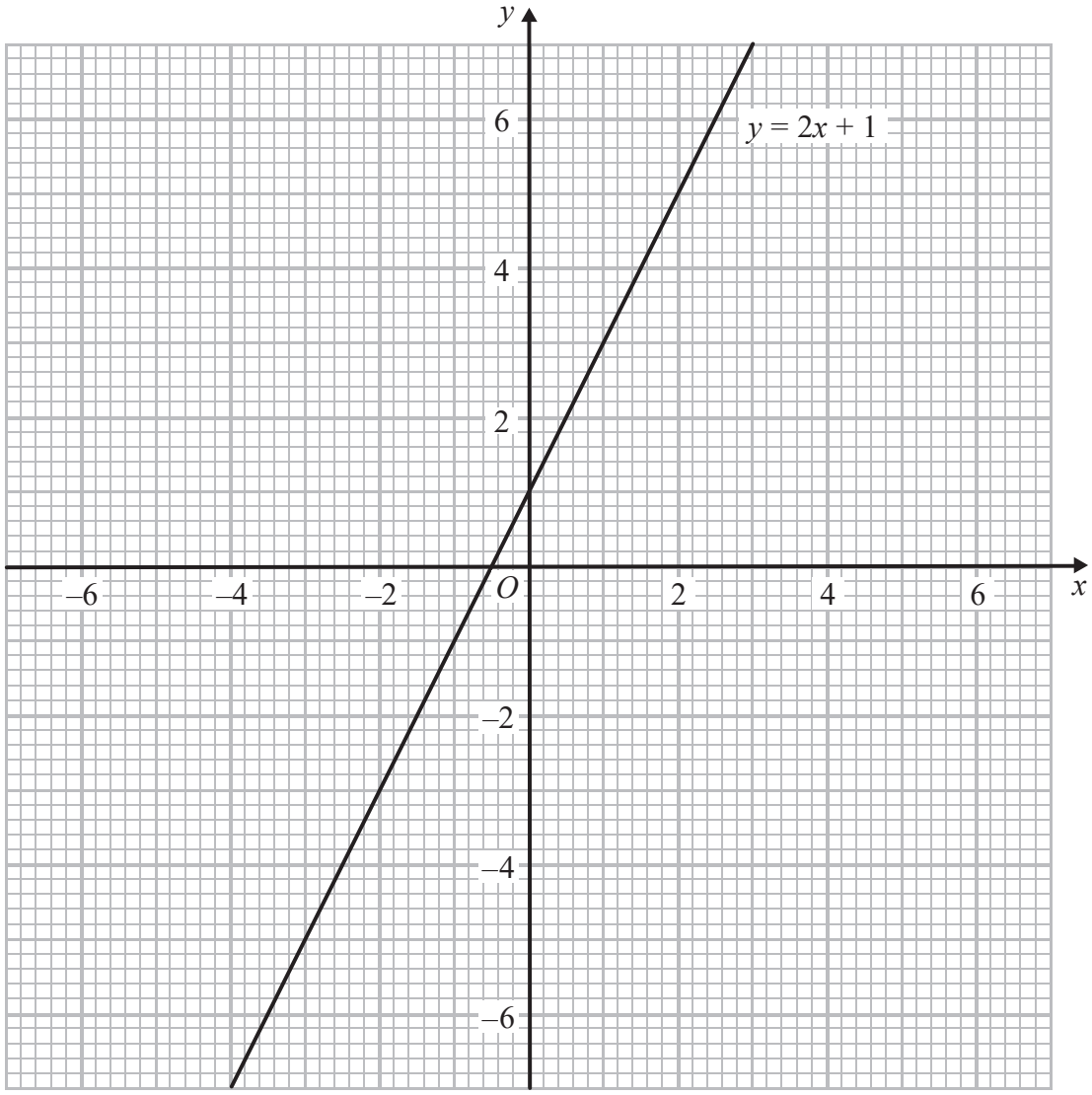
***17** Prove algebraically that $0.1\dot{6}\dot{3} = \frac{9}{55}$

You must show your working.

(Total for Question 17 is 3 marks)

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18 The diagram shows the graph of $y = 2x + 1$



(a) Find an equation of the straight line that is perpendicular to $y = 2x + 1$ and passes through the point $(-2, 5)$.

.....

(3)

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(b) Solve the simultaneous equations

$$y - 2x = 1$$
$$2y - 5x = 2$$

$x =$ .....

$y =$ .....

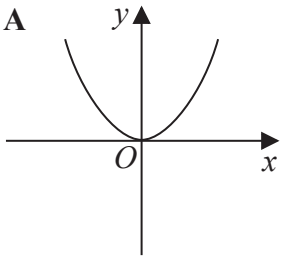
(3)

(Total for Question 18 is 6 marks)

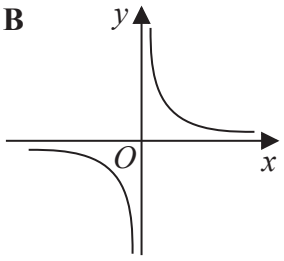
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19 Here are some graphs.

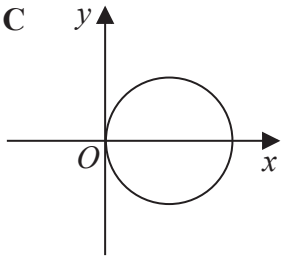
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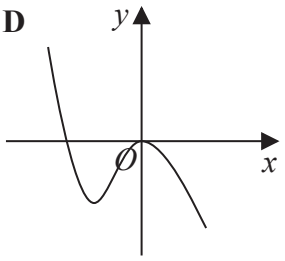
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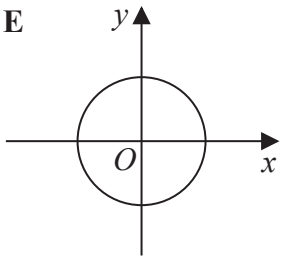
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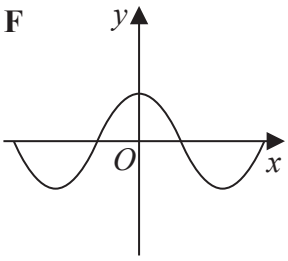
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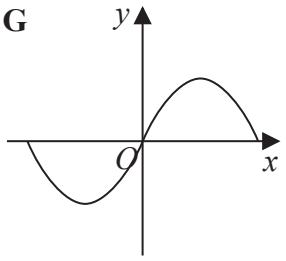
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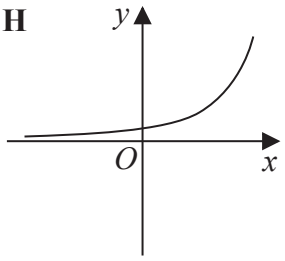
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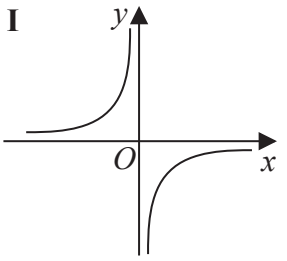
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H



I



(a) Write down the letter of the graph that could have the equation $y = \cos x°$

.....

(1)

(b) Write down the letter of the graph that could have the equation $y = -x^3 - x^2$

.....

(1)

(c) Write down the letter of the graph that could have the equation $y = 2^x$

.....

(1)

(Total for Question 19 is 3 marks)

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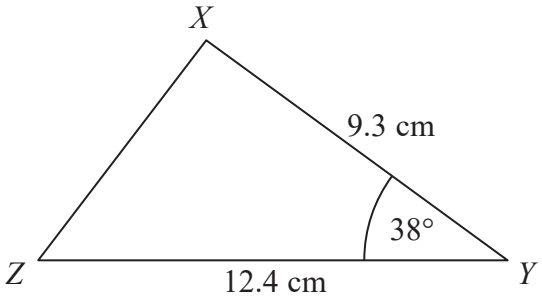


Diagram **NOT** accurately drawn

XYZ is a triangle.

XY = 9.3 cm
YZ = 12.4 cm
Angle *XYZ* = 38°

(a) Work out the area of triangle *XYZ*.
Give your answer correct to 3 significant figures.

..... cm^2

(2)

(b) Work out the length of *XZ*.
Give your answer correct to 3 significant figures.

.....cm

(3)

(Total for Question 20 is 5 marks)

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21 y is directly proportional to the square of x.

$y = 96$ when $x = 4$

(a) Find a formula for y in terms of x.

.....

(3)

(b) Work out the value of y when $x = 7$

.....

(1)

(c) Work out the values of x for which $y = 150$

.....

(2)

(Total for Question 21 is 6 marks)

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***22**

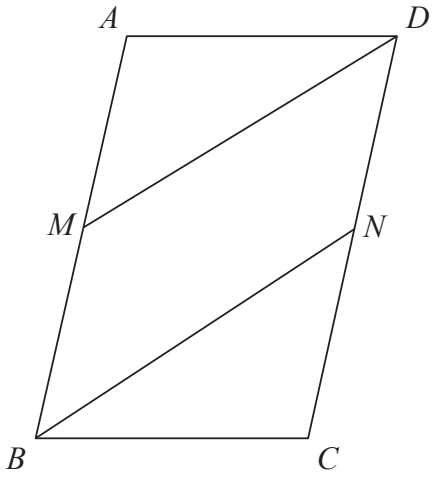


Diagram **NOT** accurately drawn

ABCD is a parallelogram.
M is the midpoint of *AB*.
N is the midpoint of *DC*.

(a) Prove that triangle *AMD* is congruent to triangle *CNB*.

(3)

(b) Hence, prove that *MD* = *NB*

(1)

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 100 MARKS

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Write your name here

Surname	Other names

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Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Wednesday 12 November 2014 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM2H/01

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

Total Marks

Instructions

- Use **black** ink or ball-point pen.
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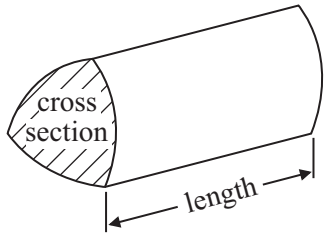
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GCSE Mathematics 2MM01

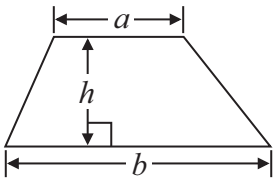
Formulae: Higher Tier

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Anything you write on this formulae page will gain NO credit.

Volume of prism = area of cross section × length

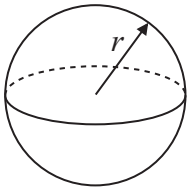


Area of trapezium = $\frac{1}{2}(a + b)h$



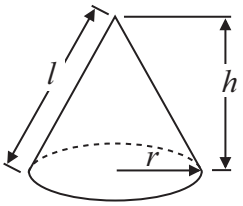
Volume of sphere = $\frac{4}{3}\pi r^3$

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

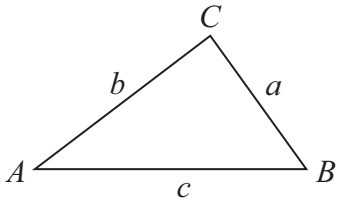


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

1 (a) Divide 1064 in the ratio 3 : 4

.....

(2)

(b) Some money is shared in the ratio 7 : 9
What percentage is the greater share?

.....%

(3)

(Total for Question 1 is 5 marks)

2 Decrease 280 by $17\frac{1}{2}\%$

.....

(Total for Question 2 is 3 marks)

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3 Here is a diagram showing a circle and a square.

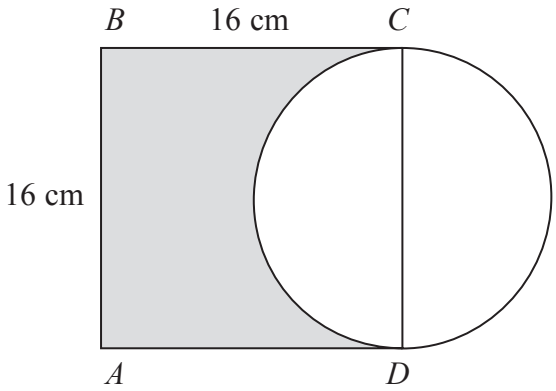


Diagram **NOT** accurately drawn

The square, *ABCD*, has sides of length 16 cm.
The circle has a radius of 8 cm.

(a) Calculate the perimeter of the shaded shape.
Give your answer correct to 1 decimal place.

..... cm

(3)

(b) Calculate the percentage of the area of the square that is shaded.
Give your answer correct to 1 decimal place.

..... %

(4)

(Total for Question 3 is 7 marks)

4 $-9 < 4n \leqslant 12$

n is an integer.

(a) Write down all the possible values of n.

.....

(3)

(b) Tamsin thinks of a whole number.

She multiplies her number by 4 and then adds 3
Her answer is greater than 24

Find the smallest whole number that Tamsin could have thought of.

.....

(3)

(Total for Question 4 is 6 marks)

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***5** The diagram shows a solid shape made from a square-based pyramid and a cuboid.

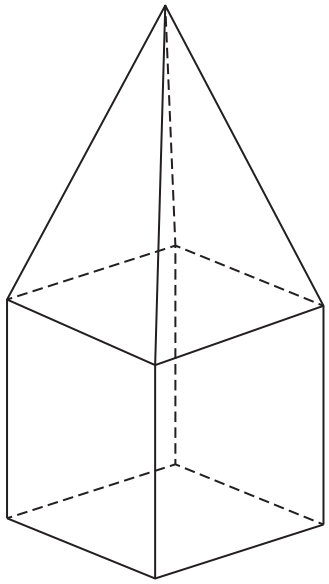


Diagram **NOT** accurately drawn

The shape has

1 face in the shape of a square,
4 faces in the shape of a triangle,
4 faces in the shape of a rectangle.

The area of each rectangle is 12% of the total surface area of the shape.
The total surface area of the shape is 600 cm^2
The area of each triangle is 62 cm^2

Which has the greater area, the square face or a rectangular face?
You must show all your working.

(Total for Question 5 is 6 marks)

6 The diagram shows a solid prism.

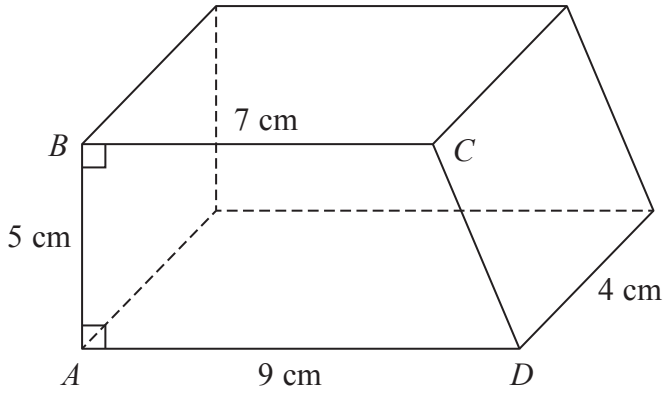


Diagram **NOT** accurately drawn

The cross section of the prism is a trapezium.
$AB = 5$ cm
$BC = 7$ cm
$AD = 9$ cm
The prism has a length of 4 cm.

(a) Calculate the volume of the prism.

..... cm^3

(3)

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Here is the face *ABCD* of the prism.
This face is a trapezium.

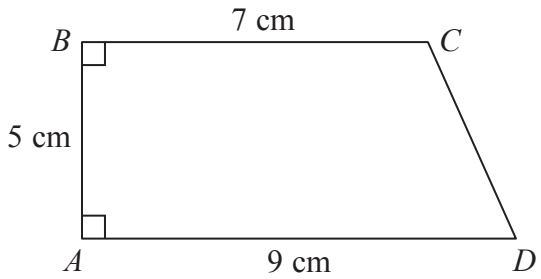


Diagram **NOT** accurately drawn

(b) Calculate the length of *CD*.
Give your answer correct to 3 significant figures.

..... cm

(4)

(Total for Question 6 is 7 marks)

7 Here is a rectangle.

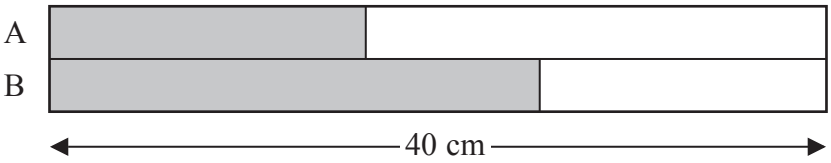


Diagram **NOT** accurately drawn

The rectangle has been divided into two strips, A and B.
The strips have the same width.

$\frac{2}{5}$ of strip A is shaded.

$\frac{5}{8}$ of strip B is shaded.

The length of the rectangle is 40 cm.

What fraction of the rectangle is **not** shaded?

.....

(Total for Question 7 is 4 marks)

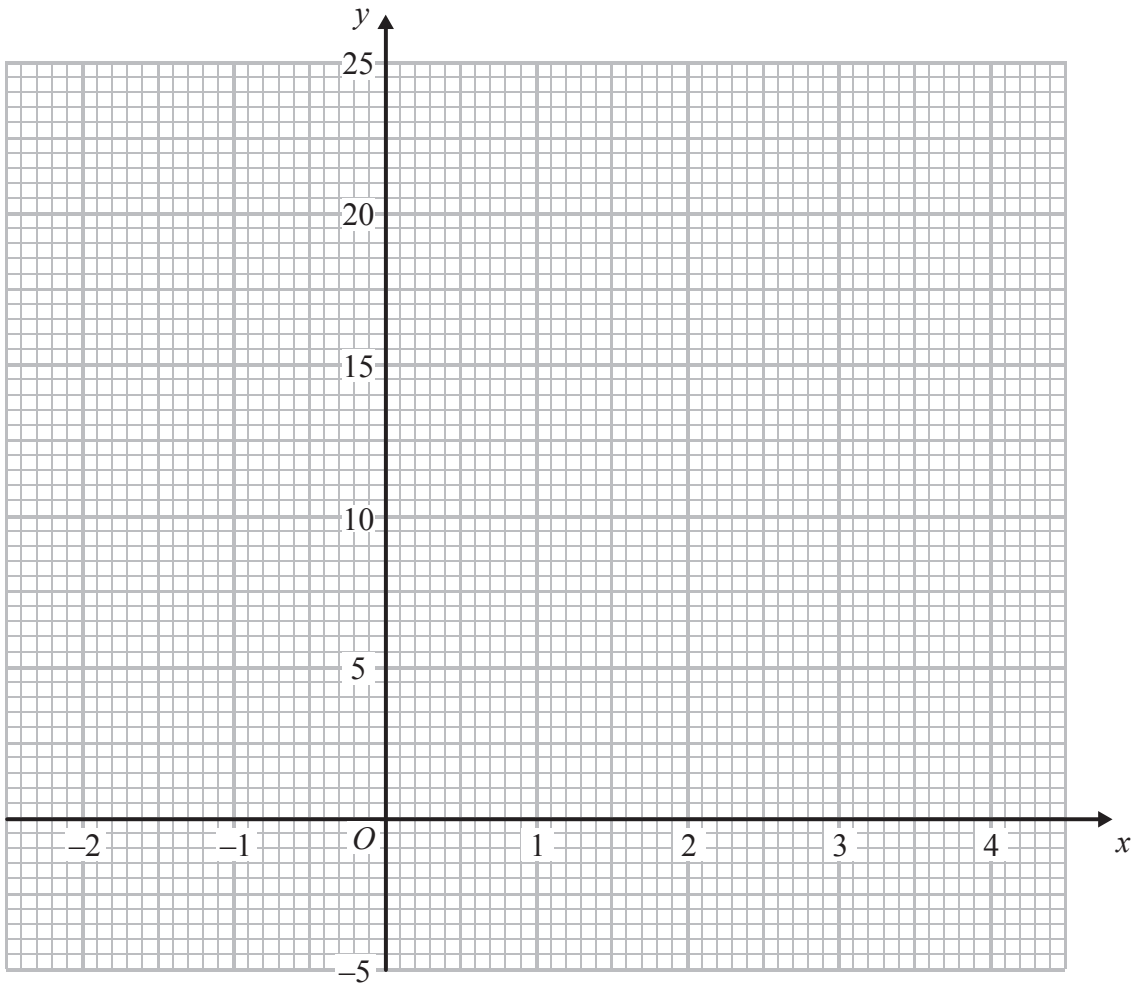
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8 (a) Complete the table for $y = 2x^2 - 5x$

x	–2	–1	0	1	2	3	4
y		7				3	

(2)

(b) On the grid, draw the graph of $y = 2x^2 - 5x$



(2)

(c) Use the graph to find estimates of the solutions of the equation $2x^2 - 5x = 5$

.....

(2)

(Total for Question 8 is 6 marks)

***9**

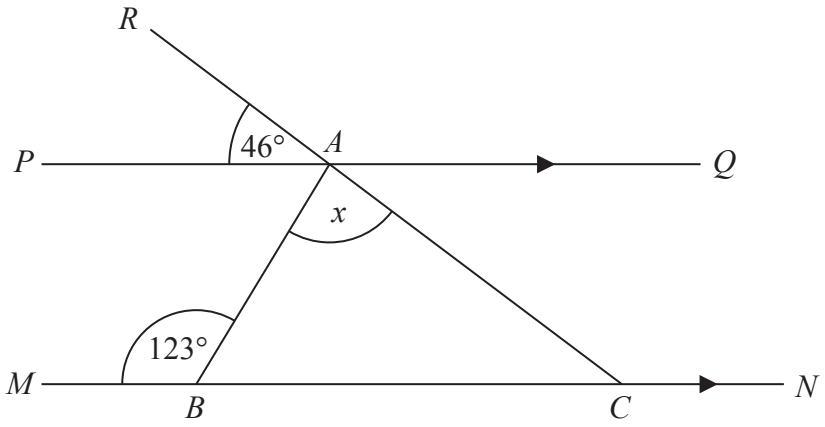


Diagram **NOT** accurately drawn

ABC is a triangle.
PAQ, *RAC*, and *MBCN* are straight lines.
Angle *ABM* = 123°
Angle *RAP* = 46°

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

(Total for Question 9 is 4 marks)

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10 (a) Use your calculator to work out $\dfrac{\sqrt{(5.9 + 4.6)}}{3.7^2}$

Write down all the figures on your calculator display.

.....

(2)

$\sqrt[3]{x} = 6$

(b) Find the value of x.

.....

(1)

$y^4 = 256$

(c) Find a value of y.

.....

(1)

(Total for Question 10 is 4 marks)

11 (a) ABC is a right-angled triangle.

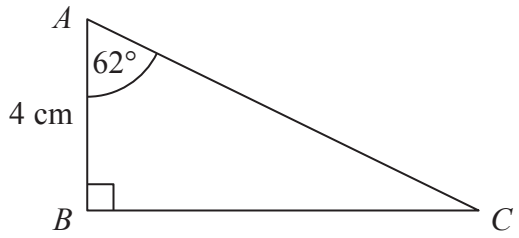


Diagram **NOT** accurately drawn

$AB = 4$ cm
Angle $CAB = 62°$

Work out the length of BC.
Give your answer correct to 3 significant figures.

..... cm

(3)

(b) PQR is a right-angled triangle.

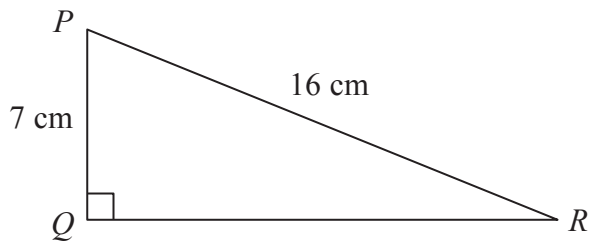


Diagram **NOT** accurately drawn

$PQ = 7$ cm
$PR = 16$ cm

Work out the size of the angle PRQ.
Give your answer correct to 3 significant figures.

.....°

(3)

(Total for Question 11 is 6 marks)

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12 The diagram shows a quarter of a cylinder.

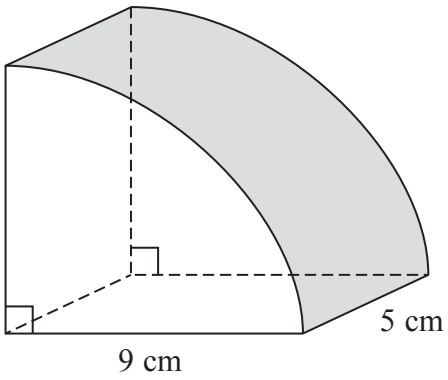


Diagram **NOT** accurately drawn

The cylinder has a radius of 9 cm and a length of 5 cm.

Work out the area of the curved surface, shown shaded in the diagram.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 12 is 3 marks)

13 Find an equation of a line parallel to the line $y = 3x + 4$ that passes through the point (2, 5).

.....

(Total for Question 13 is 3 marks)

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14 (a) Make x the subject of $3(x + 2) = y + x$

.....

(3)

(b) Solve $x^2 - 3x - 27 = 0$

Give your solutions correct to 2 decimal places.

.....

(3)

(Total for Question 14 is 6 marks)

15 The diagram shows three sides of a regular polygon.

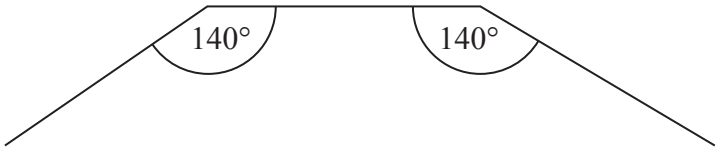


Diagram **NOT** accurately drawn

Each interior angle of the regular polygon is 140°

Work out the number of sides of the regular polygon.
You must show all your working.

.....

(Total for Question 15 is 3 marks)

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16 Work out the value of

$$\frac{(2.4 \times 10^8) + (1.5 \times 10^6)}{2 \times (1.5 \times 10^6)}$$

.....

(Total for Question 16 is 2 marks)

17 A number is increased by 12%.
The result is decreased by 9% to give the final answer.

Calculate the percentage change between the original number and the final answer.

.....

(Total for Question 17 is 3 marks)

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18 *LMN* and *PQR* are two mathematically similar triangles.

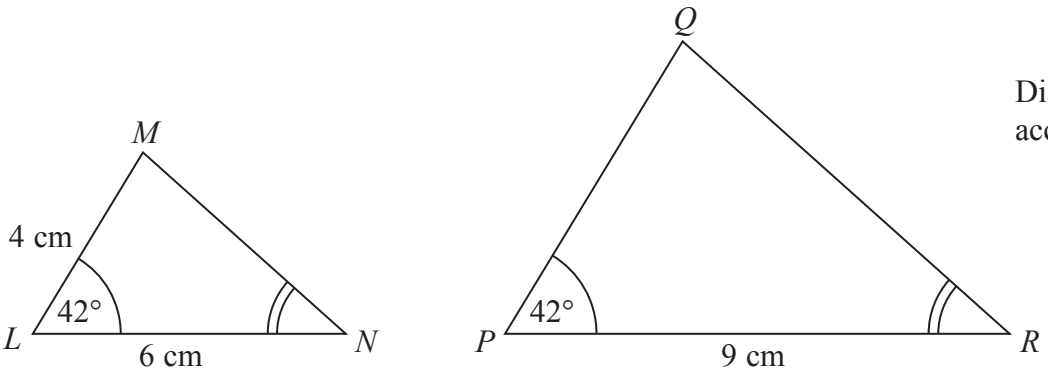


Diagram **NOT** accurately drawn

Work out the length of *QR*.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 18 is 5 marks)

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19 S is inversely proportional to the cube of t.

When $t = 4$, $S = \frac{1}{2}$

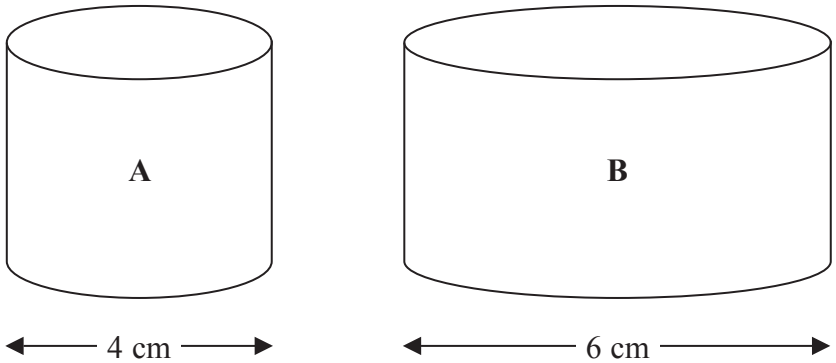
Find the value of S when $t = 8$

.....

(Total for Question 19 is 4 marks)

20 Here are two cylinders.

Diagram **NOT** accurately drawn



The height of cylinder **A** is the same as the height of cylinder **B**.

The diameter of cylinder **A** is 4 cm.
The diameter of cylinder **B** is 6 cm.

Work out the ratio of the volume of cylinder **A** to the volume of cylinder **B**.

.....

(Total for Question 20 is 2 marks)

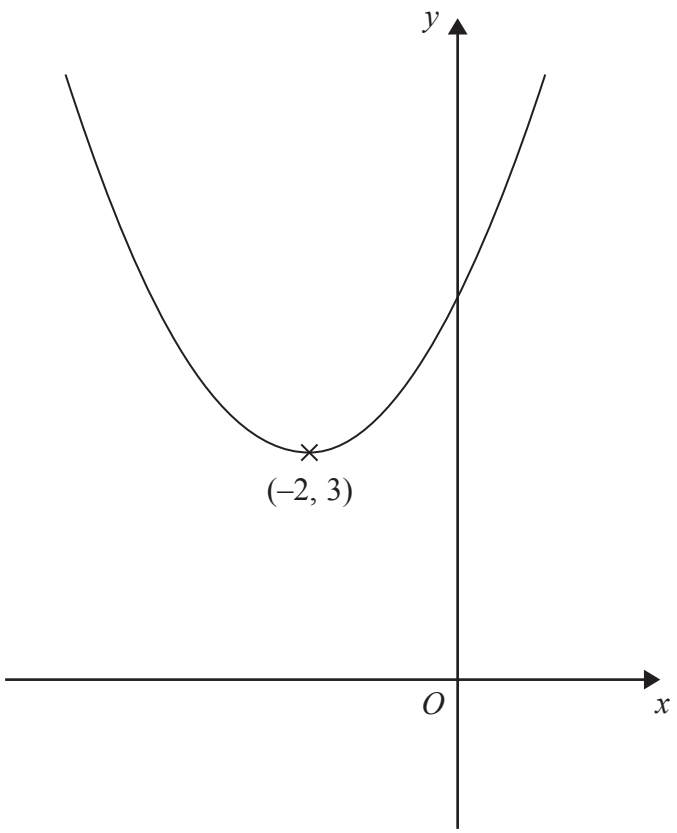
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***21** $x = 0.0\dot{3}\dot{6}$

Prove algebraically that x can be written as $\frac{4}{110}$

(Total for Question 21 is 3 marks)

22 The diagram shows part of the curve with equation $y = f(x)$
The coordinates of the minimum point of the curve are $(-2, 3)$



Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x) + 2$

(..... , ...)

(ii) $y = f(x - 6)$

(..... , ...)

(Total for Question 22 is 2 marks)

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23 Solve the simultaneous equations

$$x^2 + y^2 = 2$$
$$2x + 1 = y$$

$x =$ ..... and $y =$ .....

or $x =$ ..... and $y =$ .....

(Total for Question 23 is 6 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: (Calculator) Unit 2

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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: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	152 × 3 = 456 152 × 4 = 608	456 , 608	2	M1 for 1064 ÷ (3 + 4) (= 152) A1 cao
	(b)		56.25	3	M1 for $\frac{9}{7+9}$ or $\frac{7}{7+9}$ oe M1 for a complete method to find percentage, eg. $\frac{9 \text{ (or } 7)}{7+9} \times 100$ A1 cao; ignore any rounding or truncating if 56.25 seen
2			231	3	M1 for a correct method to find 17.5% of 280; eg. $\frac{17.5}{100} \times 280$ (= 49) M1 (dep) for 280 – "49" A1 cao **OR** M1 for 100 – 17.5 (= 82.5) M1 (dep) for a correct method to find 82.5% of 280; eg. 280 × 0.825 A1 cao

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		73.1	3	M1 for a method to find circumference of the circle; eg. $\pi \times 16$ or 50.26... M1 for a fully complete method, eg. $\pi \times 16 \div 2 + 3 \times 16$ A1 for answer in range 73.1 to 73.2
	(b)		60.7	4	M1 for 16×16 (= 256) M1 for a correct method to find the area of the circle; eg. $\pi \times 8 \times 8$ (= 64π or 201.06....) M1(dep on M1) for a fully complete method to find the required percentage; eg. ("256" – "$64\pi \div 2$") ÷ "256" × 100 A1 for answer in range 60.7 to 60.8

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)		–2, –1, 0, 1, 2, 3	3	M1 for $-\frac{9}{4} < n$ or $n \leq \frac{12}{4}$ or –9 ÷ 4, -8 ÷ 4, ... , 12 ÷ 4 (dividing at least three numbers between -9 and 12 by 4) or –2.25, –2, ... , 3 seen (at least three values seen) A2 for all six integers given (A1 for a list containing at least 4 correct integers, condone no more than 1 incorrect integer)
	(b)		6	3	M1 for $4x + 3 > 24$ (accept an equation) M1 for clear intention to subtract 3 from each side of an inequality (or equation) or a clear intention to divide all terms by 4 as a first step or 5.25 oe A1 cao **OR** M1 for subtracting 3 from 24 or for dividing 24 by 4 and then subtracting 3 M1 for (24 – 3) ÷ 4 (= 5.25) A1 cao **OR** M1 for 5 × 4 + 3 = 23 or 6 × 4 + 3 = 27 M1 for a trial using a value of x between 5 and 6 A1 cao

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*5			Rectangular face is greater with supporting working	6	M1 for a correct method to find 12% of 600; eg. 0.12 × 600 (= 72), the area of each rectangle M1 (dep) for the total area of the 4 rectangles, eg. 4 × "72" (= 288) M1 (indep) for the total area of the 4 triangles, eg. 4 × 62 (= 248) M1 for 600 – 4 × "72" – "4 × 62 " A1 for 64 C1 ft (dep M3) for a clear statement that the area of the rectangle is greater **OR** M1 for 62 ÷ 600 × 100 (= $10\frac{1}{3}$ (%)) M1 (dep) for 4 × "10⅓" (= $41\frac{1}{3}$ (%)) M1 (indep) for 4 × 12 or 48(%) M1 for 100 – "4 × 12 " – 4 × "10⅓" A1 for $10\frac{2}{3}$ (%) C1 ft (dep M3) for a clear statement that the area of the rectangle is greater

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		160	3	M1 for a correct method to find the area of the cross section; eg. $\frac{5}{2}(7 + 9)$ (= 40) or for a correct method to find the volume of an appropriate prism, eg. 5 × 7 × 4 (= 140) or 5 × 9 × 4 (=180) M1 (dep) for a correct method to find the required volume; eg. "40" × 4 or "140" + 0.5 × 2 × 5 × 4 or “180” – 0.5 × 2 × 5 × 4 A1 cao
	(b)		5.39	4	M1 for 9 – 7 (= 2) M1 for $5^2 + "2"^2$ M1 for $\sqrt{5^2 + "2"^2}$ $(= \sqrt{"29"})$ A1 in the range 5.3 - 5.4

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7			$\frac{39}{80}$	4	M1 for a correct method to find $\frac{2}{5}$ of 40; eg. $40 \div 5 \times 2$ (= 16) **or** for a correct method to find $\frac{5}{8}$ of 40; eg. $40 \div 8 \times 5$ (= 25) M1 for a correct method to find $\frac{2}{5}$ of 40 **and** $\frac{5}{8}$ of 40 M1 (dep on M1) for 80 – "16" – "25" (= 39) or $\frac{\text{"16" + "25"}}{80}$ $(= \frac{41}{80})$ A1 $\frac{39}{80}$ oe **OR** M1 for $1 - \frac{2}{5}$ $(= \frac{3}{5})$ **and** $1 - \frac{5}{8}$ $(= \frac{3}{8})$ M1 for a correct method to find $\frac{3}{5}$ of 40; eg. $40 \div 5 \times 3$ (= 24) **or** for a correct method to find $\frac{3}{8}$ of 40; eg. $40 \div 8 \times 3$ (= 15) M1 (dep on M1) for "24" + "15" (= 39) A1 $\frac{39}{80}$ oe

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	(a)	<table><tr><td>x</td><td>–2</td><td>–1</td><td>0</td></tr><tr><td>y</td><td>18</td><td>7</td><td>0</td></tr></table> <table><tr><td>x</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y</td><td>–3</td><td>–2</td><td>3</td><td>12</td></tr></table>	18, 0, –3, –2, 12	2	B2 all correct (B1 any three correct)
	(b)		Correct graph	2	M1 for 5 or more "points" plotted correctly, provided at least B1 scored in (a) A1 cao for the correct graph
	(c)		3.2 to 3.3 and –0.8 to –0.7	2	M1 for $y = 5$ drawn or an answer in the range 3.2 to 3.3 or in the range –0.8 to –0.7 or ft their graph (accept answers written as coordinates). A1 for answers in the ranges 3.2 to 3.3 and –0.8 to –0.7 or ft their graph (do not accept answers written as coordinates).

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*9			77° and reasons	4	M1 for a correct method to find an angle which could then be used to find x; eg. 180 – 123 (= 57) or angle ACB = 46 M1 for a complete method which could lead to the answer C2 (dep on M2) for x = 77 cao and all correct reasons given for their choice of method. (C1 (dep on M1) for one correct reason linked to their M1) Reasons include: exterior angle of a triangle is equal to the sum of the interior opposite angles corresponding angles on parallel lines are equal alternate angles on parallel lines are equal angles in a triangle add up to 180 angles on a straight line add up to 180 allied angles add up to 180 vertically opposite angles are equal
10	(a)		0.236696(15....)	2	M1 for 13.69 seen or 3.24... seen A1 for 0.2366(9615..)
	(b)		216	1	B1 cao
	(c)		4 or –4 or ±4	1	B1 for 4 or –4 or ±4

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		7.52	3	M1 for tan 62 = $\frac{\text{opp}}{4}$ M1 for 4 × tan 62 A1 for answer in the range 7.52 to 7.53
	(b)		25.9	3	M1 for sin (x) = $\frac{7}{16}$ (= 0.4375) M1 for $\sin^{-1}(\frac{7}{16})$ A1 for answer in the range 25.9 to 26.0 [SC: B1 for answer in the range 64.0 to 64.1]
12			70.7	3	M1 for 2 × π × 9 (= 56.5486...) M1 for a complete and correct method, A1 answer in the range 70.5 to 71.0
13			$y = 3x - 1$	3	B1 for gradient of 3 M1 for substitution into $y = mx + c$; eg. 5 = 3×2 + c oe or $\frac{y-5}{x-2} = 3$ oe A1 for $y = 3x - 1$ oe [SC: B1 for $y = 3x$ + any constant]

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		$x = \frac{y-6}{2}$	3	M1 for $3x + 6 = y + x$ or $x + 2 = \frac{y+x}{3}$ M1 for correctly isolating terms in x and other terms on opposite sides in an equation; eg. $3x - x = y - 6$ or $x - \frac{x}{3} = \frac{y}{3} - 2$ A1 for $x = \frac{y-6}{2}$ oe
	(b)		6.91, –3.91	3	M1 for $\frac{-(-3) \pm \sqrt{(-3)^2 - 4\times1\times(-27)}}{2\times1}$, condone one sign error in substitution M1 for $x = \frac{3 \pm \sqrt{117}}{2}$ A1 6.90 to 6.91 and –3.90 to –3.91
15			9	3	M1 for 180 – 140 (= 40) [Note: the 40 may be shown on the diagram] M1 for 360 ÷ "40" A1 cao OR M1 for $\frac{n-2}{n} \times 180 = 140$ M1 for 360 ÷ "40" A1 cao

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16			80.5 or 8.05×10^{1}	2	M1 for 2.415×10^{8} (or 241500000) or 3×10^{6} (or 3000000) A1 for 80.5 or 8.05×10^{1}
17			1.92% (increase)	3	M1 for 1.12 or any correct method to increase a number by 12% or 0.91 or any correct method to decrease a number by 9% M1 for a fully correct method to increase by 12% and then decrease by 9%; eg. 1.12×0.91 (= 1.0192) or 0.0192 seen A1 for 1.92% (increase)
18			6.06	5	B1for sf = $9 \div 6$ (= 1.5) oe or $6 \div 9$ (= 0.66..) oe or $QP = 6$ M1 for a correct statement of the cosine rule with correct two sides and angle substituted; eg. $4^2 + 6^2 - 2 \times 4 \times 6 \times \cos 42$ M1 ft for a fully correct rearrangement of the cosine rule to give a correct value for MN^2 or QR^2; eg. 52 – 35.6709.. (= 16.3290...) M1 for a correct use of their scale factor; eg. 4.04092.. × 1.5 or 4×1.5 (= 6) A1 for answer in the range 6.06 to 6.07

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19			$\frac{1}{16}$	4	M1 for $S \propto \frac{1}{t^3}$ or $S = \frac{k}{t^3}$ M1 for $\frac{1}{2} = \frac{k}{4^3}$ oe or $S = \frac{32}{t^3}$ M1 $S = \frac{32}{8^3}$ oe A1 for $\frac{1}{16}$ oe
20			4 : 9	2	M1 for $\pi \times 2^2 \times h$ $(= 4\pi h)$ and $\pi \times 3^2 \times h$ $(= 9\pi h)$ A1 for 4 : 9 oe or M1 for $\left(\frac{6}{4}\right)^2$ oe A1 for 4 : 9 oe [SC: B1 for 9 : 4 oe if M0 scored]

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*21			$\frac{1}{16}$	4	M1 for $S \propto \frac{1}{t^3}$ or $S = \frac{k}{t^3}$ M1 for $\frac{1}{2} = \frac{k}{4^3}$ oe or $S = \frac{32}{t^3}$ M1 $S = \frac{32}{8^3}$ oe A1 for $\frac{1}{16}$ oe
22	(i) (ii)		(-2, 5) (4, 3)	2	B1 cao B1 cao
23		$x^2 + (2x + 1)^2 = 2$ $x^2 + 4x^2 + 4x + 1 = 2$ $5x^2 + 4x - 1 = 0$ $(5x - 1)(x + 1)$	$x = 0.2, y = 1.4$ and $x = -1, y = -1$	6	M1 for $x^2 + (2x + 1)^2 = 2$ or $(y^2) = (2x + 1)^2$ M1 for $x^2 + 4x^2 + 4x + 1 = 2$ A1 for $5x^2 + 4x - 1 = 0$ M1 (dep M1) for factorising their quadratic, eg.$(5x - 1)(x + 1)$ or for correct substitution into the quadratic formula A1 for $x = 0.2$ and $x = -1$ A1 for $x = 0.2$, $y = 1.4$ and $x = -1$, $y = -1$

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: 5MM2H_01			
Question		**Modification**	**Notes**
Q05		Model provided for all candidates. Diagram also provided for MLP.	
Q06		Model provided for all candidates. Diagram also provided for MLP. Wording added: Angle ABC = angle BAD = 90°	
Q08		y axis: 1 square for 1. x axis: 1 square for 0.5	
Q12		Model provided for all candidates. Diagram also provided for MLP.	
Q14	(a)	MLP x changed to e y changed to f	

PAPER: 5MM2H_01			
Question		**Modification**	**Notes**
Q18		Wording added: In triangle LMN, LM = 4 cm LN = 6 cm Angle MLN = 42° In triangle PQR, PR = 9 cm Angle QPR = 42° Angle MNL = angle QRP	
Q20		Model provided for all candidates. Diagram also provided for MLP.	

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Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Thursday 19 June 2014 – Morning

Time: 1 hour 45 minutes

Paper Reference

5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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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5/5/6/6/C2/

P 4 3 4 0 4 A 0 1 2 4

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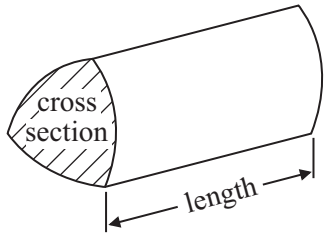
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GCSE Mathematics 2MM01

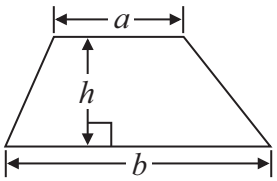
Formulae: Higher Tier

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

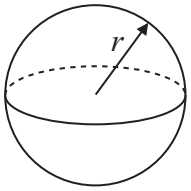


Area of trapezium = $\frac{1}{2}(a + b)h$



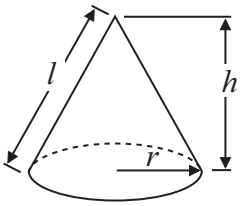
Volume of sphere = $\frac{4}{3}\pi r^3$

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

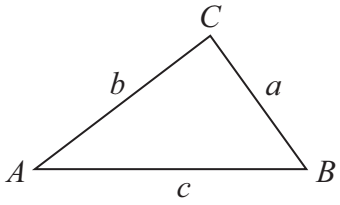


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

1 The total weight of 55 identical items is 2.75 kg.

Work out the total weight of 22 of these identical items.

..... kg

(Total for Question 1 is 2 marks)

2 (a) Increase 614 by 18%.

.....

(2)

(b) Write 36 as a percentage of 48

..... %

(2)

(Total for Question 2 is 4 marks)

3 (a) Use your calculator to work out $\sqrt{5 + 1.7^3}$

Write down all the figures on your calculator display.

.....

(1)

(b) Use your calculator to work out $\dfrac{16.7 \times 4.5}{7.83^2 + 2.9}$

Write down all the figures on your calculator display.

.....

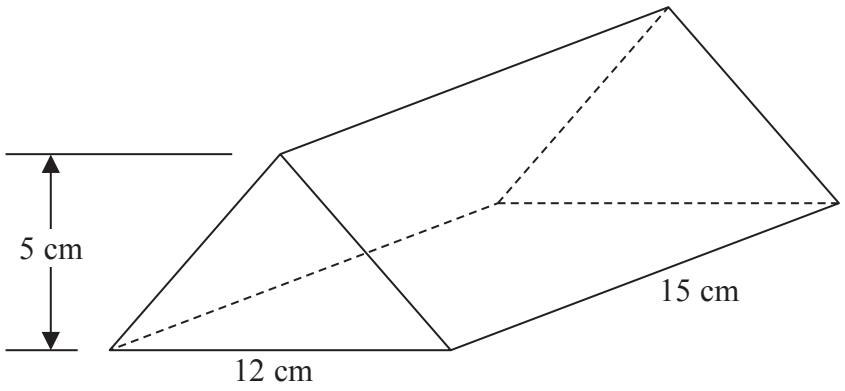
(2)

(Total for Question 3 is 3 marks)

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4 Here is a solid triangular prism.

Diagram **NOT** accurately drawn



Work out the volume of this prism.

.....

(Total for Question 4 is 3 marks)

5 Peter has x counters.

Lia has 7 more counters than Peter.
Soraya has 3 times as many counters as Peter.

The total number of counters is T.

Write a formula for T in terms of x.

.....

(Total for Question 5 is 3 marks)

***6** Which of these has the largest value?

the reciprocal of 2.9
or the square root of 0.12
or the cube of 0.7

Show how you got your answer.

(Total for Question 6 is 3 marks)

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7 Here is a 6-sided polygon.

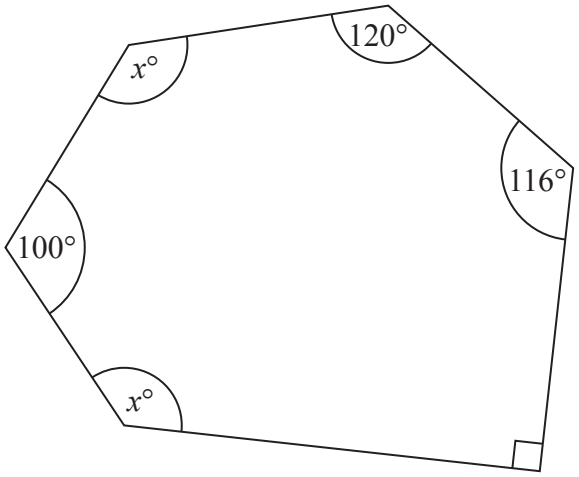


Diagram **NOT** accurately drawn

Work out the value of x.

.....

(Total for Question 7 is 4 marks)

8 A circle has a circumference of 54 cm.

Work out the diameter of the circle.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 8 is 2 marks)

9 Beth has 600 counters.

$\frac{3}{5}$ of the counters are yellow.

25% of the counters are red.
The rest of the counters are green.

Beth is given some more red counters.
Now the ratio of the number of green counters to the number of red counters is 1 : 2

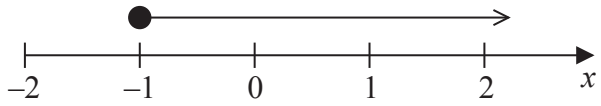
How many red counters was Beth given?

.....

(Total for Question 9 is 4 marks)

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10 Here is a number line.



(a) Write down the inequality shown on the number line.

.....

(1)

p is an integer.

$-5 < p \leqslant -2$

(b) Write down all the possible values of p.

.....

(2)

(c) Solve $5y - 2 < 18$

.....

(2)

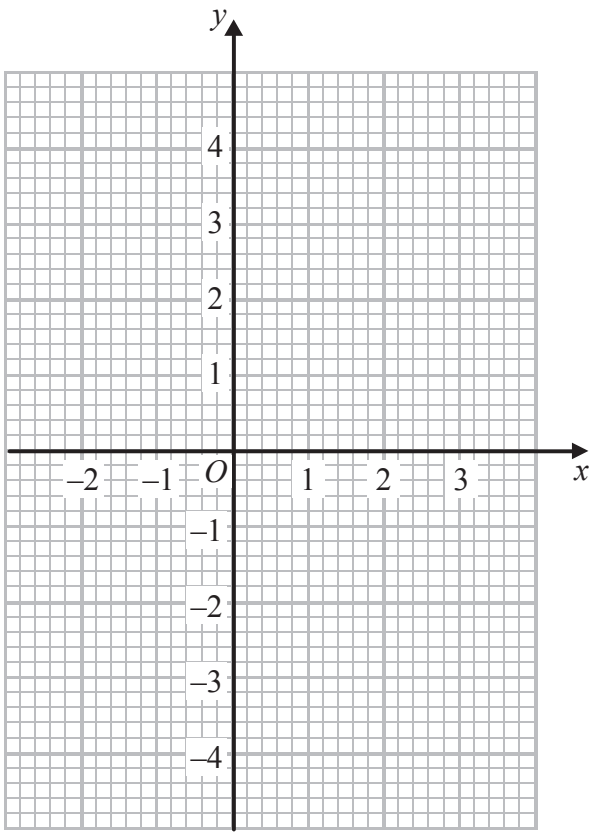
(Total for Question 10 is 5 marks)

11 (a) Complete the table of values for $y = x^2 - x - 3$

x	–2	–1	0	1	2	3
y		–1		–3	–1	

(2)

(b) Draw the graph of $y = x^2 - x - 3$ for values of x from –2 to 3



(2)

(c) Use your graph to find estimates for the solutions of $x^2 - x - 3 = 0$

.....

(2)

(Total for Question 11 is 6 marks)

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12 £360 is shared in the ratio 1 : 3 : 5

Work out the difference between the largest share and the smallest share.

£ .....

(Total for Question 12 is 3 marks)

***13**

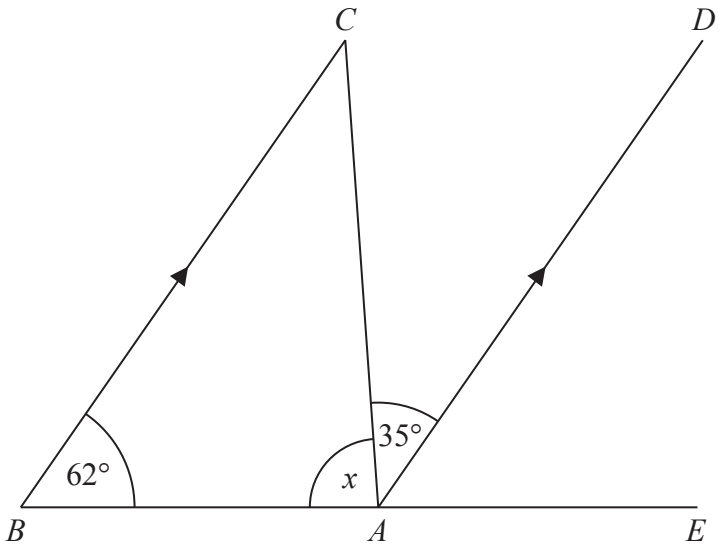


Diagram **NOT** accurately drawn

ABC is a triangle.
BC is parallel to *AD*.
BAE is a straight line.

Work out the size of the angle marked *x*.
You must give reasons for your answer.

(Total for Question 13 is 4 marks)

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14 (a) Make e the subject of the formula $f = 5e - 3$

.....

(2)

(b) Make g the subject of the formula $h = \frac{g}{c} + d$

.....

(2)

(Total for Question 14 is 4 marks)

15 £8000 gets 4% compound interest for 3 years.

Work out the amount of money at the end of 3 years.

£ .....

(Total for Question 15 is 3 marks)

16 A number is increased by 25% to get 5950

What is the number?

.....

(Total for Question 16 is 3 marks)

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17

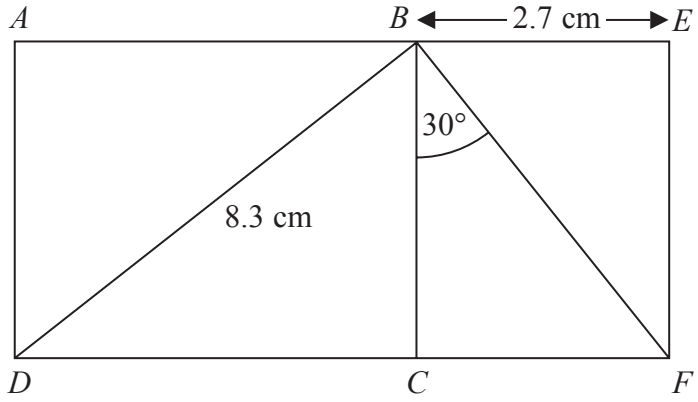


Diagram **NOT** accurately drawn

ABCD and *BEFC* are rectangles.

BD = 8.3 cm
BE = 2.7 cm
Angle *CBF* = 30°

Work out the size of angle *BDC*.
Give your answer correct to one decimal place.

.....°

(Total for Question 17 is 5 marks)

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18 Solve the simultaneous equations

$$4x - 3y = 11$$
$$6x + 2y = -3$$

$x =$ .....

$y =$ .....

(Total for Question 18 is 4 marks)

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***19**

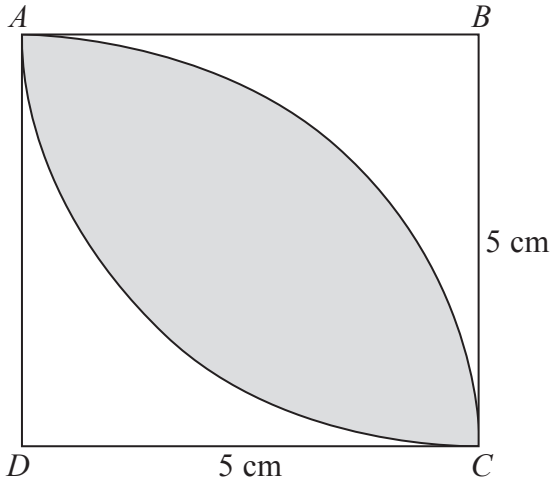


Diagram **NOT** accurately drawn

ABCD is a square of side 5 cm.
BAC is a sector of a circle centre *B*.
DAC is a sector of a circle centre *D*.

Is the area of the shaded region greater than the area of the region that is **not** shaded?

(Total for Question 19 is 5 marks)

20 A straight line has equation $y = 3x + 1$

The straight line L is parallel to the line with equation $y = 3x + 1$
Line L passes through the point (2, 10).

Find an equation of the line L.

.....

(Total for Question 20 is 3 marks)

***21** Prove algebraically that the recurring decimal $0.4\dot{3}$ can be written as the fraction $\frac{13}{30}$

(Total for Question 21 is 3 marks)

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22 y is inversely proportional to the square of x.

$y = 4$ when $x = 3$

Find the value of y when $x = 10$

.....

(Total for Question 22 is 4 marks)

23 ABC is a triangle.

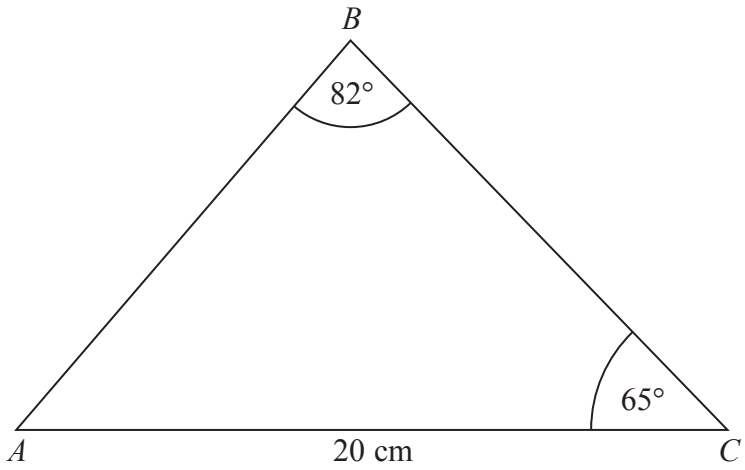


Diagram **NOT** accurately drawn

$AC = 20$ cm
Angle $ACB = 65°$
Angle $ABC = 82°$

Calculate the length of AB.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 23 is 3 marks)

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24 The diagram shows a solid shape made from a cone on top of a cylinder.

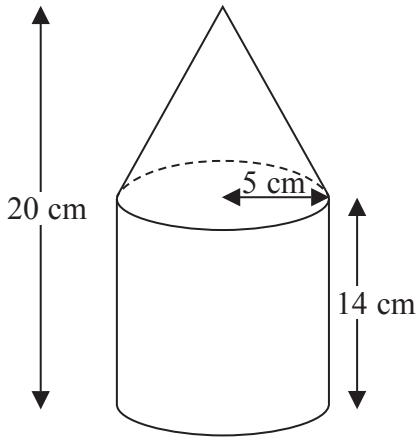


Diagram **NOT** accurately drawn

The radius of the cylinder is 5 cm.
The radius of the base of the cone is 5 cm.

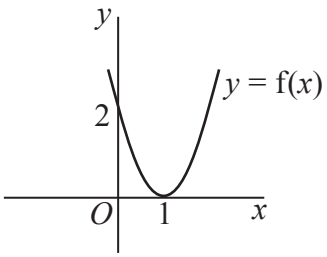
The height of the cylinder is 14 cm.
The height of the solid shape is 20 cm.

Work out the total surface area of the solid shape.
Give your answer correct to 3 significant figures.

..... cm^2

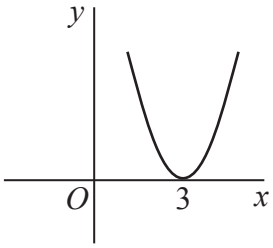
(Total for Question 24 is 5 marks)

25 Here is the graph of $y = f(x)$.

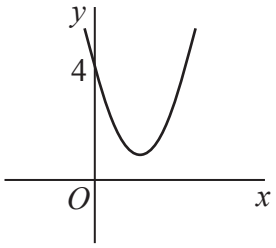


Each of the graphs **A**, **B**, **C**, **D**, **E** and **F** is a transformation of the graph of $y = f(x)$.

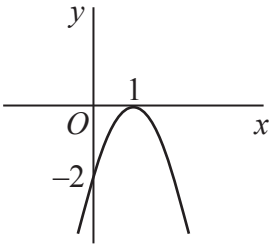
Graph **A**



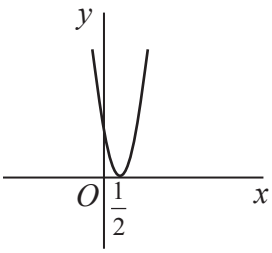
Graph **B**



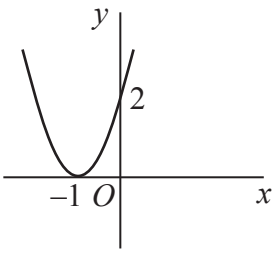
Graph **C**



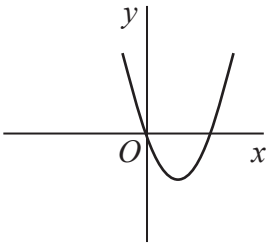
Graph **D**



Graph **E**



Graph **F**



Match each of the graphs **A**, **B**, **C**, **D**, **E** and **F** to its equation in the table.

Equation	Graph
$y = f(x) + 2$	
$y = f(-x)$	
$y = f(2x)$	
$y = -f(x)$	
$y = f(x - 2)$	
$y = f(x) - 2$	

(Total for Question 25 is 3 marks)

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26 The diagram shows a trapezium.

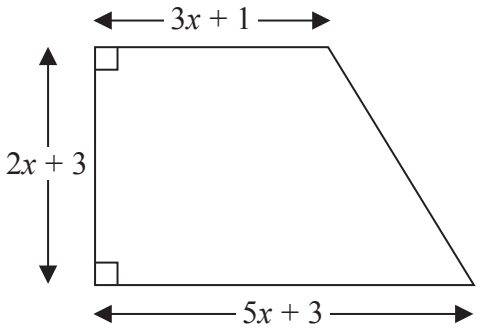


Diagram **NOT** accurately drawn

All the measurements are in centimetres.

The area of the trapezium is 46 cm^2.

(a) Show that $x^2 + 2x - 5 = 0$

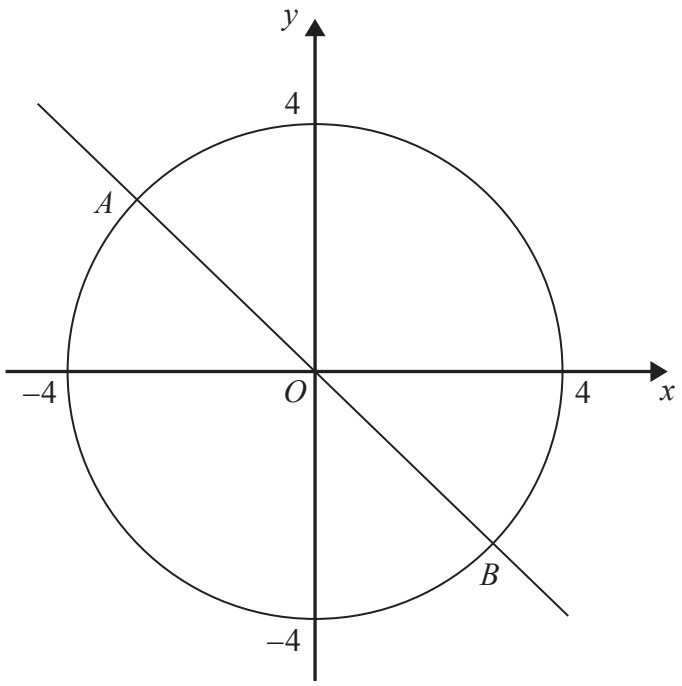
(3)

(b) Solve the equation $x^2 + 2x - 5 = 0$
Give your solutions correct to 2 decimal places.

(3)

(Total for Question 26 is 6 marks)

27 Here is a circle centre O and the line with equation $y = -x$



(a) Write down the equation of the circle.

.....

(1)

The line with equation $y = -x$ meets the circle at the points A and B.

(b) Work out the x-coordinate of A.

.....

(2)

(Total for Question 27 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 2H

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Summer 2014
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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: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			1.1	2	M1 for 2.75 ÷ 55 × 22 oe, eg $\frac{2}{5} \times 2.75$ A1 cao
2	(a)		724.52	2	M1 for 614 × 18 ÷ 100 oe or 110.52 seen or 614 × 1.18 A1 cao
	(b)		75	2	M1 for 36 ÷ 48 × 100 oe A1 cao
3	(a)		3.148491702	1	B1 for 3.148(491702)
	(b)		1.170398496	2	M1 for 75.15 or 61.3... or 64.2... A1 for 1.17(0398496)
4			450 cm^3	3	M1 for $\frac{1}{2}(5 \times 12) \times 15$ oe A1 cao B1 (indep) for cm^3

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		$x + x + 7 + 3x = T$	$T = 5x + 7$	3	B3 for $T = 5x + 7$ oe (B2 for $5x + 7$ oe or $T = 5x + a$ oe, $a \neq 0$ or $T = bx + 7$ oe, $b \neq 0$ B1 for $x + 7$ or $3x$ or T = a linear expression in x or $5x + a$ oe, $a \neq 0$ or $bx + 7$ oe, $b \neq 0$)
*6		$\sqrt{0.12} = 0.346...$	square root of 0.12 + working	3	M1 for $\frac{1}{2.9}$ or $1 \div 2.9$ (=0.3448…) M1 for $0.7 \times 0.7 \times 0.7$ oe (= 0.343) C1 for square root of 0.12 identified as biggest **and** all 3 evaluated correctly truncated or rounded to at least 3 decimal places
7			147	4	M1 for correct method to find sum of interior angles of a hexagon A1 for 720 M1 (dep on M1) for ['720' – (100 + 120 + 116 + 90)] ÷ 2 oe A1 cao OR M1 for 360 – (80 + 90 +64 + 60) condone one incorrect exterior angle A1 for 66 M1 (dep on M1) for 180 – ('66' ÷ 2) A1 cao
8			17.2	2	M1 for $54 \div \pi$ A1 for 17.1 – 17.2

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9			30	4	M1 for Y: 600 ÷ 5 × 3 oe (= 360) M1 for R: 600 × 25 ÷ 100 oe (= 150) M1 (dep on M2) for (600 – '360' – '150') × 2 – '150' oe A1 cao OR M1 for Y: 3 ÷ 5 × 100 (= 60%) M1 for G: 100 – '60' – 25 (= 15) **and** '15' ÷ 100 × 600 (= 90) M1 (dep on M2) for '90' × 2 − 150 A1 cao OR M1 for $\frac{12}{20}+\frac{5}{20}$ $(=\frac{17}{20})$ oe M1 for $\left(1-'\frac{17}{20}'\right)\times 600$ (= 90) M1 (dep on M2) for '90' × 2 − 150 A1 cao
10	(a)		$x \geq -1$	1	B1 cao
	(b)		−4,−3,−2	2	B2 for all 3 values and no extras (ignore repeats) (B1 for 2 correct values and no extras or all 3 correct values and −5)
	(c)		$y < 4$	2	M1 for clear intention to add 2 onto each side of an inequality (or equation) or clear intention to divide all terms by 5 as a first step or (y =) 4 A1 cao

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)	<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>**3**</td><td>–1</td><td>**–3**</td><td>–3</td><td>–1</td><td>**3**</td></tr></table>	3, –3, 3	2	B2 for all 3 correct (B1 for 2 correct)
	(b)		graph	2	M1 for 5 or 6 of 'points' plotted correctly (provided B1 is awarded in part a) A1 for correct graph
	(c)		–1.3, 2.3	2	B1 ft for '–1.3' ± 0.2 B1 ft for '2.3' ± 0.2
12			160	3	M1 for 360 ÷ (1 + 3 + 5) (= 40) M1 (dep) for 5 × '40' (= 200) A1 cao OR M1 for 360 ÷ (1 + 3 + 5) (= 40) M1 (dep) for 5 – 1 (= 4) A1 cao

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*13			$x = 83°$ and reasons	4	M2 for 180 – 62 – 35 (=83) (M1 for angle *ACB* = 35° (could be on the diagram)) C2 for $x = 83°$ **and** alternate angles are equal **and** angles in a triangle add up to 180° (C1 (dep on M1) for 1 relevant reason) OR M2 for 180 – 62 – 35 (=83) (M1 for angle *DAE* = 62° (could be on the diagram)) C2 for $x = 83°$ **and** corresponding angles are equal **and** angles on a straight line add up to 180° (C1(dep on M1) for 1 relevant reason) OR M2 for 180 – 62 – 35 (=83) C2 for $x = 83°$ **and** co-interior (allied) angles add up to 180° (C1 for co-interior (allied) angles add up to 180°)

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)		$e = \frac{f+3}{5}$	2	M1 for $f + 3 = 5e - 3 + 3$ oe A1 for $e = \frac{f+3}{5}$ oe (SC B1 for $e = \frac{f-3}{5}$ oe)
	(b)		$g = c(h - d)$	2	M1 for correct first step A1 for $g = ch - cd$ oe
15			8998.91	3	M1 for $\frac{4}{100} \times 8000$ (= 320) oe or 1.04×8000 (=8320) oe M1 for complete method A1 for 8998.91(2) OR M2 for 8000×1.04^3 oe A1 for 8998.91(2)
16			4760	3	M1 for 100 + 25 or 125 or 1 + 0.25 or 1.25 M1 for 5950 ÷ '1.25' or 5950 ÷ '125' × 100 A1 cao

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17			34.3	5	M1 for method to find *BC*, eg $\tan 30 = \frac{2.7}{BC}$ or $\frac{BC}{\sin 60} = \frac{27}{\sin 30}$ A1 for (*BC*=) 4.67 − 4.68 M1 for complete method to find *BDC*, eg $\sin BDC = \frac{'BC'}{8.3}$ oe M1 for $\sin^{-1}\frac{'BC'}{8.3}$ A1 for 34.2 – 34.3 OR M1 for method to find BF, eg $\frac{BF}{\sin 90} = \frac{27}{\sin 30}$ A1 for 5.4 M1 for $\frac{'5.4'}{\sin BDC} = \frac{8.3}{\sin 60}$ M1 for $\sin^{-1}('5.4' \times \sin 60 \div 8.3)$ A1 for 34.2 – 34.3
18		$12x - 9y = 33$ $\underline{12x + 4y = -6}$ $-13y = 39 \quad y = -3$ $4x - -9 = 11$ $4x = 11 - 9 = 2$ OR $8x - 6y = 22$ $\underline{18x + 6y = -9}$ $26x = 13 \quad x = {}^1/_2$ $2 - 3y = 11$ $3y = -9$	$x = \frac{1}{2}$ $y = -3$	4	M1 for correct process to eliminate either *x* or *y* (condone 1 arithmetic error) A1 for either $x = \frac{1}{2}$ or $y = -3$ M1 (dep) for correct substitution of their found variable or for correct process to eliminate the other variable (condone 1 arithmetic error) A1 for both $x = \frac{1}{2}$ and $y = -3$

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*19		Area of rectangle = 5 × 5 =25 Area of sector = 0.25 × π × 5^2 = 19.634… Semi area shaded = 7.134… (eg 0.25 × π × 5^2 – 0.5 × 5 × 5) Semi area not shaded = 5.365… (eg 0.5 × 5 × 5 – 7.134…) Area shaded = 14.269… (eg 2 × 7.134…) Area not shaded = 10.730… (eg 2 × 5.365…)	Yes with working	5	M1 for correct method to find area of rectangle or triangle M1 for correct method to find area of sector or part of sector M1 (dep on M2) for correct method to find area shaded or not shaded A1 for correct area shaded or not shaded C1 for Yes with correct figures to compare, eg 7.13… and 5.36… or 14.26…and 10.73…or 14.26…and 12.5 or 10.73 and 12.5 or 39.26…and 25
20		$y = 3x + c$ 10 = 6 + c $c = 4$	$y = 3x + 4$	3	B1 for (y =) $3x + c$, $c \neq 1$ or gradient identified as 3 M1 for 10 = '3' × 2 + c, oe or (y =) $3x + 4$ A1 for $y = 3x + 4$ oe

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*21			correct proof	3	M1 for (x =) 0.433(...) or correct first step, eg $1000x = 433.33(\ldots)$ or $100x = 43.33(...)$ or $10x = 4.33(\ldots)$ M1 for method as far as subtracting, eg $10x - x = 4.33\ldots - 0.433\ldots (= 3.9)$ C1 (dep on M2 scored) for completing the proof, eg $\frac{3.9}{9} = \frac{13}{30}$ or $\frac{42.9}{99} = \frac{13}{30}$
22			0.36	4	M1 for $y = \frac{k}{x^2}$ or $y \propto \frac{1}{x^2}$ M1 for $4 = \frac{k}{3^2}$ oe or (k =) 36 M1 for $\frac{'36'}{10^2}$ oe A1 for 0.36 oe **Alternative method** M1for $y = \frac{k}{x^2}$ or $y \propto \frac{1}{x^2}$ M1 for $\frac{y}{3^2} = \frac{4}{10^2}$ oe M1 for (y =) $3^2 \times \frac{4}{10^2}$ A1 for 0.36 oe
23		$\frac{x}{\sin 65} = \frac{20}{\sin 82}$ $x = \frac{20 \sin 65}{\sin 82} = \frac{18.12615...}{0.990268...}$ = 18.30429...	18.3	3	M1 for $\frac{x}{\sin 65} = \frac{20}{\sin 82}$ oe M1 for (x =) $\frac{20 \sin 65}{\sin 82}$ oe A1 for 18.3 – 18.31

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
24			641	5	M1 for area base = $\pi \times 5^2$ (= 25π = 78.5...) M1 for curved SA cylinder = $2\pi \times 5 \times 14$ (=140π = 439.8...) M1 for $l = \sqrt{5^2 + 6^2}$ (= 7.80...) M1 (dep) for curved SA cone = $\pi \times 5 \times \sqrt{5^2 + 6^2}$ (= 122.6...) A1 for 641 – 642
25			BEDCAF	3	B3 for all 6 correct (B2 for 4 or 5 correct B1for 2 or 3 correct)

PAPER: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
26	(a)	½(3x + 1 + 5x + 3)(2x + 3) = ½ (8x + 4)(2x + 3) So, (4x + 2)(2x + 3) – 46 = 0 $8x^2 + 16x + 6 - 46 = 0$ $8x^2 + 16x - 40 = 0$ $x^2 + 2x - 5 = 0$	Proof	3	M1for correct method to find area of trapezium M1 (dep) for expanding all brackets to get a correct expression for the area C1 for complete correct proof
	(b)	$x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-5)}}{2 \times 1}$ $= \frac{-2 \pm \sqrt{24}}{2}$ **OR** $(x + 1)^2 - 1^2 - 5$ $= (x + 1)^2 - 6$ $x + 1 = \pm \sqrt{6}$	1.45, –3.45	3	M1 for $\frac{-2 \pm \sqrt{2^2 - 4(1)(-5)}}{2 \times 1}$ condone one sign error in substitution M1for $\frac{-2 \pm \sqrt{24}}{2}$ A1for 1.44 to 1.45 (and –3.44 to –3.45) **OR** M1 for $(x + 1)^2 - 1^2 - 5$ oe M1 for $x + 1 = (\pm)\sqrt{6}$ A1 for 1.44 to 1.45 (and –3.44 to –3.45)
27	(a)		$x^2 + y^2 = 16$	1	B1 for $x^2 + y^2 = 16$ oe
	(b)	$x^2 + (-x)^2 = 16$ $2x^2 = 16 \quad x^2 = 8$	$-2\sqrt{2}$	2	M1 for $x^2 + (-x)^2$ = '16' oe or $2x^2 = 16$ or 4 × cos 45 A1 for $-2\sqrt{2}$ or $-\sqrt{8}$ or –2.82 to –2.83 or $-\frac{4}{\sqrt{2}}$ 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: 5MM2H_01			
Question		**Modification**	**Notes**
Q4		Model provided as well as diagram.	Standard mark scheme
Q7		In text, *x* is replaced by "the angle marked *x*°"	Standard mark scheme
Q10		Number line – line and arrow extended so it obviously goes past 2	Standard mark scheme
Q11		2 cm grid	Mark as main scheme with following amendment to part (c) B1 ft for '–1.3' ± 0.25 B1 ft for '2.3' ± 0.25
Q19		Labels moved to top and left side	Standard mark scheme

PAPER: 5MM2H_01			
Question		**Modification**	**Notes**
Q24		Model provided as well as diagram	Standard mark scheme
Q26		MLP *x* changed to *y*	Mark as main scheme with following amendment M1 for $(y + 1)^2 - 1^2 - 5$ oe M1 for $y + 1 = (\pm)\sqrt{6}$ A1 for 1.44 to 1.45 (and –3.44 to –3.45)

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Write your name here

Surname	Other names

Pearson Edexcel GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Wednesday 13 November 2013 – Morning

Time: 1 hour 45 minutes

Paper Reference

5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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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P 4 3 6 0 8 A 0 1 2 4

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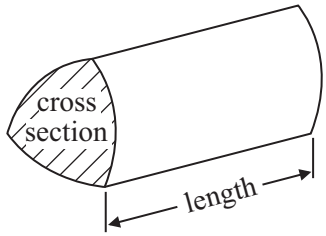
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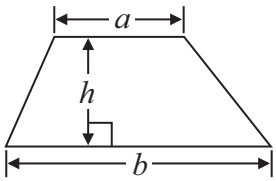
Formulae: Higher Tier

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

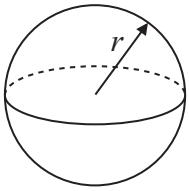


Area of trapezium = $\frac{1}{2}(a + b)h$



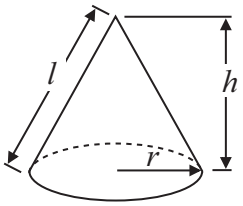
Volume of sphere = $\frac{4}{3}\pi r^3$

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

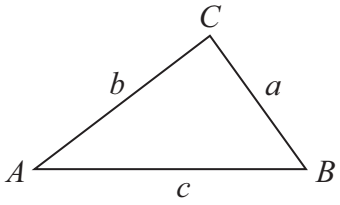


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

1 Use your calculator to work out $\dfrac{4.3 \times 2.6}{23.4 - 6.06}$

.....

(Total for Question 1 is 2 marks)

2 (a) Increase £180 by 20%

£.....

(3)

(b) Work out 26 as a percentage of 40

.....%

(2)

(Total for Question 2 is 5 marks)

3 The diagram shows a solid L-shaped prism.

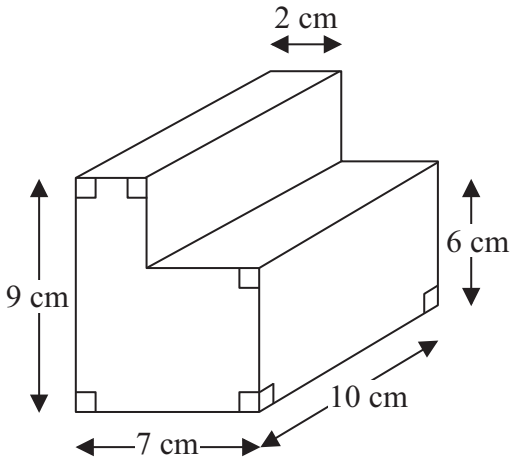


Diagram **NOT** accurately drawn

Calculate the volume of this prism.

..... cm^3

(Total for Question 3 is 3 marks)

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4 Some counters are red or green or blue.

$\frac{3}{10}$ of the counters are red.

$\frac{1}{10}$ of the counters are green.

The rest of the counters are blue.

There are 60 blue counters.

How many red counters are there?

.....

(Total for Question 4 is 4 marks)

5 $w = 5x + y$
$x = 9$
$y = -7$

(a) Work out the value of w.

.....

(2)

A 10-sided polygon has 3 angles of size c degrees and 7 angles of size d degrees.

(b) Write down an expression, in terms of c and d, for the total, in degrees, of all 10 angles.

.....

(2)

(Total for Question 5 is 4 marks)

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6 This shape is a quarter of a circle of radius 5 cm.

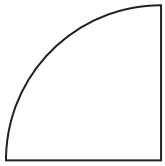


Diagram **NOT** accurately drawn

(a) Find the area of the shape.

..... cm^2

(2)

(b) Find the perimeter of the shape.

..... cm

(3)

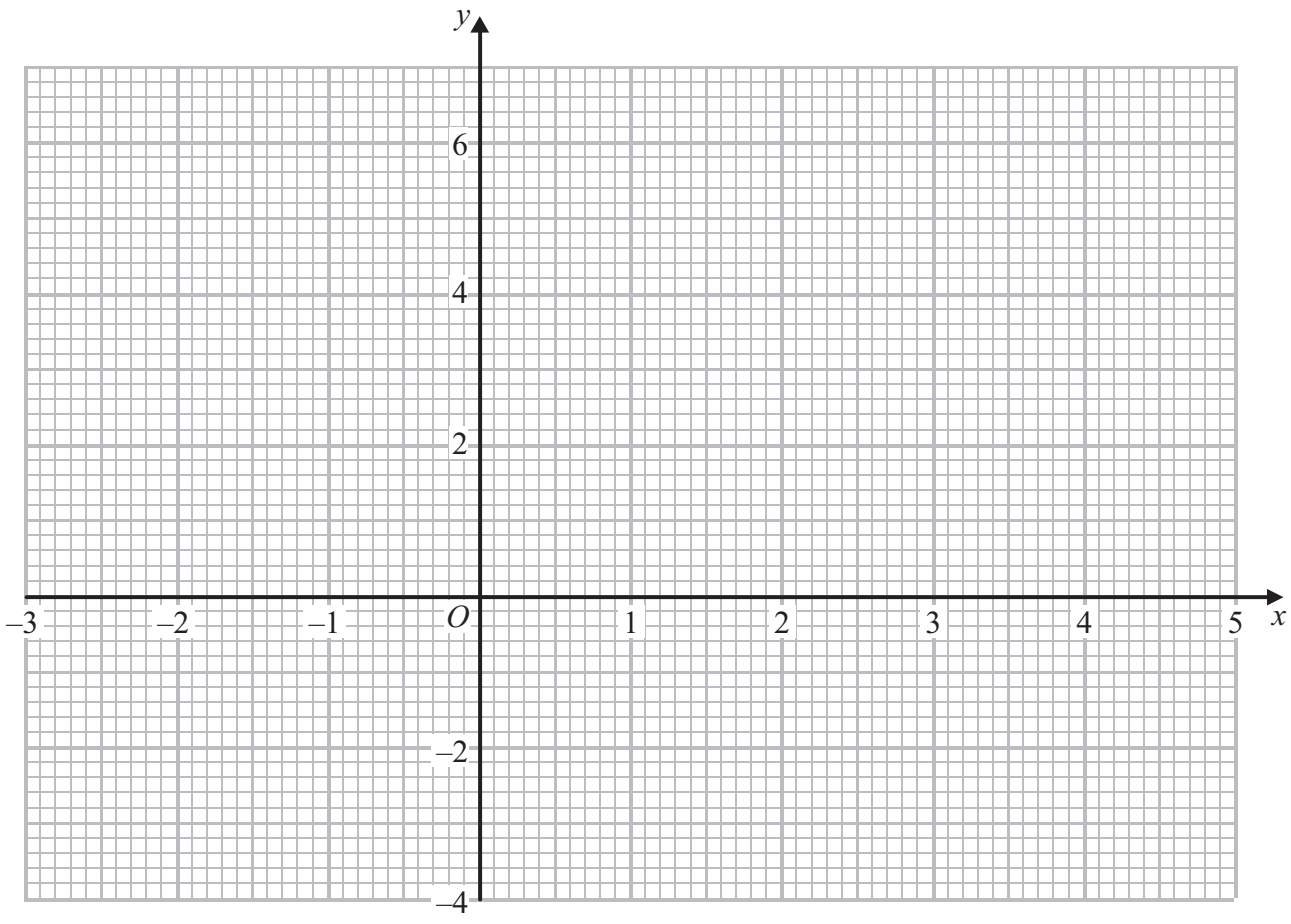
(Total for Question 6 is 5 marks)

7 (a) Complete the table of values for $y = x^2 - 2x - 2$

x	–2	–1	0	1	2	3	4
y	6						6

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 2$ for values of x from –2 to 4



(2)

(c) Use your graph to find estimates for the solutions of the equation $x^2 - 2x - 2 = -1$

.....

(2)

(Total for Question 7 is 6 marks)

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8 $-2 < n \leqslant 3$
n is an integer.

(a) Write down all the possible values of n.

.....

(2)

(b) Solve $2x + 3 < 8$

.....

(2)

(Total for Question 8 is 4 marks)

9 The diagram shows 3 sides of a regular polygon.

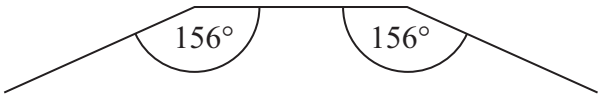


Diagram **NOT** accurately drawn

Each interior angle of the regular polygon is 156°

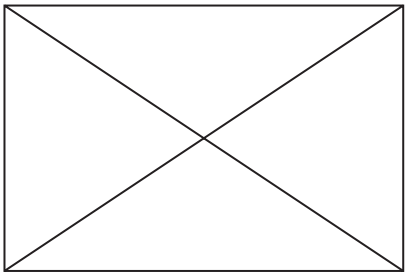
Work out the number of sides the regular polygon has.

.....

(Total for Question 9 is 3 marks)

10 The diagram shows two diagonals in a rectangle.

Diagram **NOT** accurately drawn



Work out the total length of the four sides of the rectangle and the two diagonals.

..... cm

(Total for Question 10 is 5 marks)

11 Work out $(7.8 \times 10^8) \div (6.5 \times 10^3)$
Give your answer in standard form.

.....

(Total for Question 11 is 2 marks)

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12 There are only red beads and green beads in a bag.

The ratio of the number of red beads to the number of green beads is 5 : 9

(a) What fraction of the beads are red?

.....

(1)

There is a total of 84 beads in the bag.

(b) How many of the beads are green?

.....

(3)

Susie is going to put some more beads in the bag.
There will still be only red beads and green beads in the bag.

Susie wants to have twice as many green beads as red beads in the bag.

*(c) What beads should she put in the bag?
You must explain your answer.

(3)

(Total for Question 12 is 7 marks)

***13**

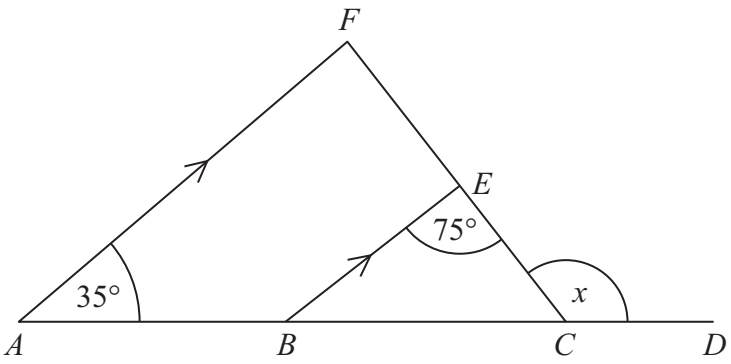


Diagram **NOT** accurately drawn

ABCD is a straight line.
AF is parallel to *BE*.
Angle *FAB* = 35°
Angle *CEB* = 75°

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

(Total for Question 13 is 4 marks)

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14 A number is decreased by 15%
The result is 204

Work out the number.

.....

(Total for Question 14 is 3 marks)

15

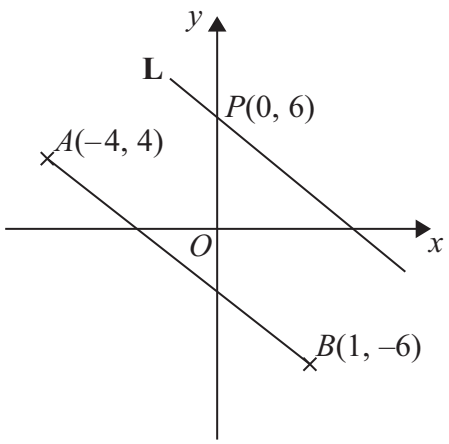


Diagram **NOT** accurately drawn

The diagram shows the line AB.
The line **L** is parallel to AB and passes through the point $P(0, 6)$.

Find an equation of the line **L**.

.....

(Total for Question 15 is 4 marks)

16 Make w the subject of the formula $3(w + x) = 4x + 7$

$w =$ .....

(Total for Question 16 is 3 marks)

17

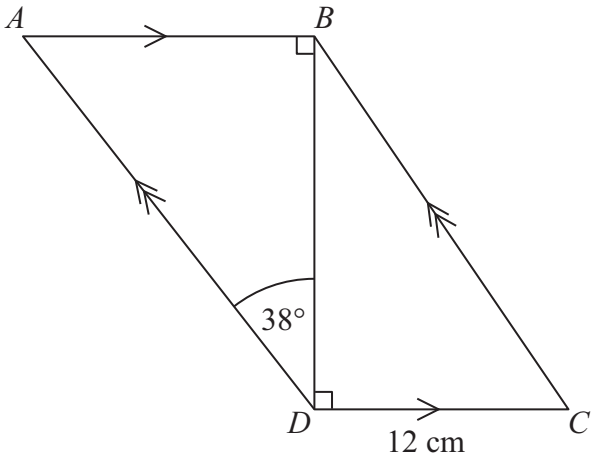


Diagram **NOT** accurately drawn

$ABCD$ is a parallelogram.
$DC = 12$ cm
Angle $ADB = 38°$

Calculate the length of AD.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 17 is 4 marks)

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18 x and y are integers such that

$$-2 \leqslant x < 3$$
$$\text{and} \quad -1 < y \leqslant 4$$

Find the values of x and y when $x = y$.

.....

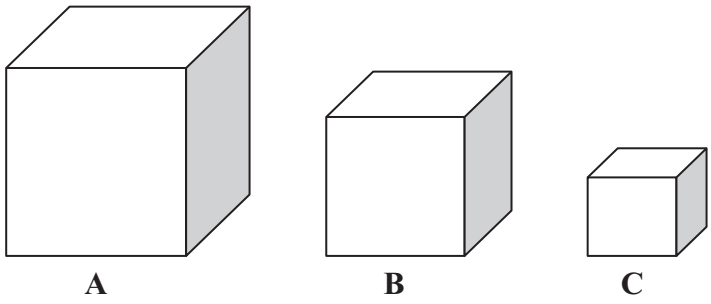
(Total for Question 18 is 2 marks)

19 Solve $x^2 - 9x - 2 = 0$
Give your solutions correct to 2 decimal places.

.....

(Total for Question 19 is 3 marks)

***20** Here are three cubes.



A B C

Diagram **NOT** accurately drawn

The volume of cube **B** is 20% less than the volume of cube **A**.
The volume of cube **C** is 20% less than the volume of cube **B**.
Cube **A** has a volume of 8000 cm^3.

What is the volume of cube **C** as a percentage of the volume of cube **A**?

(Total for Question 20 is 4 marks)

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21 y is directly proportional to the square of x.

$y = 80$ when $x = 4$

(a) Find a formula for y in terms of x.

.....

(3)

(b) Work out the value of y when $x = 7$

.....

(1)

(c) Work out the values of x for which $y = 45$

.....

(2)

(Total for Question 21 is 6 marks)

***22** Prove algebraically that $0.\dot{4}\dot{5} = \frac{5}{11}$

You must show your working.

(Total for Question 22 is 3 marks)

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23

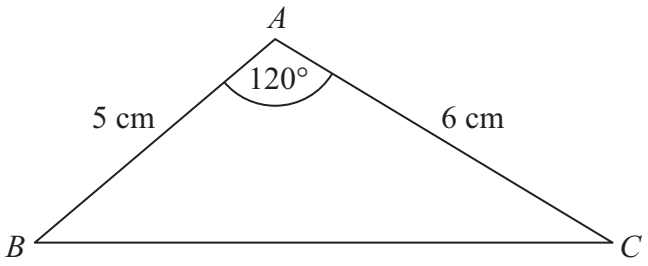


Diagram **NOT** accurately drawn

Calculate the length of the side *BC*.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 23 is 3 marks)

***24** Prove that

$$(7n + 3)^2 - (7n - 3)^2$$

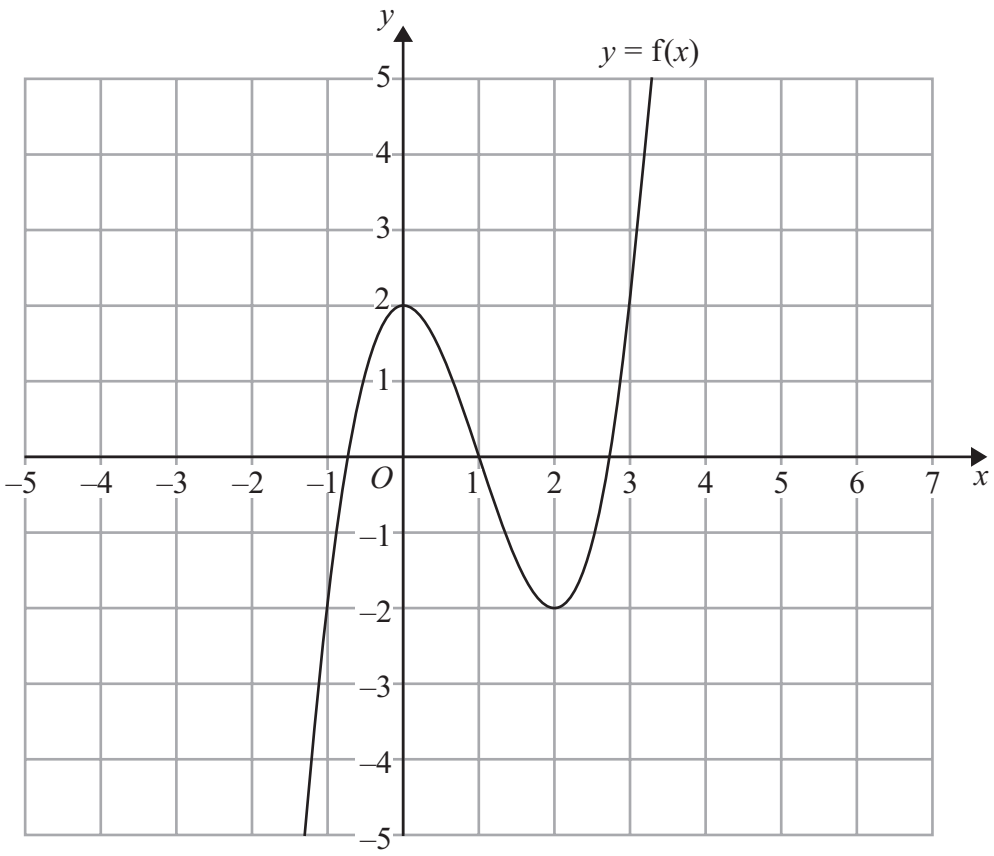
is a multiple of 12, for all positive integer values of n.

(Total for Question 24 is 3 marks)

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25 The graph of $y = f(x)$ is shown on the grids.

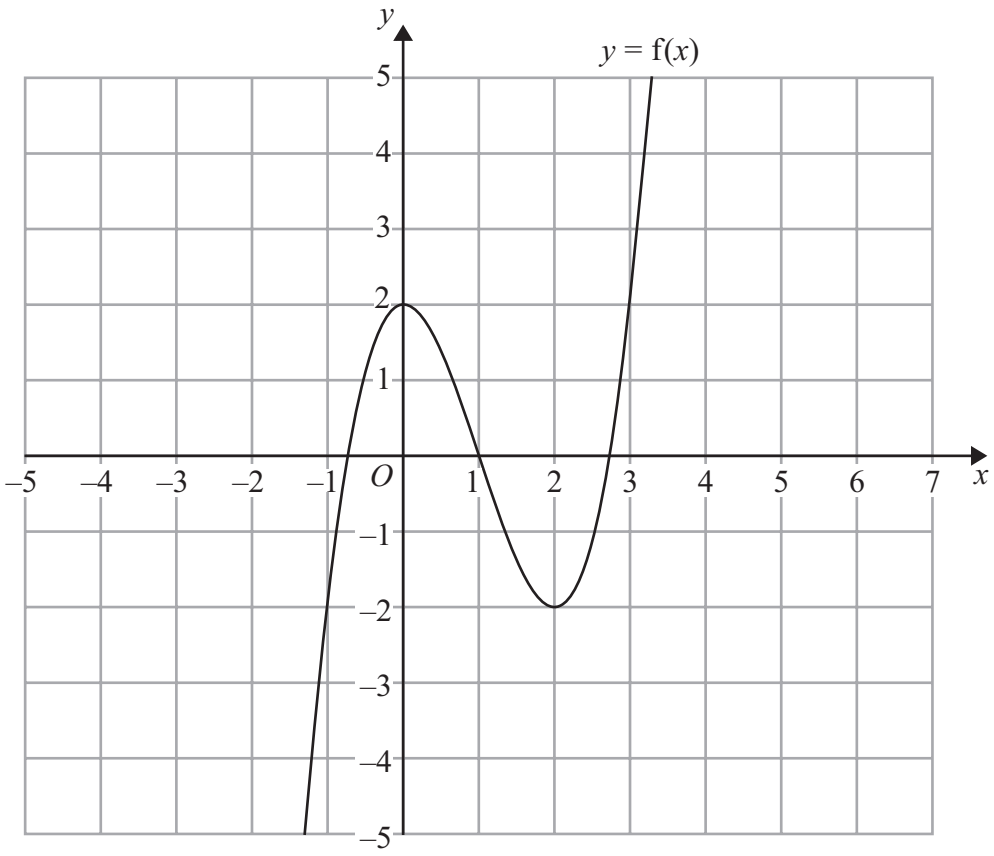
(a) On this grid, sketch the graph of $y = f(x + 1)$



(2)

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(b) On this grid, sketch the graph of $y = 2f(x)$



(2)

(Total for Question 25 is 4 marks)

***26**

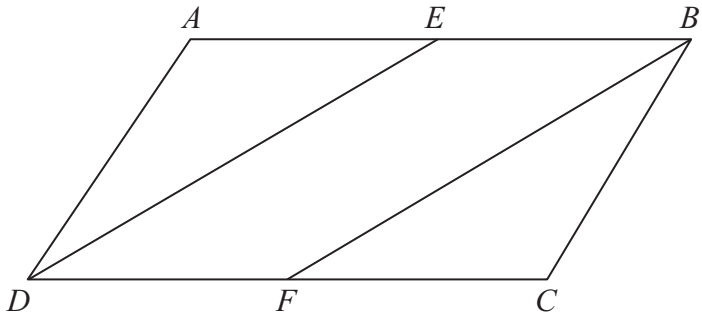


Diagram **NOT** accurately drawn

ABCD is a parallelogram.
E is the midpoint of *AB*.
F is the midpoint of *DC*.

(a) Prove that triangle *AED* is congruent to triangle *CFB*.

(3)

(b) Hence, prove that *DE* = *FB*

(1)

(Total for Question 26 is 4 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 2H

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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 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			0.64475 (2…)	2	M1 for $\frac{11.18}{17.34}$ or $\frac{1118}{1734}$ or 11.18 or 17.34 A1 for 0.644 – 0.645 or $\frac{559}{867}$
2	(a)		216	3	M2 for a correct method to increase 180 by 20% (M1 for a correct method to find 20% of 180) A1 cao
	(b)		65	2	M1 for — oe A1 cao
3			480	3	M1 for correct method to find the area of cross-section, eg 9 × 7 – (9 – 6) × (7 – 2) (=48) M1 (dep) for their cross-section × 10 A1 cao OR M1 for a correct method to find volume of any cuboid, eg 9×7×10 (=630) M1 (dep) for correct method to find total volume, eg 9 × 7 × 10 (=630) − (9 – 6) × (7 – 2) × 10 (=150) A1 cao

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4			30	4	M2 for correct method to find fraction of blue counters, eg — — or $\frac{6}{10}$ oe seen (M1 for correct method to add $\frac{3}{10}, \frac{1}{10}$ or $\frac{4}{10}$ oe seen) M1 (dep on M2) for equating "$\frac{6}{10}$ " with 60 blue counters (may be implied by correct answer) A1 cao OR (starting with *n* counters in bag stated, eg *n* = 100) M2 for correct method to find number of blue counters in bag, eg — — (=60) (M1 for — (=30) and — (=10) or — (=40)) M1 (dep on M2) for equating — (=60) with 60 blue counters (may be implied by correct answer) A1 cao [NB accept equivalent calculations involving percentages or decimals]
5	(a)		38	2	M1 for 5 × 9 – 7 or 5 × 9 + –7 A1 cao
	(b)		3*c* + 7*d*	2	M1 for 3×*c* or 7×*d* oe A1 for 3*c* + 7*d* oe

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		19.6	2	M1 for $\pi \times 5^2$ (=78.5...) (accept ⟶ oe) A1 for 19.6–19.7
	(b)		17.9	3	M1 for $2 \times \pi \times 5$ (=31.4...) M1 for $2 \times \pi \times 5 \div 4$ (=7.8...) A1 for 17.8 – 17.9
7	(a)		1, –2, –3, –2, 1	2	B2 all five correct (B1 for 3 or 4 correct)
	(b)		graph	2	M1 (dep on at least B1 scored) for all 7 of "points" plotted correctly A1 for correct graph (NB Do not accept points joined with line segments)
	(c)		2.3 to 2.5 –0.5 to –0.3	2	B1 for 2.3 to 2.5 or ft their graph B1 for –0.5 to –0.3 or ft their graph
8	(a)		–1, 0, 1, 2, 3	2	B2 for –1, 0, 1, 2, 3 (B1 for one error or one omission or one addition)
	(b)		$x < 2.5$	2	M1 for subtracting 3 from both sides or dividing both sides by 2 condone equality or incorrect inequality signs or (x=) 2.5 A1 for $x < 2.5$ oe

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9			15	3	M1 for 180 – 156 (=24) M1 for 360 ÷ "24" A1 cao OR M1 for $156 = \frac{180}{n}(n-2)$ oe M1 for $180n - 156n = 360$ oe A1 cao
10			308	5	M1 $50^2 + 40^2$ or 2500 + 1600 or 4100 M1 for $\sqrt{2500+1600}$ or $\sqrt{4100}$ A1 for 64 (.03…) seen or implied by answer M1(dep on M1) for 2 × 50 + 2 × 40 + 2 × "64(.03…)" A1 for 308 – 308.1
11			1.2×10^5	2	M1 for 1.2×10^n, $n \neq 5$ or $a\times10^5$, $a \neq 1.2$ or 120 000 oe A1 cao

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12	(a)		$\frac{5}{14}$	1	B1 for $\frac{5}{14}$ oe fraction
	(b)		54	3	M1 for 84 ÷ (5 + 9) (=6) or 1 – "(a)" (= —) M1 for 84 ÷ (5 + 9) × 9 oe or — A1 cao
	*(c)		eg 6 green	3	M1 for correct method to find twice as many green beads as red beads, eg 2 × 30 (=60) or 2 × (84 – "54") or "54" + "6" (=60) A1 for 6 (green) OR if *n* reds are added then 2*n* + 6 (greens), where *n* and 2*n* could be numbers OR 30 (red) and 60 (green) C1 (dep on M1) for showing correct relevant working and clear conclusion stating number of green beads or stating total numbers of red beads and green beads

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*13			110	4	M1 for identifying *EBC* = 35 or *AFC* = 75 M1 (dep) for (*ECB* =) 180 – 75 – 35 (=70) or (*ECD* =) 35 + 75 C2 for *x* = 110 oe from correct working and all reasons stated clearly (see below) (C1 (dep on M1) for appropriate reason) OR M1 for identifying *EBA* = 180 – 35 (=145) M1 (dep) (*ECB* =) "145" – 75 (=70) C2 for *x* = 110 oe from correct working and all reasons stated clearly (see below) (C1 (dep on M1) for appropriate reason) (SC B1 for *x* = 110 oe if M0 scored) Correct reasons: *EBC* = 35 or *AFC* = 75 (corresponding angles are equal) *ECB* = 180 – 75 – 35 (angles in a triangle add up to 180^o) *x* = 110 (angles on a straight line add up to 180^o) OR *EBC* = 35 or *AFC* = 75 (corresponding angles are equal) *x* = 110 (exterior angle of a triangle is equal to the sum of the interior opposite angles) OR *EBA* = 145 (allied angles / co-interior angles add up to 180^o) *ECB* = "145" – 75 (=70) (exterior angle of a triangle is equal to the sum of the interior opposite angles) *EDC* = 110 (angles on a straight line add up to 180^o)

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14			240	3	M1 for 1 – 0.15 (=0.85) or 85% seen M1 for 204 ÷ "0.85" oe A1 cao
15			$y = -2x + 6$	4	M1 for (gradient =) $\frac{4--6}{-4-1}$ oe or — A1 for –2 M1 for (y =) "m"x + 6 or (y =) –2x + "c" or $L = -2x + 6$ A1 cao
16			$w = \frac{x+7}{3}$	3	M1 for expanding brackets, eg 3×w+3×x or dividing each term by 3 M1 (dep on M1) for correct method to isolate w on one side of equation A1 for $w = \frac{x+7}{3}$ oe
17			19.5	4	B1 for (AB =) 12 or (CBD =) 38 M1 for — M1 for ——— ——— A1 for 19.4 – 19.5 OR B1 for (AB =) 12 or (DCB or DAB =) 52 M1 for — M1 for ——— = ——— A1 for 19.4 – 19.5

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18			0, 1, 2	2	B2 for 0, 1, 2 (B1 for one error or one omission or one addition OR B1 for (x =) –2, –1, 0, 1, 2 and (y =) 0, 1, 2, 3, 4 oe, eg number lines)
19			9.22 and –0.217	3	M1 for substituting $a = 1$, $b = -9$ and $c = -2$ into quadratic formula condone sign errors M1 for $\frac{}{\quad}$ A1 for 9.21 to 9.22 and –0.21 to –0.22 OR M1 for $\frac{\quad}{\quad} (= 0)$ M1 for (x =) A1 for 9.21 to 9.22 and –0.21 to –0.22
*20			64%	4	M1 for 0.8×8000 (= 6400) oe M1 for 0.8×0.8×8000 (=5120) oe M1 (dep on M2) for $\frac{\quad}{\quad}$ (=64) C1 for 64% from correct working OR M1 for 100% − 20% (=80%) or 1 – 0.2 (=0.8) oe seen M1 for 80% × 80% or 0.8 × 0.8 (=0.64) oe M1 (dep on M2) for "0.64"×100 (=64) or $\frac{}{\quad}$ C1 for 64% from correct working (SC B1 for 64% with no working)

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21	(a)		$y = 5x^2$	3	M1 for or $y = kx^2$ M1 for $80 = k \times 4^2$ oe A1 for $y = 5x^2$
	(b)		245	1	B1 for 245 or ft "k" $\times 7^2$
	(c)		3 and –3	2	M1 for $45 \div$ "k" (dependent on quadratic equation) A1 for 3 and –3
*22			Algebraic proof	3	M1 for ($100x =$) $100 \times 0.45...$ (=45.45…) M1 for $100x - x$ (=$99x$) and 45.45... – 0.45... (=45) C1 (dep on M2) for ($x =$) $\frac{5}{11}$ cao with full and correct algebraic proof
23			9.54	3	M1 for ($BC^2 =$) $5^2 + 6^2 - 2 \times 5 \times 6 \times \cos 120$ M1 for correct order of evaluation or 91 A1 for 9.53 – 9.54
*24			Proof	3	M1 for $49n^2 + 21n + 21n + 9$ or $49n^2 - 21n - 21n + 9$ oe or $[(7n+3) - (7n-3)][(7n+3) + (7n-3)]$ oe A1 for $84n$ oe from a correct expansion of both brackets C1 (dep on M1) for correct statement of proof, eg ($84 =$) 12×7 or — or — oe

Paper 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25	(a)		translation $\begin{pmatrix} -1 \\ 0 \end{pmatrix}$	2	M1 for a translation parallel to x-axis A1 for correct graph
	(b)		stretch parallel to y-axis sf 2	2	M1 for a stretch parallel to y-axis A1 for correct graph
*26	(a)		congruency proved	3	M1 for correct statement with correct reason M1 for a second correct statement with correct reason C1 for complete proof justifying congruency, eg SAS or AAS Eg $DAE = BCF$ (opposite angles of parallelogram are equal) $AE = FC$ (E and F are midpoints of lines of equal length) $AD = BC$ (opposite sides of parallelogram are equal) $AED \equiv CFB$ (SAS)
	(b)		explains why $DE = FB$	1	C1 for relevant statement using congruency Eg DE and FB are corresponding sides of congruent triangles


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Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Thursday 20 June 2013 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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 1 2 3 5 A 0 1 2 4

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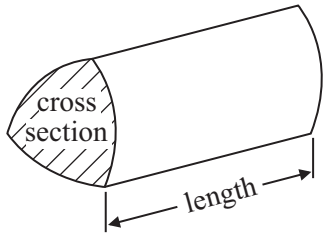
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GCSE Mathematics 2MM01

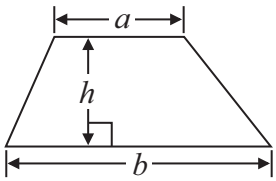
Formulae: Higher Tier

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

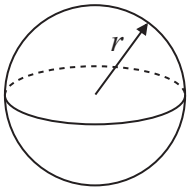


Area of trapezium = $\frac{1}{2}(a + b)h$



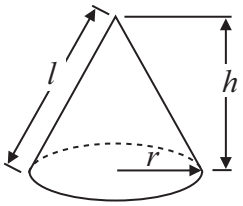
Volume of sphere = $\frac{4}{3}\pi r^3$

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

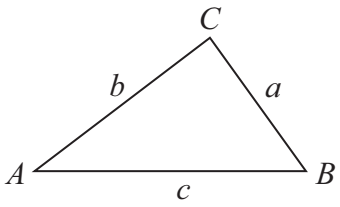


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

1 Here is a solid cuboid.

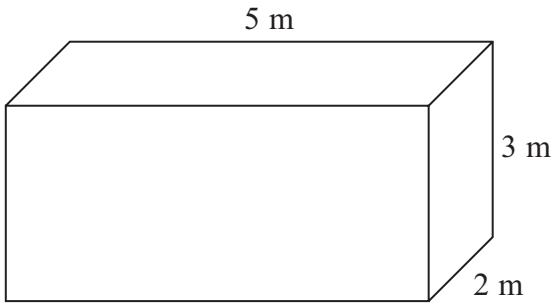


Diagram **NOT** accurately drawn

Work out the total surface area of this cuboid.

..... m^2

(Total for Question 1 is 3 marks)

2 8 cakes cost £11.60

Work out the cost of 12 cakes.

£.....

(Total for Question 2 is 2 marks)

3 (a) Increase 5 by 50%.

.....

(2)

(b) Decrease £320 by one eighth.

£ .....

(3)

(Total for Question 3 is 5 marks)

4 There are 20 counters in a bag.
14 of these counters are red.
6 of these counters are blue.

(a) Write down the ratio of the number of red counters to the number of blue counters.
Give your ratio in its simplest form.

.....

(2)

5 counters are taken from the bag.
The ratio of the number of red counters to the number of blue counters is now 4 : 1

(b) How many red counters were taken from the bag?

.....

(3)

(Total for Question 4 is 5 marks)

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***5**

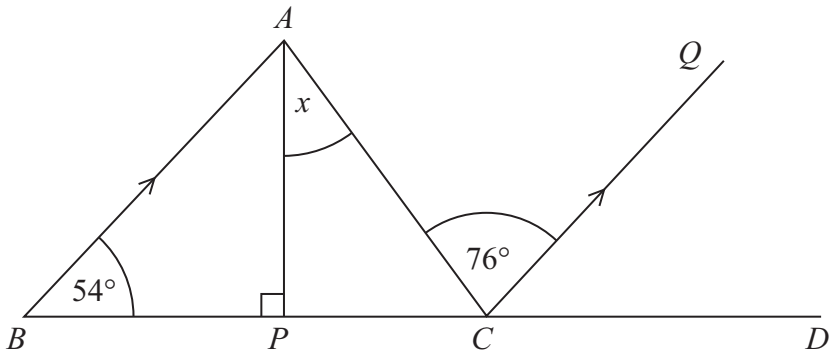


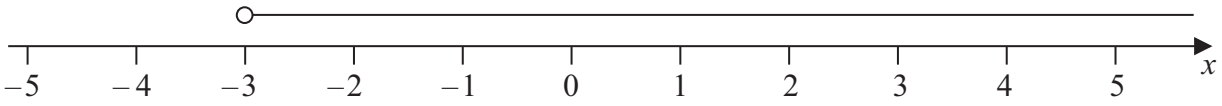
Diagram **NOT** accurately drawn

BPCD is a straight line.
BA is parallel to *CQ*.
AP is perpendicular to *BC*.
Angle *ABC* = 54°
Angle *ACQ* = 76°

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

(Total for Question 5 is 4 marks)

6 Here is a number line.

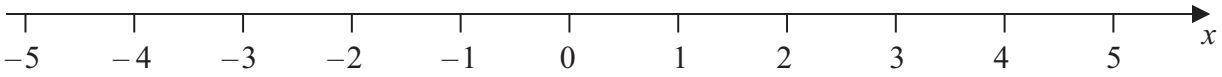


(a) Write down the inequality shown on the number line.

.....

(1)

Here is a number line.



(b) On this number line, show the inequality $-1 \leqslant x < 3$

(2)

(c) Solve $2p + 3 > 11$

.....

(2)

(Total for Question 6 is 5 marks)

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7 Here is a rectangle.

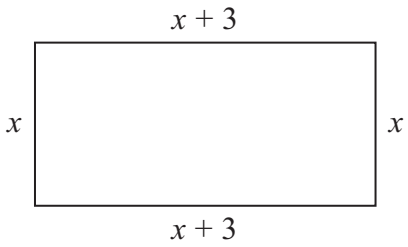


Diagram **NOT** accurately drawn

All measurements are in centimetres.

D cm is the total length of the four sides.

(a) Show that $D = 4x + 6$

(2)

(b) Make x the subject of the formula $D = 4x + 6$

.....

(2)

(Total for Question 7 is 4 marks)

8 $T = 3x - 2y$

$x = 5$
$y = -4$

(a) Work out the value of T.

.....

(2)

$W = c^3$

$c = -2$

(b) Work out the value of W.

.....

(1)

$s = \frac{1}{2}at^2$

$a = 9.8$

$t = 6$

(c) Work out the value of s.

.....

(2)

(Total for Question 8 is 5 marks)

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9 The value of x is greater than 12

(a) Write down an inequality for x.

.....

(1)

The value of y is less than or equal to 20

(b) Write down an inequality for y.

.....

(1)

(Total for Question 9 is 2 marks)

10 Here is a cylinder.

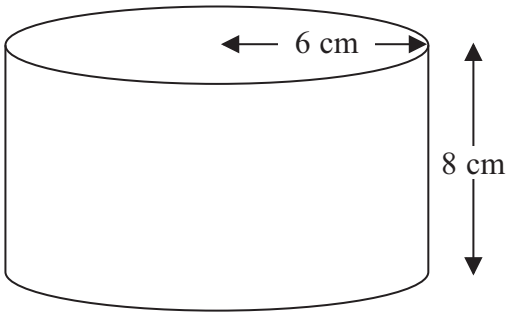


Diagram **NOT** accurately drawn

The formula to find the volume, V, of a cylinder is $V = \pi r^2 h$

The radius, r, of the cylinder is 6 cm.
The height, h, of the cylinder is 8 cm.

(a) Work out the volume of the cylinder.
Give your answer correct to 3 significant figures.

.....cm^3

(2)

(b) Work out the area of the curved surface of the cylinder.
Give your answer correct to 3 significant figures.

.....

(4)

(Total for Question 10 is 6 marks)

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11 Here is a right-angled triangle.

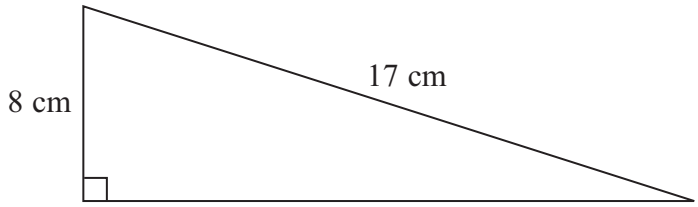


Diagram **NOT** accurately drawn

Work out the area of the triangle.

.....cm^2

(Total for Question 11 is 4 marks)

12 A number is decreased by 15%.
The result is 323

What was the original number?

.....

(Total for Question 12 is 3 marks)

13

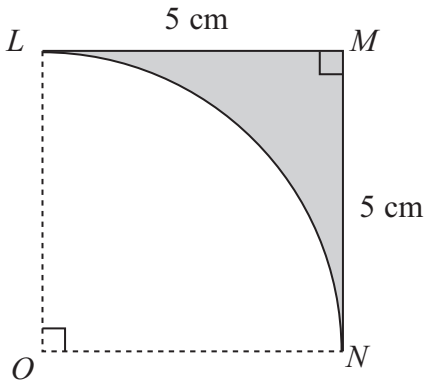


Diagram **NOT** accurately drawn

The arc LN is a quarter of a circle of radius 5 cm, centre O.

Find the perimeter of the shaded shape.
Give your answer correct to 2 decimal places.

.....cm

(Total for Question 13 is 3 marks)

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14 (a) Work out $\sqrt{1 - 0.45^2}$

Give your answer as a decimal correct to 3 decimal places.

.....

(2)

(b) Find the value of $(5.0625)^{\frac{1}{4}}$

.....

(1)

(Total for Question 14 is 3 marks)

15 Here is a right-angled triangle.

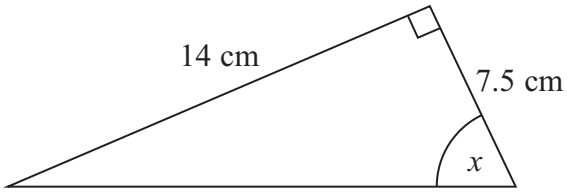


Diagram **NOT** accurately drawn

Work out the size of the angle marked x.
Give your answer to the nearest degree.

.....°

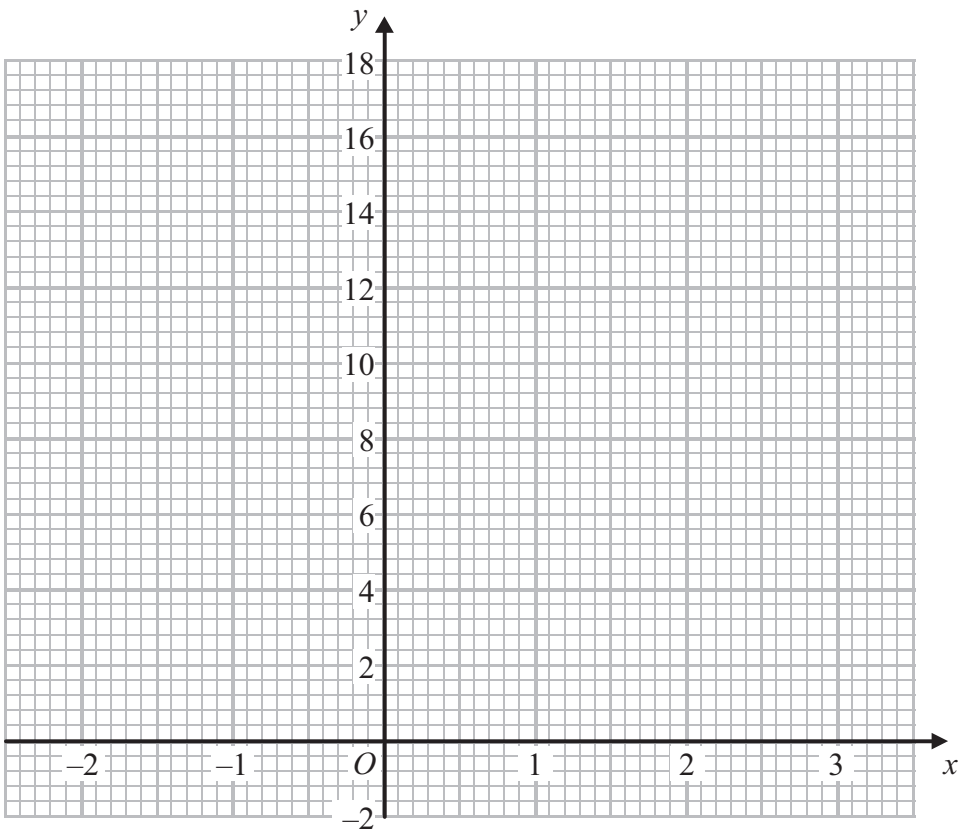
(Total for Question 15 is 3 marks)

16 (a) Complete this table of values for $y = 2x^2 - x$

x	–2	–1	0	1	2	3
y		3	0		6	

(2)

(b) On the grid, draw the graph of $y = 2x^2 - x$ for values of x from −2 to 3



(2)

(c) Solve the equation $2x^2 - x - 3 = 0$

.....

(2)

(Total for Question 16 is 6 marks)

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17 Solve the simultaneous equations.
You must show all your working.

$$3x + 2y = 9$$
$$2x - 3y = 19$$

x = ...

y = ...

(Total for Question 17 is 4 marks)

18 T is directly proportional to d.

When $d = 6$, $T = 27$

Work out the value of d when $T = 11.25$

.....

(Total for Question 18 is 3 marks)

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19 Jenny invested £10 000 at a compound interest rate of 3.5% per annum.
At the end of n years the value of this investment is £V.

(a) Work out the value of V when $n = 2$

$V =$ .....

(3)

(b) Write down a formula for V in terms of n.

.....

(2)

(c) Work out the least value of n when the value of V is greater than 15 000

.....

(2)

(Total for Question 19 is 7 marks)

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***20** $x = 0.0\dot{1}\dot{5}$

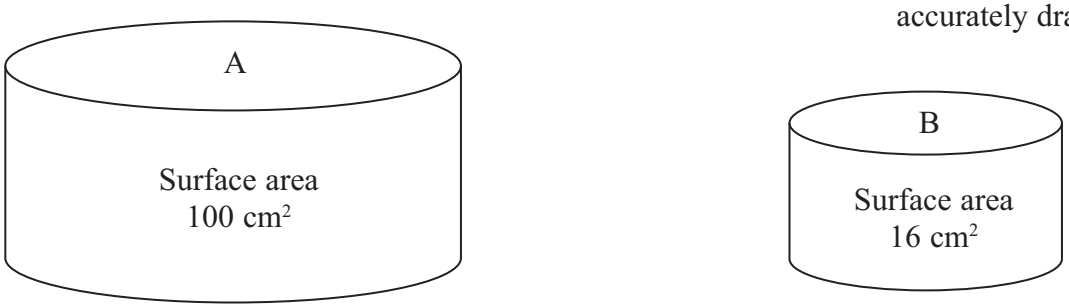
Prove algebraically that x can be written as $\frac{1}{66}$

(Total for Question 20 is 3 marks)

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21 The diagram shows two similar solid cylinders made from the same metal.

Diagram **NOT** accurately drawn



The surface area of A = 100 cm²
The surface area of B = 16 cm²

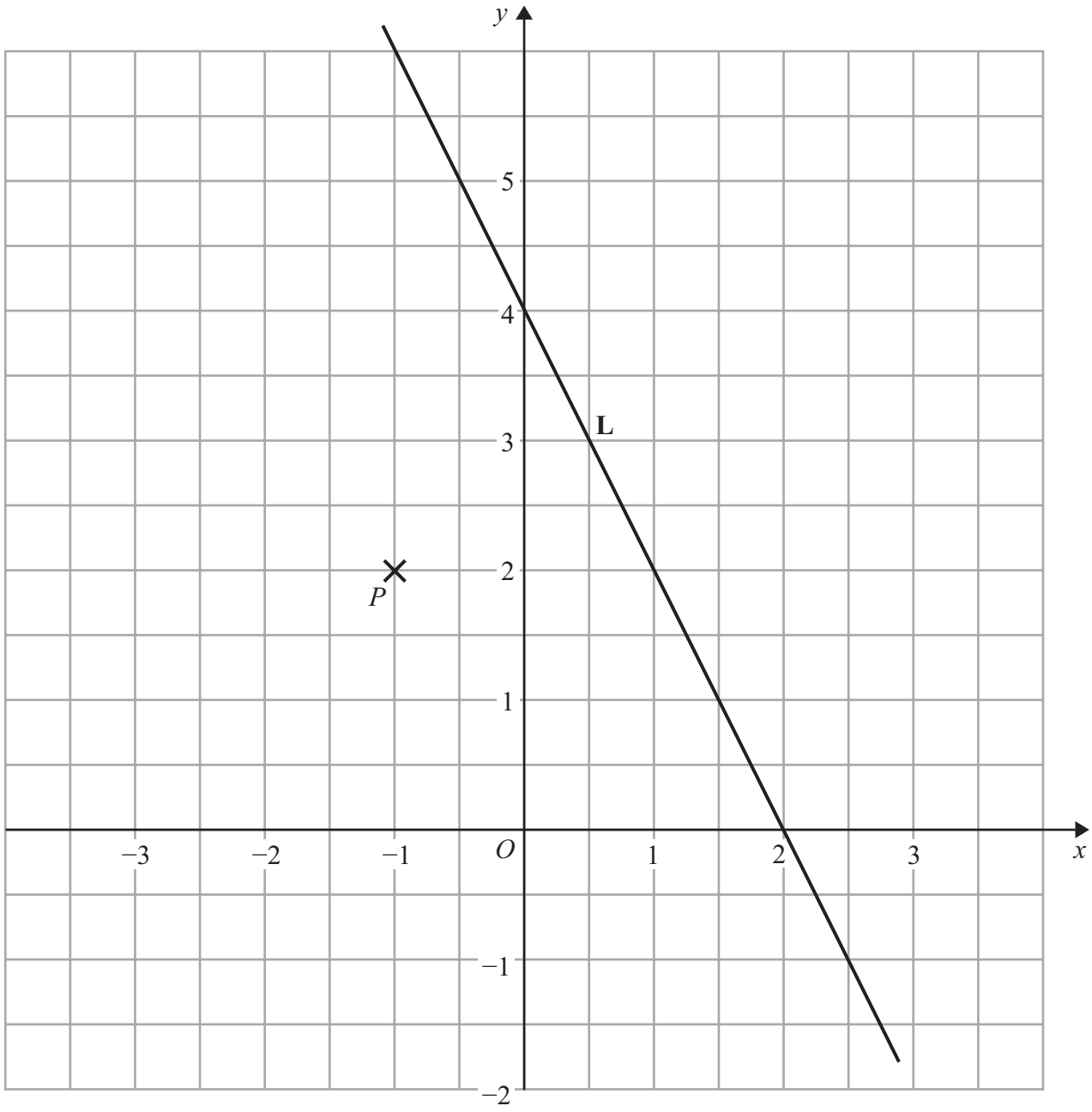
The mass of B is 1.2 kg.

Work out the mass of A.

.....kg

(Total for Question 21 is 4 marks)

22 The straight line **L** is drawn on the grid.



(a) Find an equation of **L**.

.....

(3)

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P is the point with coordinates $(-1, 2)$.

(b) (i) Find an equation of the straight line that is parallel to **L** and passes through P.

.....

(ii) Find an equation of the straight line that is perpendicular to **L** and passes through P.

.....

(4)

(Total for Question 22 is 7 marks)

***23** Prove algebraically that the product of two odd numbers is **always** an odd number.

(Total for Question 23 is 3 marks)

Turn over for Question 24

24 *ABC* is an isosceles triangle.

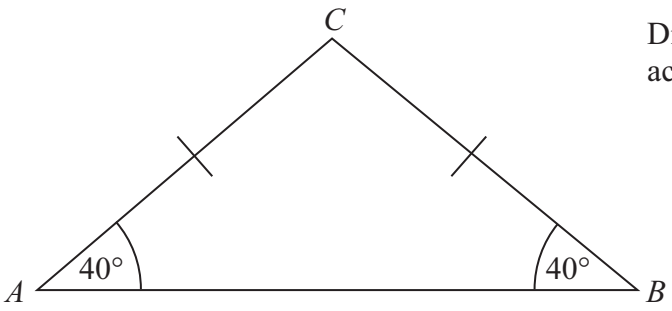


Diagram **NOT** accurately drawn

The area of this isosceles triangle is 25 cm^2.

Work out the length of each side of the triangle.
Give your answers correct to 3 significant figures.

.....

(Total for Question 24 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

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edexcel

Mark Scheme (Results)

Summer 2013

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

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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

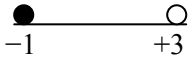
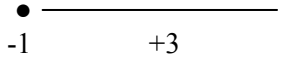
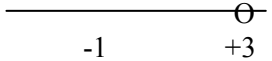
Unless otherwise stated, when an answer is given as a range (e.g 3.5 – 4.2) then this is inclusive of the end points (e.g 3.5, 4.2) and includes all numbers within the range (e.g 4, 4.1)

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: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1			62	3	M1 for correct area of one face eg 5 × 3 or 5 × 2 or 2 × 3 M1 for correct method to find the sum of the correct areas of at least 5 faces A1 cao **NB**: Any attempt to find volume gets no marks
2			17.40	2	M1 for 11.60 ÷ 8 (= 1.45) × 12 oe A1 for 17.40 (accept 17.4)
3	(a)		7.5	2	M1 for 5 + 5÷2 or 5 × 1.5 oe A1 for 7.5 oe
	(b)		280	3	M1 for $\frac{1}{8}$ × 320 oe (= 40) M1 for 320 – '40' A1 cao OR M1 for $1-\frac{1}{8}$ or $\frac{7}{8}$ oe M1 for 320 ÷ 8 × 7 oe A1 cao

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4	(a)		7 : 3	2	M1 for 14 : 6 oe A1 for 7 : 3 **[SC**: B1 for 3 : 7 if M0 scored]
	(b)		2	3	M1 for $(20 - 5) \div (4 + 1)$ (= 3) M1(dep) for $4 \times$ "3" A1 cao
*5		Angle $BAC = 76$ Angle BAP $= 180 - 90 - 54$ $= 36$ $x = 76 - 36$ OR Angle $QCD = 54$ Angle ACP $= 180 - 76 - 54$ $= 50$ $x = 180 - 90 - 50$	40^o	4	B1 for angle $BAC = 76$ (could be just on the diagram) M1 for $76 -$ "$(180 - 90 - 54)$" A1 for $x = 40^o$ (explicitly stated) C1 for 'the sum of the angles of a triangle is 180^o' **and** 'alternate angles on parallel lines are equal' **OR** B1 for angle $QCD = 54$ (could be just on the diagram) M1 for $180 - 90 -$ "$(180 - 76 - 54)$" A1 for $x = 40^o$ (explicitly stated) C1 for 'corresponding angles on parallel lines are equal' **and** 'sum of the angles on a straight line is 180^o' **and** 'the sum of the angles of a triangle is 180^o' OR 'corresponding angles on parallel lines are equal' **and** 'exterior angle of a triangle is equal to the sum of the two interior opposite angles'

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
*5 (con)					**OR** M1 for angle QCB = 180 – 54 (=126) M1 for 180 – 90 – "126 – 76" A1 for $x = 40^o$ (explicitly stated) C1 for sum of 'allied angle = 180' **and** 'the sum of the angles of a triangle is 180

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		$x > -3$	1	
	(b)			2	M1 for:  Accept this line drawn with any length OR  Accept this line drawn with any length OR Accept this line drawn with any circles OR  A1 for a fully correct diagram
	(c)	$2p > 11 - 3$ $2p > 8$	$p > 4$	2	M1 for a clear intention to subtract 3 from both sides (in an inequality) or to divide all terms by 2 (in an inequality) A1 for $p > 4$ [**SC**: B1 for $p = 4$ if M0 scored]

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)		Proof	2	M1 for $x + x + 3 + x + x + 3$ A1 for explicitly stating $D = 4x + 6$
	(b)		$x = \frac{D-6}{4}$	2	M1 for $4x = D - 6$ (a clear intention to subtract 6 from both sides) or for $\frac{D}{4} = \frac{4x}{4} + \frac{6}{4}$ (a clear intention to divide all terms by 4) A1 for $x = \frac{D-6}{4}$ oe [**SC:** B1 for $x = D - 6 \div 4$ if M0 scored]
8	(a)		23	2	M1 for $3 \times 5 - 2 \times -4$ oe A1 cao
	(b)		−8	1	B1 cao
	(c)		176.4	2	M1 for squaring the 6 first then multiplying by ½ × 9.8 oe A1 cao

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9	(a)		$x > 12$	1	B1 for $x > 12$ or $12 < x$
	(b)		$y \leq 20$	1	B1 for $y \leq 20$ or $20 \geq y$
10	(a)	$\pi \times 6^2 \times 8$	905	2	M1 for $\pi \times 6^2 \times 8$ A1 for an answer in the range 904 to 905.2
	(b)	$2 \times \pi \times 6 \times 8$	302 cm^2	4	M1 for $2 \times \pi \times 6$ oe M1 for "$2 \times \pi \times 6$" $\times 8$ A1 for an answer in the range 301 to 302 B1 (indep) for cm^2

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11			60	4	M1 for 8^2 + base^2 = 17^2 oe or $17^2 - 8^2$ oe M1 for $\sqrt{(17^2 - 8^2)}$ oe M1 (indep) for their base × 8 ÷ 2 oe A1 cao **OR** M1 for cos "x" = 8/17 M1 for inv cos 8/17 (=61.9…) M1 for ½ ×8 × 17 × sin '61.9…' A1 cao
12			380	3	M1 for 1 – 0.15 (= 0.85) or 100 – 15 (= 85) M1 for 323 ÷ 0.85 oe or 323 ÷ 85 × 100 oe A1 cao **[SC:** B2 for 280.8 – 281 if M0 scored]
13		(π × 10)÷ 4 = 7.854 7.854 + 5 + 5	17.85	3	M1 for π × 10 (= 31.4) M1(dep) for "π × 10" ÷ 4 oe (= 7.854) A1 for an answer in the range 17.85 to 17.86 **[SC:** B1 for 13.9 … if M0 scored]

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14	(a)	$1 - 0.45^2 = 1 - 0.2025$ $= 0.7975$ $\sqrt{0.7975}$	0.893	2	B2 for 0.893(028555….) [B1 for 0.9 or 0.89 or 0.7975 seen]
	(b)		1.5	1	B1 for 1.5 oe
15		$\tan x = 14 \div 7.5$ $= 1.86666…$ $\tan^{-1} 1.8666…$	62	3	M1 for $\tan x = 14 \div 7.5$ (= 1.86666…) M1 for $\tan^{-1}(14 \div 7.5)$ A1 for answer in the range 61.7 to 62

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16	(a)		-2 -1 0 1 2 3 **10** 3 0 **1** 6 **15**	2	B2 for a fully correct table (B1 for 2 correct y-values)
	(b)		Quadratic graph (overlay)	2	M1 ft for plotting at least 5 of their points correctly A1 for the correct graph
	(c)	Line $y = 3$ drawn OR $(2x – 3)(x + 1) = 0$	$x = -1$ and 1.5	2	M1 for drawing of $y = 3$ or indication of points on "graph" at $y = 3$ A1 for $x = -1$ and 1.5 or ft the readings from their graph at $y = 3$ **OR** M1 for $(2x – 3)(x + 1)$ $(= 0)$ A1 for $x = -1$ and 1.5 **OR** M1 for correct substitution into the quadratic formula A1 for $x = -1$ and 1.5

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$9x + 6y = 27$ $\underline{4x - 6y = 38}$ $13x = 65, x = 5$ $15 + 2y = 9, y = -3$ **OR** $6x + 4y = 18$ $\underline{6x - 9y = 57}$ $13y = -39, y = -3$ $3x - 6 = 9, \quad x = 5$	$x = 5, y = -3$	4	M1 for full method to eliminate x or y, allow one arithmetic error A1 for either $x = 5$ or $y = -3$ M1 (dep) for substitution of one variable into one of the equations, or by appropriate method after starting again A1 cao for $x = 5$ and $y = -3$ **OR** M1 for full method to make x or y the subject in one of the equations A1 for a correct rearrangement M1 (dep) for substitution of this variable into the other equation A1 cao for $x = 5$ and $y = -3$
18		$T = kd$ $27 = 6k, \quad k = 4.5$ $d = 11.25 \div 4.5$ **OR** $11.25 \div 27 = 0.4166\ldots$ $0.4166\ldots \times 6$	2.5	3	M1 $T = kd$ M1 for correct method to find k eg $27 = 6k$ A1 cao **OR** M1 for $27 \div 6$ oe $(= 4.5)$ or $11.25 \div 27$ oe $(= 0.4166\ldots)$ M1 for a complete correct method A1 cao

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
19	(a)	$10\,000 \times 1.035^2$	10 712.25	3	M2 for $10\,000 \times 1.035^2$ [M1 for $10\,000 \times 0.035$ (= 350) or $10\,000 \times 1.035$ (= 10350)] A1 cao
	(b)		$V = 10\,000 \times 1.035^n$	2	B2 for $V = 10\,000 \times 1.035^n$ [B1 for $10\,000 \times 1.035^n$ or $V = 10\,000 \times 1.035$]
	(c)	$10\,000 \times 1.035 \times 1.035 \times 1.035 \times 1.035$ …….. OR $1.035 = \sqrt[n]{1.5}$	12	2	M1 for $10\,000 \times 1.035^n$ where $n \geq 3$ A1 cao OR M1 for $1.035 = \sqrt[n]{1.5}$ A1 cao
*20		$x = 0.0151515...$ $1000x = 15.151515...$ $10x = 0.151515….$ $990x = 15$ $x = \frac{15}{990} = \frac{1}{66}$ **OR** $100x = 1.51515...$ $x = 0.01515...99x = 1.5$ $x = \frac{1.5}{99}$ $= \frac{15}{990} = \frac{1}{66}$	Proof	3	M1 for ($x =$) 0.0151515(...) or $1000x = 15.151515(…)$ or $100x = 1.51515(...)$ or $10x = 0.151515(…)$ M1 for two recurring decimals the difference of which is a rational number C1 (dep on M2 scored) for completing the proof by subtracting and cancelling to give a correct fraction

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
21		$\sqrt{100}:\sqrt{16} = 10 : 4$ $= 5 : 2$ (or sf = 2.5) 1.2×2.5^3	18.75	4	M1 for a correct method to find a linear scale factor M1(dep) for a correct method to find the volume s.f. from their linear s.f. M1(dep) for $1.2 \times$ '2.5'^{3} oe A1 for 18.75
22	(a)	$m = \frac{-4}{2} = -2$ $c = 4$	$y = -2x + 4$	3	M1 for a correct method to find the gradient M1 for $c = 4$ or $m = -2$ A1 for $y = -2x + 4$ oe
	(b)(i)	Gradient = −2 $2 = -2 \times -1 + c$, $c = 0$	$y = -2x$	4	M1ft for showing (or stating) that the gradient is −2 A1ft for $y = -2x$ oe
	(ii)	Gradient = 0.5 $2 = 0.5 \times -1 + c$, $c = 2.5$	$y = 0.5x + 2.5$		M1ft for showing (or stating) that the gradient is 0.5 A1 for $y = 0.5x + 2.5$ oe
*23		$(2n + 1)(2m + 1)$ $= 4nm + 2n + 2m + 1$ $= 2(2nm + n + m) + 1$	Proof	3	M1 for $2n + 1$ oe used to describe an odd number A1 for product = $4nm + 2n + 2m + 1$ where n is not the same as m C1 (dep on M1) for stating that $2 \times$ '$(2nm + n + m)$' is even since it is a multiple of 2 so adding 1 gives an odd number

Paper: 5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
24		½×AC×BC sin100 = 25 AC (or BC) = $\sqrt{\frac{25\times 2}{\sin 100}}$ = 7.125... $AB^2 = 7.125^2 + 7.125^2$ $- 2 \times 7.125^2 \times \cos 100$ = 101.53 −101.53 × cos 100 = 119.16… OR cos 40 = ½ AB/7.13 AB = 2 × 7.13 cos 40° OR ½ AB h = 25, h = 50/AB tan 40 = h ÷ ½AB = 2h ÷ AB = 100/ AB^2 AB = √(100 ÷ tan 40) = 10.916.. AC = 10.916 ÷ 2cos 40	AC = 7.13 cm, BC = 7.13 cm, AB = 10.9 cm	6	**Find *AC* or *BC* :** M1 for a correct statement to find AC or BC using 25 and 40° (or 100°) M1 for a complete correct method to find AC or BC A1 for AC or BC in the range 7.12 – 7.13 **Then find *AB* :** M1 (dep on M2) for a correct statement to find AB using the sine rule or the cosine rule or ½ AB using '7.125' and 40° M1 for a complete correct method to find AB or ½ AB A1 for AB in the range 10.9 – 10.95

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: 5MM2H_01			
Question		**Modification**	**Notes**
Q1		Model and diagram are provided.	Standard mark scheme.
Q6		2 cm gap between numbers. Small vertical lines have been extended above the number line.	Standard mark scheme.

PAPER: 5MM2H_01			
Question		**Modification**	**Notes**
Q7		MLP: x changed to y	M1 for $y + y + 3 + y + y + 3$ A1 for explicitly stating $D = 4y + 6$
			M1 for $4y = D - 6$ (a clear intention to subtract 6 from both sides) or for $\frac{D}{4} = \frac{4y}{4} + \frac{6}{4}$ (a clear intention to divide all terms by 4) A1 for $y = \frac{D-6}{4}$ oe [**SC:** B1 for $y = D - 6 \div 4$ if M0 scored]
Q10		Model and diagram are provided.	Standard mark scheme.
Q16		x axis 1.5 cm for 0.5, y axis 1.5cm for 1	Standard mark scheme.
Q21		2 models as well as a diagram are provided.	Standard mark scheme.
Q22		2 cm grid.	Standard mark scheme.

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Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Tuesday 13 November 2012 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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 ▶

P40679A

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6/6/7/3/

P 4 0 6 7 9 A 0 1 2 4

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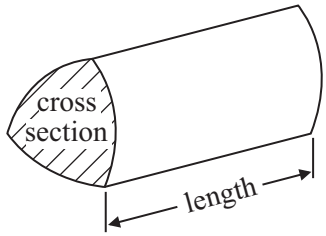
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GCSE Mathematics 2MM01

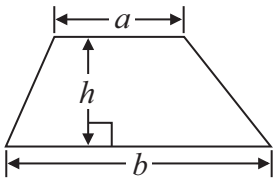
Formulae: Higher Tier

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

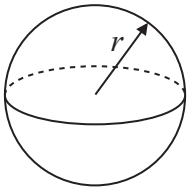


Area of trapezium = $\frac{1}{2}(a + b)h$



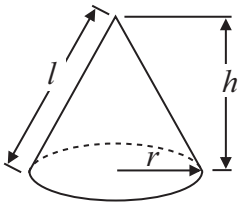
Volume of sphere = $\frac{4}{3}\pi r^3$

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

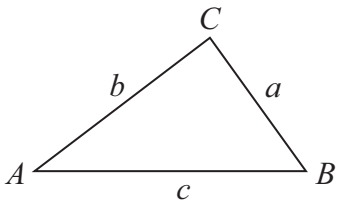


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

1 5 pencils cost £1.85

Work out the cost of 9 of these pencils.

£.....

(Total for Question 1 is 2 marks)

2 Use your calculator to work out the value of $\dfrac{3.89 \times 3.4}{7.463 - 2.85}$

Write down all the figures on your calculator display.

.....

(Total for Question 2 is 2 marks)

3 There are 30 buttons in a box.
12 of the buttons are black.
The rest of the buttons are white.

(a) Write down the ratio of the number of black buttons to the number of white buttons.
Give your ratio in its simplest form.

.....

(2)

James takes some black buttons from the box.
The ratio of the number of black buttons in the box to the number of white buttons in the box is now 1 : 2

(b) How many black buttons did James take from the box?

.....

(3)

(Total for Question 3 is 5 marks)

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***4**

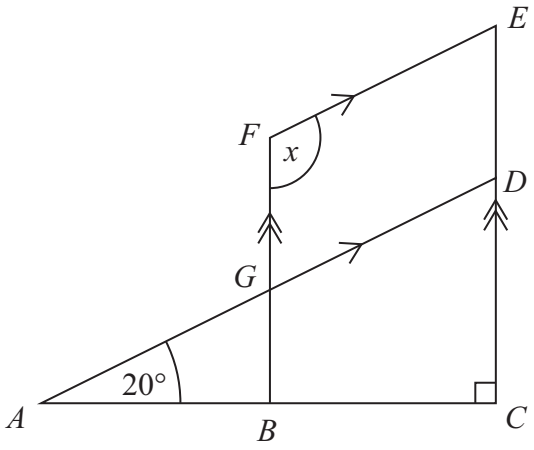


Diagram **NOT** accurately drawn

ABC is a straight line.
BGF is parallel to *CDE*.
AGD is parallel to *FE*.

Angle *CAD* = 20°
Angle *ACD* = 90°

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

(Total for Question 4 is 4 marks)

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5 A solid cube has a surface area of 150 cm^2.

Work out the volume of the cube.

.....cm^3

(Total for Question 5 is 3 marks)

***6** A regular 5-sided polygon does **not** tessellate.

Explain why.

(Total for Question 6 is 3 marks)

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7 (a) Work out the value of $4x^3$ when $x = 2$

.....

(1)

(b) Make c the subject of the formula $a = b + 5c$

$c =$.....

(2)

(Total for Question 7 is 3 marks)

8 (a) Decrease 80 by 27%

.....

(3)

(b) Express 84 as a percentage of 240

..... %

(2)

(Total for Question 8 is 5 marks)

9

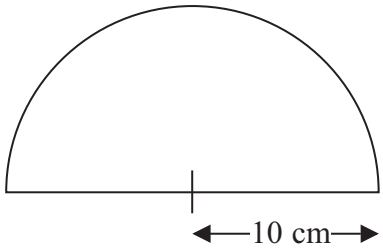


Diagram **NOT** accurately drawn

The diagram shows a semi-circle.
The radius of the semi-circle is 10 cm.

(a) Work out the area of the semi-circle.
Give your answer correct to 3 significant figures.

..... cm^2

(2)

(b) Work out the perimeter of the semi-circle.
Give your answer correct to 3 significant figures.

..... cm

(3)

(Total for Question 9 is 5 marks)

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10 Share 240 in the ratio 2 : 3 : 5

.....

(Total for Question 10 is 3 marks)

11 $-2 < n \leqslant 3$
n is an integer.

(a) Write down all the possible values of n.

.....

(2)

x is a number.
Another number is 9 greater than x.
Both numbers are whole numbers.

The total of the two numbers is less than 60

(b) Find the greatest possible value of x.

.....

(3)

(Total for Question 11 is 5 marks)

12 There are some counters in a bag.
The counters are green or blue or red.

25% of the counters are green.

$\frac{3}{5}$ of the counters are blue.

12 of the counters are red.

Work out the total number of counters in the bag.

.....

(Total for Question 12 is 4 marks)

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13

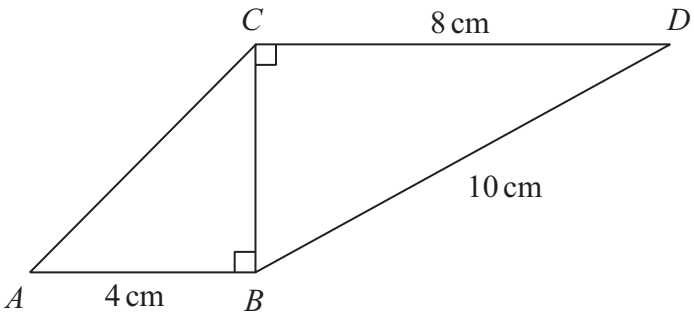


Diagram **NOT** accurately drawn

ABC and *BCD* are right-angled triangles.

AB = 4 cm.
BD = 10 cm.
CD = 8 cm.

Work out the length of *AC*.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 13 is 4 marks)

14 Work out $(9.5 \times 10^9) \div (3.8 \times 10^3)$
Give your answer in standard form.

.....

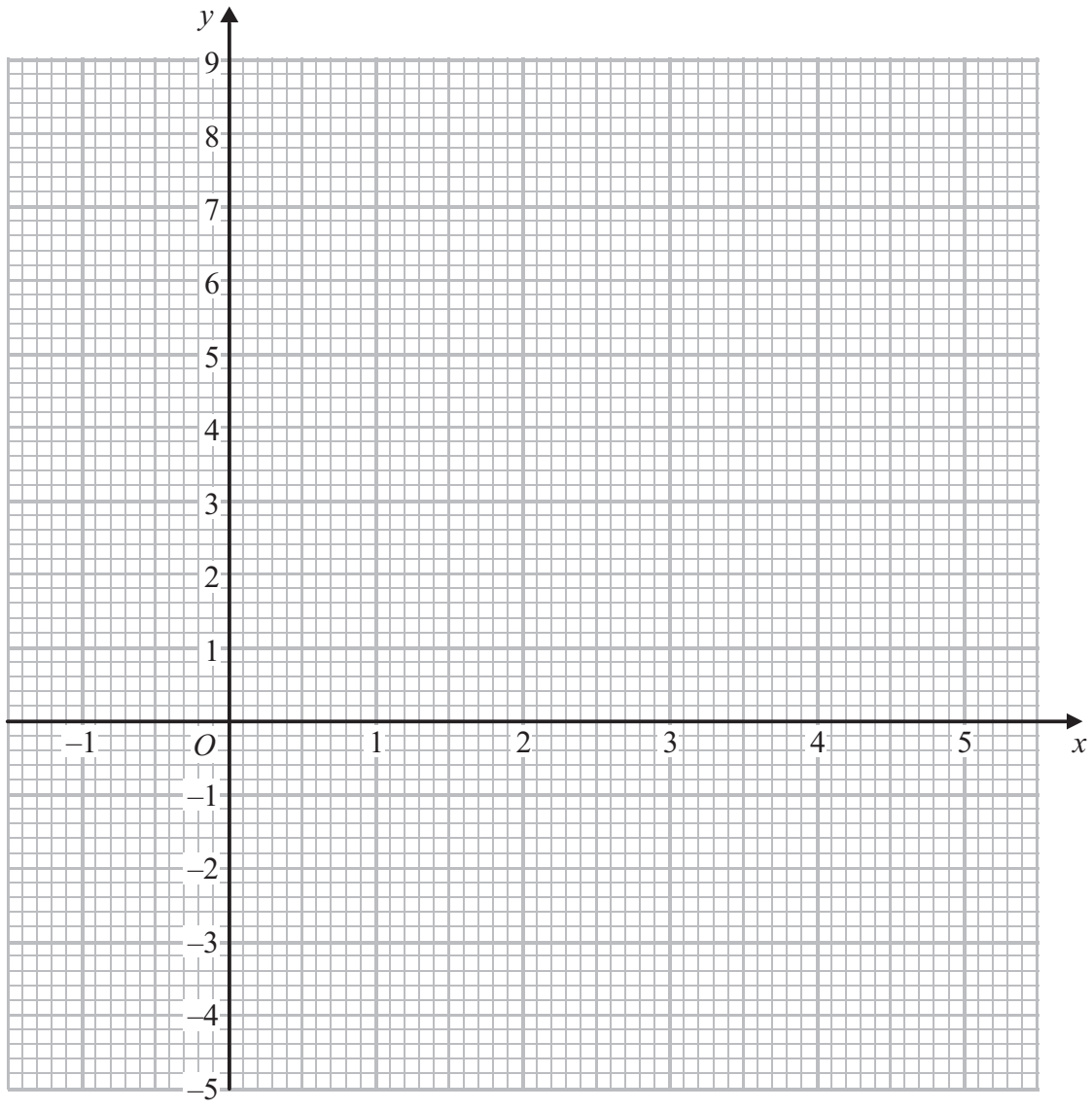
(Total for Question 14 is 2 marks)

15 (a) Complete the table of values for $y = x^2 - 3x - 2$

x	-1	0	1	2	3	4	5
y			-4		-2	2	

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 2$ for values of x from -1 to 5



(2)

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(c) Use your graph to find estimates of the values of x for which $x^2 - 3x - 2 = 0$

.....

(2)

(Total for Question 15 is 6 marks)

16 ABC is a triangle.

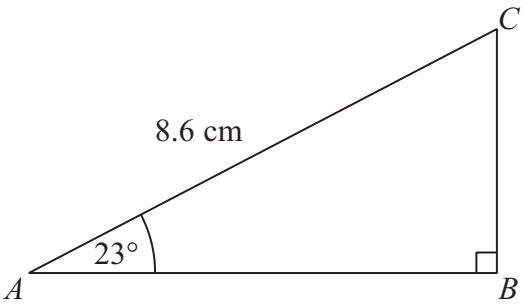


Diagram **NOT** accurately drawn

Angle $ABC = 90°$
Angle $CAB = 23°$
$AC = 8.6$ cm.

Work out the length of AB.
Give your answer correct to 3 significant figures.

.....cm

(Total for Question 16 is 3 marks)

17 A number is increased by 35%.
The result is 216

Work out the number.

.....

(Total for Question 17 is 3 marks)

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18 Solve the simultaneous equations

$$4x + 3y = -7$$
$$3x - 4y = 26$$

$x =$.....

$y =$.....

(Total for Question 18 is 4 marks)

19 The straight line **A** has equation $y = 3x - 2$

The straight line **B** is parallel to **A** and passes through the point (0, 4).

Write down an equation for line **B**.

.....

(Total for Question 19 is 2 marks)

20 Solve $3x^2 + 2x - 4 = 0$

Give your solutions correct to 3 significant figures.

.....

(Total for Question 20 is 3 marks)

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21 ABC is a triangle.

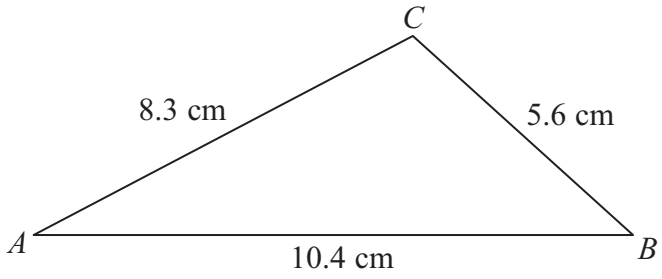


Diagram **NOT** accurately drawn

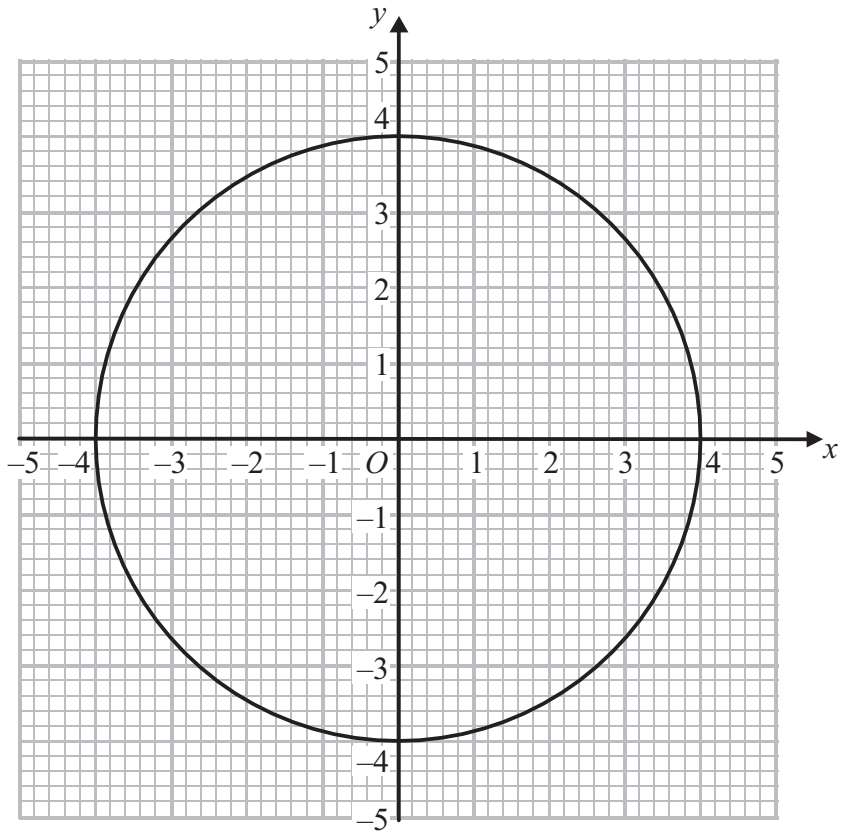
$AB = 10.4$ cm.
$AC = 8.3$ cm.
$BC = 5.6$ cm.

Calculate the area of the triangle.
Give your answer correct to 3 significant figures.

.....cm^2

(Total for Question 21 is 5 marks)

22



The diagram shows a circle of radius 4 cm, centre (0, 0).

By drawing a suitable straight line on the diagram, find estimates for the solutions of

$$x^2 + y^2 = 16$$

$$x + y = 2$$

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

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

(Total for Question 22 is 3 marks)

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23

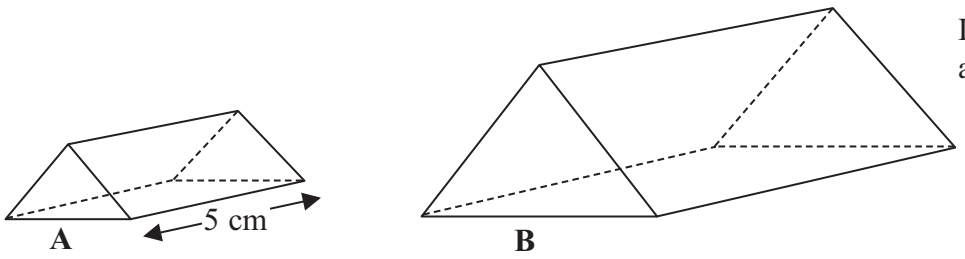


Diagram **NOT** accurately drawn

Prism **A** and prism **B** are mathematically similar.

Prism **A** has a total surface area of 104 cm^2.
Prism **B** has a total surface area of 936 cm^2.

Prism **A** has a length of 5 cm.

(a) Work out the length of prism **B**.

.....cm

(3)

Prism **B** has a volume of 1620 cm^3.

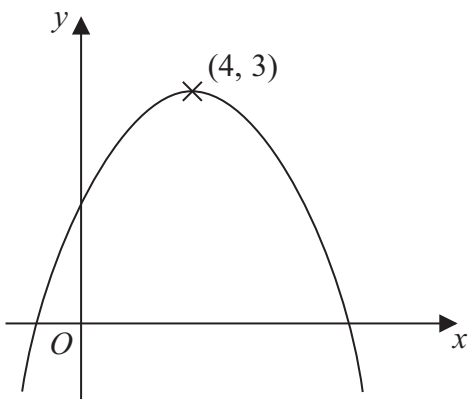
(b) Work out the volume of prism **A**.

.....cm^3

(2)

(Total for Question 23 is 5 marks)

24



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the maximum point of the curve are (4, 3).

Write down the coordinates of the maximum point of the curve with equation

(a) $y = f(x) + 5$

(.....,.....)
(1)

(b) $y = 2f(x)$

(.....,.....)
(1)

(c) $y = f(4x)$

(.....,.....)
(1)

(Total for Question 24 is 3 marks)

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25 The diagram shows a pyramid with base ABC.

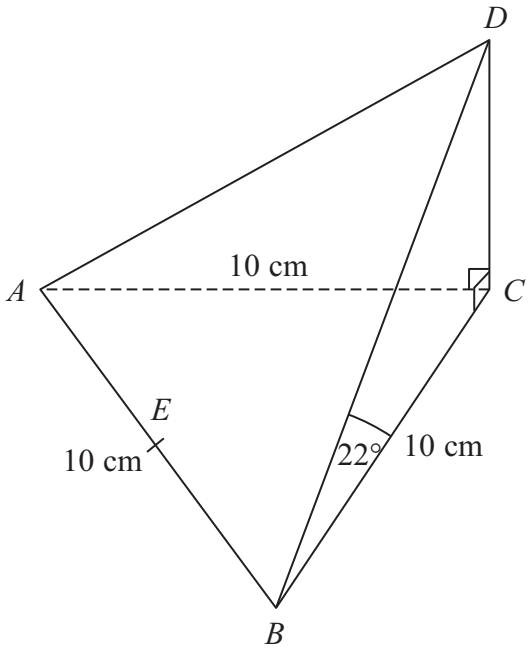


Diagram **NOT** accurately drawn

CD is perpendicular to both CA and CB.
Angle $CBD = 22°$
$AB = AC = BC = 10$ cm.
E is the midpoint of AB.

Calculate the size of the angle between the line ED and the plane ABC.
Give your answer correct to the nearest degree.

.....°

(Total for Question 25 is 5 marks)

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26 Make r the subject of the formula $p = \dfrac{2r + 5}{r - 3}$

$r =$ .....

(Total for Question 26 is 4 marks)

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27 The diagram shows a hemisphere on top of a cone.

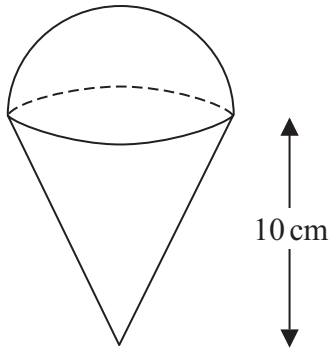


Diagram **NOT** accurately drawn

The radius of the hemisphere is equal to the radius of the cone.
The height of the cone is 10 cm.

The volume of the hemisphere is 400 cm^3.

Work out the volume of the cone.
Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 27 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 (Calculator) Paper 2H

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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

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		$1.85 \div 5 \times 9 =$	3.33	2	M1 for $1.85 \div 5$ or 1.85×9 or 0.37 seen or 16.65 seen or 333 seen A1 cao **NB**: Working can be in £ or pence
2		$= \frac{13.226}{4.613}$ = 2.867114676...	2.86711	2	B2 for 2.86711(…) (B1 for 13.226 or 4.613 seen or 2.87 or 2.867 or 2.8671)
3	(a)	30 – 12 = 18 12 : 18 = 2 : 3	2 : 3	2	M1 for 12 : "30 – 12" oe eg 12 : 18 eg 6 : 9 eg 4 : 6 or 3 : 2 A1 cao
	(b)	18 ÷ 2 = 9 12 – 9 = 3	3	3	M1 for "(30 – 12)" ÷ 2 or 9 seen M1(dep) for 12 – "9" A1 cao

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4*			110 with reasons	4	M1 for 180 – 90 – 20 or an angle correctly identified as 70 (could be on the diagram) M1 for an angle correctly identified as 180 – 70 oe (could be on the diagram) C2 for 110 and all reasons clearly given eg *ABG* = 90 corresponding angles are equal *AGB* = 180 – 90 – 20 = 70 angles in a triangle add to 180 *BGD* = 180 – 70 = 110 angles on a straight line add to 180 *x* = *BGD* = 110 corresponding angles are equal **OR** *ABG* = 90 corresponding angles are equal *AGB* = 180 – 90 – 20 = 70 angles in a triangle add to 180 *FGD* = 70 vertically opposite angles equal *x* = 180 – 70 co-interior (or allied) angles add up to 180 **OR** *ADC* = 180 – 90 – 20 = 70 angles in a triangle add to 180 *FGD* = 70 alternate angles equal *x* = 180 – 70 co-interior (or allied) angles add up to 180 (C1 for one appropriate reason for candidate's working) **QWC**: Reasons written out clearly with correct geometrical language used

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5		$150 \div 6 = 25$ $\sqrt{"25"} = 5$ $5 \times 5 \times 5 =$	125	3	M1 for $150 \div 6$ (= 25) or area of 25 (may be seen on one face of a cube) or side lengths of 5 (may be marked on a diagram) M1 for $\sqrt{"25"} \times \sqrt{"25"} \times \sqrt{"25"}$ A1 cao
6*			108 and explanation	3	M1 for $360 \div 5$ (= 72) or 3×180 (= 540) A1 for 108 C1 for explanation e.g. 108 is not a factor of 360 or diagram drawn with sizes of angles shown and explanation of why they won't fit e.g. $360 \div 108$ is not a whole number **S.C.** B1 for 3 pentagons drawn at a point with a gap identified **QWC**: Explanation should be clear with working clearly presented
7	(a)	$4 \times 2 \times 2 \times 2 = 32$	32	1	B1 cao
	(b)	$a - b = 5c$ $\frac{a-b}{5} = c$	$c = \frac{a-b}{5}$	2	M1 for an intention to subtract b from both sides as a first step or divide all terms by 5 as a first step A1 for $\frac{a-b}{5}$ oe **SC:** B1 for $a - b \div 5$

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8	(a)	$\frac{27}{100} \times 80 = 21.6$ $80 - 21.6 =$ **OR** $0.73 \times 80 =$	58.4	3	M1 for $\frac{27}{100} \times 80$ oe or 21.6 seen M1(dep) for $80 -$ "21.6" A1 cao **OR** M1 for $100 - 27$ or 73 seen M1 for $\frac{"73"}{100} \times 80$ oe A1 cao
	(b)	$\frac{84}{240} \times 100 =$	35	2	M1 for $\frac{84}{240} \times 100$ oe A1 cao
9	(a)	$\pi \times 10^2 \div 2$	157	2	M1 for $\pi \times 10^2 \div 2$ A1 for 157 – 157.1
	(b)	$\pi \times 20 \div 2 + 20 =$	51.4	3	M1 for $2 \times \pi \times 10$ or $\pi \times 20$ or 62.8 – 62.9 seen M1 (dep) for $\pi \times 20 \div 2 + 20$ or $\pi \times 20 \div 2$ or $\pi \times 20 + 20$ or 31.4 – 31.5 seen for arc length A1 for 51.4 – 51.5

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
10		240 ÷ (2 + 3 + 5) = 24 24 × 2 = 24 × 3 = 24 × 5 =	48, 72, 120	3	M1 for 240 ÷ (2 + 3 + 5) M1 for "24" × 2 or "24" × 3 or "24" × 5 A1 for 48, 72 and 120 identified
11	(a)		–1, 0, 1, 2, 3	2	B2 for all 5 values and no extras (ignore repeats) (B1 for 4 correct values and no extras or all 5 correct values and one incorrect value)
	(b)	$x + x + 9 < 60$ $2x < 51$ $x < 25.5$ **OR** 60 ÷ 2 = 30 9 ÷ 2 = 4.5 30 – 4.5 25.5 **OR** 60 – 9 = 51 51 ÷ 2 = 25.5 **OR** 25 + 34 = 59 26 + 35 = 61	25	3	M1 for $x + x + 9$ oe A2 cao (A1 for 25.5 seen) **OR** M1 for 60 ÷ 2 (= 30) **and** 9 ÷ 2 (= 4.5) A2 cao (A1 for 25.5 seen) **OR** M1 for 60 – 9 (= 51) **and** "51" ÷ 2 (= 25.5) A2 cao (A1 for 25.5 seen) **OR** M1 for at least 2 trials with correct totals A2 cao (A1 for correct trials of 25 and 26)

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
12		**PERCENTAGES:** **B:** $\frac{3}{5} \times 100 = 60$ **G:** 25% **R:** 100 – 25 – 60 = 15 12 ÷ 15 ×100 = 80 **FRACTIONS:** **G:** 25% = $\frac{1}{4}$ **B:** $\frac{3}{5}$ **R:** $1 - \frac{1}{4} - \frac{3}{5} = \frac{3}{20}$ 12 ÷ 3 × 20 = 80 **DECIMALS:** **G:** 25% = 0.25 and **B:** $\frac{3}{5} = 0.6$ **R:** 1 – 0.25 – 0.6 = 0.15 12 ÷ 0.15 = 80	80	4	**PERCENTAGES:** M1 for $\frac{3}{5} \times 100$ oe or 60(%) seen M1 for recognising that 12 represents (100 – 25 – "60")% M1 for 12 ÷ "15" × 100 A1 cao **FRACTIONS:** M1 for 25% = $\frac{1}{4}$ **and** used with $\frac{3}{5}$ M1 for recognising that 12 represents $1 - \frac{1}{4} - \frac{3}{5}$ oe M1 for 12 ÷ "3" × "20" A1 cao **DECIMALS:** M1 for 25% = 0.25 **and** $\frac{3}{5} = 0.6$ M1 for recognising that 12 represents 1 – 0.25 – 0.6 M1 for 12 ÷ "0.15" A1 cao

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13		$10^2 - 8^2 = 36$ $\sqrt{36} = 6$ $4^2 + 6^2 = 52$ $\sqrt{52}$ =	7.21	4	M1 for $10^2 - 8^2$ or $8^2 + x^2 = 10^2$ M1 for $\sqrt{100-64}$ or $\sqrt{36}$ M1 for $4^2 +$ "6"^{2} A1 for 7.21(11025)
14			2.5×10^6	2	M1 for 2 500 000 oe eg 25×10^5 eg 0.25×10^7 or 2.5×10^n or $A \times 10^6$ where $1 \leq A < 10$ A1 cao
15	(a)		2, –2, –4, 8	2	B2 for all correct (B1 for 2 or 3 correct)
	(b)		Correct graph	2	B2 for fully correct graph **OR** M1 for 6 or 7 of their points plotted correctly A1 for correct curve
	(c)		3.6, –0.6	2	B1ft from graph for 3.6 ± 0.2 B1ft from graph for –0.6 ± 0.2 **SC:** B1ft from graph for (3.6, 0) **and** (–0.6 , 0)

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16		$AB = 8.6 \cos 23$ $= 8.6 \times 0.92050\ldots$ $= 7.916\ldots$	7.92	3	M1 for $\cos 23 = \frac{AB}{8.6}$ or $\sin(90 - 23) = \frac{AB}{8.6}$ oe M1(dep on M1) for $AB = 8.6 \cos 23$ or $AB = 8.6 \sin$ "67" or 7.9 seen A1 for 7.91 – 7.92 **SC:** Award B2 for an answer of $\pm 4.58 - \pm 4.59$ or $8.04 - 8.05$
17		$216 \div 1.35 =$	160	3	M2 for $216 \div 1.35 \times 100$ oe (M1 for sight of 1.35 or 135%) A1 cao
18		$12x + 9y = -21$ $12x - 16y = 104$ $25y = -125$ $y = -5$ $4x + 3 \times -5 = -7$ **OR** $16x + 12y = -28$ $9x - 12y = 78$ $25x = 50$ $x = 2$ $4 \times 2 + 3y = -7$	$x = 2$ $y = -5$	4	M1 for correct process to eliminate either x or y (condone one arithmetic error) A1 for either $x = 2$ or $y = -5$ M1 (dep on 1st M1) for correct substitution of their found value or (indep) for correct process to eliminate the other variable (condone one arithmetic error) A1 cao for both $x = 2$ and $y = -5$ **SC**: B1 for $x = 2$ or $y = -5$ if M0 scored
19			$y = 3x + 4$	2	B2 for $y = 3x + 4$ (B1 for $y = 3x + k, k \neq 4$ or $y = mx + 4, m \neq 0$ or 3 or for $3x + 4$)

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20		$x = \frac{-2 \pm \sqrt{2^2 - 4\times3\times-4}}{2\times3}$ $= \frac{-2 \pm \sqrt{4+48}}{6}$ $= \frac{-2 \pm \sqrt{52}}{6}$ $= 0.868517...,\quad -1.535183...$	0.869, –1.54	3	M1 for correct substitution into formula of 3, 2 and –4 (condone sign errors) M1 for reduction to $\frac{-2 \pm \sqrt{52}}{6}$ A1 for 0.86 to 0.87 **and** –1.53 to –1.54
21		$\cos A = \frac{8.3^2 + 10.4^2 - 5.6^2}{2\times8.3\times10.4}$ $= \frac{145.69}{172.64} = 0.84389\ldots$ $A = 32.446\ldots$ $\frac{1}{2}\times10.4\times8.3\times \sin 32.446...$ **OR** $\cos B = \frac{5.6^2 + 10.4^2 - 8.3^2}{2\times5.6\times10.4}$ $= \frac{70.63}{116.48} = 0.60637\ldots$ $B = 52.672\ldots$ $\frac{1}{2}\times5.6\times10.4\times \sin 56.672...$ **OR** $\cos C = \frac{8.3^2 + 5.6^2 - 10.4^2}{2\times8.3\times5.6}$ $= \frac{-7.91}{92.96} = -0.08509\ldots$ $C = 94.881\ldots$ $\frac{1}{2}\times8.3\times5.6\times \sin 94.881...$	23.2	5	M1 for correct substitution into cosine rule to find any angle M1 (dep) for correct order of evaluation to get to $\cos A = \frac{x}{y}$ where x and y are numbers A1 for 32.4 – 32.5 or 52.6 – 52.7 or 94.8 – 94.9 M1 (indep) for substitution of two sides and their included angle into $\frac{1}{2}ab\sin C$ A1 for 23.1 – 23.2

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22			3.6, –1.6 –1.6, 3.6	3	M1 for drawing $x + y = 2$ or any line with gradient -1 or any straight line passing through (0, 2) A2 for 2 correct solutions ± 0.2 (A1 for 1 correct solution ± 0.2 .)
23	(a)	$\sqrt{\frac{936}{104}} = 3$ $5 \times 3 = 15$	15	3	M1 for $936 \div 104$ or 9 or $104 \div 936$ M1 for $\sqrt{\frac{936}{104}}$ or $\sqrt{9}$ or 3 or $\sqrt{\frac{104}{936}}$ or $\sqrt{\frac{1}{9}}$ or $\frac{1}{3}$ A1 cao
	(b)	$1620 \div 3^3 = 60$	60	2	M1 for $(\text{“}3\text{”})^3$ or 27 or $(\text{“}\frac{1}{3}\text{”})^3$ or $\frac{1}{27}$ A1 cao
24	(a)		(4, 8)	1	B1 cao
	(b)		(4, 6)	1	B1 cao
	(c)		(1, 3)	1	B1 cao

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25		$\sqrt{10^2 - 5^2} = 8.660254...$ $\tan 22 = \frac{DC}{10}$ $DC = 10 \tan 22° = 4.040262..$ $\tan DEC = \frac{4.04}{8.66}$ **OR** $\sqrt{10^2 - 5^2} = 8.660254...$ $\cos 22 = \frac{10}{BD}$ $BD = \frac{10}{\cos 22} = 10.785\ldots$ $ED = \sqrt{10.785^2 - 5^2}$ $= 9.556$ $\cos DEC = \frac{8.66}{9.556}$	25	5	M1 for complete method to find CE, eg $\sqrt{10^2 - 5^2}$ (= 8.660254...) M1 for $\tan 22 = \frac{DC}{10}$ M1 for $(DC =)\ 10 \tan 22°$ (= 4.04…) M1 for $\tan DEC = \frac{"4.04"}{"8.66"}$ A1 for 25 – 25.02 **OR** M1 for complete method to find CE, eg $\sqrt{10^2 - 5^2}$ (= 8.660254...) M1 for $(BD$ or $AD =) \frac{4.04}{\cos 22}$ (= 10.785…) M1 for $(ED =) \sqrt{"10.785^2" - 5^2} = 9.556$ M1 for $\cos DEC = \frac{"8.66"}{"9.556"}$ A1 for 25 – 25.02

5MM2H/01					
Question		**Working**	**Answer**	**Mark**	**Notes**
26		$p(r-3) = 2r+5$ $pr - 3p = 2r+5$ $pr - 2r = 3p+5$ $r(p-2) = 3p+5$	$\frac{3p+5}{p-2}$	4	M1 for multiplying both sides by $r-3$ eg $p(r-3)$ or $pr-3p$ or $pr-3$ or $p \times r-3$ M1 for isolating their two terms in r on one side of an equation to get $pr-2r$ or $2r-pr$ M1 (dep on M1) for correctly factorising r from '$pr-2r$' A1 for $\frac{3p+5}{p-2}$ or $\frac{-3p-5}{2-p}$ oe
27		$\frac{2}{3}\pi r^3 = 400$ $r^3 = \frac{600}{\pi} = 190.9859...$ $r = \sqrt[3]{\frac{600}{\pi}} = 5.7588238...$ $\text{Vol} = \frac{1}{3} \times \pi \times 5.7588^2 \times 10$	347	4	M1 for $\frac{2}{3}\pi r^3 = 400$ oe M1 for $r^3 = \frac{600}{\pi}$ oe or $r = 5.7(...)$ M1 for $\frac{1}{3} \times \pi \times$ ("5.7…")$^2 \times 10$ A1 for 347 – 347.4 **SC:** B2 for an answer of 218 – 219 (B1 for $r^3 = \frac{300}{\pi}$ (= 95.49...))

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Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Thursday 21 June 2012 – Afternoon
Time: 1 hour 45 minutes

Paper Reference
5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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/e2

P 4 0 6 5 3 A 0 1 2 4

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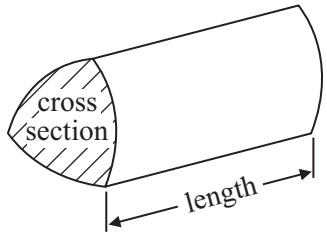
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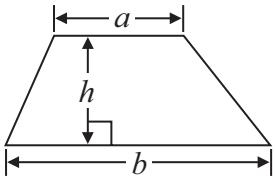
Formulae: Higher Tier

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

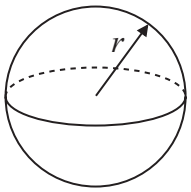


Area of trapezium = $\frac{1}{2}(a + b)h$



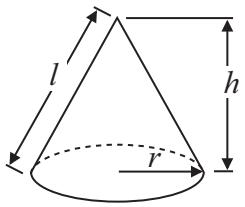
Volume of sphere = $\frac{4}{3}\pi r^3$

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

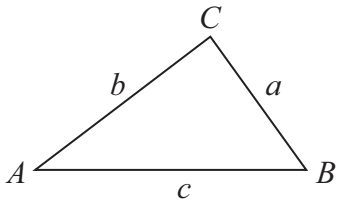


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

1 Use your calculator to work out

$$\frac{2.4 \times 3.6}{1.4 \times \sqrt{40}}$$

Write down all the figures on your calculator display.

.....

(Total for Question 1 is 2 marks)

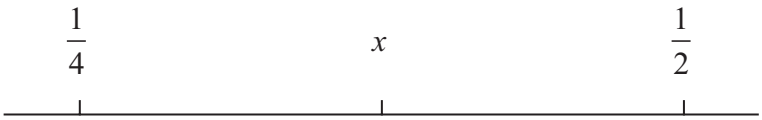
2 A circle has a diameter of 10 cm.

Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 2 is 2 marks)

3



x is halfway between $\frac{1}{4}$ and $\frac{1}{2}$

Work out the value of x.

.....

(Total for Question 3 is 3 marks)

4 Alf and Betty share some money in the ratio 3 : 5

Work out the percentage of the money that Alf gets.

..... %

(Total for Question 4 is 2 marks)

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5 x is an integer.

$-3 \leqslant x < 2$

Write down all the possible values of x.

.....

(Total for Question 5 is 2 marks)

6 Here are two boxes.



There are x marbles in box A.
There are 4 more marbles in box B than in box A.

The total number of marbles in the two boxes is T.

(a) Write a formula, in terms of x, for the total number of marbles, T, in the two boxes.

.....

(3)

$x = 13$

(b) Work out the value of T.

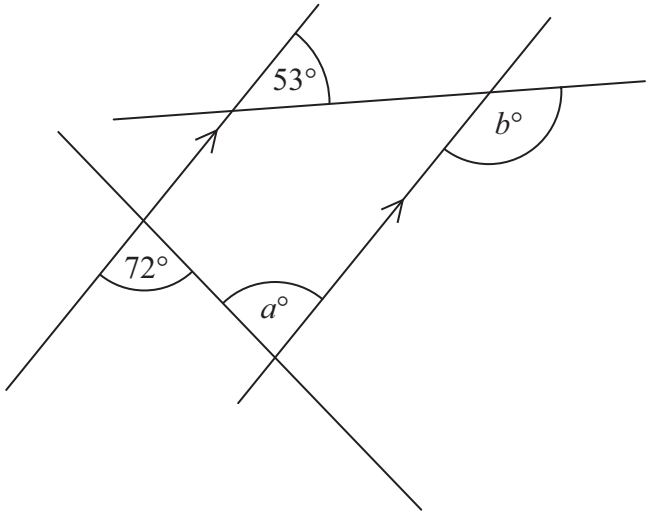
.....

(2)

(Total for Question 6 is 5 marks)

7

Diagram **NOT** accurately drawn



(a) (i) Find the value of a.

.....

(ii) Give a reason for your answer.

.....

(2)

(b) Work out the value of b.

.....

(2)

(Total for Question 7 is 4 marks)

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***8** Here is a shape.

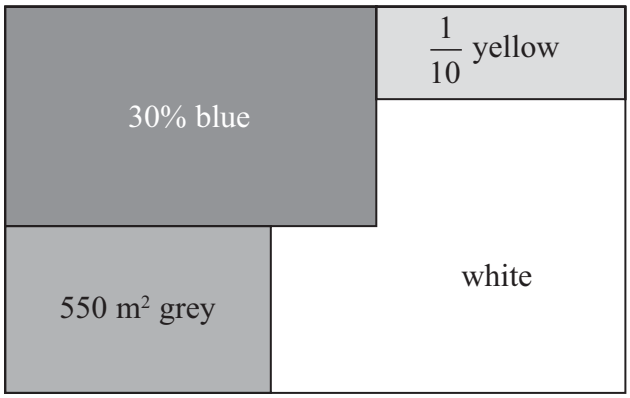


Diagram **NOT** accurately drawn

The total area of the shape is 1640 m^2.

30% of the shape is blue.

$\frac{1}{10}$ of the shape is yellow.

550 m^2 of the shape is grey.

The rest of the shape is white.

Is the white area more than 400 m^2?

(Total for Question 8 is 5 marks)

9 Here is a regular hexagon.

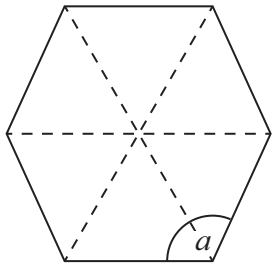


Diagram **NOT** accurately drawn

(a) Write down the size of the interior angle, marked a.

..... °

(1)

(b)

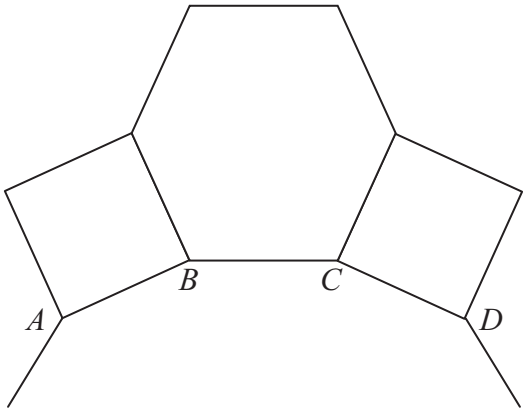


Diagram **NOT** accurately drawn

The diagram shows two squares and a regular hexagon.

AB, BC and CD are 3 sides of a regular polygon with n sides.

Work out the value of n.

.....

(3)

(Total for Question 9 is 4 marks)

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10 30% of a number is 120

Work out the number.

.....

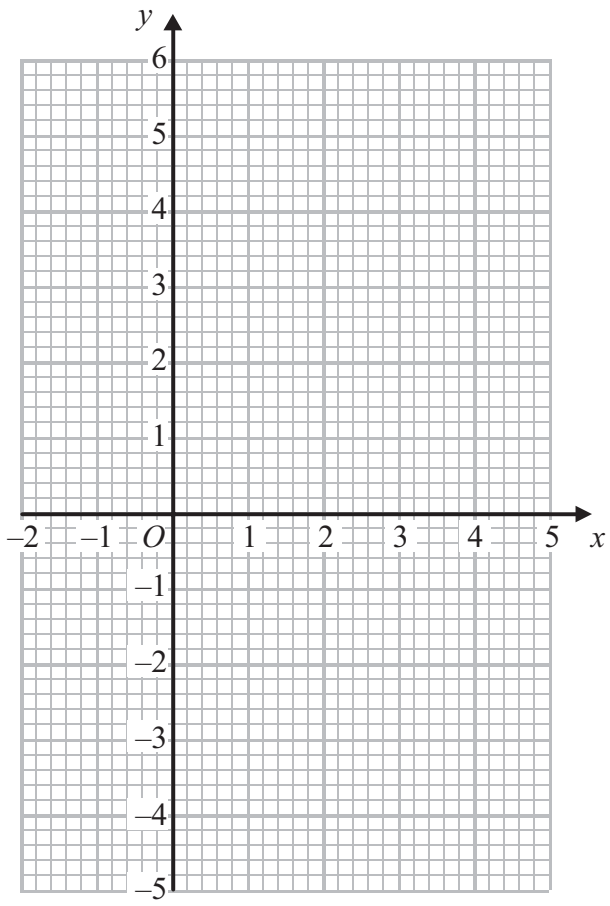
(Total for Question 10 is 3 marks)

11 (a) Complete the table of values for $y = x^2 - 3x + 1$

x	–1	0	1	2	3	4
y		1			1	5

(2)

(b) Draw the graph of $y = x^2 - 3x + 1$ for values of x from –1 to 4



(2)

(c) Use your graph to find estimates for the solutions of

$$x^2 - 3x + 1 = 4$$

.....

(2)

(Total for Question 11 is 6 marks)

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***12** Here is a solid prism.

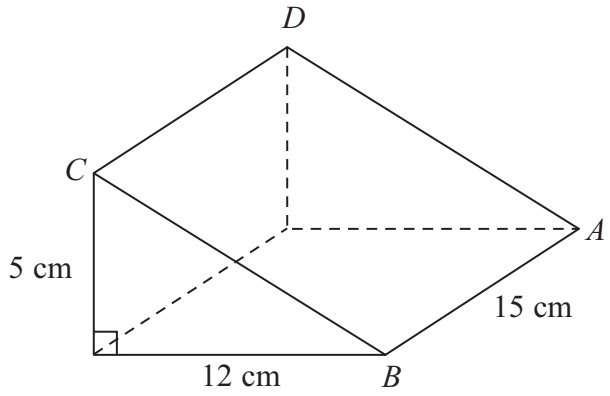


Diagram **NOT** accurately drawn

Calculate the area of the sloping face *ABCD* of the prism.

(Total for Question 12 is 5 marks)

13 (a) $x^6 = 1000$

Find the value of x.
Give your answer correct to 3 significant figures.

.....

(1)

(b) $y^{\frac{1}{2}} = 1000$

Find the value of y.

.....

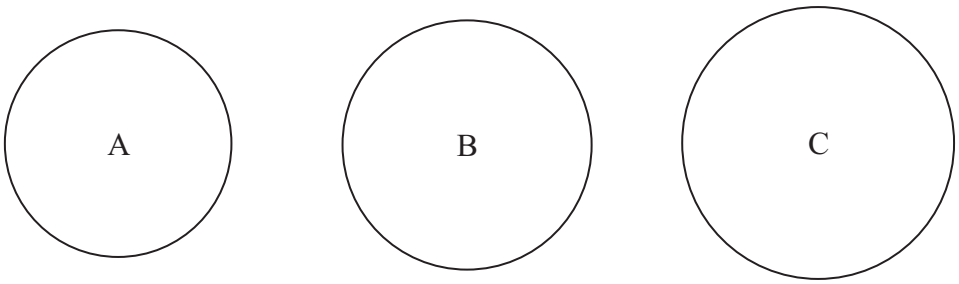
(1)

(Total for Question 13 is 2 marks)

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***14** Here are three circles A, B and C.

Diagrams **NOT** accurately drawn



The area of circle A is 200 cm^2.

The area of circle B is 10% larger than the area of circle A.

The area of circle C is 10% larger than the area of circle A.

How much larger is the area of circle C than the area of circle A?

(Total for Question 14 is 4 marks)

15

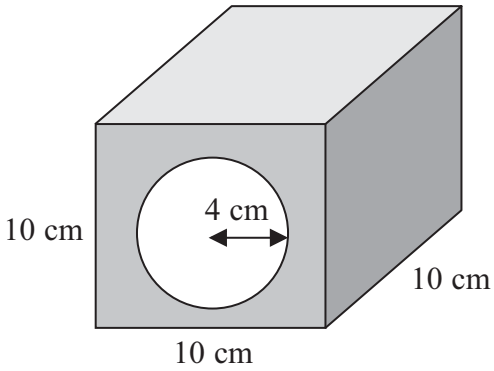


Diagram **NOT** accurately drawn

A solid is in the shape of a cube.
The solid has edges of length 10 cm.
There is a circular hole of radius 4 cm all the way through the solid.

Work out the volume of the solid.
Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 15 is 4 marks)

16 What is the smallest integer to multiply 0.35 by to get a whole number?

.....

(Total for Question 16 is 2 marks)

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17 $y = a + bx^2$

$a = 4.129 \times 10^7$
$b = 3.2 \times 10^{-2}$
$x = 45\,000$

(a) Work out the value of y.

.....

(3)

(b) Rearrange $y = a + bx^2$

to make x the subject.

.....

(2)

(Total for Question 17 is 5 marks)

18

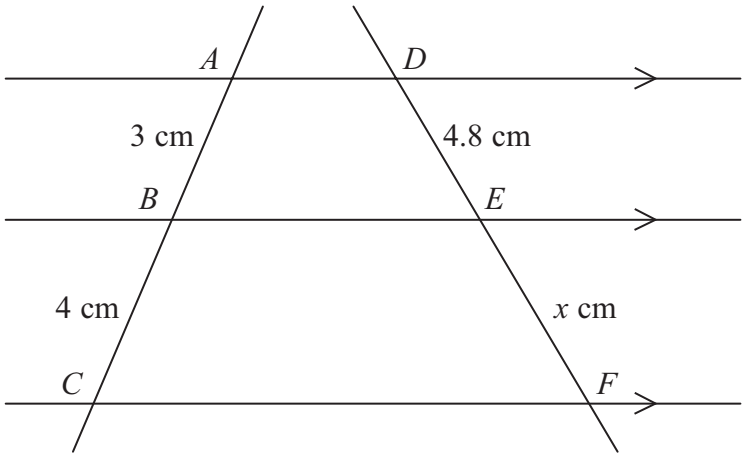


Diagram **NOT** accurately drawn

ABC and *DEF* are straight lines.

AB = 3 cm.
BC = 4 cm.
DE = 4.8 cm.
EF = *x* cm.

(a) Work out the value of *x*.

.....

(2)

The trapezium *ABED* has an area of 9.9 cm^2.

(b) Calculate the area of the trapezium *BCFE*.

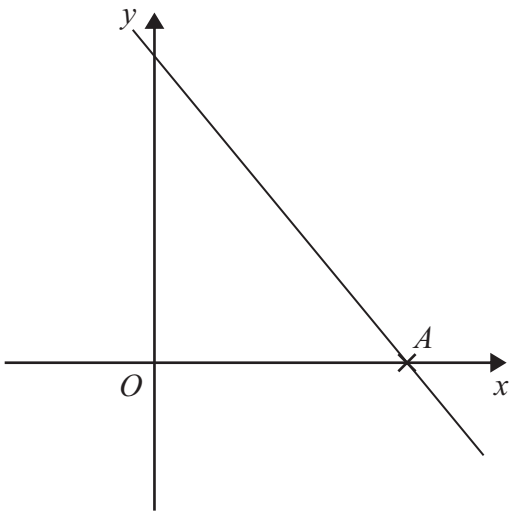
..... cm^2

(2)

(Total for Question 18 is 4 marks)

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19 Here is a sketch of the graph of the straight line with equation $3y = 9 - 4x$



The line with equation $3y = 9 - 4x$ cuts the x-axis at the point A.

(a) Work out the coordinates of the point A.

.....

(2)

The line with equation $3y = 9 - 4x$
intersects the line with equation $x + y = 12$
at the point B.

(b) Find the coordinates of the point B.

.....

(4)

(Total for Question 19 is 6 marks)

20

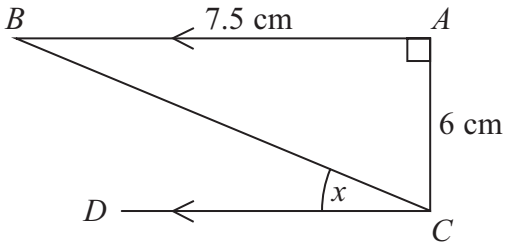


Diagram **NOT** accurately drawn

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

AC = 6 cm.
AB = 7.5 cm.

CD is parallel to *AB*.

Calculate the size of angle *x*.

.....°

(Total for Question 20 is 4 marks)

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21 y is directly proportional to the square of x.

When $x = 2$, $y = 24$

Find the value of y when $x = 3$

.....

(Total for Question 21 is 4 marks)

22 Solve $x^2 + 10x + 7 = 0$

Give your solutions correct to 3 significant figures.

.....

(Total for Question 22 is 3 marks)

23

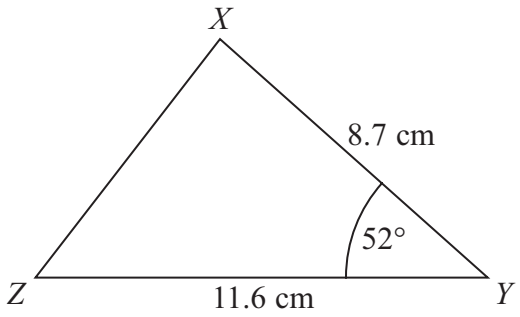


Diagram **NOT** accurately drawn

In the triangle XYZ

$XY = 8.7$ cm,
$YZ = 11.6$ cm,
Angle $XYZ = 52°$.

(a) Work out the area of triangle XYZ.
Give your answer correct to 3 significant figures.

..... cm^2

(2)

(b) Work out the length of XZ.
Give your answer correct to 3 significant figures.

..... cm

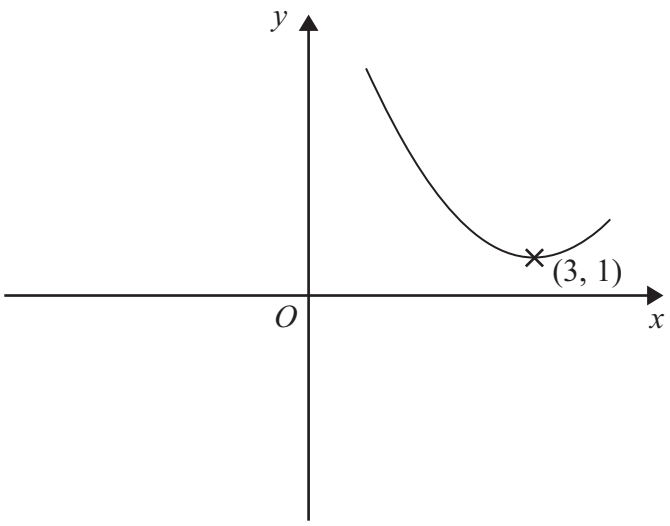
(3)

(Total for Question 23 is 5 marks)

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24 $f(x) = x^2 - 6x + 10$

Here is a sketch of the graph of $y = f(x)$



The minimum point of the graph has coordinates (3, 1).

(a) Write down the coordinates of the minimum point of the graph with equation $y = f(x + 2)$

.....

(2)

The equation $y = f(x + 2)$ can be written in the form $y = x^2 + bx + 2$

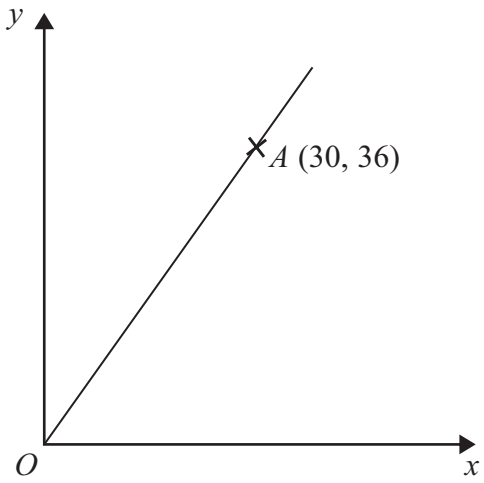
(b) Find the value of b.

.....

(2)

(Total for Question 24 is 4 marks)

25



The graph is a straight line passing through O.
The point A (30, 36) lies on the straight line.

Find the coordinates of all the points that

are on this straight line

and are between O and A

and have both coordinates integers.

.....

(Total for Question 25 is 3 marks)

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26 Solve

$$x^2 + y^2 = 1$$
$$2x + y = 2$$

.....

(Total for Question 26 is 7 marks)

TOTAL FOR PAPER IS 100 MARKS

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edexcel

Mark Scheme (Results)

June 2012

Methods in Mathematics (GCSE)
Unit 2: Methods 5MM2H_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

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		$\frac{8.64}{8.8543...} =$	0.9757885…	2	M1 any one of 8.64 or 8.85… or 0.975 or 0.976 or 0.97 or 0.98 seen A1 0.9757(8…)
2		$C = \pi \times 10$	31.4 cm	2	M1 for $\pi \times 10$ or $2 \times \pi \times 5$ A1 for 31.4 – 31.42
3		$\frac{1}{2}\left(\frac{1}{2}+\frac{1}{4}\right)=\frac{1}{2}\times\frac{2+1}{4}=\frac{3}{8}$ Or $\frac{1}{2}-\frac{1}{4}=\frac{2-1}{4}=\frac{1}{4}$ $\frac{1}{4}+\frac{1}{4}\div 2=\frac{1}{4}+\frac{1}{8}=\frac{3}{8}$ Or $\frac{1}{2}=\frac{4}{8},\frac{1}{4}=\frac{2}{8}$	$\frac{3}{8}$	3	M1 $\frac{1}{2}+\frac{1}{4}$oe or 0.5+0.25 or 50+25 M1$\frac{1}{2}$‘($\frac{1}{2}+\frac{1}{4}$)’oe or ‘0.75’÷ 2 or ‘75’÷2 A1 $\frac{3}{8}$ oe Or M1 $\frac{1}{2}-\frac{1}{4}$oe or 0.5-0.25 or 50-25 M1 $\frac{1}{4}$+’$\frac{1}{4}$’÷2 or 0.25+’(0.25’÷2) or 25% + ’(50-25’÷2)”% oe with percentage sign A1 $\frac{3}{8}$ oe OR M1 change both fractions to 8ths M1 ‘(4+2)’ ÷2 or ‘($\frac{4}{8}+\frac{2}{8}$)’÷2 A1 $\frac{3}{8}$ oe SC B1 for (37 + 38)/2 or 37.5

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
4		3 + 5 = 8 100 ÷8 = 12.5 12.5 × 3 = 37.5 Or $\frac{3}{8}\times 100$	37.5%	2	M1 3 + 5 = 8 and 100 ÷8or 30 + 50 = 80 and 100 ÷ 80 × 30 A1 cao Or M1 $\frac{3}{8}\times 100$ or $\frac{30}{80}\times 100$ oe A1 cao SC B1 for 62.5
5			−3,−2, −1 ,0,1	2	B2 −3,−2, −1 ,0,1 (B1 condone one error or omission e.g .−2, −1 ,0,1 or −3,−2, −1 ,0,1, 2)
6	(a)	A: x B: $x + 4$ $x + x + 4$	$T = 2x + 4$	3	B3 for $T = 2x + 4$ oe (B2 for $2x + 4$ oeor for $T = 2x + b$ where $b \neq 0$ **or** $T = ax + 4$ where a not equal to 0 (B1 for $x + 4$ or for $T =$ any expression)
	(b)	2 × 13 + 4 Or 13 + 17	30	2	M1 ft from their formula in the form $ax + b$ when a and $b \neq 0$ A1 ft Or M1 13 + 13 + 4 A1
7	(a)(i) (ii) (b)	 $180^o - 53^o$	72^o Alternate angles 127^o	2 2	B1 for 72^o B1 for alternateangles M1 $180^o - 53^o$ A1 cao OR M1 180 – (360 – "72" – (180–72) – (180 – 53)) A1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
8		$1640 \times \frac{30}{100} = 492$ 1640 ÷10 = 164 492+164 + 550 = 1206 1640 – 1206 = 434 Or $1640 \times \frac{40}{100}$ = 656, 656 + 550 = 1206 1640 – 1206 = 434	Yes	5	M1 for attempting to find the area of one section (blue or yellow) M1 for attempting to find the area of the second section (yellow or blue) or award M2 for attempt to find the combined area of blue and yellow) M1 for attempting to find the total area of three sections **or** four sections using white as 400 **or** subtracting the 3 sections from 1640 A1 1206 or 434 or1606 C1 dep on at least M1 for correct conclusion based upon their calculations relating their white area to 400 or"1206" to 1240 or "1606" to 1640
9	(a)		120^o	1	B1 cao
	(b)	90 + 120 = 210 360 – 210 = 150 Ext angle = 30 No of sides = 360 ÷30 = 12	12	3	M1 360 – ("120" + 90) = 150 M1 (dep on M1) for ext angle = 180 – "150" A1 cao
10		120 ÷ 0.3 **Or** 30% = 120 $\frac{120}{30} \times 100$ **Or** 10% = 40 10 × 40 = 400 **Or** 10% = 40, 120 + 120 + 120 + 40	400	3	M2 for 120 ÷ 0.3 or $\frac{120}{30} \times 100$ or 10% = 40 and 10 × 40 or 120 + 120 + 120 + 40) (M1 for 30% = 120 or 10% = 40 oe A1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		5, −1, −1	2	B2 all 3 correct (B1 any 1 correct)
	(b)	<table><tr><td>x</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>y</td><td>**5**</td><td>1</td><td>**-1**</td><td>**-1**</td><td>1</td><td>5</td></tr></table>	Correct graph	2	B1 ft 5 or 6 points plotted correctly B1 cao for the correct curve
	(c)	Draw line $y = 4$	3.8, −0.8	2	M1 ft Draw $y = 4$ or for 3.8 or – 0.8 accept as coordinates A1 ft for both results but not as coordinates
*12		Slope : $5^2 + 12^2$ $\sqrt{5^2 + 12^2} = 13$ 13 × 15 = 195	195 cm^2	5	M1 $5^2 + 12^2$ M1 $\sqrt{5^2 + 12^2}$ or $\sqrt{169}$ A1 13 M1 '13' × 15 C1 cao dep on M1 earned for "195" cm^{2}where the answer is identified **If no working shown** SC B3 for 195 cm^2 SC B2 for 195
13	(a)	$x = 1000^{\frac{1}{6}}$	3.16	1	B1 for 3.16 3.1623 (accept $x = 1000^{\frac{1}{6}}$ or $\sqrt[6]{1000}$)
	(b)	$y = 1000^2$	1000000	1	B1 (accept $y = 1000^2$ or 10^6

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
14		Area of circle B is 110% of the area of circle A Area of circle C is 110% of 110% = 121% of the area of circle A. Or Area of circle B is 220 cm^2 Area of circle C is 242 cm^2 Area of circle B is 1.1 times bigger Area of circle C is 1.1 × 1.1 = 1.21 times bigger	21% or 42 cm^2	4	B1 110% seen M1 $\frac{110}{100} \times 110$ oe A1 121% C1 dep on M1 for 21% bigger oe **or** B1 220 shown M1 $\frac{110}{100} \times 220$ A1 242 C1 dep on M1 for area is 42 cm^2bigger oe **or** B1 for 1.1 seen M1 for 1.1 × 1.1 A1 for 1.21 C1 dep on M1 for 21% larger or 1.21 times larger o.e.
15		Cube $10^3 = 1000$ Cylinder $\pi \times 4^2 \times 10 = 160\pi$ Remainder $1000 - 160\pi = 497$ Or Square $10^2 = 100$ Circle $\pi \times 4^2 = 16\pi$ Remaining area = $100 - 16\pi$ Remainder = $(100 - 16\pi) \times 10$	497 cm^3	4	M1 10^3 or sight of 1000 M1 for $\pi \times 4^2 \times 10$ sight of 503 M1 (dep on at least M1) for $'1000' - '160\pi'$ where both are volumes A1 for 497 – 497.6 **Or** M1 for 10^2 M1 for $\pi \times 4^2$ or 16π M1 (dep on at least M1) for ‘$(100 - 16\pi)$’×10 where both ”100” and “16π” are areas A1 for 497 – 497.6

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16		$20 \times 0.35 = 7$	20	2	B2 for 20 (B1 for any other multiple of 20 or $20 \times 0.35 = 7$)
17	(a)	$y = 4.129 \times 10^7 + 3.2 \times 10^{-2} \times 45000^2$ $= 4.129 \times 10^7 + 6.48 \times 10^7$ $= 106090000$	1.0609×10^8	3	B3 for 106090000 oe (B2for 64 800 000 or digits 648 seen) (B1 for correct substitution)
	(b)	$y - a = bx^2$ $\frac{y-a}{b} = x^2$ Or $\frac{y}{b} = \frac{a}{b} + x^2$ $\frac{y}{b} - \frac{a}{b} = x^2$	$x = \pm\sqrt{\frac{y-a}{b}}$	2	M1 for either an intention to $-a$ from each side of the formula or to divide each side of the formula by b as a first step in rearranging the formula A1 oe(Condone omission of ±)

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18	(a)	$\frac{x}{4.8}=\frac{4}{3}$ $x=\frac{4}{3}\times 4.8$ or $4.8+\frac{1}{3}\times 4.8$	6.4	2	M1 for $\frac{x}{4.8}=\frac{4}{3}$ oe A1 for 6.4 cao Or M1 for $4.8+\frac{1}{3}\times 4.8$ oe or $4\times(4.8\div 3)$ oe A1 for 6.4 cao
	(b)	Area *BCFE*:area *ABED* = $4^2:3^2$ Area *BCFE* = $\frac{16}{9}\times 9.9$	17.6	2	M1 sight of $4^2:3^2$ or $\left(\frac{4}{3}\right)^2$ or $\left(\frac{3}{4}\right)^2$ A1 cao
19	(a)	$9-4x=0$ Or $4x=9-3y$ so $x=\frac{9}{4}-\frac{3}{4}y$	(2.25,0)	2	M1 for writing $9-4x=0$ A1 for (2.25,0) oe(condone missing brackets)or $x=2.25$ and $y=0$
	(b)	$3(12-x)=9-4x$ $36-3x=9-4x$ $4x-3x=9-36$ $x=-27$ Substitute $-27+y=12$ $y=39$	(−27, 39)	4	M1 Sub for x or y or eliminate to get an equation in solely x or y. (Allow one arithmetic error only) A1 $x=-27$ (or $y=39$) M1(dep) Sub for value of x or y in one equation or starting again A1 $y=39$ (or $x=-27$)

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20		$\tan(ABC) = \frac{6}{7.5} = 0.8$ angle $ABC = \tan^{-1}(0.8) = 38.65\ldots$ Angle $DCB = 38.65\ldots$ Or $\tan(ACB) = \frac{7.5}{6} = 1.25$ $ACB = \tan^{-1}(1.25) = 51.34\ldots$ Angle $BCD = 90 - 51.34..$ Or $AC = \sqrt{6^2 + 7.5^2} = 9.604(686..)$ $\sin(ABC) = \frac{6}{9.605} = 0.937$ angle $ABC = \sin^{-1}(0.937) = 38.65\ldots$ Angle $DCB = 38.65\ldots$	38.7	4	M1 $\tan(ABC) = \frac{6}{7.5}$ M1 $\tan^{-1}(\frac{6}{7.5})$ M1 (indep) Angle DCB= angle ABC A1 38.65 – 38.7 Or M1 $\tan(ACB) = \frac{7.5}{6}$ M1 $\tan^{-1}(\frac{7.5}{6})$ (= 51.34) M1 (indep) Angle DCB = 90 – angle ACB A1 38.65 – 38.7 Or M1for using sin or cosine to find angle ABC or angle ACB using BC = 9.604 M1 for using $\sin^{-1}$ of $\cos^{-1}$ as appropriate M1 (indep) angle DCB= angle ABC or angle DCB = 90 – 51.34.. A1 38.65 – 38.7
21		$y = kx^2$ 24 = $k \times 2^2 k = 6$ $y = 6 \times 3^2 = 54$	54	4	M1 $y = kx^2$ or for writing $y \propto x^2$ M1 $24 = k \times 2^2$ A1 $k = 6$ A1 54

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		$x = \frac{-10 \pm \sqrt{10^2 - 4\times1\times7}}{2\times1}$ $x = \frac{-10 \pm \sqrt{72}}{2}$ Or $(x+5)^2 - 5^2 + 7 = (x+5)^2 - 18$ $x+5 = \pm\sqrt{18}$	–0.757, –9.24	3	M1 $x = \frac{-10 \pm \sqrt{10^2 - 4\times1\times7}}{2\times1}$ allow errors in sign on 'b' and 'c' M1 $x = \frac{-10 \pm \sqrt{72}}{2}$ A1 –0.75 to –0.76 and –9.2 to – 9.3 Or M1 $(x+5)^2 - 5^2 + 7$ M1 $x+5 = \pm\sqrt{18}$ A1 –0.75 to –0.76 and –9.2 to – 9.3
23	(a)	$\frac{1}{2}\times11.6\times8.7\times\sin52^o$	39.8	2	M1 $\frac{1}{2}\times11.6\times8.7\times\sin52^o$ or complete method to find area using trig and/or Pythagoras and ½ base × ht A1 39.75 – 39.8
	(b)	$XZ^2 = 8.7^2 + 11.6^2 - 2\times8.7\times11.6\times\cos52^o$ $= 85.985$	9.27	3	M1 $8.7^2 + 11.6^2 - 2\times8.7\times11.6\times\cos52^o$ M1 for correct order of evaluation or 85.985 A1 9.27 – 9.275
24	(a)	Translation of $\begin{pmatrix}-2\\0\end{pmatrix}$	(1,1)	2	B2 (1, 1) (B1 (5, 1))
	(b)	$(x+2)^2 - 6(x+2) + 10 =$ $x^2 - 2x + 2$	$b = -2$	2	M1 $(x+2)^2 - 6(x+2) + 10$ or uses the minimum point of the translated curve (1, 1) and substitutes into $y = x^2 + bx + 2$ A1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25		$\frac{36}{30}=\frac{18}{15}=\frac{12}{10}=\frac{6}{5}$ Or $y=\frac{36}{30}x,\ y=\frac{6}{5}x$ $x=5, y=6$ etc	(5, 6), (10, 12), (15, 18) (20, 24), (25, 30)	3	M1 uses equivalent fractions or ratios e.g. $\frac{36}{30}=\frac{18}{15}$ or 30:36 = 15:18or states one pair A1 two correct pairs A1 all five correct pairs with no incorrect pairs **Or** M1 $y=\frac{36}{30}x$ or $y=\frac{6}{5}x$ A1 two correct pairs A1 all five correct pairs with no incorrect pairs **NB** Ignore (0,0) and (30, 36) if included in their list
26		y= 2 – 2x $y^2=(2-2x)^2=4x^2-8x+4$ $x^2+4x^2-8x+4=1$ $5x^2-8x+3=0$ $(5x-3)(x-1)=0$ $x=\frac{3}{5},1$ $y=2-2\times\frac{3}{5}=\frac{4}{5}$ or $y=2-2=0$	$x=\frac{3}{5}, y=\frac{4}{5}$ $x=1, y=0$	7	B1 $y=2-2x$ M1 for x^2 + "$(2-2x)^2$" (=1) B1 for x^2 + "$4x^2-8x+4$" M1 Collect to 3 term quadratic M1 for attempt to factorise or correct substitution into formula A1 $x=\frac{3}{5},1$ A1 $y=\frac{4}{5},0$ SC B1 for x = 1 and y = 0 or 3/5 and 4/5

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Edexcel GCSE

Centre Number	Candidate Number

Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Thursday 17 November 2011 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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

P 4 0 6 0 5 A 0 1 2 4

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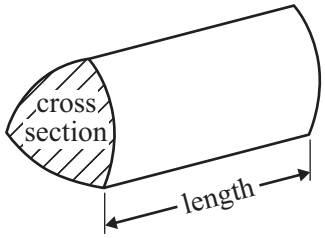
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GCSE Mathematics 2MM01

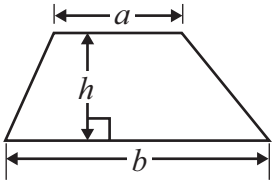
Formulae – Higher Tier

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

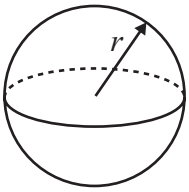


Area of trapezium $= \frac{1}{2}(a + b)h$



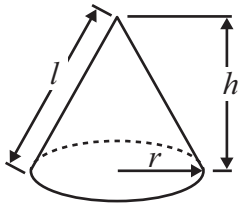
Volume of sphere $= \frac{4}{3}\pi r^3$

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

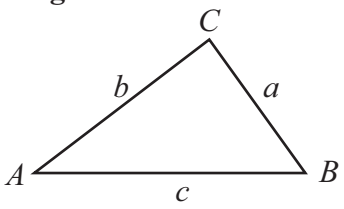


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



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.

1 (a) Work out $\frac{1}{0.625}$

.....

(1)

(b) Work out $\sqrt{2.5^3 - 3}$

Give your answer as a decimal correct to 3 significant figures.

.....

(2)

(Total for Question 1 is 3 marks)

---

2 (a) 9 pens weigh 1161 grams.

Work out the weight of 5 of these pens.

..... grams

(2)

(b) Write 13 out of 20 as a percentage.

..... %

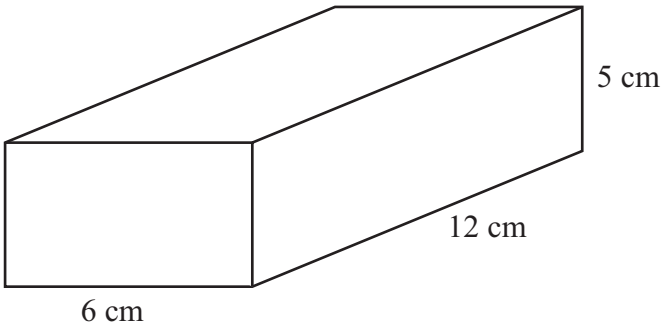
(2)

(Total for Question 2 is 4 marks)

---

3 Here is a cuboid.

Diagram **NOT** accurately drawn



Work out the total surface area of the cuboid.

.....

(Total for Question 3 is 4 marks)

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4

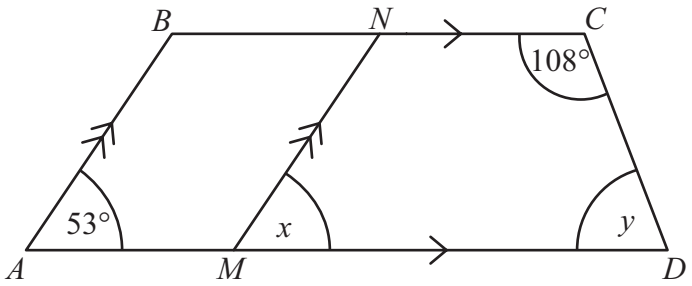


Diagram **NOT** accurately drawn

In the diagram,
AB is parallel to *MN*.
BNC is parallel to *AMD*.
Angle *BAM* = 53°.
Angle *NCD* = 108°.

(a) (i) Write down the size of angle *x*.

.....°

(ii) Give a reason for your answer.

.....

.....

(2)

(b) (i) Work out the size of angle *y*.

.....°

(ii) Give a reason for your answer.

.....

.....

(2)

(Total for Question 4 is 4 marks)

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5 Gary has 5 sticks.
The length of each of his sticks is x cm.

Sharmina has 7 sticks.
The length of each of her sticks is y cm.

The total length of Gary's and Sharmina's sticks is T cm.

Write down a formula for T in terms of x and y.

.....

(Total for Question 5 is 3 marks)

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6 There are a total of 120 counters in a box.

There are only red counters and blue counters in the box.
There are three times as many red counters as blue counters in the box.

Carl takes $\frac{1}{3}$ of the red counters from the box.

Kerry takes 80% of the blue counters from the box.

Work out the ratio of the number of red counters to the number of blue counters now in the box.
Give your ratio in its simplest form.

.....

(Total for Question 6 is 5 marks)

7 (a) The input for this number machine is m.



Find an expression, in terms of m, for the output.

.....

(2)

(b) The output for this number machine is n.



Find an expression, in terms of n, for the input.

.....

(2)

(Total for Question 7 is 4 marks)

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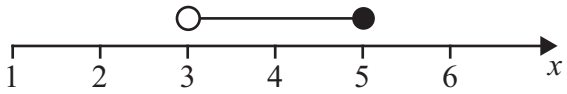
8 n is an integer and $-3 \leqslant n < 2$

(a) Write down all the possible values of n.

.....

(2)

Here is a number line.



(b) Write down the inequality shown on the number line.

.....

(2)

(c) Solve $4x + 3 \leqslant 18$

.....

(2)

(Total for Question 8 is 6 marks)

9 The diagram shows a solid prism.

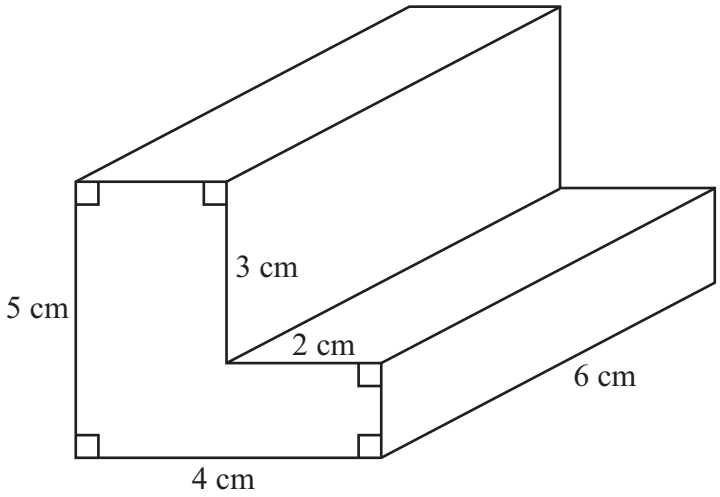


Diagram **NOT** accurately drawn

Work out the volume of the prism.

..... cm^3

(Total for Question 9 is 4 marks)

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10 (a) Work out the size of an exterior angle of a regular pentagon.

.....°

(2)

(b) Work out the size of an interior angle of a regular pentagon.

.....°

(2)

(Total for Question 10 is 4 marks)

11 When a number is reduced by 30% the answer is 17 920

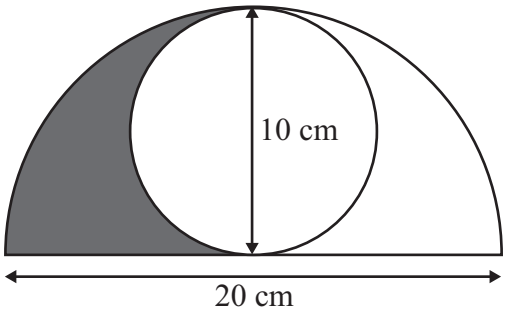
What is the number?

.....

(Total for Question 11 is 3 marks)

12 The diagram shows a circle inside a semicircle.

Diagram **NOT** accurately drawn



The circle has a diameter of 10 cm.
The semicircle has a diameter of 20 cm.

Work out the area shaded.
Give your answer correct to 1 decimal place.

..... cm^2

(Total for Question 12 is 5 marks)

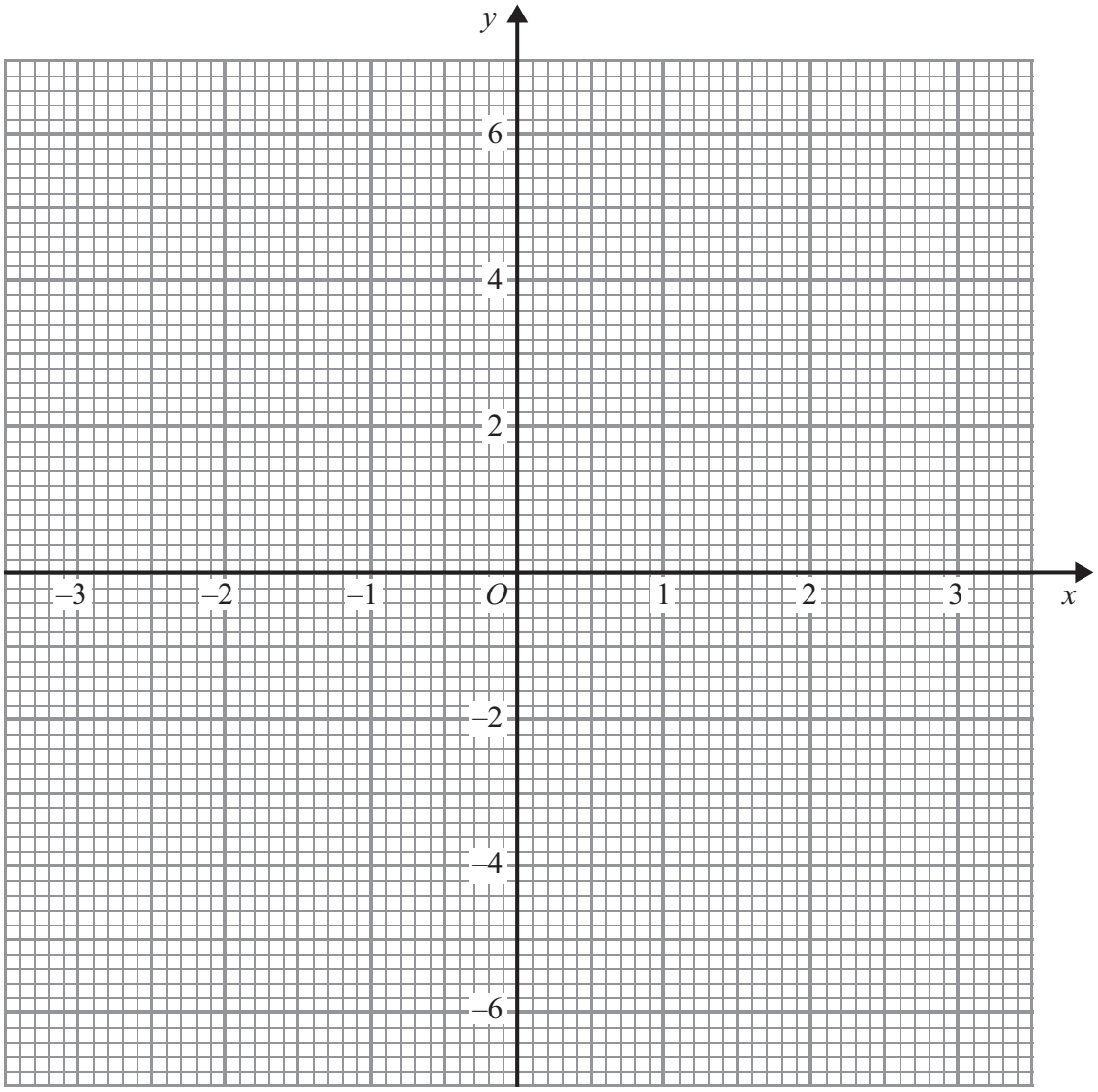
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13 (a) Complete the table of values for $y = x^2 - 3$

x	−3	−2	−1	0	1	2	3
y	6		−2		−2	1	

(2)

(b) On the grid, draw the graph of $y = x^2 - 3$ for values of x from –3 to 3



(2)

(c) Use the graph to find estimates of the values of x when $x^2 - 3 = 0$

.....

(2)

(Total for Question 13 is 6 marks)

14 Here is a shape.

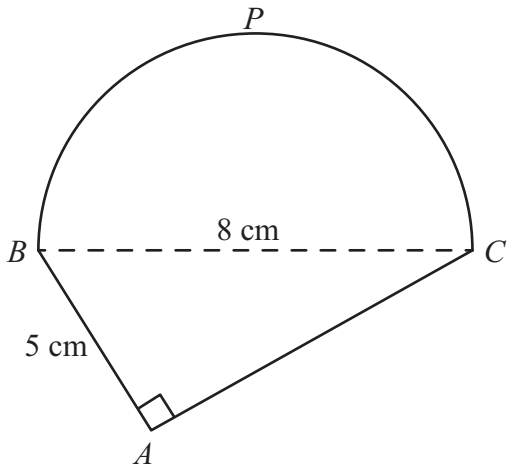


Diagram **NOT** accurately drawn

BPC is a semicircle.
ABC is a right-angled triangle.
BC = 8 cm.
AB = 5 cm.

Work out the perimeter of the shape.
Give your answer correct to 3 significant figures.

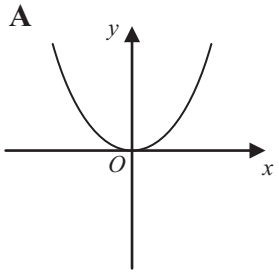
..... cm

(Total for Question 14 is 5 marks)

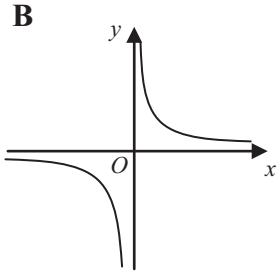
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15 Here are some graphs.

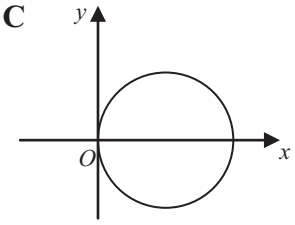
A



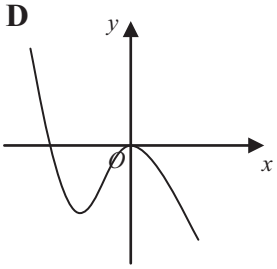
B



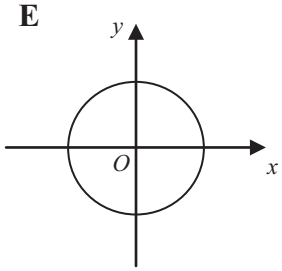
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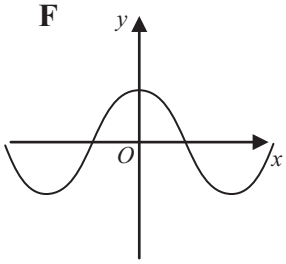
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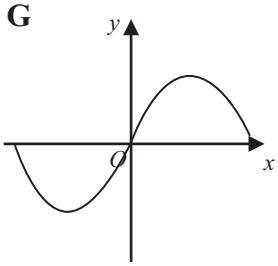
E



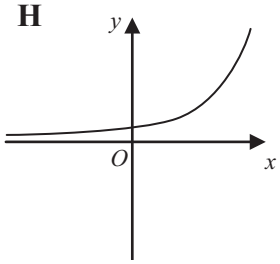
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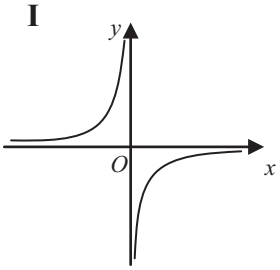
G



H



I



(i) Write down the letter of the graph that could have the equation $y = \frac{1}{x}$

.....

(ii) Write down the letter of the graph that could have the equation $y = \sin x$

.....

(iii) Write down the letter of the graph that could have the equation $x^2 + y^2 = 1$

.....

(Total for Question 15 is 3 marks)

16 $A : B : C = x + 1 : 3 : x - 1$

$A + B + C = 60$

$B = 30$

Work out the value of x.

.....

(Total for Question 16 is 5 marks)

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17

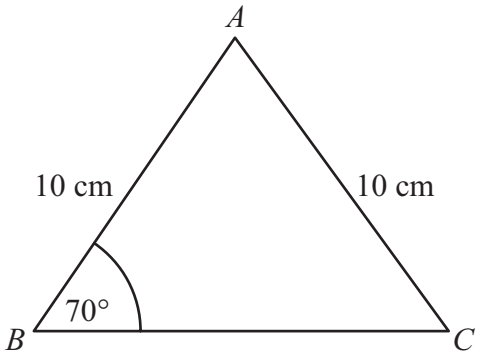


Diagram **NOT** accurately drawn

Triangle ABC is an isosceles triangle.
$AB = AC = 10$ cm.
Angle $ABC = 70°$.

Work out the length of BC.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 17 is 4 marks)

***18** $A = 1500$

B is 5% greater than A.
C is 5% greater than B.

Kim says

'C is 10% greater than A'.

Is she right?

(Total for Question 18 is 4 marks)

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19

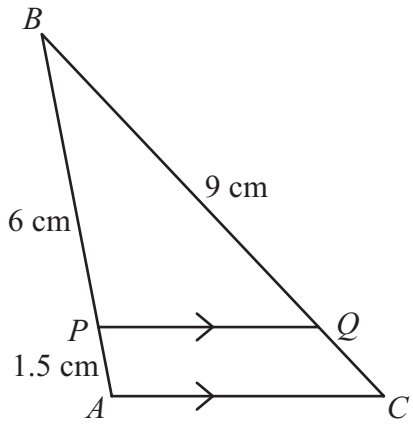


Diagram **NOT** accurately drawn

PQ is parallel to *AC*.
BP = 6 cm.
PA = 1.5 cm.
BQ = 9 cm.

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

..... cm

(2)

Angle *PBQ* = 30°.

(b) Work out the area of triangle *PBQ*.

..... cm^2

(2)

(Total for Question 19 is 4 marks)

20 $x = \dfrac{2ya}{y - a}$

$y = 2.5 \times 10^{-3}$
$a = 1.8 \times 10^{-3}$

(a) Calculate the value of x.
Give your answer in standard form correct to 3 significant figures.

.....

(3)

(b) Make y the subject of the formula $x = \dfrac{2ya}{y - a}$

$y =$ .....

(4)

(Total for Question 20 is 7 marks)

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21 The line L passes through the point $(-1, 2)$ and is perpendicular to the line with equation $y = 2x + 3$

Find an equation of the line L.

.....

(Total for Question 21 is 3 marks)

22 Solve the simultaneous equations

$$2x - 3y = 12$$
$$3x + 5y = -1$$

.....

(Total for Question 22 is 4 marks)

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23 P is inversely proportional to the square of x.

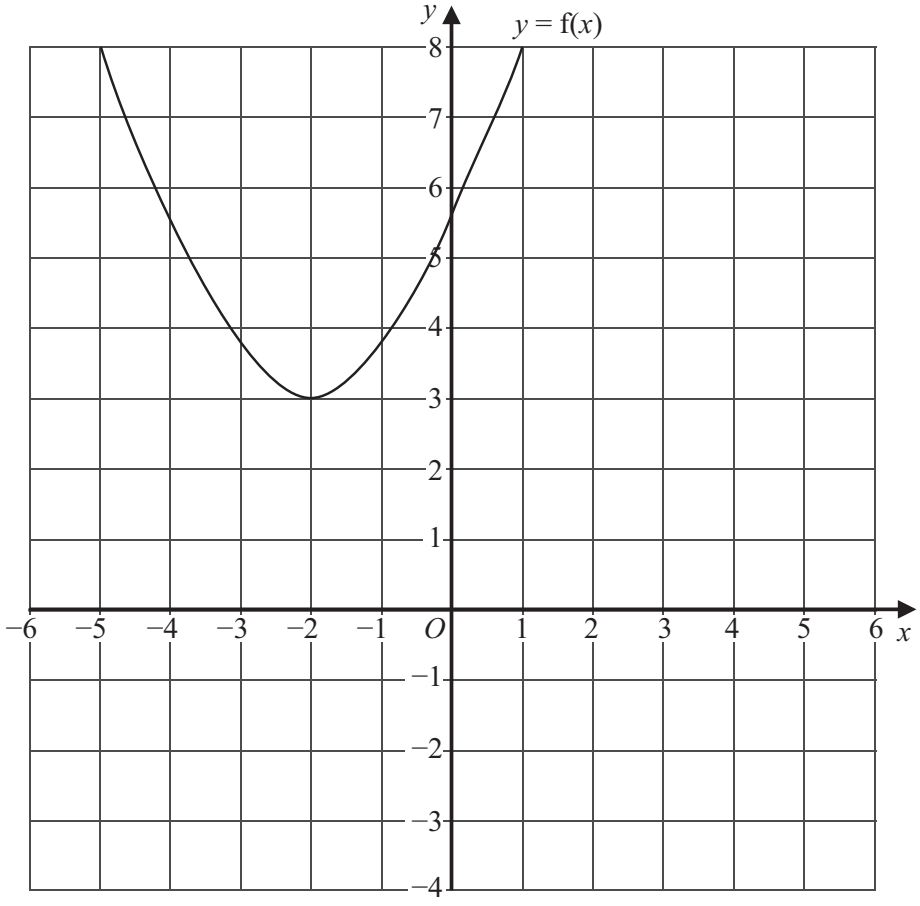
Given that $x = 5$ when $P = 6$,

find the value of P when $x = 8$
Give your answer correct to 2 decimal places.

$P =$ .....

(Total for Question 23 is 3 marks)

24



The diagram shows part of a curve with equation $y = f(x)$.
The coordinates of the minimum point of the curve are $(-2, 3)$.

Write down the coordinates of the minimum point of the curve with equation

(i) $y = f(x) - 2$

(..... , ...)

(ii) $y = f(2x)$

(..... , ...)

(iii) $y = f(-x)$

(..... , ...)

(Total for Question 24 is 3 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

November 2011

GCSE Mathematics (5MM2H)
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

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1	(a)	$\frac{1}{0.625}$	1.6	1	B1 for 1.6 or $\frac{8}{5}$ or $1\frac{3}{5}$
	(b)	$\sqrt{15.625-3} = \sqrt{12.625}$	3.55	2	M1 for 15.625 – 3 or 12.625 or $\sqrt{\frac{200}{4}}$ A1 for 3.55(3…)
2	(a)	$\frac{1161}{9} = 129,\ \ 129 \times 5 = 645$	645	2	M1 for $\frac{1161}{9}$ or 1161 × 5 or sight of 129 or 5805 A1 cao
	(b)	$\frac{(13 \times 5)}{(20 \times 5)}$	65	2	M1 for $\frac{(13\times5)}{(20\times5)}$ or $\frac{13}{20} \times 100$ or $13\times\frac{100}{20}$ A1 cao
3		2×(6×5) + 2×(5×12) + 2×(6×12) =60 + 120 + 144 = 324	324 cm^2	4	M1 for 5×6(=30) **or** 12×5(=60) **or** 6×12(=72) M1 for adding the areas of 5 or 6 faces, at least 4 of which must be correct A1 cao C1 (indep) for cm^2
4	(a)(i)		53	2	B1 cao
	(ii)		corresponding angles are equal		B1 for corresponding (angles) are equal or fully correct alternative reasons.
	(b)	108 + y = 180	72	2	B1 cao B1 for co-interior (or allied) or supplementary angles add to 180° Or Angles on a straight line add to 180° **and a**lternate angles **and** angles in a quadrilateral add to 360° Or fully correct alternative reasons.

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
5			$T = 5x + 7y$	3	B3 cao $T = 5x + 7y$ $T = 5\times x + 7\times y$ (B2 for $5 \times x + 7\times y$ seen Or $T = k + 7y$ where $k \neq 5x$ or $T = k + 7y$ where $k \neq 7y$ and k is algebraic or numerical B1 for $5 \times x$ or $7 \times y$ seen or T = a linear expression in x and/or y)
6		$\frac{3}{4} \times 120 = 90$, $\frac{1}{4} \times 120 = 30$ $\frac{2}{3} \times 90 = 60$, $\frac{20}{100} \times 30 = 6$ 60 : 6	10 : 1	5	M1 for $\frac{3}{4} \times$ 120 oe or 90 or $\frac{1}{4} \times$ 120 oe or 30 M2 (indep) for $(1 - \times \frac{1}{3}) \times$'90' oe (or 60) AND $\frac{(100-80)}{100 \times '30'}$ oe (or 6) (M1 (indep) for $1 - \frac{1}{3} \times$'90' oe or 60 OR $\frac{(100-80)}{100 \times '30'}$ oe or 6 OR both $\frac{1}{3} \times 90$ (=30) and $\frac{80}{100} \times 30$ (=24) M1 (dep on at least M2) for '60' : '6' or 1 to 10 or 6 to 60 oe or reversed ratio 6:60 A1 10:1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
7	(a)	$2 \times m - 3$	$2m - 3$	2	M1 for $2\times m$ **or** $m - 3$ **or** $b\times m - 3$ A1 for $2m - 3$ oe **NB:** If additional variable is introduced as subject then ignore. If $2m - 3 = k$ where k is a number then ignore k
	(b)	$(n + 3) \div 2$	$\frac{n+3}{2}$	2	M1 for $n + 3$ **or** $\frac{n \pm 3}{2}$ oe **or** $n + 3 \div 2$ **or** $\frac{n}{2} \pm 3$ or for a reverse flow chart with at least one correct inverse process identified A1 for $\frac{n+3}{2}$ oe NB If additional variable is introduced as subject then ignore. If $\frac{n+3}{2} = k$ where k is a number then ignore k
8	(a)		$-3, -2, -1, 0, 1$	2	B2 for all 5 correct values and no extras; ignore repeats, any order (-1 for each omission or additional value)
	(b)		$3 < x \leq 5$	2	B2 for $3 < x \leq 5$ **or** just >3 **and** ≤ 5 (B1 for $3 < x$ **or** $x \leq 5$ **or** $5 \geq x$ **or** >3 **or** ≤ 5 **or** $3 \leq x < 5$) **NB**: Accept the use of any letter other than x throughout and ignore any attempts to list integer values
	(c)	$4x \leq 18 - 3$ $x \leq \frac{15}{4}$	$x \leq \frac{15}{4}$	2	M1 for intention to subtract 3 from both sides or divide each term by 4 **or** $(x =) \frac{15}{4}$ oe A1 for $x \leq \frac{15}{4}$ oe

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		Area of cross-section 5×2 + 2×2 = 14 or 5×4 – 3×2 = 14 Volume of prism = 14×6 = 84 **or** 5 × 2 × 6 + 2 × 2 × 6 =60 + 24 =84 **or** 5 × 4 × 6 = 120 3 × 2 × 6 = 36 120 – 36 = 84	84	4	M1 for splitting cross-section into at least two rectangles **or** completing the enclosing rectangle M1 (dep) for a complete area, correct product for at least one rectangle M1 (dep) for 'area' × 6 A1 cao **or** M1 for splitting cuboid into at least two cuboids or completing the enclosing cuboid M1 (dep) for correct product for volume of at least one cuboid M1 (dep) for complete volume of prism (at least one product must be correct) A1 cao
10	(a)	$\frac{360}{5}$	72	2	M1 for a complete correct method to find exterior angle eg $\frac{360}{5}$ A1 cao
	(b)	180 – 72	108	2	M1 ft for 180 – '72' **or** ((5 – 2)×180)÷5 A1cao SC : If no marks scored in (a) or (b) then award 1 mark in (a) for sight of $\frac{360}{5}$ seen anywhere.

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11		e.g. 70% = 17920 1% = $\frac{17920}{70}$(=256) 100% = $\frac{17920}{70} \times 100$	25600	3	M1 100%–30%, or 70% or 1 – 0.3 or 0.7 M1 for $\frac{17920}{70} \times 100$ or $\frac{17920}{0.7}$ A1 cao
12		$\frac{\frac{1}{2} \times \pi \times 10^2 - \pi \times 5^2}{2} = 12.5\pi$	39.3	5	M1 for $\pi \times 5^2$ (=78.5(39…)) **or** $\pi \times 10^2$ (=314(.159…)) **or** 100π **or** 25π M1 for $\frac{1}{2} \times \pi \times 10^2$ (=157(.07…)) **or** 50π M1 (dep on at least one of the previous Ms) for $\frac{1}{2} \times \pi \times 10^2 - \pi \times 5^2$ M1 (dep on previous M) for $(\frac{1}{2} \times \pi \times 10^2 - \pi \times 5^2) \div 2$ or $\frac{\text{'157.07...'} - \text{'78.53....'}}{2}$ or 25π/2 A1 for answer in range 39.2 – 39.3 **or** M1 for $\pi \times 5^2$ (=78.5(39…)) **or** $\pi \times 10^2$ (=314(.159…)) **or** 100π **or** 25π M1 for $\frac{1}{4} \times \pi \times 10^2$ (=78.5(398…)) **or** 25π M1 for $\frac{1}{2} \times \pi \times 5^2$ (=39.2(69…)) **or** 12.5π M1(dep on 2 previous Ms) for '78.5' – '39.2' A1 for answer in range 39.2 – 39.3

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
13	(a)		1, –3, 6	2	B2 for all 3 correct (B1 for 1 or 2 correct)
	(b)		Graph	2	B2 for a fully correct graph **or** B1 ft for all their points plotted correctly ±2mm B1 for a smooth curve drawn through their points provided B1 awarded in (a)
	(c)		1.7, −1.7	2	B1 for –1.6 to –1.8 or ft from their graph B1 for 1.6 to 1.8 or ft from their graph
14		$(AC=)\ \sqrt{(8^2-5^2)} = 6.244(9\ldots)$ $(BPC=)\ 0.5\times\pi\times8 = 12.56(6\ldots)$ $5 + 6.244(9\ldots) + 12.56(6\ldots)$	23.8	5	M1 for $8^2 - 5^2$ or $AC^2 + 5^2 = 8^2$ M1 for $\sqrt{(8^2-5^2)}$ (=6.24(4..)) with least one of 8^2 or 5^2 correctly evaluated. M1 for 8π (=25.13 to 25.13(2…)) or $8\pi/2$ or 4π (=12.56(6…)) using π=3.14 or better M1 for 5 + their AC + their arc PBC A1 for 23.7 – 23.9
15	(i)		B	3	B1 cao
	(ii)		G		B1 cao
	(iii)		E		B1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
16		e.g. $x + 1 : 3 : x - 1$ $(\times 10)$ $10x + 10 : 30 : 10x - 10$ $10x + 10 + 30 + 10x - 10 = 60$ $20x = 30$ $x = 1.5$	1.5	5	M2 for $10\times (x+1)$ and $10\times (x-1)$ (M1 for $x + 1 + 3 + x - 1$ or $2x + 3$ oe or $x + 1 + x - 1 = 30$ or $x = 15$) M1 for '$10x+10$'$+30+$'$10x-10$' $= 60$ or '$10x+10$' $+$'$10x-10$' $= 30$ oe M1 for an attempt to reduce the form $ax = b$ (condone one error) A1 cao
17		$2 \times 10\cos 70$ OR $BC^2 = 10^2 + 10^2 -$ $2\times 10\times 10\times \cos 40$ $BC = \sqrt{46.79(1....)}$	6.84	4	M1 for $180 - 2\times 70$ M1 for $\frac{10}{\sin 70} = \frac{BC}{\sin(180-2\times 70)}$ M1 for $BC = \frac{\sin(180-2\times 70)\times 10}{\sin 70}$ A1 for 6.84(0…) OR M1 for $180 - 2\times 70$ M1 for $10^2 + 10^2 - 2\times 10\times 10\times \cos(180 - 2\times 70)$ M1 for $\sqrt{'46.79(1....)'}$ A1 for 6.84(0…) M1 for perpendicular from A to BC, may be implied by correct working M1 for $10\times \cos 70$ or $10\times \sin 20$ or correct attempt to use sin or cos M1 for $2\times$ '$10\times \cos 70$' A1 for 6.84(0...)

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
17		$2 \times 10\cos 70$ OR $BC^2 = 10^2 + 10^2 - 2\times10\times10\times\cos 40$ $BC = \sqrt{46.79(1....)}$	6.84	4	M1 for $180 - 2\times70$ M1 for $\frac{10}{\sin 70} = \frac{BC}{\sin(180-2\times70)}$ M1 for $BC = \frac{\sin(180-2\times70)\times10}{\sin 70}$ A1 for 6.84(0…) OR M1 for $180 - 2\times70$ M1 for $10^2 + 10^2 - 2\times10\times10\times\cos(180-2\times70)$ M1 for $\sqrt{'46.79(1....)'}$ A1 for 6.84(0…) M1 for perpendicular from A to BC, may be implied by correct working M1 for $10\times\cos70$ or $10\times\sin20$ or correct attempt to use sin or cos M1 for $2\times$ '$10\times\cos70$' A1 for 6.84(0...)

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		(1 + 0.05) ×1500 = 1575 (1 + 0.05) × 1575 = 1653.75 1.1×1500 = 1650 OR 1.05×1.05 = 1.1025	No + reason	4	M1 for (1 + 0.05) ×1500 oe or 1575 M1 (dep) for (1 + 0.05) × '1575' (=1653.75) OR M2 for (1 + 0.05) × (1 + 0.05) × 1500 (=1653.75) Or 1.1025 × 1500 (=1653.75) M1 for 1.1×1500 or 1650 C1 for No with justification comparing 2 correct values, 1653.75 > 1650 oe Alternative M1 for 1.05 M2 for $(1.05)^2$ M1 for 1.1 C1 for No with justification comparing 2 correct values 1.1 < 1.1025 oe, 0.1 < 0.1025 oe, 10% < 10.25% oe or
19	(a)	$\frac{9}{6}\times 1.5$ or $\frac{7.5}{6}\times 9-9$	2.25	2	M1 for $\frac{6}{1.5}, \frac{1.5}{6}, \frac{9}{6}, \frac{6}{9}, \frac{7.5}{6}$ or $\frac{6}{7.5}$ oe used as scale factor A1 cao
	(b)	0.5 × 6 × 9 × sin30	13.5	2	M1 for attempt to use 0.5 × 6 × 9 × sin30 or any other complete correct method. A1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
20	(a)	$2 \times (2.5\times10^{-3}) \times (1.8\times10^{-3}) = 9\times10^{-6}$ $(2.5\times10^{-3}) - (1.8\times10^{-3}) = 7\times10^{-4}$ $\frac{9 \times 10^{-6}}{7 \times 10^{-4}} = 1.29 \times 10^{-2}$	1.29×10^{-2}	3	M1 for $2 \times (2.5\times10^{-3}) \times (1.8\times10^{-3})$ OR 9×10^{-6} or 0.000009 oe seen OR $(2.5\times10^{-3}) - (1.8\times10^{-3})$ or 7×10^{-4} oe seen M1 for $\frac{"9\times10^{-6}"}{"7\times10^{-4}"}$ (= 0.0128 to 0.0129) with at least one of numerator or denominator correct. A1 for 1.28×10^{-2} to 1.29×10^{-2}
	(b)	$x \times (y - a) = 2ay$ $xy - xa = 2ay$ $xy - 2ay = xa$ $y(x - 2a) = xa$ $y = \frac{xa}{x - 2a}$	$(y =) \frac{xa}{x - 2a}$	4	M1 for $x \times (y - a)$ or $xy \pm xa$ or $xy \pm a$ M1 for $xy \pm 2ay = \ldots$ M1 for $y(x \pm 2a) = \ldots$ A1 for $y (=) \frac{xa}{(x - 2a)}$ oe
21		Gradient $= \frac{-1}{(2)}$ $y = -0.5x + c$ $2 = -0.5(-1) + c$ $c = 1.5$	$y = -0.5x + 1.5$	3	M1 for a clear attempt to use $\frac{-1}{m}$ or $\frac{-1}{2m}$ or -0.5 seen M1 for an attempt to use their gradient with $(-1, 2)$ in a correct equation, e.g. $2 = '-0.5'(-1) + c$ or $y - 2 = '-0.5'(x - (-1))$ A1 for $y = -0.5x + 1.5$ oe

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		$\mathbf{6}x - 9y = 36$ $\mathbf{6}x + 10y = -2$ $19y = -38$ $2x - 3\times -2 = 12$ OR $10x - \mathbf{15}y = 60$ $9x + \mathbf{15}y = -3$ $19x = 57$ $2\times 3 - 3y = 12$ OR $x = \frac{(12+3y)}{2}$ $\frac{3(12+3y)}{2} + 5y = -1$ $36 + 9y + 10y = -2$ $19y = -38$ $x = \frac{(12+3\times -2)}{2}$	$x = 3, y = -2$	4	M1 for correct process to eliminate either x or y (condone one arithmetic error) A1 for either $x = 3$ or $y = -2$ M1 (dep) for correct substitution of their found variable OR M1 for correct process to eliminate the other variable (condone one arithmetic error) A1 cao for both $x = 3, y = -2$ [SC B1 for $x = 3$ or $y = -2$ if M0 scored]
23		$P = k/x^2$ $6 = k/5^2$ ($k = 150$) $P = \frac{150}{8^2}$	2.34	3	M1 for $P = k/x^2$ or $P \propto k/x^2$ M1 for $6 = k/5^2$ or ($k =$) 150 seen or $6\times 5^2 = P\times 8^2$ A1 2.34
24	(i) (ii) (iii)		(–2, 1) (–1, 3) (2, 3)	3	B1 cao B1 cao B1 cao

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Methods in Mathematics

Unit 2: Methods 2

For Approved Pilot Centres ONLY

Higher Tier

Tuesday 21 June 2011 – Morning
Time: 1 hour 45 minutes

Paper Reference
5MM2H/01

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. 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 may be used.**
- If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.



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 ▶

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6/6/6/6/6

P 3 8 9 5 8 A 0 1 2 4

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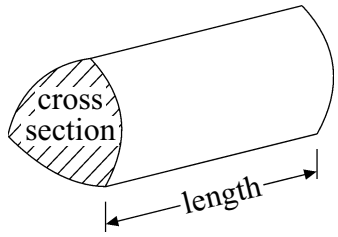
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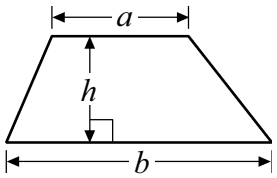
Formulae – Higher Tier

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

Volume of a prism = area of cross section × length

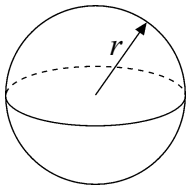


Area of trapezium $= \frac{1}{2}(a+b)h$



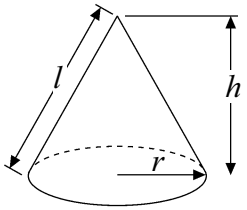
Volume of sphere $= \frac{4}{3}\pi r^3$

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

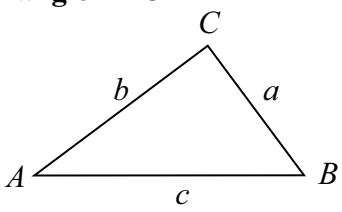


Volume of cone $= \frac{1}{3}\pi r^2 h$

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



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.

***1**

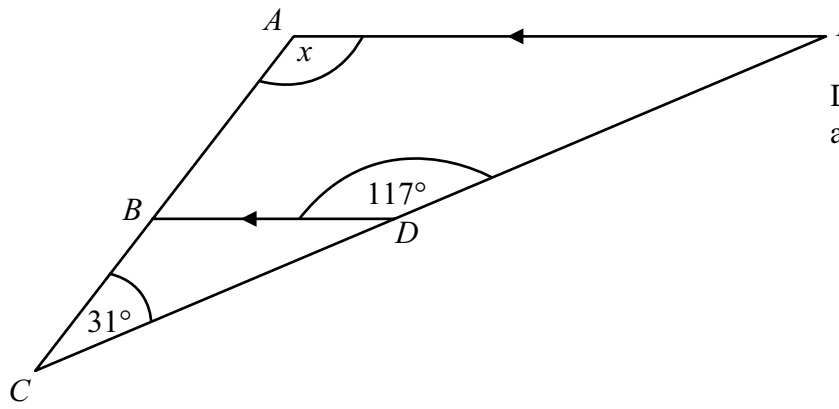


Diagram **NOT** accurately drawn

AE is parallel to *BD*.
ABC and *CDE* are straight lines.

Work out the size of the angle marked *x*.
You must give reasons for your answer.

(Total for Question 1 is 5 marks)

2 Divide £168 in the ratio 3 : 5 : 4

£..... £..... £.....

(Total for Question 2 is 3 marks)

3 (a) Write $\frac{17}{80}$ as a decimal.

.....

(1)

(b) Use your calculator to work out $\frac{5.6 \times 1.8}{18.03 - 7.4}$

.....

(2)

(Total for Question 3 is 3 marks)

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4 (a) Work out 15% of £600

£ .....

(2)

(b) Decrease £150 by 12%.

£ .....

(2)

(c) Work out 28 as a percentage of 35

..... %

(2)

(Total for Question 4 is 6 marks)

5 The diagram shows a solid prism.

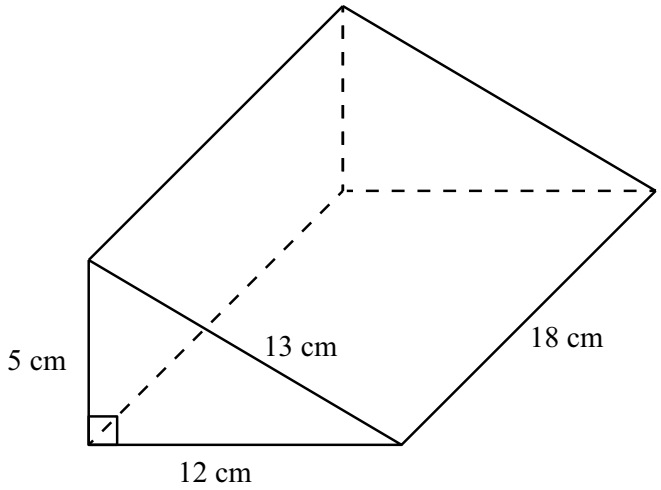


Diagram **NOT** accurately drawn

Work out the total surface area of the prism.

..... cm^2

(Total for Question 5 is 3 marks)

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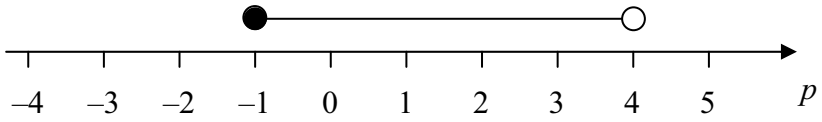
6 n is an integer and $-2 < n \leqslant 3$

(a) Write down all the possible values of n.

.....

(2)

Here is a number line.



(b) Write down the inequality shown on the number line.

.....

(2)

(Total for Question 6 is 4 marks)

7 The formula for the circumference of a circle is $C = \pi d$.

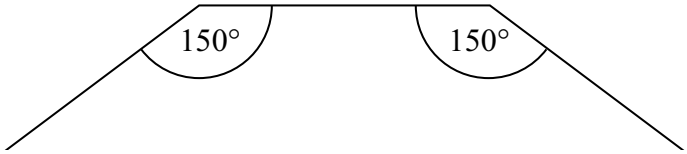
Work out the circumference of a circle of radius 4.7 cm.
Give your answer correct to 1 decimal place.

..... cm

(Total for Question 7 is 3 marks)

8 The diagram shows 3 sides of a regular polygon.

Diagram **NOT** accurately drawn



Each interior angle of the regular polygon is 150°.

Work out the number of sides of the regular polygon.

.....

(Total for Question 8 is 3 marks)

9 The width of a rectangle is a whole number of centimetres.
The length of the rectangle is 9 cm longer than its width.

The perimeter of the rectangle is less than 200 cm.

Find the greatest possible width of the rectangle.

..... cm

(Total for Question 9 is 4 marks)

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10

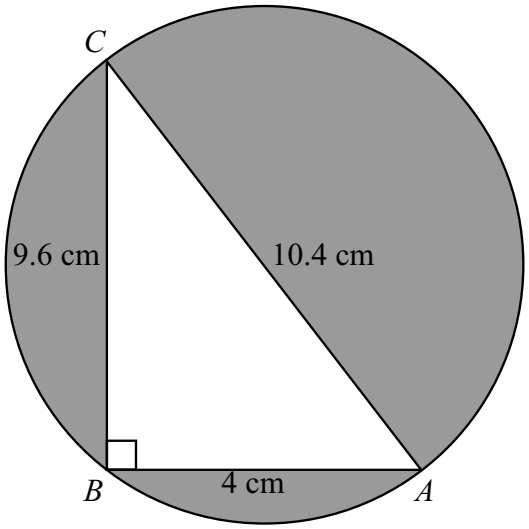


Diagram **NOT** accurately drawn

AC is a diameter of the circle.
ABC is a right-angled triangle.

Work out the shaded area.
Give your answer correct to 1 decimal place.

..... cm^2

(Total for Question 10 is 5 marks)

11 (a) Complete the table for $y = x^2 + 2x - 4$

x	-4	-3	-2	-1	0	1	2
y		-1	-4				4

(2)

(b) On the grid opposite, draw the graph of $y = x^2 + 2x - 4$

(2)

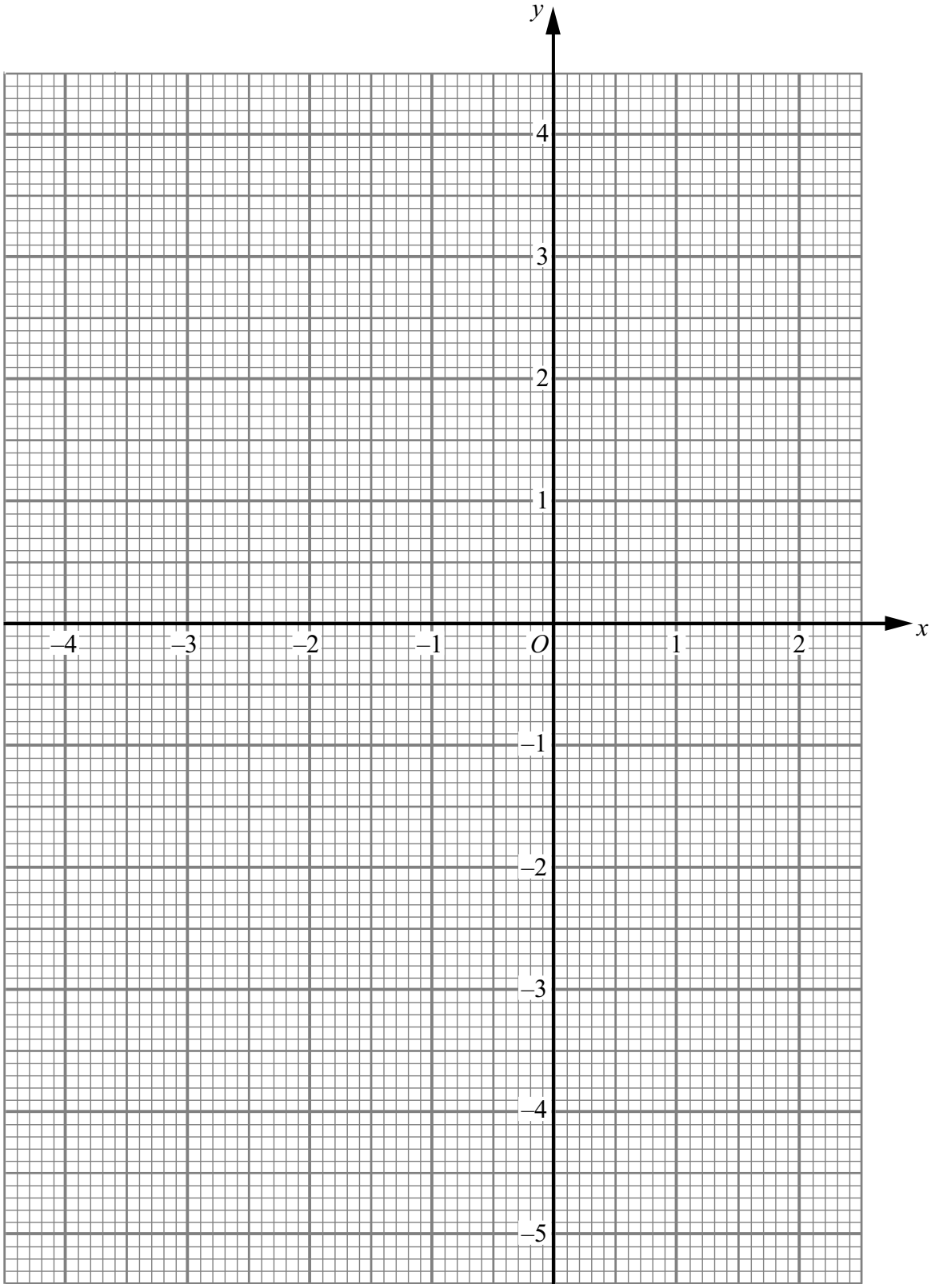
(c) Use the graph to find estimates of the solutions of the equation

$x^2 + 2x - 4 = 0$

.....

(2)

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(Total for Question 11 is 6 marks)

12

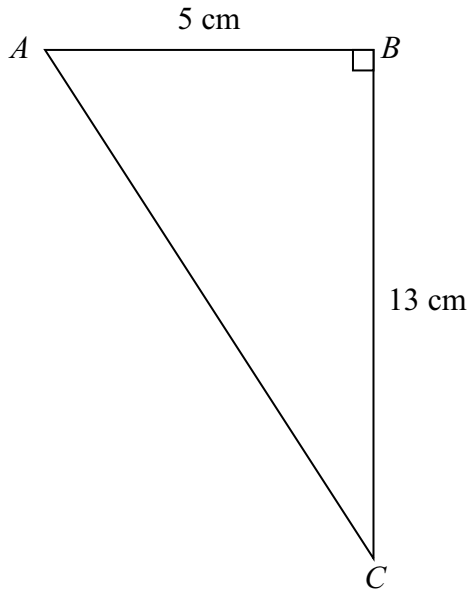


Diagram **NOT** accurately drawn

ABC is a right-angled triangle.

AB = 5 cm.
BC = 13 cm.

Work out the length of *AC*.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 12 is 3 marks)

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13 $$c^2 = \frac{2\times 7\times 10^6 + 9\times 10^7}{7\times 10^6 \times 9\times 10^7}$$

Work out the value of c.
Give your answer in standard form correct to 2 significant figures.

.....

(Total for Question 13 is 3 marks)

14 When a number is increased by 15% the answer is 253
What is the number?

.....

(Total for Question 14 is 3 marks)

15 The diagram shows a quadrilateral $ABCD$.

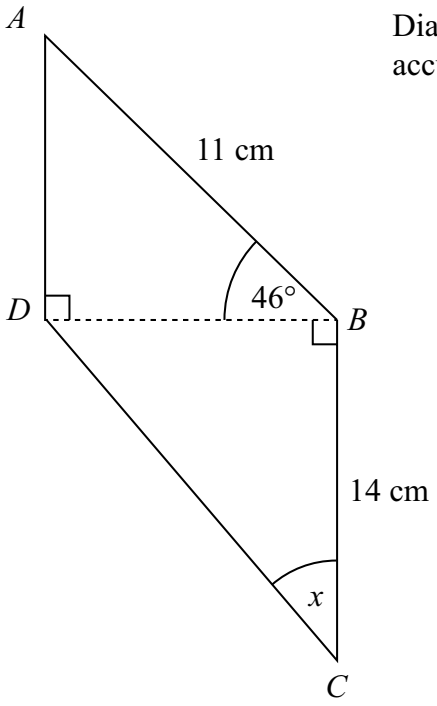


Diagram **NOT** accurately drawn

Angle ADB = Angle DBC = 90°.
AB = 11 cm.
BC = 14 cm.
Angle ABD = 46°.

Work out the size of the angle marked x.

.....°

(Total for Question 15 is 6 marks)

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16 Solve the simultaneous equations.
You must show all your working.

$3x + 8y = 6$

$5x - 2y = 33$

$x =$ .....

$y =$ .....

(Total for Question 16 is 4 marks)

17 $m = kp^2$

Given that $m = 16$ when $p = 5$

(a) work out the value of k.

.....

(2)

(b) Work out the value of p when $m = 36$

.....

(2)

(Total for Question 17 is 4 marks)

18 Solve $3x^2 - 5x - 1 = 0$

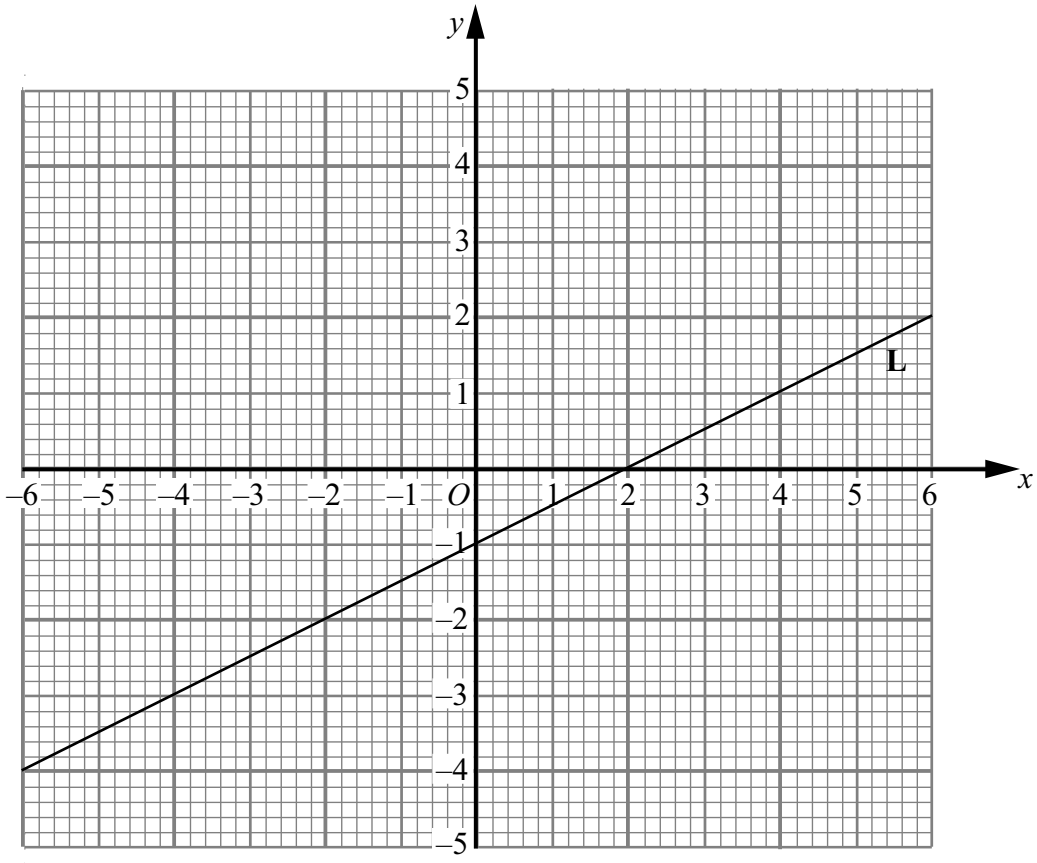
Give your solutions correct to 3 significant figures.

.....

(Total for Question 18 is 3 marks)

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19



The straight line **L** has equation $y = \frac{1}{2}x - 1$

(a) Write down an equation of a line parallel to **L**.

.....

(1)

(b) Find an equation of the line that goes through the point (4, 1) and is perpendicular to **L**.

.....

(3)

(Total for Question 19 is 4 marks)

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20 Make a the subject of the formula $2(a - m) = 7 - a$

$a =$ .....

(Total for Question 20 is 3 marks)

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21 The diagram shows a solid shape.

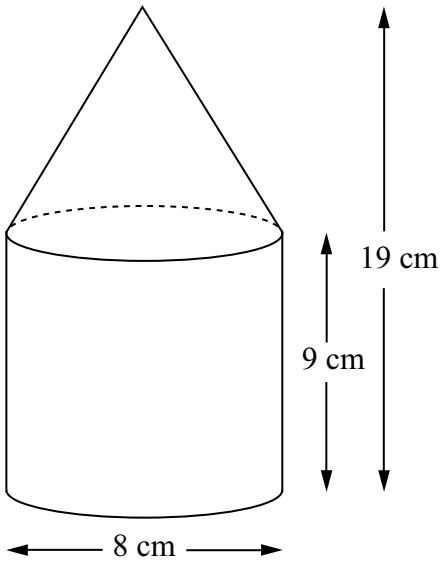


Diagram **NOT** accurately drawn

The shape is a cone on top of a cylinder.

The shape has a total height of 19 cm.
The base of the cone has a diameter of 8 cm.
The cylinder has a diameter of 8 cm and height 9 cm.

Work out the volume of the shape.
Give your answer correct to 3 significant figures.

..... cm^3

(Total for Question 21 is 4 marks)

22 The diagram shows a sector of a circle of radius 6.8 cm.

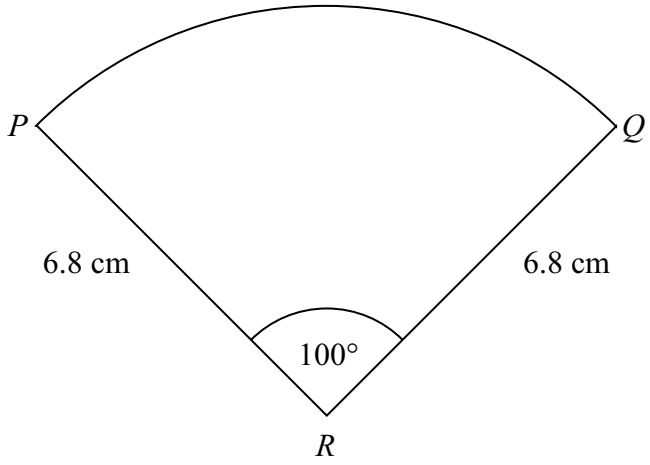


Diagram **NOT** accurately drawn

PQ is an arc of the sector.
Angle *PRQ* = 100°.

Work out the perimeter of the sector.
Give your answer correct to 3 significant figures.

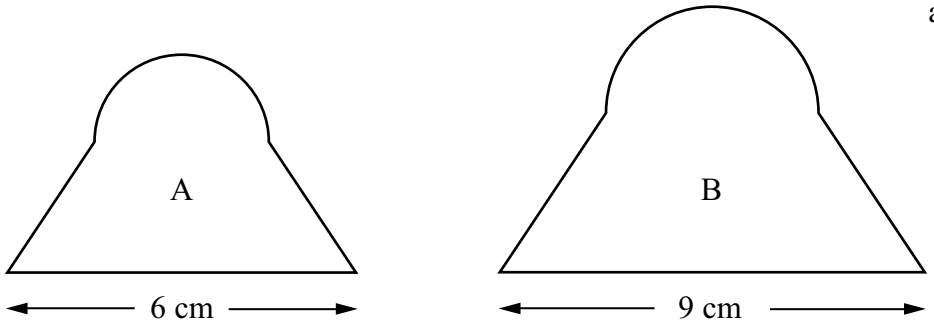
..... cm

(Total for Question 22 is 3 marks)

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23 The diagram shows two similar solid shapes, A and B.

Diagram **NOT** accurately drawn



The total surface area of A is 103 cm^2.

Work out the total surface area of B.

..... cm^2

(Total for Question 23 is 3 marks)

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24

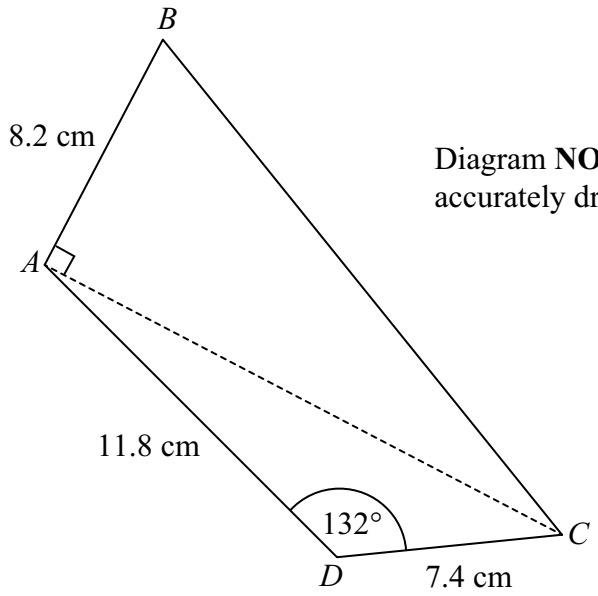


Diagram **NOT** accurately drawn

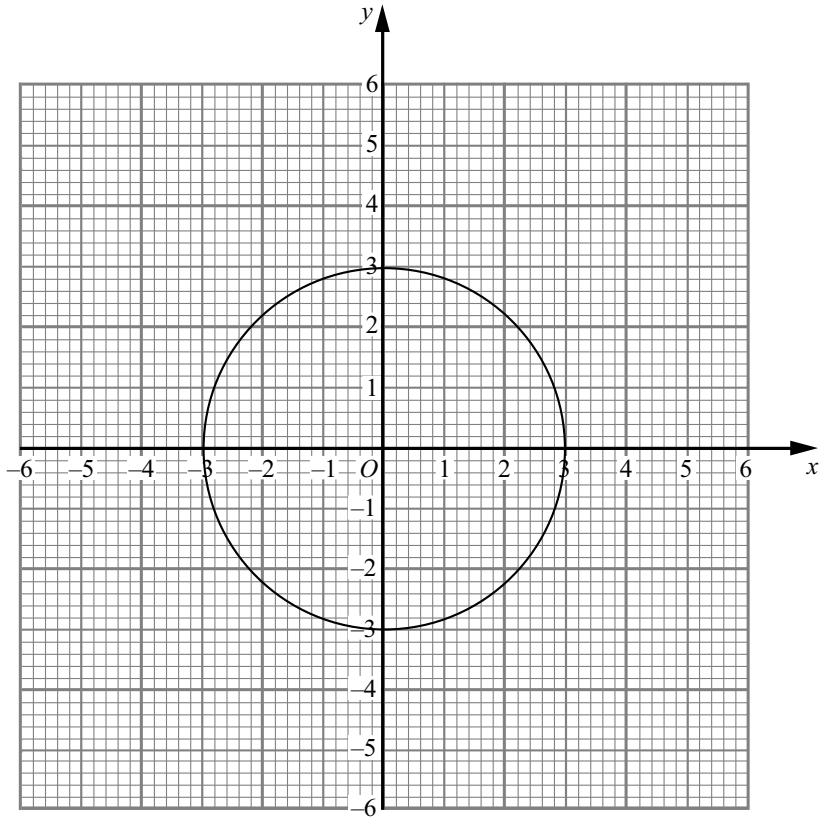
Work out the area of the quadrilateral *ABCD*.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 24 is 6 marks)

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25



(a) Write down the equation of the circle.

.....

(1)

(b) Solve the equations $x^2 + y^2 = 25$
$y - 2x = 5$

.....

(5)

(Total for Question 25 is 6 marks)

TOTAL FOR PAPER IS 100 MARKS

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Mark Scheme (Results)

June 2011

Methods in Mathematics (GCSE)
Unit 2: Methods 5MM2H_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

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
1		*BDC* = 180 – 117 (=63) *CBD* = 180 – 63 – 31 OR *CBD* = 117 - 31	86	5	M1 for 180 – 117 (=63) M1 for 180 – '63' – 31 A1 for $x = 86^o$ [Note: For the award of A1, it is NOT enough just to say, or show, that angle CBD = 86^o] C2 for all 3 reasons ***angles*** in a ***triangle*** add up to ***180^o*** ***angles*** on a ***straight line*** add up to ***180^o*** ***corresponding angles*** on parallel lines are equal (C1 for 1 or 2 reasons) OR M2 for 117 - 31 A1 for $x = 86^o$ [Note: For the award of A1, it is NOT enough just to say, or show, that angle CBD = 86^o] C2 for both reasons ***External (exterior)angle*** of a triangle equals sum of two ***interior opposite angles*** ***corresponding angles*** on parallel lines are equal (C1 for 1 reason)
2		168 ÷ (3 + 4 + 5) (=14) 5 × 14	42, 70, 56	3	M1 for 168 ÷ (3 + 4 + 5) (=14) M1 for 5 × '14' or 4 × '14' or 3 × '14' A1 cao OR M2 for $^3/_{12} \times 168$ or $^4/_{12} \times 168$ or $^5/_{12} \times 168$ (M1 for $^1/_{12} \times 168$) A1 cao [SC: B1 for 1 or 2 correct answers if M0 scored]

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
3	(a)		0.2125	1	B1 cao
	(b)		0.948259….	2	M1 for $\frac{1008}{1063}$ or 10.08 or 10.63 seen A1 for 0.95 or 0.948(259…..)
4	(a)	$\frac{15}{100} \times 600$ or 0.15×600	90	2	M1 for $\frac{15}{100} \times 600$ or 0.15×600 oe or 60 + 30 A1 cao
	(b)	$\frac{88}{100} \times 150$ or 0.88×150 OR $150 - \frac{12}{100} \times 150$ or $150 - 0.12 \times 150$	132	2	M1 for $\frac{88}{100} \times 150$ or 0.88×150 or $150 - \frac{12}{100} \times 150$ or $150 - 0.12 \times 150$ oe A1 cao
	(c)	$\frac{28}{35} \times 100$	80	2	M1 for $\frac{28}{35} \times 100$oe A1 cao
5		$13 \times 18 + 12 \times 18 + 5 \times 18 + ½ \times 5 \times 12 \times 2$	600	3	M1 for 13×18 (=234)or 12×18 (=216) or 5×18 (=90) or $½ \times 5 \times 12$ (=30) M1 for summing 4 or 5 areas, 3 of which must be correct A1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
6	(a)		-1, 0, 1, 2, 3	2	B2 for all 5 values and no others (B1 for 4 correct values and no others or all 5 correct values and one additional incorrect value)
	(b)		$-1 \leq p < 4$	2	B2 for $-1 \leq p < 4$ or just ≥ -1 **and** < 4) [B1 for $-1 \leq p$ or $p < 4$ or $p \geq -1$ oe or ≥ -1 or < 4 or $-1 < p \leq 4$] [Note: accept the use of any letter other than p throughout and ignore any attempt to list integer values]
7		4.7×2 (= 9.4) $\pi \times 9.4$	29.5	3	M1 for 4.7×2 (= 9.4) M1 for $\pi \times$ " 4.7×2" A1 for 29.5 – 29.55
8		180 – 150 (=30) 360 ÷ "30" OR $\frac{N-2}{N} \times 180 = 150$ $(N-2)180 = 150N$ 30N = 360	12	3	M1 for 180 – 150 (=30) [Note: the 30^o angle may be shown on the diagram] M1 for 360 ÷ "30" A1 cao OR M1 for $\frac{N-2}{N} \times 180 = 150$ M1 for 360 ÷ "30" A1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
9		$2x + 2(x \pm 9) < 200$ $2x + 2x \pm 18 < 200$ $4x \pm 18 < 200$ $4x < 182$ (or 218) $x < 45.5$ ($x < 54.5$, so width <45.5) OR 200 ÷ 4 =50 9 + 9 ÷ 4 = 4.5 50 – 4.5 = 45.5 OR 200 – 18 = 182 182 ÷ 4 = 45.5	45	4	B1 for $x \pm 9$ oe seen (it could just be on a diagram) or a rectangle with length 9 cm greater than the width M1 for $2x + 2(x \pm 9)$ oe A1 for 45.5 B1 for answer of 45 OR M1 for 200 ÷ 4 (=50) M1 for (9 + 9) ÷ 4 (=4.5) A1 for 45.5 B1 for answer of 45 OR M1 for 200 – 18 (= 182) M1 for 182 ÷ 4 A1 for 45.5 B1 for answer of 45 [SC: B3 for 45.5 seen from any method]
10		$\Pi \times (10.4 \div 2)^2 - 0.5 \times 9.6 \times 4$	65.7	5	M1 for 10.4÷2 (=5.2) M1 for $\pi \times$"5.2"^{2} (=84.948....) M1 for 0.5×9.6×4 (=19.2) M1 (dep on at least one previous M1) for'84.948…' – '19.2' [ie their area of the circle – their area of the triangle] A1 for an answer in the range 65.7 – 65.8

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
11	(a)		**4,** (-1), (-4), **-5, -4, -1**, (4)	2	B2 for all 4 values correct (B1 for 2 or 3 values correct)
	(b)		Correct graph	2	M1 (dep on at least B1 scored) for their points plotted correctly A1 for a smooth quadratic graph drawn through their points provided there is just **one** turning point [Do not accept points joined with line segments]
	(c)		1.2, -3.2	2	B1 ft from graph for 1.2 to 1.3 B1 ft from graph for -3.2 to -3.3 [Note: If their graph crosses the x-axis at more than 2 points, all solutions are required for B2, one 'correct' solution only for B1]
12		$5^2 + 13^2$ (=194) $\sqrt{194}$	13.9	3	M1 for $(AC^2 =)\ 5^2 + 13^2$ M1 for $\sqrt{'5^2' + '13^2'}$ (= √194) (Note: there must be an attempt to square both 5 and 13) A1for an answer in the range 13.92 – 13.93
13		$\frac{14000000+90000000}{6.3\times10^{14}} = \frac{104000000}{6.3\times10^{14}}$ $= \frac{1.04\times10^{8}}{6.3\times10^{14}} = 1.65\ldots\times10^{-7}$ $= \sqrt{16.5\ldots\times\ 10^{-8}}$	4.1×10^{-4}	3	M1 for 14000000 + 90000000 (=104000000) oe or 63×10^{13} oe or $1.65\ldots\times10^{-7}$ oe M1 (dep) for √"$(1.65\ldots \times 10^{-7})$" A1 cao
14		253 ÷ 1.15	220	3	M1 for sight of 1.15 or 115% M1 for 253 ÷ 1.15 **or** $\frac{253}{115}\times100$ oe A1 cao

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
15		$\cos 46 = \frac{BD}{11}$ $h = 80$ 11 × cos 46 $\tan x = \frac{7.64}{14}$ $x = \tan^{-1}(\frac{7.64}{14})$	28.6	6	M1 for $\cos 46 = \frac{BD}{11}$ M1 for $BD = 11 \times \cos 46$ (= 7.64…) A1 for answer in the range 7.6 - 8 M1 for $\tan x = \frac{"7.64"}{14}$ M1 for $x = \tan^{-1}(\frac{"7.64"}{14})$ A1 for 28.4 – 29
16		$3x + 8y = 6$ $20x - 8y = 132$ $23x = 138$ $x = 6$ $18 + 8y = 6$ $y = -1.5$	$x = 6$, $y = -1.5$	4	M1 for correct method to obtain either x or y (condone one error) A1 for $x = 6$ **or** $y = -1.5$ M1 for correct substitution of found variable into an equation A1 for correct value of second variable [SC: B1 for $x = 6$ or $y = -1.5$ if M0 scored]
17	(a)	$m = kp^2$ $16 = k \times 5^2$	0.64	2	M1 for $16 = k \times 5^2$ A1 for $k = 0.64$ $(= \frac{16}{25})$ oe
	(b)	$36 = \frac{16}{25} \times p^2$ $P^2 = \frac{25 \times 36}{16}$ $p = \frac{5 \times 6}{4} = \frac{30}{4}$	7.5	2	M1ft for 36 ÷ "0.64" oe A1ft for 7.5 oe

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
18		$3x^2 - 5x - 1 = 0$ $x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4 \times 3 \times (-1)}}{2 \times 3}$ $x = \frac{5 \pm \sqrt{37}}{6}$	1.85, -0.180	3	M1 for substitution into formula , condone incorrect signs M1 for $x = \frac{5 \pm \sqrt{37}}{6}$ A1 for -0.180 **and** 1.85 (accept 1.84) [SC: B1 for 1.85 **or** -0.180 if M0 scored]
19	(a)		y = ½ x + c ($c \neq$ -1)	1	B1 for y = ½x + c ($c \neq$-1 but could be zero)
	(b)	-1÷ ½ = -2 1 = -2 × 4 + c	y = 9 – 2x	3	M1(ft) for gradient = -1÷ ½ (= -2) **or** line drawn perpendicular to **L** through (4,1) with an attempt to find it's gradient M1 for 1 = '-2' × 4 + c or c = 9 seen or for reading off the value of y where their perpendicular crosses the y-axis A1 cao for y = 9 – 2x oe [SC: B2 for 9 – 2x seen if M0 scored]
20		$2a - 2m = 7 - a$ $3a = 7 + 2m$ $a = \frac{2m + 7}{3}$	$a = \frac{2m + 7}{3}$	3	M1 $2a - 2m = 7 - a$ M1 $2a + a = 7 + 2m$ (isolating correctly all terms in a from "$2a - 2m = 7 - a$" A1 for $a = \frac{2m + 7}{3}$ oe
21		$\pi \times 4^2 \times 9$ (=452.38..) $^1/_3 \times \pi \times 4^2 \times 10$ (=167.55)	620	4	M1 for $\pi \times 4^2 \times 9$ (= 452.39..) M1 for $^1/_3 \times \pi \times 4^2 \times 10$ (= 167.55..) M1 (dep on 1 previous M1) for "$\pi \times 4^2 \times 9$" + "$^1/_3 \times \pi \times 4^2 \times 10$" [Note: both parts must be volumes] A1 answer in the range 619 – 621 [SC: B2 for an answer in the range 2475 to 2484 if M0 scored, ie consistently taking the radius as 8 cm]

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
22		$\frac{100}{360}\times\pi\times6.8\times2$	25.5	3	M1 for $\frac{100}{360}\times\pi\times6.8\times2$ (=11.86..) M1 for "11.86" + 2 × 6.8 oe [Note: "11.86" must be from an attempt to find the length of the arc] A1 for answer in the range 25.4 – 25.6
23		4.5 ÷ 3 = 3/2 $103\times\left(\frac{3}{2}\right)^2$ OR 3 ÷4.5 = 2/3 $103\div\left(\frac{2}{3}\right)^2$	231.75	3	B1 for 3 ÷ 2 **or** 2 ÷ 3 **or** 1.5 oe **or** $^2/_3$ oe or 103 ÷ 6 × 9 (= 154.5) M1 for $103\times"\left(\frac{3}{2}\right)"^2$ or $103\div"\left(\frac{2}{3}\right)"^2$ oe A1 cao
24		$AC^2 = 11.8^2 + 7.4^2$ $-2\times11.8\times7.4\times\cos132$ AC = 17.63… ½ ×8.2 × "17.63… (= 72.28..) + ½ × 11.8 × 7.4 × sin132 (= 32.445..)	105	6	M1 for $AC^2 = 11.8^2 + 7.4^2 - 2\times11.8\times7.4\times\cos132$ M1 for correct order of operations or 310.85… A1 for AC = 17.63… M1 for Area of ABC = ½ ×8.2 × "17.63…" **or** Area of ADC = ½ × 11.8 × 7.4 × sin132 M1 for "½ ×8.2 × "17.63…"" + "½ × 11.8 × 7.4 × sin132" A1 for an answer in the range 104.7 – 105

5MM2H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
25	(a)		$x^2 + y^2 = 9$	1	B1 cao
	(b)	$x^2 + y^2 = 25$ $y - 2x = 5$ $y = 2x + 5$ $x^2 + (2x + 5)^2 = 25$ $x^2 + 4x^2 + 20x + 25 = 25$ $5x^2 + 20x = 0$ $5x(x + 4) = 0$ $x = 0,\ x = -4$ $y = 5,\ y = -3$	$x = 0, y = 5$ $x = -4, y = -3$	5	M1 for clear attempt to draw a circle, centre (0,0) A1 for circle, radius 5, centre (0,0) drawn M1 for clear method seen to draw straight line eg. Calculation of points or use of $y = mx + c$ A1 for $y = 2x + 5$ drawn A1 for $x = 0, y = 5$ **and** $x = -4, y = -3$ **OR** M1 for $x^2 + (2x + 5)^2 = 25$ M1 for $x^2 + 4x^2 + 20x + 25 = 25$ A1 $5x^2 + 20x = 0$ M1 for factorising their quadratic or for a correct method to find BOTH solutions of their quadratic A1 for $x = 0, y = 5$ **and** $x = -4, y = -3$ [SC: B1 for $x = 0, y = 5$ **or** $x = -4, y = -3$ if M0 scored]

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