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IGCSE

Mathematics (Specification A)

Sample Assessment Materials (SAMs)

Edexcel IGCSE in Mathematics (Specification A)(4MA0)

First examination 2011

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We will inform centres of any changes to this issue. The latest issue can be found on the Edexcel website: www.edexcel.org.uk.

Acknowledgements

This document has been produced by Edexcel on the basis of consultation with teachers, examiners, consultants and other interested parties. Edexcel acknowledges its indebtedness to all those who contributed their time and expertise to its development.

Authorised by Roger Beard
Prepared by Parul Patel

Contents

Introduction

These sample assessment materials have been prepared to support the specification.

The aim of these materials is to provide students and centres with a general impression and flavour of the actual question papers and mark schemes in advance of the first operational examinations.

Sample question papers

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						4	M	A	0	/	1	F	Signature	

Paper Reference(s)

4MA0/1F

Edexcel IGCSE

Mathematics A

Paper 1F

Foundation Tier

Sample Assessment Material

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
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10	
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12	
13	
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15	
16	
17	
18	
19	
Total	

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator.
Tracing paper may be used.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions in the spaces provided in this question paper.
You must NOT write on the formulae page. Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 19 questions in this question paper. The total mark for this paper is 100.
There are 20 pages in this question paper. Any blank pages are indicated.
You may use a calculator.

Advice to Candidates

Write your answers neatly and in good English.

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Turn over

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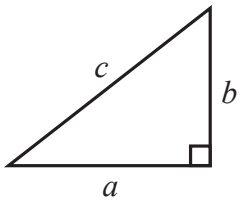
IGCSE MATHEMATICS

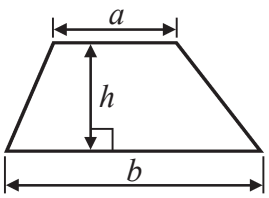
FORMULA SHEET – FOUNDATION TIER

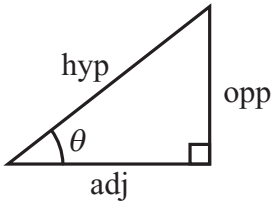
Pythagoras' Theorem

$a^2 + b^2 = c^2$



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





adj = hyp × cos θ

opp = hyp × sin θ

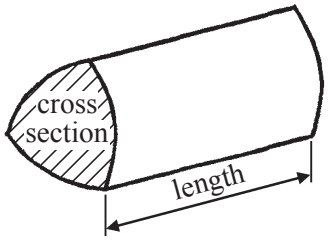
opp = adj × tan θ

or $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$

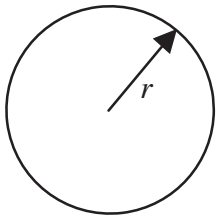
$\tan\theta = \frac{\text{opp}}{\text{adj}}$

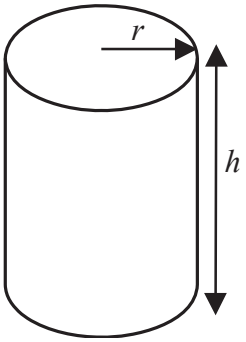
Volume of prism = area of cross section × length



Circumference of circle = $2\pi r$

Area of circle = πr^2





Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

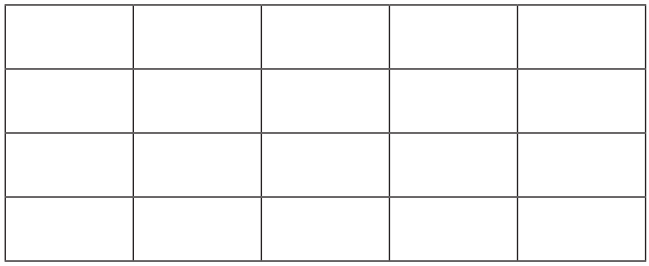
Leave blank

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. (a) (i) Shade 40% of this shape.



(ii) When 40% of the shape is shaded, what percentage is unshaded?

..... %
(2)

(b) Write 40% as a decimal.

.....
(1)

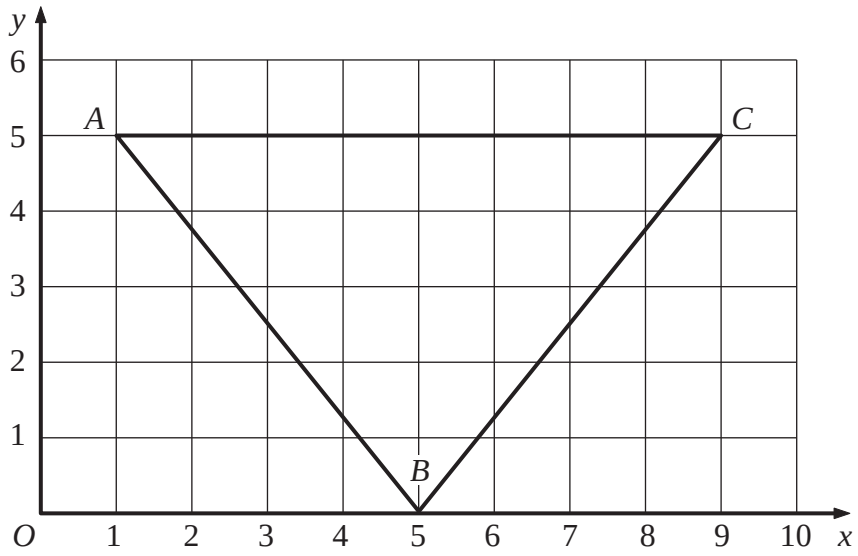
(c) Write 40% as a fraction.
Give your fraction in its simplest form.

.....
(2) **Q1**

(Total 5 marks)

Leave blank

2. The diagram shows a triangle *ABC* on a centimetre grid.



(a) Write down the coordinates of the point

(i) *A*, (..... , ...)

(ii) *B*. (..... , ...)

(2)

(b) Measure the length of the line *AB*.
Give your answer in millimetres.

..... mm

(1)

(c) Find the perimeter of triangle *ABC*.

..... mm

(2)

(d) Write down the special name for triangle *ABC*.

.....

(1)

(e) (i) Measure the size of angle *B*.

°

.....

(1)

(ii) Write down the special name for this type of angle.

.....

(1)

Q2

(Total 8 marks)

Leave blank

3.

15	21	23	24	25	27	33	35	39

(a) From the numbers in the box, write down

(i) an even number

.....

(1)

(ii) a factor of 60

.....

(1)

(iii) a multiple of 9

.....

(1)

(iv) a square number

.....

(1)

(v) a prime number.

.....

(1)

(b) Write a number from the box on the dotted line so that each calculation is correct.

(i) ..... + 87 = 111

(ii) ..... × 46 = 1794

(2) **Q3**

(Total 7 marks)

Leave blank

4. Here are the first five terms of a number sequence.

1 7 13 19 25

(a) Write down the next term in the sequence.

.....

(1)

(b) Explain how you worked out your answer.

.....

(1)

(c) Find the 11th term of the sequence.

.....

(1)

(d) The 50th term of the sequence is 295
Work out the 49th term of the sequence.

.....

(1)

Tamsin says, "Any two terms of this sequence add up to an even number."

(e) Explain why Tamsin is right.

.....

.....

.....

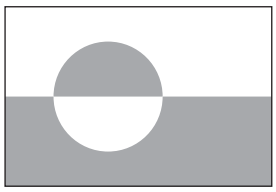
(1)

Q4

(Total 5 marks)

Leave blank

5. Here are 9 flags.



A

B

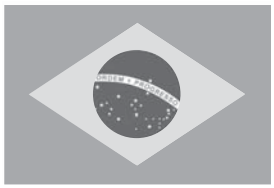
C

D

E

F

G



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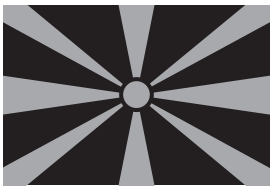


I

(a) Write down the letter of the flag which has:

(i) exactly one line of symmetry

.....
(1)

(ii) rotational symmetry of order 4

.....
(1)

(iii) 2 lines of symmetry and rotational symmetry of order 2

.....
(1)

(iv) no lines of symmetry and rotational symmetry of order 2

.....
(1)

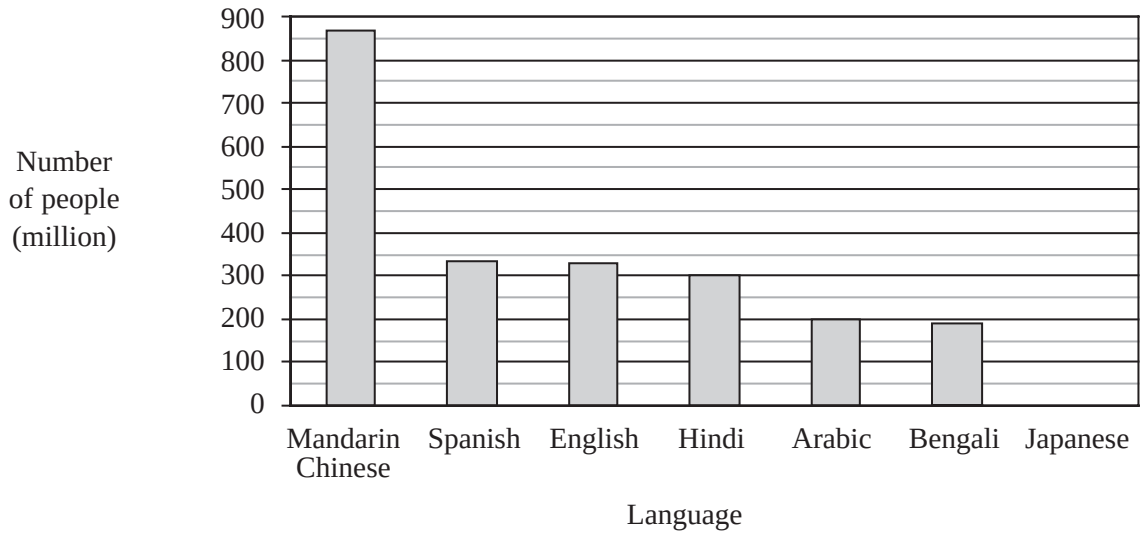
(b) Write down the letter of the flag which has a rhombus on it.

.....
(1)
(Total 5 marks)

Q5

Leave blank

6. The bar chart shows information about the number of people, in millions, who speak each of 6 languages.



(a) Write down the number of people who speak Hindi.

..... million
(1)

(b) Write down the number of people who speak Mandarin Chinese.

..... million
(1)

(c) Which language is spoken by 190 million people?

.....
(1)

125 million people speak Japanese.

(d) Draw a bar on the bar chart to show this information.
(1)

(e) Find the ratio of the number of people who speak Hindi to the number of people who speak Japanese.
Give your ratio in its simplest form.

.....
(2)

Leave blank

330 million people speak English.
70% of these people live in the USA.

(f) Work out 70% of 330 million.

..... million
(2)

332 million people speak Spanish.
143 million of these people live in South America.

(g) Work out 143 million as a percentage of 332 million.
Give your answer correct to 1 decimal place.

..... %
(2)

Q6

(Total 10 marks)

7. (a) Solve $2x + 9 = 1$

x = ...
(2)

(b) Solve $5y - 4 = 2y + 7$

y = ...
(2)

Q7

(Total 4 marks)

Leave blank

8. The table shows information about the time in each of five cities.
For each city, it shows the number of hours time difference from the time in London.

+ shows that the time is ahead of the time in London.
− shows that the time is behind the time in London.

City	Time difference from London (hours)
Cairo	+2
Montreal	−5
Bangkok	+7
Rio de Janeiro	−3
Los Angeles	−8
Mexico City	

(a) When the time in London is 6 a.m., what is the time in:

(i) Bangkok,

.....

(ii) Los Angeles.

.....

(2)

(b) The time in Mexico City is 2 hours ahead of the time in **Los Angeles**.
Complete the table to show the time difference of Mexico City from London.

(1)

(c) Write down the name of the city in which the time is 10 hours behind Bangkok.

.....

(1)

(d) Work out the time difference between

(i) Cairo and Montreal,

..... hours

(ii) Rio de Janeiro and Los Angeles.

..... hours

(2)

Q8

(Total 6 marks)

Leave blank

9. (a) Find the value of $4 \times (8 - 3)$

.....

(1)

(b) Put brackets in the expression below so that the answer is 19

$$7 + 4 \times 5 - 2$$

(1)

(c) Find 3.8^3

.....

(1)

(d) Find $\sqrt{6.76}$

.....

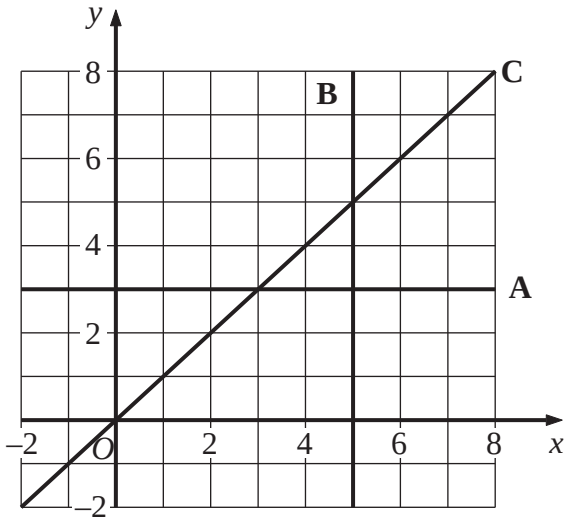
(1)

Q9

(Total 4 marks)

Leave blank

10.



Write down the equation of

(i) line **A**,

.....

(1)

(ii) line **B**,

.....

(1)

(iii) line **C**.

.....

(1)

Q10

(Total 3 marks)

11. (a) Use your calculator to work out the value of

$$\frac{(3.7+4.6)^2}{2.8+6.3}$$

Write down all the figures on your calculator display.

.....

(2)

(b) Give your answer to part (a) correct to 2 decimal places.

.....

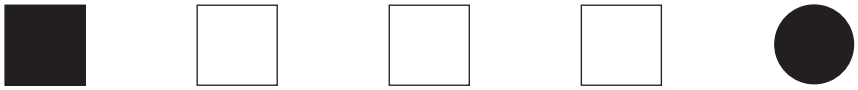
(1)

Q11

(Total 3 marks)

Leave blank

12. Here are five shapes.



Four of the shapes are squares and one of the shapes is a circle.
One square is black.
Three squares are white.
The circle is black.

The five shapes are put in a bag.
Alec takes at random a shape from the bag.

(a) Find the probability that he will take the black square.

.....
(1)

(b) Find the probability that he will take a white square.

.....
(2)

Jasmine takes a shape at random from the bag 150 times.
She replaces the shape each time.

(c) Work out an estimate for the number of times she will take a white square.

.....
(2)

Q12

(Total 5 marks)

Leave blank

13. A basketball court is a rectangle, 28 m long and 15 m wide.

(a) Work out the area of the rectangle.

..... m^2
(2)

(b) In the space below, make an accurate scale drawing of the rectangle.
Use a scale of 1 cm to 5 m.

(2) **Q13**

(Total 4 marks)

14. (a) Work out the value of $x^2 - 5x$ when $x = -3$

.....
(2)

(b) Factorise $x^2 - 5x$

.....
(2) **Q14**

(Total 4 marks)

Leave blank

15. Hajra counted the numbers of sweets in 20 packets.
The table shows information about her results.

Number of sweets	Frequency
46	3
47	6
48	3
49	5
50	2
51	1

(a) What is the mode number of sweets?

.....
(1)

(b) Work out the range of the number of sweets.

.....
(2)

(c) Work out the mean number of sweets in the 20 packets.

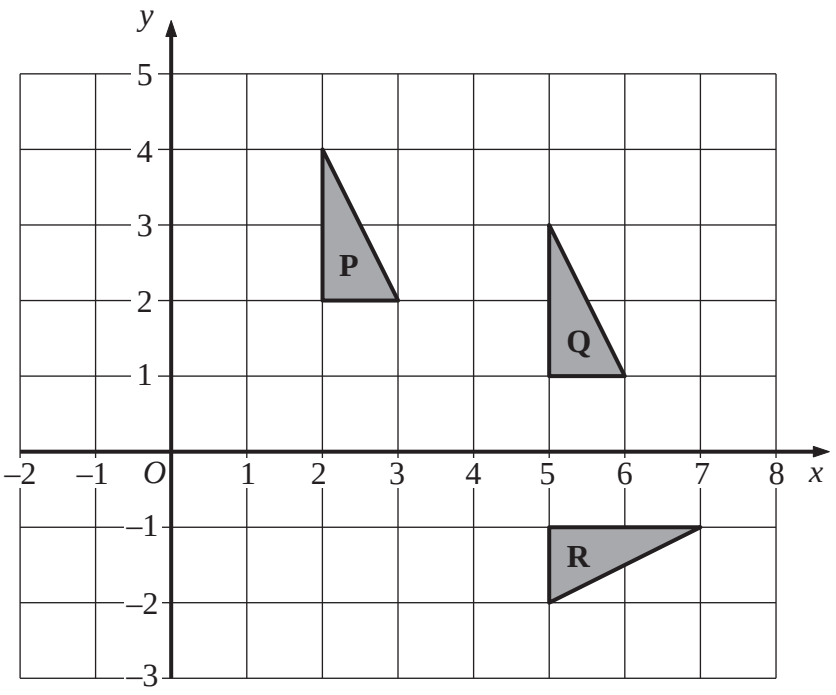
.....
(3)

Q15

(Total 6 marks)

Leave blank

16.



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

.....

.....

(2)

(b) Describe fully the single transformation which maps triangle **P** onto triangle **R**.

.....

.....

(3) **Q16**

(Total 5 marks)

Leave blank

17. (a) Simplify, leaving your answers in index form,

(i) $7^5 \times 7^3$

.....

(1)

(ii) $5^9 \div 5^3$

.....

(1)

(b) Solve $\frac{2^9 \times 2^4}{2^n} = 2^8$

$n =$ .....

(2) **Q17**

(Total 4 marks)

18. (a) Expand and simplify $3(4x - 5) - 4(2x + 1)$

.....

(2)

(b) Expand and simplify $(y + 8)(y + 3)$

.....

(2)

(c) Expand $p(5p^2 + 4)$

.....

(2) **Q18**

(Total 6 marks)

Leave blank

19. A tunnel is 38.5 km long.

(a) A train travels the 38.5 km in 21 minutes.

Work out the average speed of the train.
Give your answer in km/h.

..... km/h
(3)

(b) To make the tunnel, a cylindrical hole 38.5 km long was drilled.
The radius of the cylindrical hole was 4.19 m.

Work out the volume of earth, in m^3, which was removed to make the hole.
Give your answer correct to 3 significant figures.

..... m^3
(3)

Q19

(Total 6 marks)

TOTAL FOR PAPER: 100 MARKS

END

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Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						4	M	A	0	/	2	F	Signature	

Paper Reference(s)

4MA0/2F

Edexcel IGCSE

Mathematics A

Paper 2F

Foundation Tier

Sample Assessment Material

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
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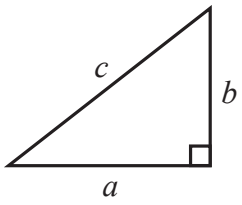
IGCSE MATHEMATICS

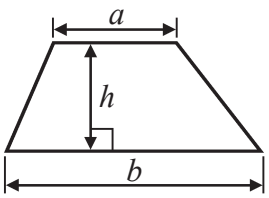
FORMULA SHEET – FOUNDATION TIER

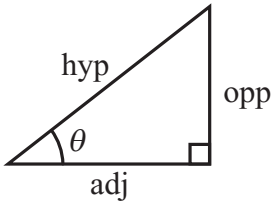
Pythagoras' Theorem

$a^2 + b^2 = c^2$



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





adj = hyp × cos θ

opp = hyp × sin θ

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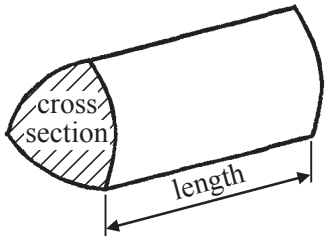
or $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$

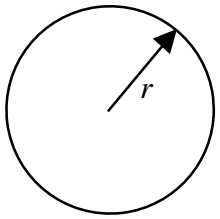
$\tan\theta = \frac{\text{opp}}{\text{adj}}$

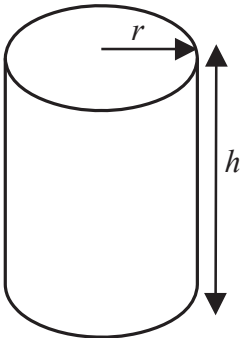
Volume of prism = area of cross section × length



Circumference of circle = $2\pi r$

Area of circle = πr^2





Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

Leave blank

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. (a) Here is a list of numbers.

999 1999 199 9000 1009

(i) Write these numbers in order of size.
Start with the smallest.

.....

(1)

(ii) From the list, write down an even number.

.....

(1)

(iii) From the list, write down a number that is a multiple of 9

.....

(1)

(b) Here are four cards.
Each card has a number on it.

3	4	1	2

The four cards are arranged to make the number 3412
The cards can be re-arranged to make other numbers.

(i) Write down the largest number that can be made.

.....

(1)

(ii) Write down the smallest **odd** number that can be made.

.....

(2)

(Total 6 marks)

Q1

Leave blank

2. On the probability scale, mark the following with a cross (**x**).

(i) The probability that the next baby to be born will be a boy.
Label this cross **A**.

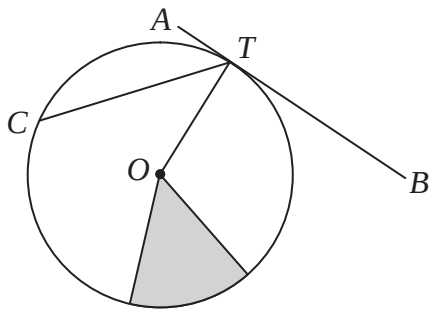
(ii) The probability that the day after Saturday will be Sunday.
Label this cross **B**.

(iii) The probability that a person chosen at random has a birthday in May.
Label this cross **C**.

Q2

(Total 3 marks)

3. *O* is the centre of the circle.



The line *AB* touches the circle at *T*.

(a) Write down the mathematical name for the line

(i) *OT*,

.....
(1)

(ii) *CT*,

.....
(1)

(iii) *AB*.

.....
(1)

(b) Write down the mathematical name for the shaded region.

.....
(1)

Q3

(Total 4 marks)

Leave blank

4. (a) Write a number in the box so that this is a correct calculation.

$$189 \times \square = 3969$$

(1)

(b) Write down the value of the 3 in the number 3969

.....

(1)

(c) Write the number 3969 correct to the nearest 10

.....

(1)

(d) Write the number 3969 correct to the nearest 100

.....

(1)

(e) Find the square root of 3969

.....

(1)

(f) Find the cube root of 3969

(i) Write down all the figures on your calculator display.

.....

(1)

(ii) Give your answer correct to 3 significant figures.

.....

(1)

Q4

(Total 7 marks)

Leave blank

5. This formula gives the cost of hiring a bike for a number of days.

cost in pounds = 4 × number of days + 2

(a) Angus hired a bike for 5 days.
Calculate the cost.

£ .....

(2)

(b) Jeevan hired a bike.
The cost was £30
Calculate the number of days for which Jeevan hired the bike.

.....

(2)

Q5

(Total 4 marks)

Leave blank

6. Here is a list of fractions.

$$\frac{7}{20} \qquad \frac{3}{10} \qquad \frac{9}{25} \qquad \frac{12}{36}$$

From the list, write down the fraction which is

(a) equivalent to $\frac{1}{3}$

.....

(1)

(b) equal to 0.3

.....

(1)

(c) the largest.

.....

(3) **Q6**

(Total 5 marks)

Leave blank

7. Chocolate bars cost £1.10 each.
Cakes cost £1.25 each.
Joshi buys 2 chocolate bars and 3 cakes.
He pays with a £10 note.

Work out how much change he should receive.

£ .....

Q7

(Total 3 marks)

Leave blank

8. Here are the numbers of points scored by 8 teams in a season.

5 3 14 12 4 3 6 9

(a) Find the mode.

.....

(1)

(b) Work out the mean.

.....

(3)

(c) Find the median.

.....

(2)

(d) The team that scored 4 points was The Cheetahs.
Later, The Cheetahs had points taken away because of foul play.

(i) Will the median increase or decrease or stay the same?

.....

(ii) Give your reason.

.....

.....

.....

(2)

(e) A team is chosen at random from these 8 teams.
Find the probability that this team scored more than 10 points.

.....

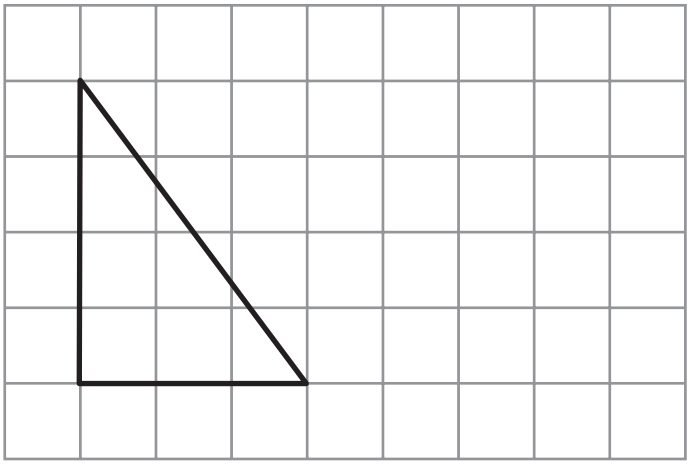
(2)

Q8

(Total 10 marks)

Leave blank

9. The diagram shows a triangle drawn on a 1 cm grid.

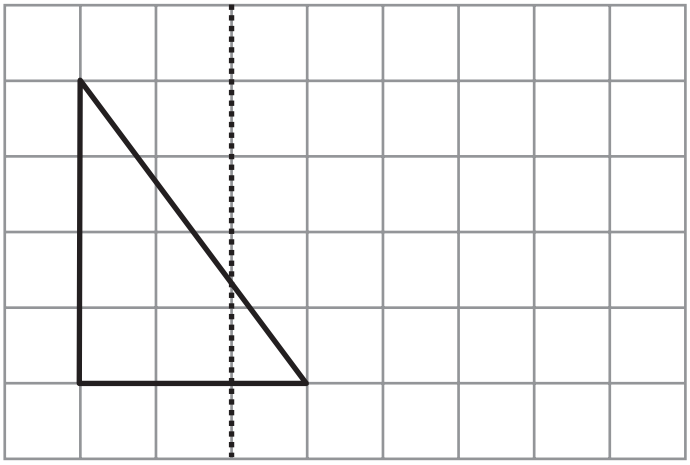


(a) Work out the area of the triangle.
State the units of your answer.

....

(3)

(b)



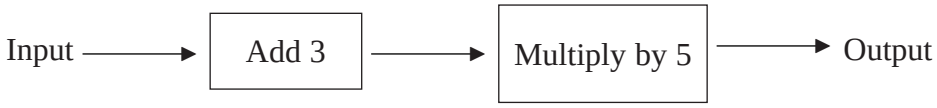
On the grid, reflect the triangle in the dotted line.

(2) **Q9**

(Total 5 marks)

Leave blank

10. Here is a number machine.



(a) Work out the **output** when the **input** is 6

.....

(2)

(b) Work out the **input** when the **output** is 70

.....

(2)

(c) Work out the **input** when the **output** is –85

.....

(2)

(d) Find an expression, in terms of x, for the **output** when the **input** is x.

.....

(2) **Q10**

(Total 8 marks)

Leave blank

11.

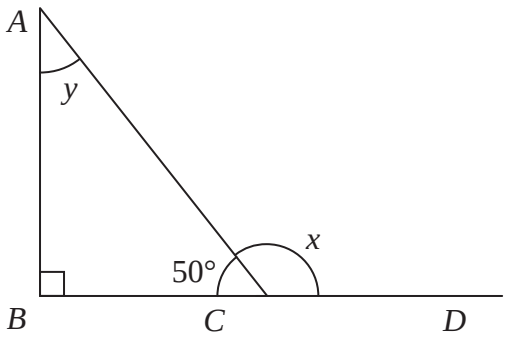


Diagram **NOT** accurately drawn

In the diagram *BCD* is a straight line.

(a) Work out the size of angle *x*.

.....°

(1)

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

.....°

(1)

(ii) Give a reason for your answer to part (b)(i).

.....

.....

(1)

Q11

(Total 3 marks)

Leave blank

12. Michelle has £4800

She gives $\frac{2}{5}$ of the £4800 to a charity.

(a) How much money does Michelle give to the charity?

£ .....

(2)

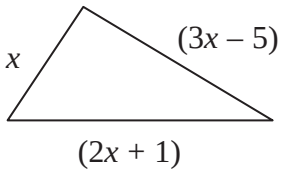
(b) The charity spends 85% of this money on medicines.
How much money does the charity spend on medicines?

£ .....

(2) **Q12**

(Total 4 marks)

13. The diagram shows the lengths, in cm, of the sides of a triangle.



The perimeter of the triangle is 17 cm.

(i) Use this information to write an equation in x.

.....

(1)

(ii) Solve your equation.

x = ...

(2) **Q13**

(Total 3 marks)

Leave blank

14. Anji mixes sand and cement in the ratio 7 : 2 by weight.
The total weight of the mixture is 27 kg.

Calculate the weight of sand in the mixture.

..... kg **Q14**

(Total 3 marks)

15. Solve $5(x - 4) = 35$

x = ... **Q15**

(Total 3 marks)

Leave blank

16. Julian has to work out $\frac{6.8 \times 47.6}{2.09}$ without using a calculator.

(a) Round each number in Julian's calculation to one significant figure.

.....

(2)

(b) Use your rounded numbers to work out an estimate for $\frac{6.8 \times 47.6}{2.09}$

Give your answer correct to one significant figure.

.....

(2)

(c) Without using your calculator, explain why your answer to part (b) should be larger than the exact answer.

.....

.....

.....

(2) **Q16**

(Total 6 marks)

Leave blank

17. The diagram shows a wall.

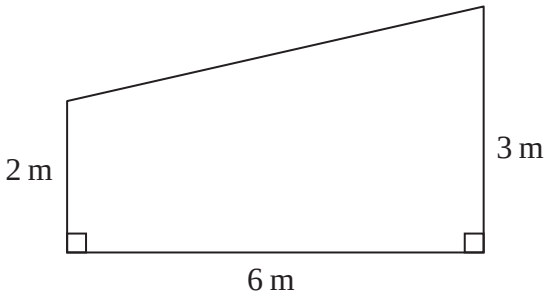


Diagram **NOT** accurately drawn

(a) Calculate the area of the wall.

..... m^2
(2)

(b) 1 litre of paint covers an area of 20 m^2.
Work out the volume of paint needed to cover the wall.
Give your answer in cm^3.

..... cm^3
(3)

Q17

(Total 5 marks)

Leave blank

18. Solve the simultaneous equations

$$y = x + 3$$
$$y = 7x$$

x = ...

y = ... **Q18**

(Total 3 marks)

Leave blank

19. (a)

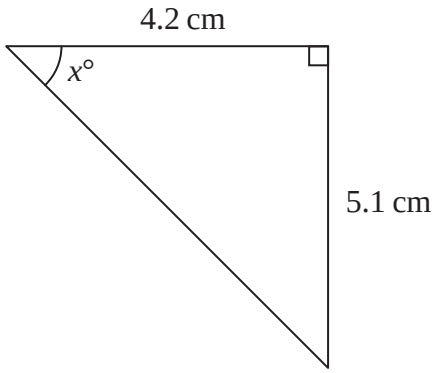


Diagram **NOT** accurately drawn

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

x = ...
(3)

(b)

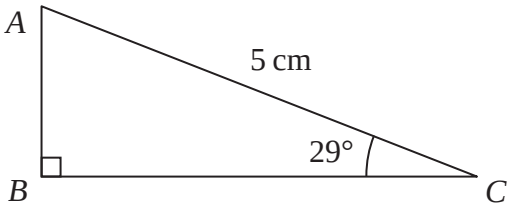


Diagram **NOT** accurately drawn

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

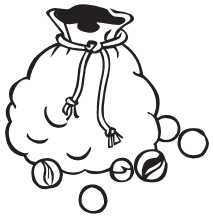
..... cm
(3)

Q19

(Total 6 marks)

Leave blank

20. A bag contains some marbles.
The colour of each marble is red or blue or green or yellow.



A marble is taken at random from the bag.
The table shows the probability that the marble is red or blue or green.

Colour	Probability
Red	0.1
Blue	0.2
Green	0.1
Yellow	

(a) Work out the probability that the marble is yellow.

.....

(2)

(b) Work out the probability that the marble is blue or green.

.....

(2)

The probability that the marble is made of glass is 0.8

(c) Beryl says "The probability that the marble is green or made of glass is $0.1 + 0.8 = 0.9$"

Is Beryl correct? .....

Give a reason for your answer.

.....

.....

(2) **Q20**

(Total 6 marks)

PLEASE TURN OVER FOR QUESTION 21

Leave blank

21.

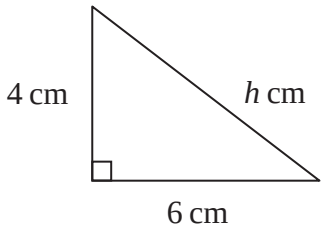


Diagram **NOT** accurately drawn

Calculate the value of h.
Give your answer correct to 3 significant figures.

h = ...

Q21

(Total 3 marks)

TOTAL FOR PAPER: 100 MARKS

END

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						4	M	A	0	/	3	H	Signature	

Paper Reference(s)

4MA0/3H

Edexcel IGCSE

Mathematics A

Paper 3H

Higher Tier

Sample Assessment Material

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
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17	
18	
19	
Total	

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator.
Tracing paper may be used.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions in the spaces provided in this question paper.
You must NOT write on the formulae page. Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 19 questions in this question paper. The total mark for this paper is 100.
There are 20 pages in this question paper. Any blank pages are indicated.
You may use a calculator.

Advice to Candidates

Write your answers neatly and in good English.

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Turn over

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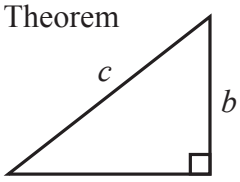
IGCSE MATHEMATICS
FORMULA SHEET – HIGHER TIER

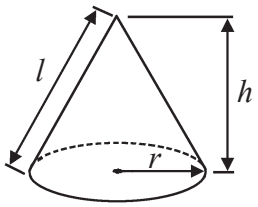
Pythagoras' Theorem



$a^2 + b^2 = c^2$

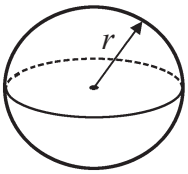
Volume of cone = $\frac{1}{3}\pi r^2 h$

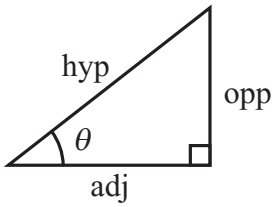
Curved surface area of cone = $\pi r l$



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

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





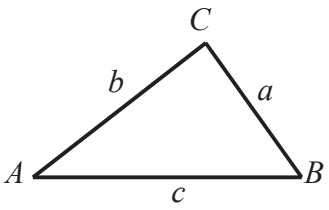
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

or $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

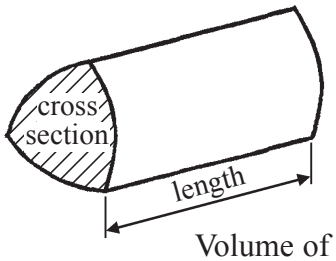
In any triangle ABC



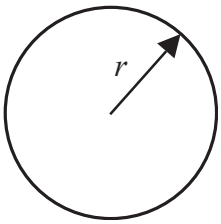
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



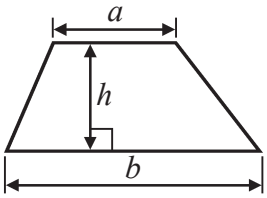
Volume of prism = area of cross section × length

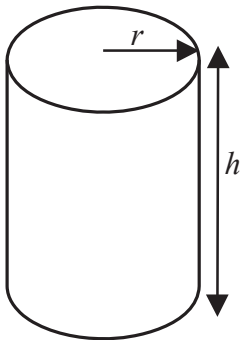


Circumference of circle = $2\pi r$

Area of circle = πr^2

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





Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

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

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

Leave blank

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all stages in your working.

1. (a) Use your calculator to work out the value of

$$\frac{(3.7+4.6)^2}{2.8+6.3}$$

Write down all the figures on your calculator display.

.....

(2)

(b) Give your answer to part (a) correct to 2 decimal places.

.....

(1) **Q1**

(Total 3 marks)

2. (a) Work out the value of $x^2 - 5x$ when $x = -3$

.....

(2)

(b) Factorise $x^2 - 5x$

.....

(2) **Q2**

(Total 4 marks)

Leave blank

3. Hajra counted the numbers of sweets in 20 packets.
The table shows information about her results.

Number of sweets	Frequency
46	3
47	6
48	3
49	5
50	2
51	1

Work out the mean number of sweets in the 20 packets.

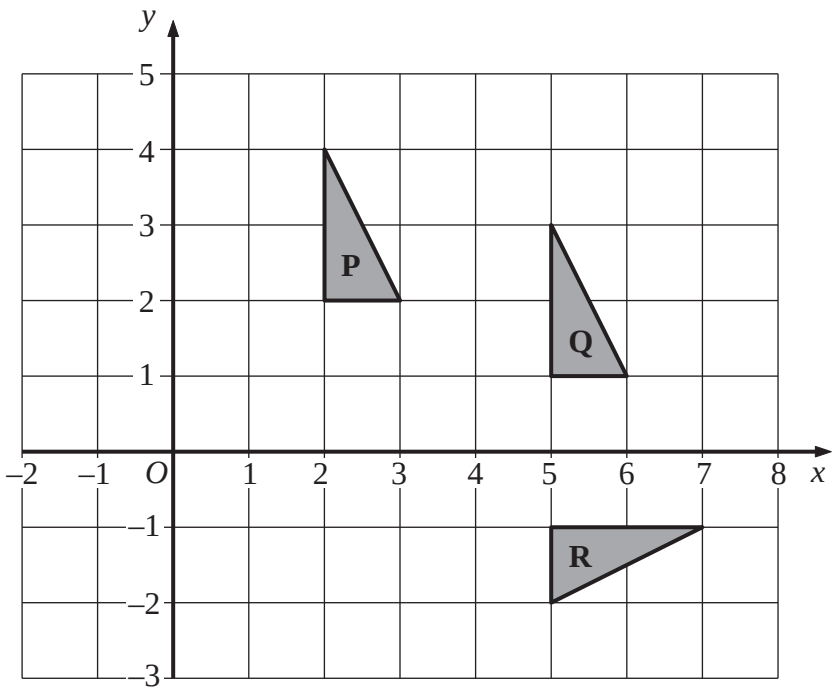
.....

Q3

(Total 3 marks)

Leave blank

4.



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

.....

.....

(2)

(b) Describe fully the single transformation which maps triangle **P** onto triangle **R**.

.....

.....

(3)

Q4

(Total 5 marks)

Leave blank

5. (a) Simplify, leaving your answers in index form,

(i) $7^5 \times 7^3$

.....

(1)

(ii) $5^9 \div 5^3$

.....

(1)

(b) Solve $\frac{2^9 \times 2^4}{2^n} = 2^8$

$n =$ .....

(2)

Q5

(Total 4 marks)

6. (a) Expand and simplify $3(4x - 5) - 4(2x + 1)$

.....

(2)

(b) Expand and simplify $(y + 8)(y + 3)$

.....

(2)

(c) Expand $p(5p^2 + 4)$

.....

(2)

Q6

(Total 6 marks)

Leave blank

7. A tunnel is 38.5 km long.

(a) A train travels the 38.5 km in 21 minutes.

Work out the average speed of the train.
Give your answer in km/h.

..... km/h
(3)

(b) To make the tunnel, a cylindrical hole 38.5 km long was drilled.
The radius of the cylindrical hole was 4.19 m.

Work out the volume of earth, in m^3, which was removed to make the hole.
Give your answer correct to 3 significant figures.

..... m^3
(3)

Q7

(Total 6 marks)

Leave blank

8. (a) Shri invested 4500 dollars. After one year, he received 270 dollars interest.
Work out 270 as a percentage of 4500.

..... %
(2)

(b) Kareena invested an amount of money at an interest rate of 4.5% per year.
After one year, she received 117 dollars interest.
Work out the amount of money Kareena invested.

..... dollars
(2)

(c) Ravi invested an amount of money at an interest rate of 4% per year.
At the end of one year, interest was added to his account and the total amount in his account was then 3328 dollars.
Work out the amount of money Ravi invested.

..... dollars
(3)

Q8

(Total 7 marks)

Leave blank

9. (a) Solve $5x - 4 = 2x + 7$

$x =$ .....

(2)

(b) Solve $\frac{7-2y}{4} = 2y + 3$

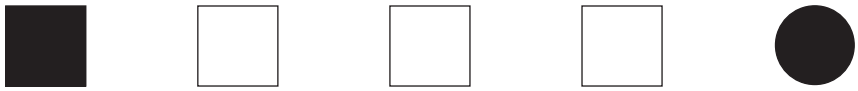
$y =$ .....

(4) **Q9**

(Total 6 marks)

Leave blank

10. Here are five shapes.



Four of the shapes are squares and one of the shapes is a circle.
One square is black.
Three squares are white.
The circle is black.
The five shapes are put in a bag.

(a) Jasmine takes a shape at random from the bag 150 times.
She replaces the shape each time.

Work out an estimate for the number of times she will take a white square.

.....

(3)

(b) Alec takes a shape at random from the bag and does **not** replace it.
Bashir then takes a shape at random from the bag.

Work out the probability that

(i) they both take a square,

.....

(2)

(ii) they take shapes of the same colour.

.....

(3)

Q10

(Total 8 marks)

Leave blank

11.

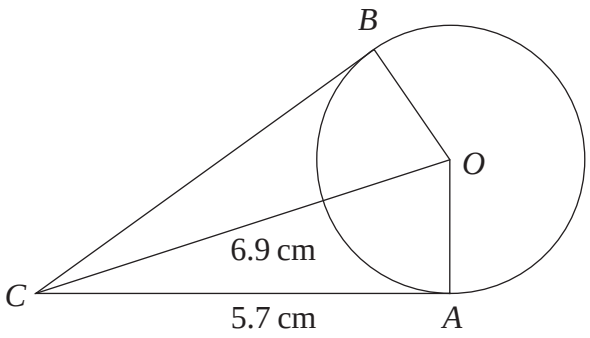


Diagram **NOT** accurately drawn

A and *B* are points on a circle, centre *O*.
The lines *CA* and *CB* are tangents to the circle.
CA = 5.7 cm.
CO = 6.9 cm.

(a) Give a reason why angle *CAO* = 90°.

.....

.....

(1)

(b) Calculate the perimeter of the kite *CAOB*.
Give your answer correct to 3 significant figures.

..... cm

(5)

Q11

(Total 6 marks)

Leave blank

12. The grouped frequency table gives information about the weights of 60 cows.

Weight (w kg)	Frequency
$100 < w \leqslant 200$	10
$200 < w \leqslant 300$	16
$300 < w \leqslant 400$	15
$400 < w \leqslant 500$	9
$500 < w \leqslant 600$	6
$600 < w \leqslant 700$	4

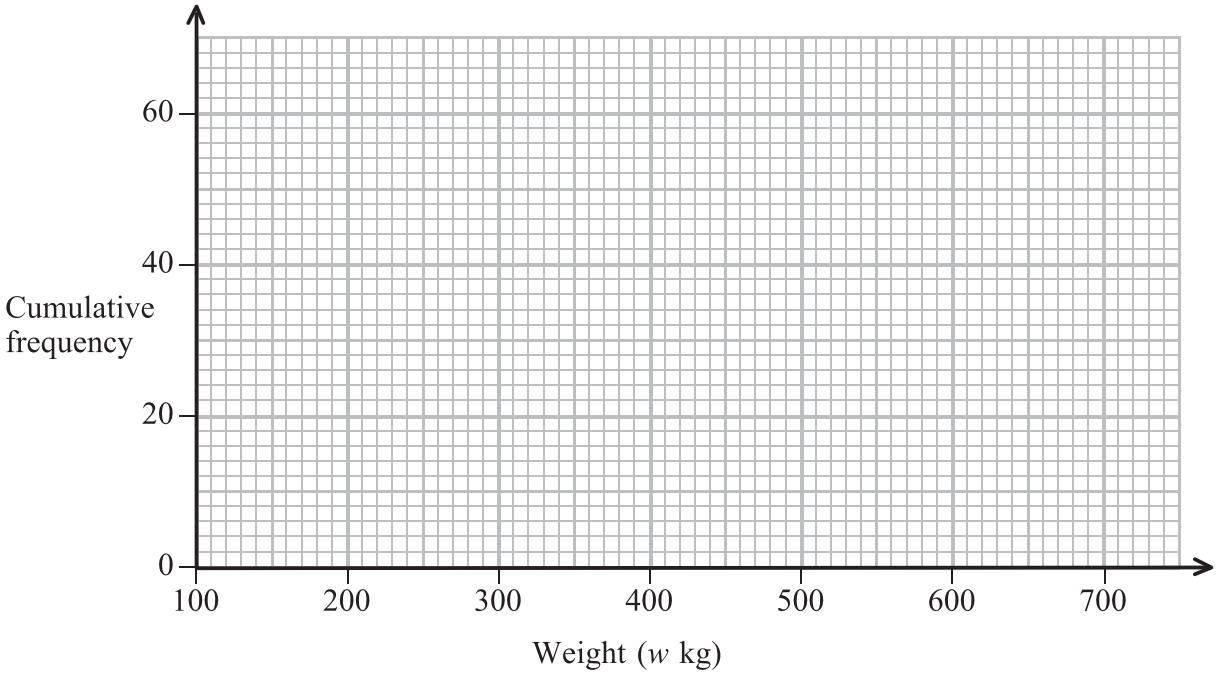
(a) Complete the cumulative frequency table.

Weight (w kg)	Cumulative frequency
$100 < w \leqslant 200$	
$100 < w \leqslant 300$	
$100 < w \leqslant 400$	
$100 < w \leqslant 500$	
$100 < w \leqslant 600$	
$100 < w \leqslant 700$	

(1)

Leave blank

(b) On the grid, draw the cumulative frequency graph for your table.



(2)

(c) Use your graph to find an estimate for the number of cows that weighed more than 430 kg.
Show your method clearly.

.....

(2)

Q12

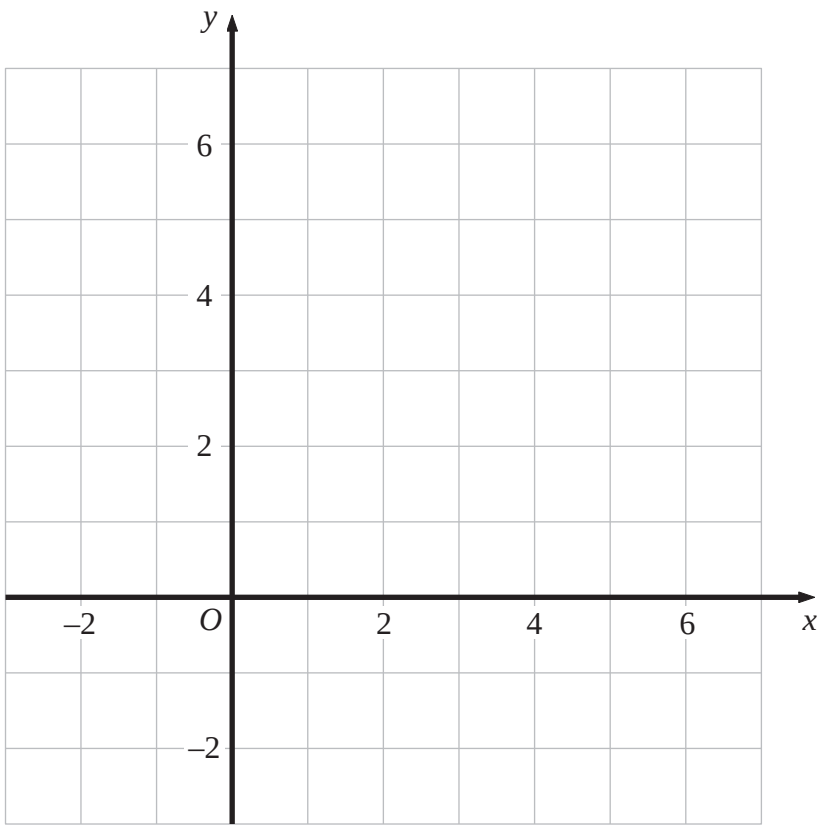
(Total 5 marks)

Leave blank

13. Show, by shading on the grid, the region which satisfies all three of these inequalities.

$$y \leqslant 5 \qquad y \leqslant 2x \qquad y \geqslant x + 1$$

Label your region **R**.



Q13

(Total 4 marks)

Leave blank

14. (a) Make r the subject of the formula $A = \pi r^2$, where r is positive.

$r =$ .....
(2)

The area of a circle is 14 cm^2, correct to 2 significant figures.

(b) (i) Work out the lower bound for the radius of the circle.
Write down all the figures on your calculator display.

..... cm
(2)

(ii) Give the radius of the circle to an appropriate degree of accuracy.
You must show working to explain how you obtained your answer.

..... cm
(2)

Q14

(Total 6 marks)

Leave blank

15. The frequency, f kilohertz, of a radio wave is inversely proportional to its wavelength, w metres.

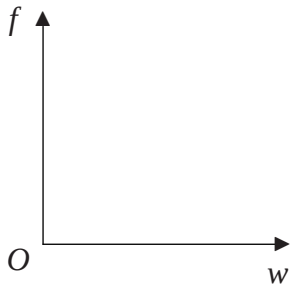
When $w = 200$, $f = 1500$

(a) (i) Express f in terms of w.

$f =$ .....

(2)

(ii) On the axes, sketch the graph of f against w.



(2)

(b) The wavelength of a radio wave is 1250 m.
Calculate its frequency.

..... kilohertz

(2)

Q15

(Total 6 marks)

Leave blank

16. PQR is a triangle.
E is the point on PR such that $PR = 3PE$.
F is the point on QR such that $QR = 3QF$.

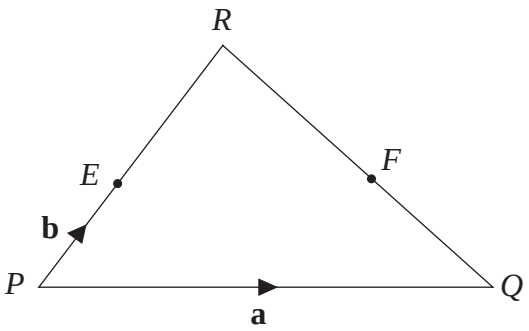


Diagram **NOT** accurately drawn

$\overrightarrow{PQ} = \mathbf{a}$, $\overrightarrow{PE} = \mathbf{b}$.

(a) Find, in terms of **a** and **b**,

(i) $\overrightarrow{PR}$

.....
(1)

(ii) $\overrightarrow{QR}$

.....
(1)

(iii) $\overrightarrow{PF}$

.....
(1)

(b) Show that $\overrightarrow{EF} = k\overrightarrow{PQ}$ where k is an integer.

(2) **Q16**

(Total 5 marks)

Leave blank

17. A curve has equation $y = x^2 + \frac{16}{x}$

The curve has one turning point.

Find $\frac{dy}{dx}$ and use your answer to find the coordinates of this turning point.

.....

Q17

(Total 4 marks)

Leave blank

18.

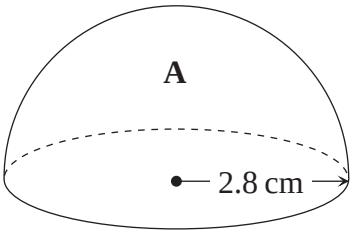


Diagram **NOT** accurately drawn

A solid hemisphere **A** has a radius of 2.8 cm.

(a) Calculate the **total** surface area of hemisphere **A**.
Give your answer correct to 3 significant figures.

..... cm^2
(3)

A larger solid hemisphere **B** has a **volume** which is 125 times the volume of hemisphere **A**.

(b) Calculate the **total** surface area of hemisphere **B**.
Give your answer correct to 3 significant figures.

..... cm^2
(3)

Q18

(Total 6 marks)

PLEASE TURN OVER FOR QUESTION 19

Leave blank

19. Solve the simultaneous equations

$$y = 3x - 1$$

$$x^2 + y^2 = 5$$

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

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

Q19

(Total 6 marks)

TOTAL FOR PAPER: 100 MARKS

END

Centre No.						Paper Reference							Surname	Initial(s)
Candidate No.						4	M	A	0	/	4	H	Signature	

Paper Reference(s)

4MA0/4H

Edexcel IGCSE

Mathematics A

Paper 4H

Higher Tier

Sample Assessment Material

Time: 2 hours

Examiner's use only

Team Leader's use only

Question Number	Leave Blank
1	
2	
3	
4	
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7	
8	
9	
10	
11	
12	
13	
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15	
16	
17	
18	
19	
20	
21	
Total	

Materials required for examination
Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser, calculator.
Tracing paper may be used.

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions in the spaces provided in this question paper.
You must NOT write on the formulae page. Anything you write on the formulae page will gain NO credit.
If you need more space to complete your answer to any question, use additional answer sheets.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 21 questions in this question paper. The total mark for this paper is 100.
There are 20 pages in this question paper. Any blank pages are indicated.
You may use a calculator.

Advice to Candidates

Write your answers neatly and in good English.

Turn over

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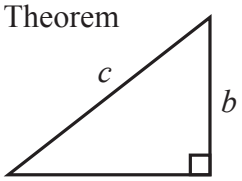
IGCSE MATHEMATICS
FORMULA SHEET – HIGHER TIER

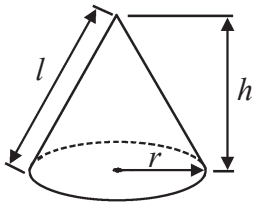
Pythagoras' Theorem



$a^2 + b^2 = c^2$

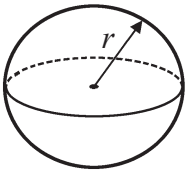
Volume of cone = $\frac{1}{3}\pi r^2 h$

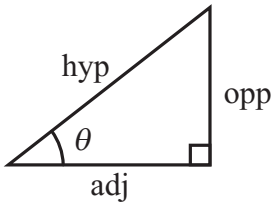
Curved surface area of cone = $\pi r l$



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

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





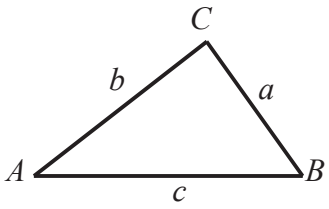
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

or $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

$\cos\theta = \frac{\text{adj}}{\text{hyp}}$

$\tan\theta = \frac{\text{opp}}{\text{adj}}$

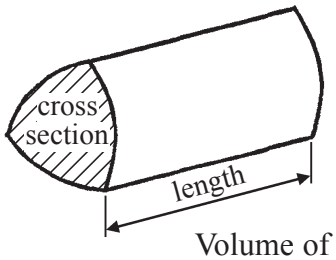
In any triangle ABC



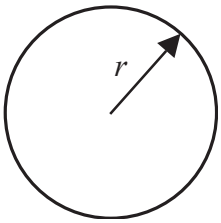
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



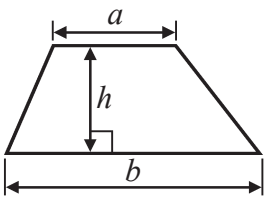
Volume of prism = area of cross section × length

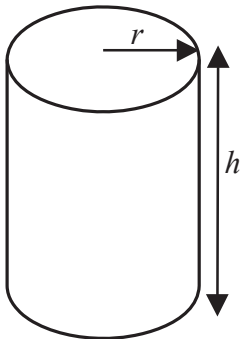


Circumference of circle = $2\pi r$

Area of circle = πr^2

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





Volume of cylinder = $\pi r^2 h$

Curved surface area of cylinder = $2\pi rh$

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

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

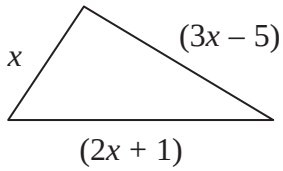
Leave blank

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. The diagram shows the lengths, in cm, of the sides of a triangle.



The perimeter of the triangle is 17 cm.

(i) Use this information to write an equation in x.

.....

(1)

(ii) Solve your equation.

x = ...

(2)

(Total 3 marks)

Q1

2. Anji mixes sand and cement in the ratio 7 : 2 by weight.
The total weight of the mixture is 27 kg.

Calculate the weight of sand in the mixture.

..... kg

(Total 3 marks)

Q2

Leave blank

3. Solve $5(x - 4) = 35$

$x =$ .....

Q3

(Total 3 marks)

4. Julian has to work out $\frac{6.8 \times 47.6}{2.09}$ without using a calculator.

(a) Round each number in Julian's calculation to one significant figure.

.....

(2)

(b) Use your rounded numbers to work out an estimate for $\frac{6.8 \times 47.6}{2.09}$

Give your answer correct to one significant figure.

.....

(2)

(c) Without using your calculator, explain why your answer to part (b) should be larger than the exact answer.

.....

.....

.....

(2)

Q4

(Total 6 marks)

Leave blank

5. The diagram shows a wall.

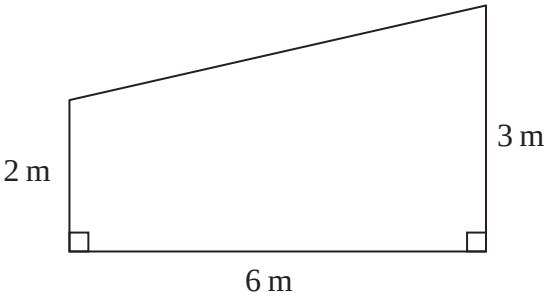


Diagram **NOT** accurately drawn

(a) Calculate the area of the wall.

..... m^2
(2)

(b) 1 litre of paint covers an area of 20 m^2.
Work out the volume of paint needed to cover the wall.
Give your answer in cm^3.

..... cm^3
(3)

Q5

(Total 5 marks)

Leave blank

6. Solve the simultaneous equations

$$y = x + 3$$
$$y = 7x$$

$x =$ .....

$y =$ **Q6**

(Total 3 marks)

Leave blank

7. (a)

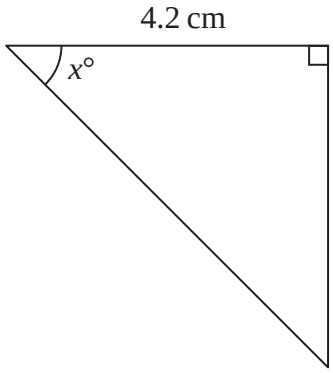


Diagram **NOT** accurately drawn

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

x = ...

(3)

(b)

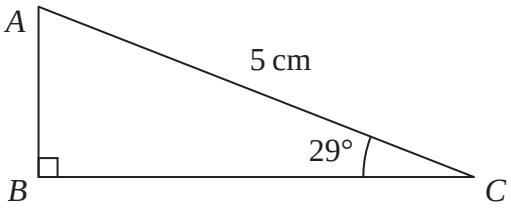


Diagram **NOT** accurately drawn

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

..... cm

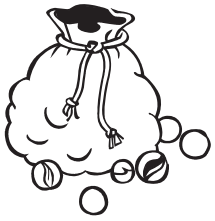
(3)

Q7

(Total 6 marks)

Leave blank

8. A bag contains some marbles.
The colour of each marble is red or blue or green or yellow.



A marble is taken at random from the bag.
The table shows the probability that the marble is red or blue or green.

Colour	Probability
Red	0.1
Blue	0.2
Green	0.1
Yellow	

(a) Work out the probability that the marble is yellow.

.....
(2)

(b) Work out the probability that the marble is blue or green.

.....
(2)

The probability that the marble is made of glass is 0.8

(c) Beryl says "The probability that the marble is green or made of glass is $0.1 + 0.8 = 0.9$"

Is Beryl correct? .....

Give a reason for your answer.

.....

.....
(2) **Q8**

(Total 6 marks)

Leave blank

9.

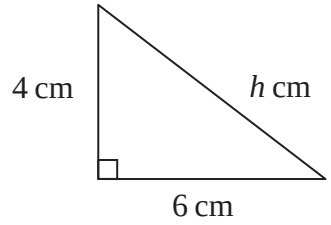


Diagram **NOT** accurately drawn

Calculate the value of h.
Give your answer correct to 3 significant figures.

h = ...

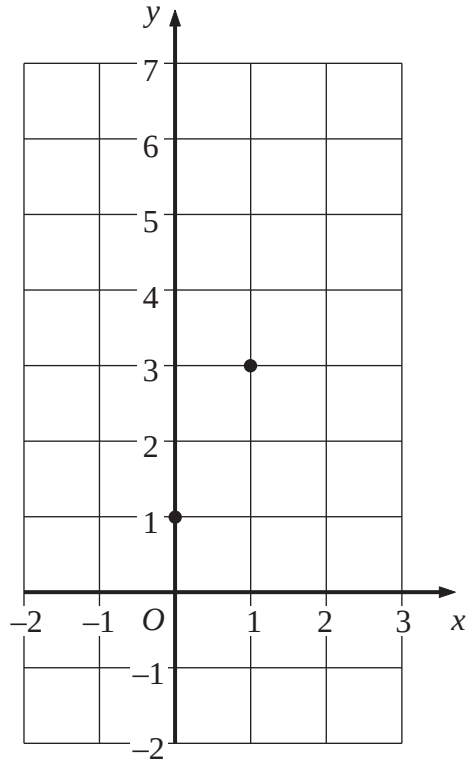
Q9

(Total 3 marks)

PLEASE TURN OVER FOR QUESTION 10

Leave blank

10. (a)



Find the equation of the straight line that passes through the points (0, 1) and (1, 3).

.....

(4)

(b) Write down the equation of a line parallel to the line whose equation is $y = -2x + 5$

.....

(1)

(c) Write down the coordinates of the point of intersection of the two lines whose equations are $y = 3x - 4$ and $y = -2x - 4$

(....., ...)

(1)

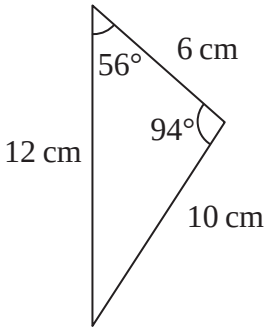
Q10

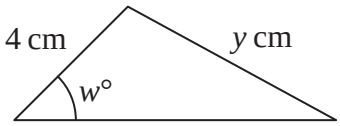
(Total 6 marks)

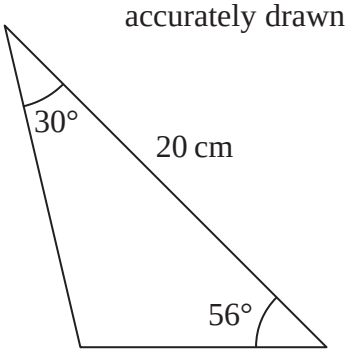
Leave blank

11. Here are three similar triangles.

Diagrams **NOT** accurately drawn







Find the value of

(a) w,

w = ...

(1)

(b) x,

x = ...

(2)

(c) y.

y = ...

(2)

Q11

(Total 5 marks)

Leave blank

12. Simplify

(a) $\dfrac{a^3 \times a^4}{a^2}$

.....

(2)

(b) $(\sqrt{x})^6$

.....

(1)

(c) $\dfrac{3(x+1)^2}{6(x+1)}$

.....

(2)

Q12

(Total 5 marks)

Leave blank

13. Here are the marks scored in a maths test by the students in two classes.

Class A 2 13 15 16 4 6 19 10 11 4 5 15 4 16 6

Class B 12 11 2 5 19 14 6 6 10 14 9

(a) Work out the interquartile range of the marks for each class.

Class A .....

Class B .....

(4)

(b) Use your answers to give one comparison between the marks of Class A and the marks of Class B.

.....

.....

(1) **Q13**

(Total 5 marks)

14. Solve $\frac{5x-7}{x-1} = x+1$

x = ... **Q14**

(Total 4 marks)

Leave blank

15. There are 35 students in a group.
18 students play hockey.
12 students play both hockey and tennis.
15 students play neither hockey nor tennis.

Find the number of students who play tennis.

.....

Q15

(Total 4 marks)

16. A triangle has sides of length 5 cm, 6 cm and 9 cm.

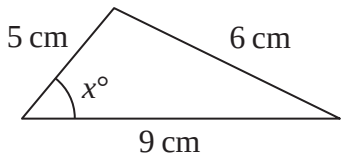


Diagram **NOT** accurately drawn

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

x =.....

Q16

(Total 3 marks)

Leave blank

17. The functions f and g are defined as follows.

$$f(x) = \frac{1}{x+2}$$

$$g(x) = \sqrt{x-1}$$

(a) (i) State which value of x cannot be included in the domain of f.

.....

(1)

(ii) State which **values** of x cannot be included in the domain of g.

.....

(2)

(b) Calculate fg(10)

.....

(3)

(c) Express the inverse function g^{-1} in the form $g^{-1}(x)$ = ...

.....

(4)

Q17

(Total 10 marks)

Leave blank

18. A fair, 6-sided dice has faces numbered 1, 2, 3, 4, 5 and 6
When the dice is thrown, the number facing up is the score.
The dice is thrown three times.

(a) Calculate the probability that the total score is 18

.....
(2)

(b) Calculate the probability that the score on the third throw is exactly double the **total** of the scores on the first **two** throws.

.....
(4)

Q18

(Total 6 marks)

Leave blank

19. (a) Calculate the area of an equilateral triangle of side 5 cm.
Give your answer correct to 3 significant figures.

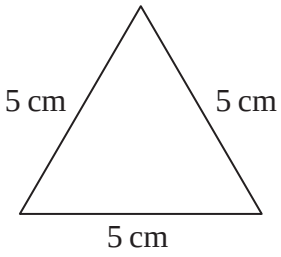


Diagram **NOT** accurately drawn

..... cm^2
(2)

(b) The diagram shows two overlapping circles.
The centre of each circle lies on the circumference of the other circle.
The radius of each circle is 5 cm.
The distance between the centres is 5 cm.

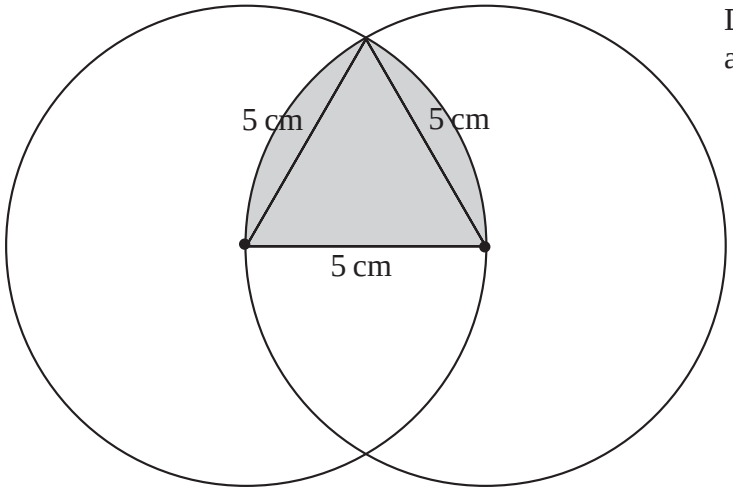


Diagram **NOT** accurately drawn

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

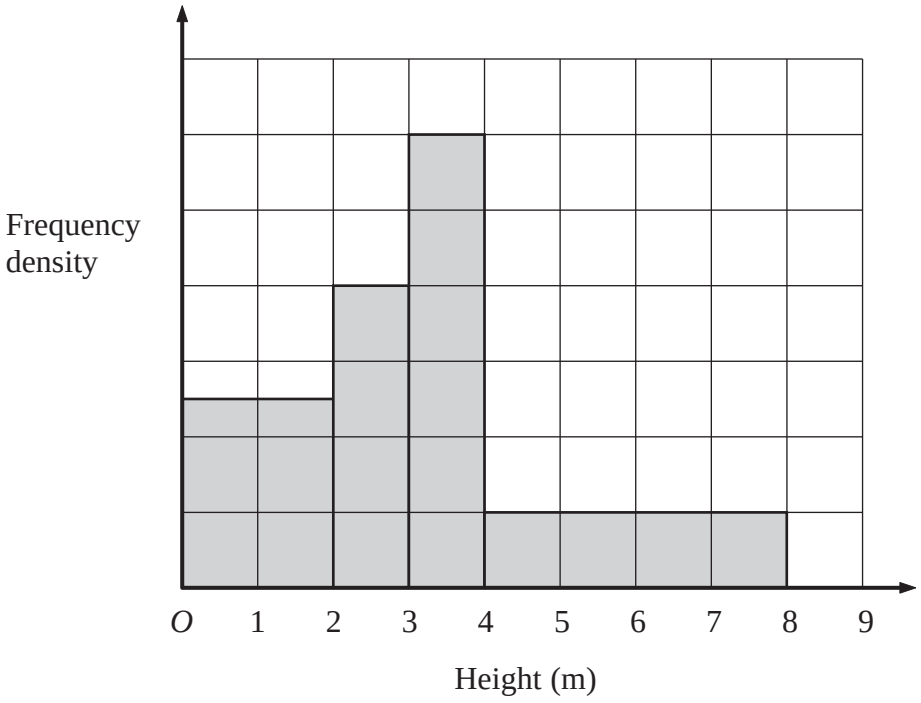
..... cm^2
(3)

Q19

(Total 5 marks)

Leave blank

20. The histogram shows information about the height, h metres, of some trees.



The number of trees with heights in the class $2 < h \leqslant 3$ is 20

Find the number of trees with heights in the class

(a) $4 < h \leqslant 8$

.....

(1)

(b) $3 < h \leqslant 4$

.....

(2)

Q20

(Total 3 marks)

Leave blank

21. (a) Factorise $16x^2 - 1$

.....

(1)

(b) Hence express as the product of its prime factors

(i) 1599

.....

(3)

(ii) 1.599×10^6

.....

(2)

Q21

(Total 6 marks)

TOTAL FOR PAPER: 100 MARKS

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Sample mark schemes

General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- 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.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- **Types of mark**
  - M marks: method marks
  - A marks: accuracy marks
  - B marks: unconditional accuracy marks (independent of M marks)

- **Abbreviations**
  - cao – correct answer only
  - ft – follow through
  - isw – ignore subsequent working
  - SC: special case
  - oe – or equivalent (and appropriate)
  - dep – dependent
  - indep - independent

- **No working**

  If no working is shown then correct answers normally score full marks
  If no working is shown then incorrect (even though nearly correct) answers score no marks.

- **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 it is clear from the working that the "correct" answer has been obtained from incorrect working, award 0 marks.

Any case of suspected misread loses A (and B) marks on that part, but can gain the M marks.
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 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.
If there is no answer on the answer line then check the working for an obvious answer.

- **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.

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

- **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.

- **Parts of questions**

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

Paper 1F

Question Number	Working	Answer	Mark	Notes
1(a)(i)		8 rectangles shaded	**1**	B1

Question Number	Working	Answer	Mark	Notes
1(a)(ii)		60	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
1(b)		0.4(0)	**1**	B1

Question Number	Working	Answer	Mark	Notes
1(c)	$\frac{40}{100}$	$\frac{2}{5}$	**2**	M1 for $\frac{40}{100}$, $\frac{20}{50}$ etc A1 cao

Question Number	Working	Answer	Mark	Notes
2(a)(i)		(1,5)	**1**	B1

Question Number	Working	Answer	Mark	Notes
2(a)(ii)		(5,0)	**1**	B1

Question Number	Working	Answer	Mark	Notes
2(b)		64	**1**	B1 Allow $\pm$2mm

Question Number	Working	Answer	Mark	Notes
2(c)	8(0) + 2 x “64”	204 – 212 inc	**2**	M1 Also award for 20.4 – 21.2 A1 ft from “64”
Question Number	Working	Answer	Mark	Notes
2(d)		isosceles	**1**	B1

Question Number	Working	Answer	Mark	Notes
2(e)(i)		77	**1**	B1 allow $\pm$ 2°

Question Number	Working	Answer	Mark	Notes
2(e)(ii)		acute	**1**	B1

Question Number	Working	Answer	Mark	Notes
3(a)(i)		24	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
3(a)(ii)		15	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
3(a)(iii)		27	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
3(a)(iv)		25	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
3(a)(v)		23	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
3(b)(i)		24	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
3(b)(ii)		39	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
4(a)		31	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
4(b)		eg ‘Add 6’	**1**	B1

Question Number	Working	Answer	Mark	Notes
4(c)		61	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
4(d)		289	**1**	B1 ft from (b)

Question Number	Working	Answer	Mark	Notes
4(e)		eg ‘Sum of two odd numbers is always even’	**1**	B1 Accept if ‘odd’ used correctly

Question Number	Working	Answer	Mark	Notes
5(a)(i)		B	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
5(a)(ii)		F	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
5(a)(iii)		I	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
5(a)(iv)		D	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
5(b)		H	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
6(a)		300	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
6(b)		855 – 875	**1**	B1

Question Number	Working	Answer	Mark	Notes
6(c)		Bengali	**1**	B1

Question Number	Working	Answer	Mark	Notes
6(d)		100 < bar < 150	**1**	B1

Question Number	Working	Answer	Mark	Notes
6(e)	300:125	12:5	**2**	M1 for 300:125, 60:25 also for 125:300, 25:60, 5:12 A1

Question Number	Working	Answer	Mark	Notes
6(f)	$\frac{70}{100} \times 330$	231	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
6(g)	$\frac{143}{332} \times 100$	43.1	**2**	M1 for $\frac{143}{332}$ or 0.430722... A1 for 43.1 or better

Question Number	Working	Answer	Mark	Notes
7(a)	$2x = 1 - 9$	–4 oe	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
7(b)	$5y - 2y = 7 + 4$	$\frac{11}{3}$, $3\frac{2}{3}$ oe	**2**	M1 A1 Also accept 2 or more d.p. rounded or truncated e.g. 3.66, 3.67

Question Number	Working	Answer	Mark	Notes
8(a)(i)		1 pm	**1**	B1 Accept 1300

Question Number	Working	Answer	Mark	Notes
8(a)(ii)		10 pm	**1**	B1 Accept 2200

Question Number	Working	Answer	Mark	Notes
8(b)		−6	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
8(c)		Rio de Janeiro	**1**	B1 Accept Rio

Question Number	Working	Answer	Mark	Notes
8(d)(i)		7	**1**	B1 Accept −7

Question Number	Working	Answer	Mark	Notes
8(d)(ii)		5	**1**	B1 Accept −5

Question Number	Working	Answer	Mark	Notes
9(a)		20	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
9(b)		$7 + 4 \times (5 - 2)$	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
9(c)		54.872	**1**	B1

Question Number	Working	Answer	Mark	Notes
9(d)		2.6	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
10(i)		$y=3$	**1**	B1

Question Number	Working	Answer	Mark	Notes
10(ii)		$x=5$	**1**	B1

Question Number	Working	Answer	Mark	Notes
10(iii)		$y = x$	**1**	B1

Question Number	Working	Answer	Mark	Notes
11(a)	$\frac{68.89}{9.1}$	7.5703…	**2**	M1 for 8.3, 68.89, 9.1 or 30.90… A1 Accept if first 5 figures correct Also accept $7\frac{519}{910}$, $\frac{6889}{910}$

Question Number	Working	Answer	Mark	Notes
11(b)		7.57	**1**	B1 ft from (a) if non-trivial ie (a) must have more than 2 d.p.

Question Number	Working	Answer	Mark	Notes
12(a)		$\frac{1}{5}$	**1**	B1 Accept 0.2, 20%

Question Number	Working	Answer	Mark	Notes
12(b)		$\frac{3}{5}$	**2**	M1 for fraction with denominator 5 A1 for $\frac{3}{5}$ Accept 0.6, 60%

Question Number	Working	Answer	Mark	Notes
12(c)	$150 \times$ "$\frac{3}{5}$"	90	**2**	M1 A1 ft from "$\frac{3}{5}$" Do not accept $\frac{90}{150}$

Question Number	Working	Answer	Mark	Notes
13(a)	28×15	420	**2**	M1 A1 cao

Question Number	Working	Answer	Mark	Notes
13(b)		Rectangle 5.6cm long and 3cm wide	**2**	B2 B1 for each Allow $\pm$ 2mm

Question Number	Working	Answer	Mark	Notes
14(a)	$(-3)^2 - 5 \times -3$	24	**2**	M1 for substn or 9 or 15 seen A1 cao

Question Number	Working	Answer	Mark	Notes
14(b)		$x(x-5)$	**2**	B2 B1 for factors which, when expanded and simplified, give two terms, one of which is correct *SC* B1 for $x(5-x)$, $x(x-5x)$

Question Number	Working	Answer	Mark	Notes
15(a)		47	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
15(b)	51 – 46	5	**2**	M1 for 51 – 46, 46 – 51 etc A1 cao

Question Number	Working	Answer	Mark	Notes
15(c)	$(46 \times 3) + (47 \times 6) +$ $(48 \times 3) + (49 \times 5) +$ $(50 \times 2) + (51 \times 1)$ or $138 + 282 + 144 + 245 +$ $100 + 51$ or 960 "960" ÷ 20	48	**3**	M1 for finding at least 4 products and adding M1 (dep) for division by 20 A1 cao

Question Number	Working	Answer	Mark	Notes	
16(a)		translation 3 squares to the right and 1 square down	**2**	B2 B1 for translation. Accept translate, translated etc Accept 'across' instead of 'to the right' B1 for 3 right and 1 down or $\begin{pmatrix} 3 \\ -1 \end{pmatrix}$ but not (3, –1)	These marks are independent but award no marks if answer is not a single transformation

Question Number	Working	Answer	Mark	Notes	
16(b)		rotation of 90° clockwise about (2, –1)	**3**	B3 B1 for rotation Accept rotate, rotated etc B1 for 90° clockwise or –90° or 270° B1 for (2, –1)	These marks are independent but award no marks if answer is not a single transformation

Question Number	Working	Answer	Mark	Notes
17(a)(i)		7^8	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
17(a)(ii)		5^6	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
17(b)	$9 + 4 - n = 8$ or $13 - n = 8$	5	**2**	M1 Also award for $2^n = 2^5$, $2^n = 32$ or 2^5 on answer line A1 cao

Question Number	Working	Answer	Mark	Notes
18(a)	$12x-15-8x-4$	$4x-19$	**2**	M1 for at least 3 terms correct inc signs A1 cao

Question Number	Working	Answer	Mark	Notes
18(b)	$y^2+3y+8y+24$	$y^2+11y+24$	**2**	M1 for 3 terms correct or y^2+11y seen A1

Question Number	Working	Answer	Mark	Notes
18(c)		$5p^3 + 4p$	**2**	B2 cao B1 for either $5p^3$ or for $+ 4p$

Question Number	Working	Answer	Mark	Notes
19(a)	$\frac{38.5}{21}\times 60$ or $\frac{21}{60} = 0.35$; $\frac{38.5}{0.35}$	110	**3**	M1 for $\frac{38.5}{21}$ or 1.8333... or $\frac{38.5}{0.35}$ or 183.333... or $\frac{21}{60}$ or 0.35 M1 for "1.8333..." $\times$ 60 or $\frac{38.5}{"0.35"}$ A1 cao

Question Number	Working	Answer	Mark	Notes
19(b)	$\pi \times 4.19^2 \times 38500$	2 120 000	**3**	M2 M1 for π × (no with digits 419)^2 × no with digits 385 A1 for 2 120 000 or for answer which rounds to 2 120 000 ($\pi \rightarrow$ 2123433.419 3.14 $\rightarrow$ 2122356.929 3.142 $\rightarrow$ 2123708.749)

Question Number	Working	Answer	Mark	Notes
1(a)(i)		199, 999, 1009, 1999, 9000	**1**	B1

Question Number	Working	Answer	Mark	Notes
1(a)(ii)		9000	**1**	B1

Question Number	Working	Answer	Mark	Notes
1(a)(iii)		999 or 9000	**1**	B1

Question Number	Working	Answer	Mark	Notes
1(b)(i)		4321	**1**	B1

Question Number	Working	Answer	Mark	Notes
1(b)(ii)		1243	**2**	B2 B1 for number beginning with 1 or ending with 1 or 3

Question Number	Working	Answer	Mark	Notes
2(i)		A at 0.5 ± 2mm	**1**	B1

Question Number	Working	Answer	Mark	Notes
2(ii)		B at 1	**1**	B1

Question Number	Working	Answer	Mark	Notes
2(iii)		C at $2 \leq d \leq 25$mm from 0	**1**	B1 ie between 0 and 0.25 exclusive

Question Number	Working	Answer	Mark	Notes
3(a)(i)		Radius	**1**	B1 allow misspellings

Question Number	Working	Answer	Mark	Notes
3(a)(ii)		Chord	**1**	B1 allow misspellings

Question Number	Working	Answer	Mark	Notes
3(a)(iii)		Tangent	**1**	B1 allow misspellings

Question Number	Working	Answer	Mark	Notes
3(b)		Sector	**1**	B1 allow misspellings

Question Number	Working	Answer	Mark	Notes
4(a)		21	**1**	B1

Question Number	Working	Answer	Mark	Notes
4(b)		3	**1**	B1 or 3000 or 3 thousand or 1000 or thousands

Question Number	Working	Answer	Mark	Notes
4(c)		3970	**1**	B1

Question Number	Working	Answer	Mark	Notes
4(d)		4000	**1**	B1

Question Number	Working	Answer	Mark	Notes
4(e)		63	**1**	B1

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Question Number	Working	Answer	Mark	Notes
4(f)(i)		15.83289...	**1**	B1

Question Number	Working	Answer	Mark	Notes
4(f)(ii)		15.8	**1**	B1 ft from f(i)

Question Number	Working	Answer	Mark	Notes
5(a)	$4 \times 5 + 2$	22	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
5(b)	$\frac{28}{4}$	7	**2**	M1 Allow $\frac{30}{4}$ or ans 7.25 oe A1

Question Number	Working	Answer	Mark	Notes
6(a)		$\frac{12}{36}$	**1**	B1

Question Number	Working	Answer	Mark	Notes
6(b)		$\frac{3}{10}$	**1**	B1

Question Number	Working	Answer	Mark	Notes
6(c)		$\frac{9}{25}$	**3**	M1 Attempt to convert all to dec or % or c.d. M1 All correctly converted A1

Question Number	Working	Answer	Mark	Notes
7	2 × 1.10 + 3 × 1.25 or 5.95 10.00 – "5.95"	4.05	**3**	M1 M1 dep A1

Question Number	Working	Answer	Mark	Notes
8(a)		3	**1**	B1

Question Number	Working	Answer	Mark	Notes
8(b)	Σx attempted or $\frac{56}{8}$	7	**3**	M1 eg 48.125 M1 dep A1

Question Number	Working	Answer	Mark	Notes
8(c)	Arrange in order	5.5 oe	**2**	M1 or answer 5 or 6 A1

Question Number	Working	Answer	Mark	Notes
8(d)(i)		Same	**1**	B1 indep

Question Number	Working	Answer	Mark	Notes
8(d)(ii)		Middle unchanged	**1**	B1 or still 5.5

Question Number	Working	Answer	Mark	Notes
8(e)		$\frac{2}{8}$ oe	**2**	B1 num B1 denom Ratio subtr B1

Question Number	Working	Answer	Mark	Notes
9(a)		$6cm^2$	**3**	B2 B1 for 5 to 7 incl B1 cm^2

Question Number	Working	Answer	Mark	Notes
9(b)		Triangle correct ± 2 mm	**2**	B2 B1 for a vertex correct ±2mm or correct size and orientation ± 2 mm

Question Number	Working	Answer	Mark	Notes
10(a)	$(6 + 3) \times 5$ oe	45	**2**	M1 Bracket essential unless ans correct A1

Question Number	Working	Answer	Mark	Notes
10(b)	$\frac{70}{5}$ or $14 - 3$	11	**2**	M1 allow $\frac{67}{5}$ or 13.2 A1

Question Number	Working	Answer	Mark	Notes
10(c)	$\frac{-85}{5} - 3$ or $-17 - 3$	–20	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
10(d)		$5(x+3)$ or $(x+3)\times 5$ or $5x+15$ oe	**2**	B2 B1 for answer $x+3\times 5$ B0 for answer $5x+3$ or $x+15$ '$x=$' subtract B1

Question Number	Working	Answer	Mark	Notes
11(a)		130	**1**	B1

Question Number	Working	Answer	Mark	Notes
11(b)(i)		40	**1**	B1

Question Number	Working	Answer	Mark	Notes
11(b)(ii)		Angle sum of triangle	**1**	B1 Not 180 – (90 + 50)

Question Number	Working	Answer	Mark	Notes
12(a)	$\frac{2}{5}\times 4800$	1920	**2**	B1 seen A1 cao

Question Number	Working	Answer	Mark	Notes
12(b)	$0.85\times$ "1920" oe	1632	**2**	B1 Allow 0.85 x 4800 oe A1 cao

Question Number	Working	Answer	Mark	Notes
13(i)		$x+2x+1+3x-5=17$	**1**	B1 oe eg $6x-4=17$ ISW not '$=p$'

Question Number	Working	Answer	Mark	Notes
13(ii)	$6x = 21$ or $6x - 21 = 0$ etc	x = 3.5 oe eg $\frac{21}{6}$	**2**	M1 ft (i) if $6x = c$ A1

Question Number	Working	Answer	Mark	Notes
14	9 seen $\frac{7}{9} \times 27$ or $7 \times \frac{27}{9}$ oe	21	**3**	B1 M1 dep B1 A1 21 seen and ans = 3 B1M1AO

Question Number	Working	Answer	Mark	Notes
15	$5x - 20 = 35$ $5x = 55$	11	**3**	M1 M1 dep or M2 for $x - 4 = 7$ A1

Question Number	Working	Answer	Mark	Notes
16(a)		$\frac{7 \times 50}{2}$ or 7, 50, 2	**2**	B1 for 7 and 2 B1 for 50

Question Number	Working	Answer	Mark	Notes
16(b)	175	200 or 100	**2**	M1 ft from (a), (175 seen, using $\frac{(6 \text{ or } 7)(48 \text{ or } 50)}{2 \text{ or } 3}$ correctly eval'd eg 168 A1f If no wking: ft (a)

Question Number	Working	Answer	Mark	Notes
16(c)		Number incr or 6.8 and 47.6 incr denom decr or 2.09 decr (b) rnded up (not rnd to 1 sf) or '175' rnded to 200	**2**	B2 any two of these B1 any one of these Ignore other

Question Number	Working	Answer	Mark	Notes
17(a)	$\frac{(2+3)}{2}\times 6$ or $2\times 6+\frac{1}{2}\times 6\times 1$ oe	15	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
17(b)	$\frac{15}{20}\times 1000$ $\frac{1000}{20}\times 15$ $1000\times\frac{15}{20}$	750	**3**	M1 or 0.75 M1 ft '15' for M1M1 only A1

Question Number	Working	Answer	Mark	Notes
18	$x+3=7x$ $(6x=3$ oe) $7y=7x+21$ $(6y=21)$	$x=\frac{1}{2}$, $y=3\frac{1}{2}$	**3**	M1 $y=7(y-3)$ $y=7y-21$ $0=6x-3$ A1 A1

Question Number	Working	Answer	Mark	Notes
19(a)	tan used $\tan x = \frac{5.1}{4.2}$ or $\tan x = 1.2\ldots$ oe	$x = 50.5\ldots$	**3**	M1 (sin or cos) and ($\sqrt{}$ ($4.2^2 + 5.1^2$) or 6.6) used M1 $\sin x = 5.1/(\sqrt{}$ ($4.2^2 + 5.1^2$) or $\cos x = 4.2/(\sqrt{}$ ($4.2^2 + 5.1^2$) A1

Question Number	Working	Answer	Mark	Notes
19(b)	sin29 = AB/5 or *C*/sin29 = 5/sin90 *AB* = 5sin29	*AB* = 2.42...cm	**3**	M1 *BC* = 5cos29 M1 *AB* = $\sqrt{}$ ($5^2 + (5\cos29)^2$) or 5cos29 × tan29 A1

Question Number	Working	Answer	Mark	Notes
20(a)	1 – (0.1 + 0.2 + 0.1) or 1 – 0.4 oe	0.6	**2**	M1 or 0.6 in table A1 allow in table if not contrad on line

Question Number	Working	Answer	Mark	Notes
20(b)	0.2 + 0.1 or 1 – ('0.6' + 0.1)	0.3	**2**	M1 or 0.3 seen A1

Question Number	Working	Answer	Mark	Notes
20(c)		(Poss) overlap or mut excl or doesn't wk for B or Y {No or poss or poss yes}	**2**	B2 B1 Can't tell and (No or poss) B1 Correct reason only B0 Incorrect reason B0 Unqualified Yes

Question Number	Working	Answer	Mark	Notes
21	$4^2 + 6^2$ (= 52) $\sqrt{(4^2 + 6^2)}$ or $\sqrt{}$"52" or $2\sqrt{13}$	h = 7.21...	**3**	M1 M1 dep A1

Paper 3H

Question Number	Working	Answer	Mark	Notes
1(a)	$\frac{68.89}{9.1}$	7.5703...	**2**	M1 for 8.3, 68.89, 9.1 or 30.90... A1 Accept if first 5 figures correct Also accept $7\frac{519}{910}$, $\frac{6889}{910}$

Question Number	Working	Answer	Mark	Notes
1(b)		7.57	**1**	B1 ft from (a) if non-trivial ie (a) must have more than 2 d.p.

Question Number	Working	Answer	Mark	Notes
2(a)	$(-3)^2 - 5 \times -3$	24	**2**	M1 for substn or 9 or 15 seen A1 cao

Question Number	Working	Answer	Mark	Notes
2(b)		$x(x-5)$	**2**	B2 B1 for factors which, when expanded and simplified, give two terms, one of which is correct *SC* B1 for $x(5-x)$, $x(x-5x)$

Question Number	Working	Answer	Mark	Notes
3	$(46 \times 3) + (47 \times 6) +$ $(48 \times 3) + (49 \times 5) +$ $(50 \times 2) + (51 \times 1)$ or $138 + 282 + 144 + 245 +$ $100 + 51$ or 960 "960" ÷ 20	48	**3**	M1 for finding at least 4 products and adding M1 (dep) for division by 20 A1 cao

Question Number	Working	Answer	Mark	Notes	
4(a)		translation 3 squares to the right and 1 square down	**2**	B2 B1 for translation. Accept translate, translated etc Accept 'across' instead of 'to the right' B1 for 3 right and 1 down or $\begin{pmatrix}3\\-1\end{pmatrix}$ but not (3, –1)	These marks are independent but award no marks if answer is not a single transformation

Question Number	Working	Answer	Mark	Notes	
4(b)		rotation of 90° clockwise about (2, –1)	**3**	B3 B1 for rotation Accept rotate, rotated etc B1 for 90° clockwise or –90° or 270° B1 for (2, –1)	These marks are independent but award no marks if answer is not a single transformation

Question Number	Working	Answer	Mark	Notes
5(a)(i)		7^8	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
5(a)(ii)		5^6	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
5(b)	$9 + 4 - n = 8$ or $13 - n = 8$	5	**2**	M1 Also award for $2^n = 2^5$, $2^n = 32$ or 2^5 on answer line A1 cao

Question Number	Working	Answer	Mark	Notes
6(a)	$12x-15-8x-4$	$4x-19$	**2**	M1 for at least 3 terms correct inc signs A1 cao

Question Number	Working	Answer	Mark	Notes
6(b)	$y^2+3y+8y+24$	$y^2+11y+24$	**2**	M1 for 3 terms correct or y^2+11y seen A1

Question Number	Working	Answer	Mark	Notes
6(c)		$5p^3+4p$	**2**	B2 cao B1 for either $5p^3$ or for $+4p$

Question Number	Working	Answer	Mark	Notes
7(a)	$\frac{38.5}{21}\times 60$ or $\frac{21}{60}$ = 0.35 ; $\frac{38.5}{0.35}$	110	**3**	M1 for $\frac{38.5}{21}$ or 1.8333... or $\frac{38.5}{0.35}$ or 183.333... or $\frac{21}{60}$ or 0.35 M1 for "1.8333..." $\times$ 60 or $\frac{38.5}{"0.35"}$ A1 cao

Question Number	Working	Answer	Mark	Notes
7(b)	$\pi \times 4.19^2 \times 38500$	2 120 000	**3**	M2 M1 for π × (no with digits 419)^2 × no. with digits 385 A1 for 2 120 000 or for answer which rounds to 2 120 000 ($\pi \rightarrow$ 2123433.419 3.14 $\rightarrow$ 2122356.929 3.142 $\rightarrow$ 2123708.749)

Question Number	Working	Answer	Mark	Notes
8(a)	$\frac{270}{4500} \times 100$	6	**2**	M1 for $\frac{270}{4500}$ or 0.06 or $\frac{4770}{4500}$ or 1.06 A1 cao

Question Number	Working	Answer	Mark	Notes
8(b)	$117 \times \frac{100}{4.5}$	2600	**2**	M1 for $\frac{117}{4.5}$ or 26 seen A1 cao

Question Number	Working	Answer	Mark	Notes
8(c)	$\frac{3328}{1.04}$ or $3328 \times \frac{100}{104}$	3200	**3**	M2 for $\frac{3328}{1.04}$ or $3328 \times \frac{100}{104}$ M1 for $\frac{3328}{104}$, 104% = 3328 or 32 seen A1 cao

Question Number	Working	Answer	Mark	Notes
9 (a)	$5x - 2x = 7 + 4$	$\frac{11}{3}$, $3\frac{2}{3}$ oe	**2**	M1 for correct rearrangement A1 also accept 2 or more d.p. rounded or truncated eg 3.66, 3.67

Question Number	Working	Answer	Mark	Notes
9(b)	$4 \times \frac{7-2y}{4}$ or $7 - 2y$ $= 4(2y + 3)$ $7 - 2y = 8y + 12$ or simpler $10y = -5$	$-\frac{1}{2}$ oe	**4**	M1 for clear intention to multiply both sides by 4 or a multiple of 4. For example, award for $4 \times \frac{7-2y}{4}$ or $7 - 2y$ $= 4 \times 2y + 3$ or $8y + 3$ or $2y + 3 \times 4$ or $2y + 12$ M1 for correct expansion of brackets (usually $8y + 12$) or for correct rearrangement of correct terms eg $8y + 2y = 7 - 12$ A1 for reduction to correct equation of form $ay = b$ A1

Question Number	Working	Answer	Mark	Notes
10(a)	$150 \times \frac{3}{5}$	90	**3**	Accept decimals B1 for $\frac{3}{5}$ seen M1 for $150 \times \frac{3}{5}$ A1 cao do not accept $\frac{90}{150}$

Question Number	Working	Answer	Mark	Notes
10(b)(i)	$\frac{4}{5} \times \frac{3}{4}$	$\frac{12}{20}$ or $\frac{3}{5}$ oe	**2**	Accepts decimals M1 for $\frac{4}{5} \times \frac{3}{4}$ seen A1

Question Number	Working	Answer	Mark	Notes	
10(b)(ii)	$\frac{2}{5}\times\frac{1}{4}+\frac{3}{5}\times\frac{2}{4}$	$\frac{8}{20}$ or $\frac{2}{5}$ oe	**3**	Accepts decimals M1 for $\frac{2}{5}\times\frac{1}{4}$ or $\frac{3}{5}\times\frac{2}{4}$ M1 (dep) for adding both above products A1 for $\frac{8}{20}$ or $\frac{2}{5}$ oe	SC M1 for $\frac{2}{5}\times\frac{2}{5}$ or $\frac{3}{5}\times\frac{3}{5}$ SC M1 (dep) for adding both above products

Question Number	Working	Answer	Mark	Notes
11(a)		tangent at any point of a circle and the radius at that point are perpendicular	**1**	B1 for mention of tangent and radius or line from centre

Question Number	Working	Answer	Mark	Notes
11(b)	$6.9^2 - 5.7^2$ or 47.61 – 32.49 or 15.12 $\sqrt{(6.9^2 - 5.7^2)}$ 3.88844… $2 \times 5.7 + 2 \times$ "3.88844…"	19.2	**5**	M1 for squaring and subtracting M1 (dep) for square root A1 for 3.89 or better M1 for $2 \times 5.7 + 2 \times$ "3.888.." only A1 for 19.2 or answer which rounds to 19.2 (19.176888…)

Question Number	Working	Answer	Mark	Notes
12(a)		10, 26, 41, 50, 56, 60	**1**	B1 cao

Question Number	Working	Answer	Mark	Notes
12(b)	Points correct Curve or line segments		**2**	B1 $\pm$ ½ sq ft from sensible table B1 ft if 4 or 5 points correct or if points are plotted consistently within each interval (inc end points) at the correct height

Question Number	Working	Answer	Mark	Notes
12(c)	Use of w = 430 on graph	Approx 16	**2**	M1 may be shown on graph or implied by 43, 44 or 45 stated A1 if M1 scored, ft from cumulative frequency graph If no method shown, ft only from correct curve

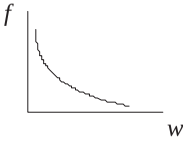
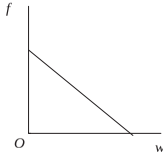
Question Number	Working	Answer	Mark	Notes
13		lines region	**4**	B3 B1 for each correct line (full or broken) Ignore additional lines B1 for correct region shaded in or out or for correct region labelled R

Question Number	Working	Answer	Mark	Notes
14(a)	$r^2 = \frac{A}{\pi}$	$\sqrt{\frac{A}{\pi}}$	**2**	M1 for $r^2 = \frac{A}{\pi}$ or $r^2 = A \div \pi$ A1 Ignore ±

Question Number	Working	Answer	Mark	Notes
14(b)(i)	$\sqrt{\frac{13.5}{\pi}}$	2.07296...	**2**	M1 for 13.5 seen A1 for answer which rounds to 2.073

Question Number	Working	Answer	Mark	Notes
14(b)(ii)	$\sqrt{\frac{14.5}{\pi}}$ or 2.14836...	2.1	**2**	M1 for $\sqrt{\frac{14.5}{\pi}}$ or value which rounds to 2.148 or 2.149 cao A1 dep on previous 3 marks in (b)

Question Number	Working	Answer	Mark	Notes
15(a)(i)	$f = \frac{k}{w}$	$f = \frac{300000}{w}$	**2**	M1 may be implied by $1500 = \frac{k}{200}$ A1 Also award if answer is $f = \frac{k}{w}$ but k is evaluated as 300 000 in (a) **or** (b)

Question Number	Working	Answer	Mark	Notes
15(a)(ii)			**2**	B2 B1 for graph with negative gradient (increasing or constant) even if it touches or crosses one or both axes eg 

Question Number	Working	Answer	Mark	Notes
15(b)	$f = \frac{300000}{1250}$	240	**2**	M1 for substitution in $f = \frac{k}{w}$ A1 ft from k

Question Number	Working	Answer	Mark	Notes
16(a)(i)		$3\mathbf{b}$	**1**	B1

Question Number	Working	Answer	Mark	Notes
16(a)(ii)		$3\mathbf{b} - \mathbf{a}$	**1**	B1

Question Number	Working	Answer	Mark	Notes
16(a)(iii)		$\frac{2}{3}\mathbf{a} + \mathbf{b}$ or $\mathbf{a} + \frac{1}{3}(3\mathbf{b} - \mathbf{a})$ or $3\mathbf{b} - \frac{2}{3}(3\mathbf{b} - \mathbf{a})$ oe	**1**	B1

Question Number	Working	Answer	Mark	Notes
16(b)	$\frac{2}{3}\mathbf{a}$ or $\frac{2}{3}\overrightarrow{PQ}$ or $k = \frac{2}{3}$ or $\mathbf{a} + \frac{1}{3}(3\mathbf{b} - \mathbf{a}) - \mathbf{b}$ or $\frac{2}{3}\mathbf{a} + \mathbf{b} - \mathbf{b}$ or (a)(iii) $- \mathbf{b}$ or $-\mathbf{b} + \mathbf{a} + \frac{1}{3}(3\mathbf{b} - \mathbf{a})$ or $-\mathbf{b} + \mathbf{a} + \frac{1}{3}$(a)(ii) or $2\mathbf{b} - \frac{2}{3}(3\mathbf{b} - \mathbf{a})$ or $2\mathbf{b} - \frac{2}{3}$(a)(ii) oe		**2**	B2 for $\frac{2}{3}\mathbf{a}$ or $\frac{2}{3}\overrightarrow{PQ}$ or $k = \frac{2}{3}$ unless clearly obtained by non-vector method or for expression in terms of **a** and/or **b** (need not be simplified) for $\overrightarrow{EF}$ either correct or ft from (a) B1 for correct vector statement with at least 3 terms which includes $\overrightarrow{EF}$ (or $\overrightarrow{FE}$) in terms of capital letters and/or **a**, **b** eg $\overrightarrow{PQ} = \overrightarrow{PE} + \overrightarrow{EF} + \overrightarrow{FQ}$ $\overrightarrow{PF} = \overrightarrow{PE} + \overrightarrow{EF}$ $\quad$ $\mathbf{a} = \mathbf{b} + \overrightarrow{EF} + \overrightarrow{FQ}$ If an attempt is crossed out and replaced, mark all attempts, including crossed out one, and award best mark.

Question Number	Working	Answer	Mark	Notes
17	$\left(\frac{dy}{dx} =\right) 2x - \frac{16}{x^2}$ "$2x \pm \frac{16}{x^2}$" $= 0$	(2, 12)	**4**	B1 for $2x$ B1 for $\pm \frac{16}{x^2}$ or $\pm 16x^{-2}$ M1 A1 cao For answer (2, 12) with no preceding marks scored, award B0 B0 M1 A1

Question Number	Working	Answer	Mark	Notes
18(a)	$\pi \times 2.8^2 + \frac{1}{2} \times 4\pi \times 2.8^2$	73.9	**3**	M2 M1 for each item Also award for values rounding to 24.6 and to 49.2 or 49.3 A1 for 73.9 or for answers which rounds to 73.9

Question Number	Working	Answer	Mark	Notes
18(b)	$\sqrt[3]{125}$ or 5 seen $25 \times 73.89...$	1850	**3**	M1 M1 for $25 \times$ (a) or for $\pi \times (2.8 \times 5)^2 + 2\pi \times (2.8 \times 5)^2$ or for substituting $r = 2.8 \times 5$ in the expression used in (a) A1 for 1850 or for any value in range 1846.3 – 847.5 ft from $25 \times$ (a)

Question Number	Working	Answer	Mark	Notes
19	$x^2+(3x-1)^2=5$ $x^2+9x^2-3x-3x+1=5$ or $x^2+9x^2-6x+1=5$ $10x^2-6x-4=0$ $(5x+2)(2x-2)=0$ or $(5x+2)(x-1)=0$ or $(10x+4)(x-1)=0$ or $\frac{6\pm\sqrt{196}}{20}$ or $\frac{3\pm\sqrt{49}}{10}$ or $\frac{3}{10}\pm\frac{\sqrt{49}}{10}$ $x=-\frac{2}{5}$, $y=-2\frac{1}{5}$ $x=1$, $y=2$	$x=-\frac{2}{5}$, $y=-2\frac{1}{5}$ $x=1$, $y=2$	**6**	M1 for correct substitution B1 (indep) for correct expansion or $(3x-1)^2$ even if unsimplified B1 for correct simplification B1 for correct factorisation or for correct substitution into the quadratic formula and correct evaluation of 'b^2-4ac' or for using square completion correctly as far as is indicated A1 for both values of x A1 for complete, correct solutions

Paper 4H

Question Number	Working	Answer	Mark	Notes
1(i)		$x + 2x + 1 + 3x - 5 = 17$	**1**	B1 oe eg $6x - 4 = 17$ ISW not '$= p$'

Question Number	Working	Answer	Mark	Notes
1(ii)	$6x = 21$ or $6x - 21 = 0$ etc	$x = 3.5$ oe eg $\frac{21}{6}$	**2**	M1 ft (i) if $6x = c$ A1

Question Number	Working	Answer	Mark	Notes
2	9 seen $\frac{7}{9} \times 27$ or $7 \times \frac{27}{9}$ oe	21	**3**	B1 M1 dep B1 A1 21 seen and ans = 3 B1M1AO

Question Number	Working	Answer	Mark	Notes
3	$5x - 20 = 35$ $5x = 55$	11	**3**	M1 M1 dep or M2 for $x - 4 = 7$ A1

Question Number	Working	Answer	Mark	Notes
4(a)		$\frac{7 \times 50}{2}$ or 7, 50, 2	**2**	B1 for 7 and 2 B1 for 50

Question Number	Working	Answer	Mark	Notes
4(b)	175	200 or 100	**2**	M1 ft from (a), (175 seen, using $\frac{(6 \text{ or } 7)(48 \text{ or } 50)}{2 \text{ or } 3}$ correctly eval'd eg 168) A1f If no wking: ft (a)

Question Number	Working	Answer	Mark	Notes
4(c)		Number incr or 6.8 and 47.6 incr denom decr or 2.09 decr (b) rnded up (not rnd to 1 sf) or '175' rnded to 200	**2**	B2 any two of these B1 any one of these Ignore other

Question Number	Working	Answer	Mark	Notes
5(a)	$\frac{(2+3)}{2}\times 6$ or $2\times 6+\frac{1}{2}\times 6\times 1$ oe	15	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
5(b)	$\frac{15}{20}\times 1000$ $\frac{1000}{20}\times 15$ $1000\times\frac{15}{20}$	750	**3**	M1 or 0.75 M1 ft '15' for M1M1 only A1

Question Number	Working	Answer	Mark	Notes
6	$x+3=7x$ $(6x=3$ oe) $7y=7x+21$ $(6y=21)$	$x=\frac{1}{2}$, $y=3\frac{1}{2}$	**3**	M1 $y=7(y-3)$ $y=7y-21$ $0=6x-3$ A1 A1

Question Number	Working	Answer	Mark	Notes
7(a)	tan used $\tan x = \frac{5.1}{4.2}$ or $\tan x = 1.2\ldots$ oe	$x = 50.5\ldots$	**3**	M1 (sin or cos) and ($\sqrt{}$ ($4.2^2 + 5.1^2$) or 6.6) used M1 $\sin x = 5.1/(\sqrt{}$ ($4.2^2 + 5.1^2$) or $\cos x = 4.2/(\sqrt{}$ ($4.2^2 + 5.1^2$) A1

Question Number	Working	Answer	Mark	Notes
7(b)	sin29 = $AB/5$ or C/sin29 = 5/sin90 AB = 5sin29	AB = 2.42...cm	**3**	M1 BC = 5cos29 M1 AB = $\sqrt{}$ (5^2 + (5cos29)^2) or 5cos29 × tan29 A1

Question Number	Working	Answer	Mark	Notes
8(a)	1 – (0.1 + 0.2 + 0.1) or 1 – 0.4 oe	0.6	**2**	M1 or 0.6 in table A1 allow in table if not contrad on line

Question Number	Working	Answer	Mark	Notes
8(b)	0.2 + 0.1 or 1 – ('0.6' + 0.1)	0.3	**2**	M1 or 0.3 seen A1

Question Number	Working	Answer	Mark	Notes
8(c)		(Poss) overlap or mut excl or doesn't wk for B or Y {No or poss or poss yes}	**2**	B2 B1 Can't tell and (No or poss) B1 Correct reason only B0 Incorrect reason B0 Unqualified Yes

Question Number	Working	Answer	Mark	Notes
9	$4^2 + 6^2$ (= 52) $\sqrt{(4^2 + 6^2)}$ or $\sqrt{}$"52" or $2\sqrt{13}$	h = 7.21...	**3**	M1 M1 dep A1

Question Number	Working	Answer	Mark	Notes
10(a)	V/H in any correct triangle attempted Grad = 2, may be embedded or implied	y = '2' $x + 1$	**4**	M1 eg $\frac{3-1}{1-0}$ not $\frac{3}{1}$ A1 M1 B2f B1f for grad. B1 for y - int (lin eqn) or B1f for just '2' $x + 1$ No wking, ans $2x + 1$: M1A1 B1

Question Number	Working	Answer	Mark	Notes
10(b)		$y = -2 \pm c$	**1**	B1 $y = -2x \pm$ any no. (not 5) or letter or $y = -2x$

Question Number	Working	Answer	Mark	Notes
10(c)		(0, –4)	**1**	B1

Question Number	Working	Answer	Mark	Notes
11(a)		56	**1**	B1

Question Number	Working	Answer	Mark	Notes
11(b)	$\frac{x}{20} = \frac{6}{12}$ or $\frac{4}{8}$ oe	10 or 10.0...	**2**	M1 or x /sin30 = 20/sin(180 – 30 – 56) A1

Question Number	Working	Answer	Mark	Notes
11(c)	$\frac{y}{10}=\frac{4}{6}$ or $\frac{8}{12}$ oe	6.6 to 6.7 incl oe	**2**	M1 or $y = \sqrt{(4^2 + 8^2 - 2\times 4\times 8\times \cos 56')}$ or y /sin56 = 8/sin(180 – 30 – 56) A1 (a)(b): ft (a) M-mks only

Question Number	Working	Answer	Mark	Notes
12(a)	$\frac{a^7}{a^2}$ or $a\times a^4$ or $a^3\times a^2$	a^5	**2**	M1 A1

Question Number	Working	Answer	Mark	Notes
12(b)		x^3	**1**	B1

Question Number	Working	Answer	Mark	Notes
12(c)	Correctly cancel numbers or $(x + 1)$	$\frac{1}{2}(x + 1)$ or $0.5(x + 1)$ or $\frac{x+1}{2}$ or $\frac{x}{2}+\frac{1}{2}$ or equiv	**2**	M1 eg $\frac{1}{2}$ or 0.5 or denom = 2 or $\frac{3(x+1)}{6}$ or $\frac{3x+3}{6}$ or $k(x+1)$ A1 Not ISW

Question Number	Working	Answer	Mark	Notes
13(a)	Attempt arrange one set in order State or indicate correct 15 and 4 or 14 and 6	Class A:11 Class B:8	**4**	M1 M1 NB: IQR for B = 8, check wking A1 A1

Question Number	Working	Answer	Mark	Notes
13(b)		A more spread or gter dispersion or less consistent than B	**1**	B1 B1f Consistent with (a). Ignore other. Not: gter "range" or "difference" or "more constant" or "gter IQR" or "gter variance"

Question Number	Working	Answer	Mark	Notes
14	$5x - 7 = x^2 - 1$ or $5x - 7 =$ $(x-1)(x+1)$ $x^2 - 5x + 6 = 0$ $(x-2)(x-3)\ (= 0)$ or $\frac{5 \pm \sqrt{(-5)^2 - 4\times 6}}{2}$	x = 2 or 3	**4**	M1 condone $5x - 7 = x - 1 \times x + 1$ M1 allow different order with = 0 M1 $(x - 2.5)^2 + 6 - 6.25$ A1 T & I or no wking: 4 mks or 0 mks

Question Number	Working	Answer	Mark	Notes
15	2 overlapping circles, 12 in overlap 6 in H only 2 in T only	14	**4**	M1 M1 or 6 play H only M2 M1 or $20 - 6$, $6 + 12 + x = 20$, $20 - 18$, $35 - 33$: M3 A1 ans 2: M3A0

Question Number	Working	Answer	Mark	Notes
16	$9^2 + 5^2 - 2 \times 5 \times 9 \times \cos x = 6^2$ $90\cos x = 70$ or $-90\cos x = -70$ $(\cos x = \frac{70}{90})$	x = 38.9 or better	**3**	M1 or $\cos x = \frac{9^2 + 5^2 - 6^2}{2 \times 5 \times 9}$ M2 M1 A1

Question Number	Working	Answer	Mark	Notes
17(a)(i)		-2	**1**	B1 or $x \neq -2$ or $x = -2$

Question Number	Working	Answer	Mark	Notes
17(a)(ii)		$x < 1$	**2**	B2 B1 for $x \leq 1$ or 0, –1, –2, –3...

Question Number	Working	Answer	Mark	Notes
17(b)	$\sqrt{9}$ or $\sqrt{(10-1)}$ $\frac{1}{\sqrt{9}+2}$	$\frac{1}{5}$ or 0.2	**3**	M1 M1 or $\frac{1}{\sqrt{(x-1)}+2}$ A1 ignore ans = –1

Question Number	Working		Answer	Mark	Notes
17(c)	$y = \sqrt{(x-1)}$ $y^2 = x - 1$ $x = y^2 + 1$	–1, ✓ Reverse order squ, + 1	$(g^{-1}(x) =) x^2 + 1$ oe	**4**	M1 M1 $y = \sqrt{(x-1)}$ y M1 M1dep $x = \sqrt{(y-1)}$ x condone ✓x-1 if next step M1 $x^2 = y - 1$ A1 A1 $y^2 + 1$ M3 $y = x^2 + 1$ M3 $x = x^2 + 1$ M3 SC $(g^{-1}(x) =)\ (x+1)^2$: B1

Question Number	Working	Answer	Mark	Notes
18(a)	$\frac{1}{6} \times \frac{1}{6} \times \frac{1}{6}$ alone	$\frac{1}{216}$ or 0.0046...	**2**	M1 0.17^3 or 0.16^3 or better. Not $\times k$ A1

Question Number	Working	Answer	Mark	Notes
18(b)	1, 1, 4 or 1, 2, 6 or 2, 1, 6 seen or implied 1, 1, 4 **and** 1, 2, 6(or 2, 1, 6) seen or implied $\left(\frac{1}{6}\right)^3 \times 3$	$\frac{1}{72}$ or $\frac{3}{216}$ or 0.014 or better	**4**	M1 ie one route M1 ie two routes incl 1, 1, 4 M1 ie three routes and correct exp'n A1 $\left(\frac{1}{6}\right)^3 \times 2$ or $\frac{1}{108}$, no wking: M0A0

Question Number	Working	Answer	Mark	Notes
19(a)	$\frac{1}{2} \times 5 \times 5 \times \sin 60$	10.8...	**2**	M1 $\frac{1}{2} \times 5 \times \sqrt{(5^2 - \left(\frac{5}{2}\right)^2)}$ or $\frac{1}{2} \times 5 \times 4.33$ A1 $\frac{(25\sqrt{3})}{4}$ M1AO

Question Number	Working	Answer	Mark	Notes
19(b)	sect = $\frac{1}{6} \times \pi \times 5^2$ or 13.1 "10.8" + $2(\frac{1}{6} \times \pi \times 5^2 - 10.8")$ or "10.8" + 2×2.26 or $2 \times \frac{1}{6} \times \pi \times 5^2 - 0.8$"	15.4 cm^2	**3**	M1 M1 Δ + 2(sect $-\Delta$) or 2 × sect $-\Delta$ Allow eg $\Delta = \frac{1}{2} \times 5 \times 5$ A1

Question Number	Working	Answer	Mark	Notes
20(a)		20	**1**	M1

Question Number	Working	Answer	Mark	Notes
20(b)		30	**2**	B2 B1 1sq reps freq of 5 seen anywhere

Question Number	Working	Answer	Mark	Notes
21(a)		$(4x-1)(4x+1)$	**1**	B1

Question Number	Working	Answer	Mark	Notes
21(b)(i)	$16 \times 10^2 - 1$ seen or implied $(4 \times 10 - 1) \times$ $(4 \times 10 + 1)$ or 39×41	$3 \times 13 \times 41$	**3**	M1 13 or 39 or 41 or 123 as factor M1 factors 3, 13, 41 or 39, 41 or 13, 123 A1 Ans $3 \times$ 5s33 M0A0

Question Number	Working	Answer	Mark	Notes
21(b)(ii)	1599×10^3 or 1599×1000	'$3 \times 13 \times 41$' $\times 2^3 \times 5^3$ oe	**2**	M1 or tree including 1000 or 10 and 100 A1f ft (i) $\times 2^3 \times 5^3$

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