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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Thursday 7 January 2021

Morning (Time: 2 hours) | Paper Reference **4MA1/1HR**

Mathematics A

Paper 1HR
Higher Tier



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

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided
  – *there may be more space than you need.*
- **Calculators may be used.**
- You must **NOT** write anything on the formulae page.
  Anything you write on the formulae page will gain NO credit.

Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.

Turn over ▶

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International GCSE Mathematics

Formulae sheet – Higher Tier

Arithmetic series

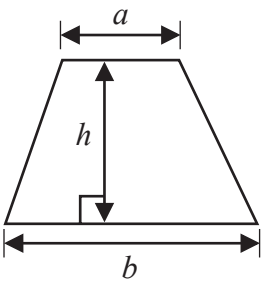
Sum to n terms, $S_n = \frac{n}{2}[2a + (n-1)d]$

The quadratic equation

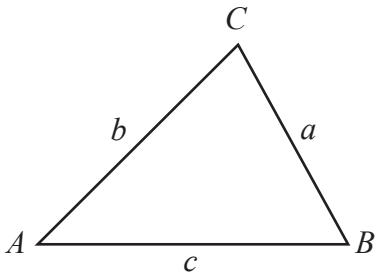
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$ are given by:

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

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



Trigonometry



In any triangle ***ABC***

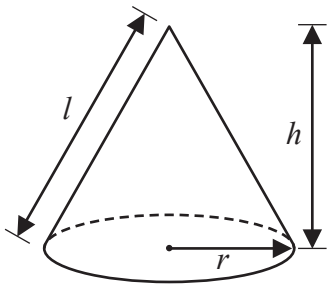
Sine Rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

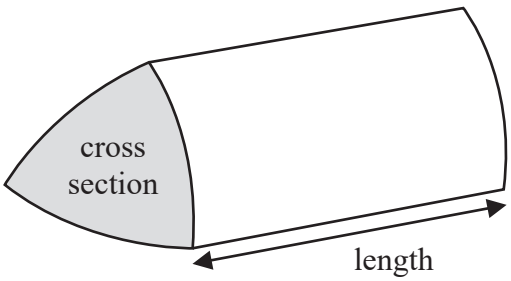
Area of triangle $= \frac{1}{2}ab\sin C$

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

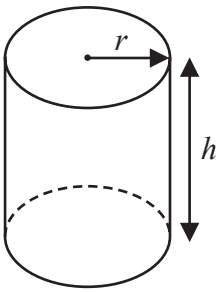
Curved surface area of cone $= \pi rl$



Volume of prism
= area of cross section × length

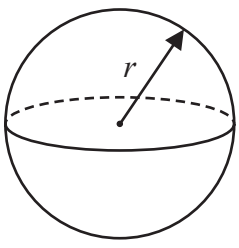


Volume of cylinder $= \pi r^2 h$
Curved surface area of cylinder $= 2\pi rh$



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

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



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Answer ALL TWENTY TWO questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Show that $3\frac{1}{5} \times 1\frac{5}{6} = 5\frac{13}{15}$

(Total for Question 1 is 3 marks)

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2 Given that $a < b < c$

the four whole numbers a, a, b and c have

a mode of 7
a median of 8.5
a mean of 9

Work out the value of a, the value of b and the value of c.

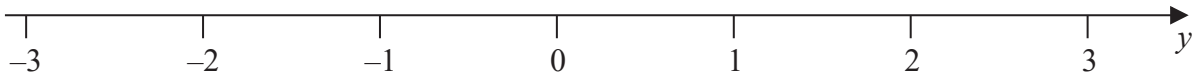
$a =$ .....

$b =$ .....

$c =$ .....

(Total for Question 2 is 4 marks)

3 (a) On the number line, show the inequality $-2 \leqslant y < 1$



(2)

n is an integer.

(b) Write down all the values of n that satisfy $-3.4 < n \leqslant 2$

.....

(2)

(Total for Question 3 is 4 marks)

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4 A train journey from Paris to Amsterdam took 3 hours 24 minutes.
The total distance the train travelled was 433.5 km.

Work out the average speed of the train.
Give your answer in kilometres per hour.

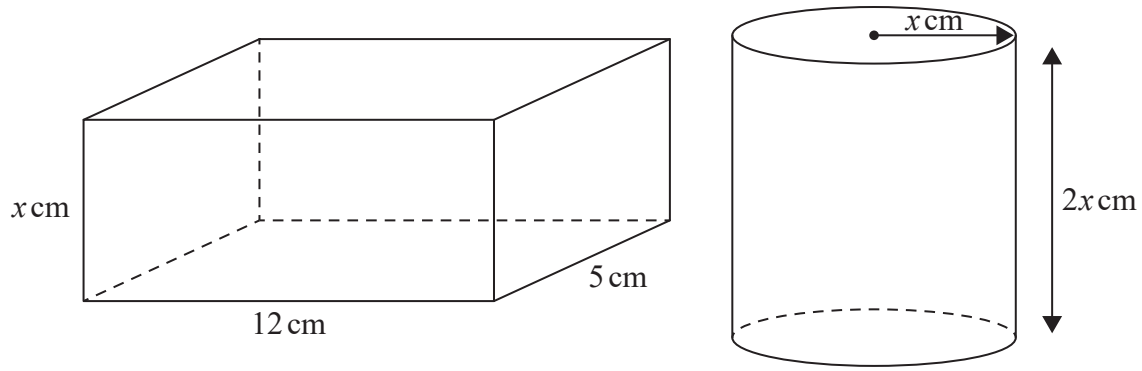
..... km/h

(Total for Question 4 is 3 marks)

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5 The diagram shows a cuboid and a cylinder.

Diagram **NOT** accurately drawn



The dimensions of the cuboid are x cm by 12 cm by 5 cm.
The volume of the cuboid is 270 cm^3

The radius of the cylinder is x cm.
The height of the cylinder is $2x$ cm.

(a) Work out the volume of the cylinder.
Give your answer correct to the nearest whole number.

..... cm^3

(3)

(b) Change 1 m^3 to cm^3

..... cm^3

(1)

(Total for Question 5 is 4 marks)

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6 (a) Make c the subject of $A = \frac{c}{y} - 5z$

.....

(2)

(b) Write down the value of g^0

.....

(1)

(c) Factorise $x^2 - 11x + 24$

.....

(2)

(Total for Question 6 is 5 marks)

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7 Kuro invests 50 000 yen for 3 years in a savings account.
She gets 2.4% per year compound interest.

Work out how much money Kuro will have in her savings account at the end of the 3 years.
Give your answer correct to the nearest yen.

..... yen

(Total for Question 7 is 3 marks)

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8 The diagram shows a regular pentagon, *ABCDE*, a regular hexagon, *CFGHID*, and a quadrilateral, *EDIJ*.

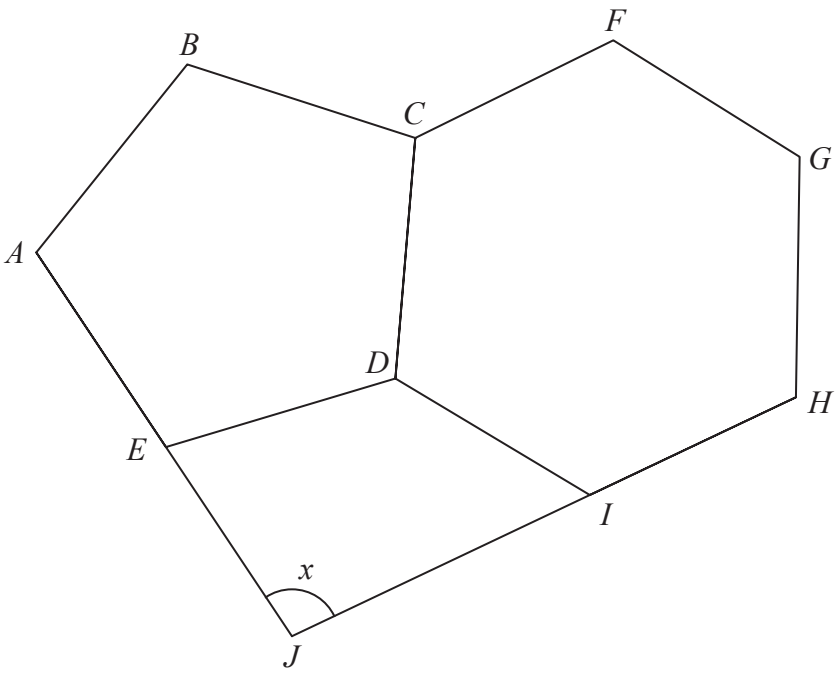


Diagram **NOT** accurately drawn

AEJ and *HIJ* are straight lines.

Work out the size of the angle marked *x*.
Show your working clearly.

.....°

(Total for Question 8 is 5 marks)

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9 $A = 2^8 \times 3^5 \times 11^4$ $B = 2^6 \times 3 \times 11^8$

(a) Find the highest common factor (HCF) of A and B.

.....

(2)

(b) Find the lowest common multiple (LCM) of $2A$ and $3B$.
Give the LCM as a product of powers of its prime factors.

.....

(2)

(Total for Question 9 is 4 marks)

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10 The diagram shows one face of a wall.
This face is in the shape of a pentagon with exactly one line of symmetry.

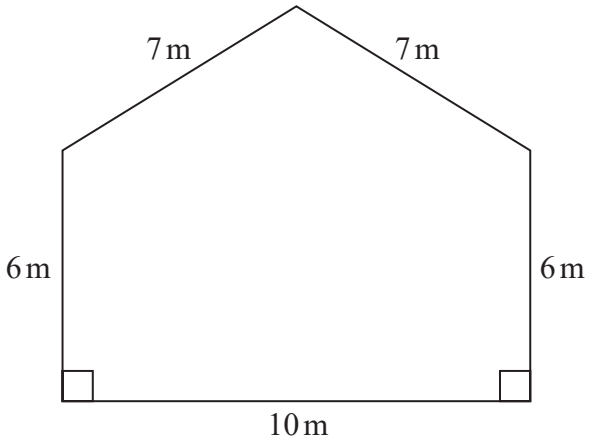


Diagram **NOT** accurately drawn

Omondi is going to paint this face of the wall once.
He has to buy all the paint that he needs to use.

The paint in each tin of paint Omondi is going to buy will cover $16\,m^2$ of the face of the wall.

Work out the least number of tins of paint Omondi will need to buy.
Show your working clearly.

.....

(Total for Question 10 is 5 marks)

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11 The manager of a call centre asked the 120 people, who rang the call centre last week, how long they each waited before their call was answered.

The table gives information about their replies.

Time waited (t minutes)	Frequency
$0 < t \leqslant 5$	8
$5 < t \leqslant 10$	15
$10 < t \leqslant 15$	17
$15 < t \leqslant 20$	28
$20 < t \leqslant 25$	33
$25 < t \leqslant 30$	19

(a) Complete the cumulative frequency table.

Time waited (t minutes)	Cumulative frequency
$0 < t \leqslant 5$	
$0 < t \leqslant 10$	
$0 < t \leqslant 15$	
$0 < t \leqslant 20$	
$0 < t \leqslant 25$	
$0 < t \leqslant 30$	

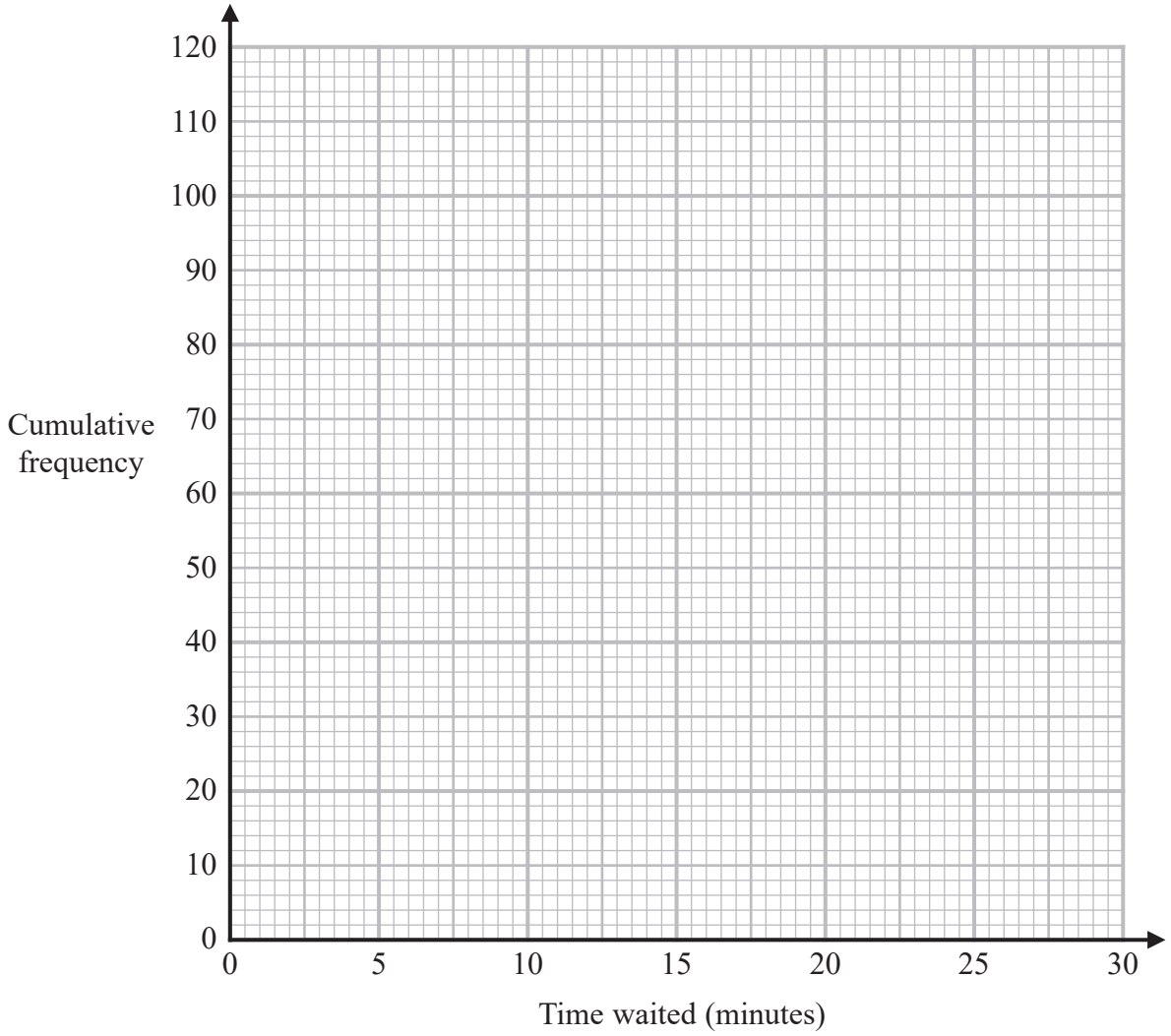
(1)

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



(2)

(c) Use your graph to find an estimate for the median of the times waited.

..... minutes

(1)

(d) Using your graph, find an estimate for the percentage of the 120 people who said that they waited longer than 23 minutes before their call was answered.
Show your working clearly.

..... %

(2)

(Total for Question 11 is 6 marks)

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12 (a) Simplify $(16e^{10}f^{6})^{\frac{1}{2}}$

.....

(2)

(b) Write $\frac{2x+1}{4}+\frac{x-2}{3}$ as a single fraction in its simplest form.

.....

(3)

Given that $4^{k+3}=16\times 2^{k}$

(c) find the value of k.
Show your working clearly.

$k =$ .....

(4)

(Total for Question 12 is 9 marks)

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13 Here are two vectors.

$$\overrightarrow{AB} = \begin{pmatrix} 5 \\ 3 \end{pmatrix} \qquad \overrightarrow{CB} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$$

Find, as a column vector, $\overrightarrow{AC}$

.....

(Total for Question 13 is 2 marks)

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14

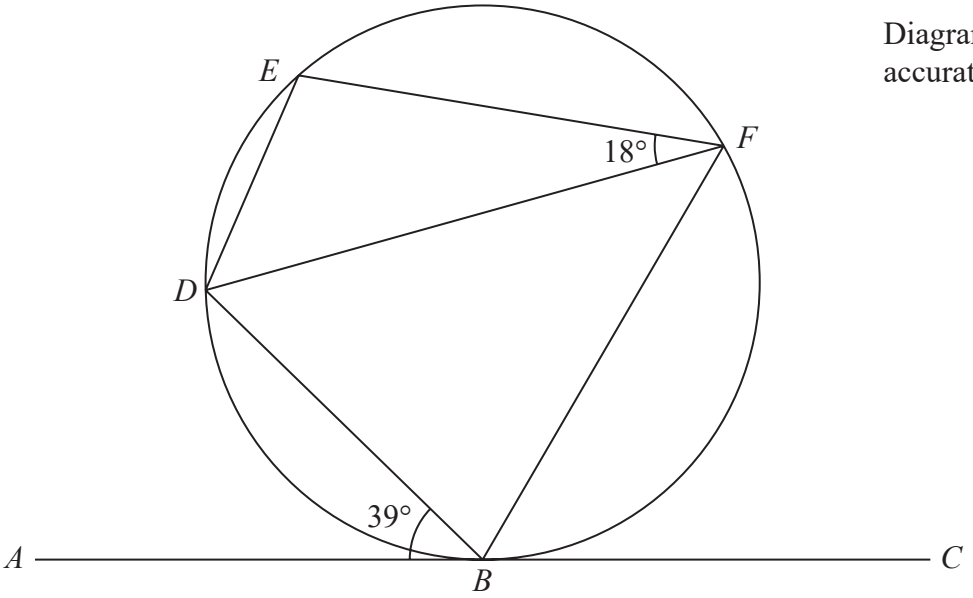


Diagram **NOT** accurately drawn

B, *D*, *E* and *F* are points on a circle.

ABC is the tangent at *B* to the circle.
Angle *ABD* = 39°
Angle *EFD* = 18°

Work out the size of angle *BDE*.
Give reasons for your working.

°

(Total for Question 14 is 4 marks)

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15 (a) Use algebra to show that $4.\dot{5}\dot{7} = 4\frac{19}{33}$

(2)

(b) Show that $\frac{2}{6 - 3\sqrt{2}}$ can be written in the form $\frac{a + \sqrt{a}}{b}$

where a and b are integers.
Show your working clearly.

(3)

(Total for Question 15 is 5 marks)

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16 (a) Expand and simplify $(x + 4)(x – 2)(x + 1)$

(3)

(b) Express $x^2 – 10x + 40$ in the form $(x + a)^2 + b$, where a and b are integers.

(2)

(Total for Question 16 is 5 marks)

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17 Solve the simultaneous equations

$$x - 6y = 5$$
$$xy - 2y^2 = 6$$

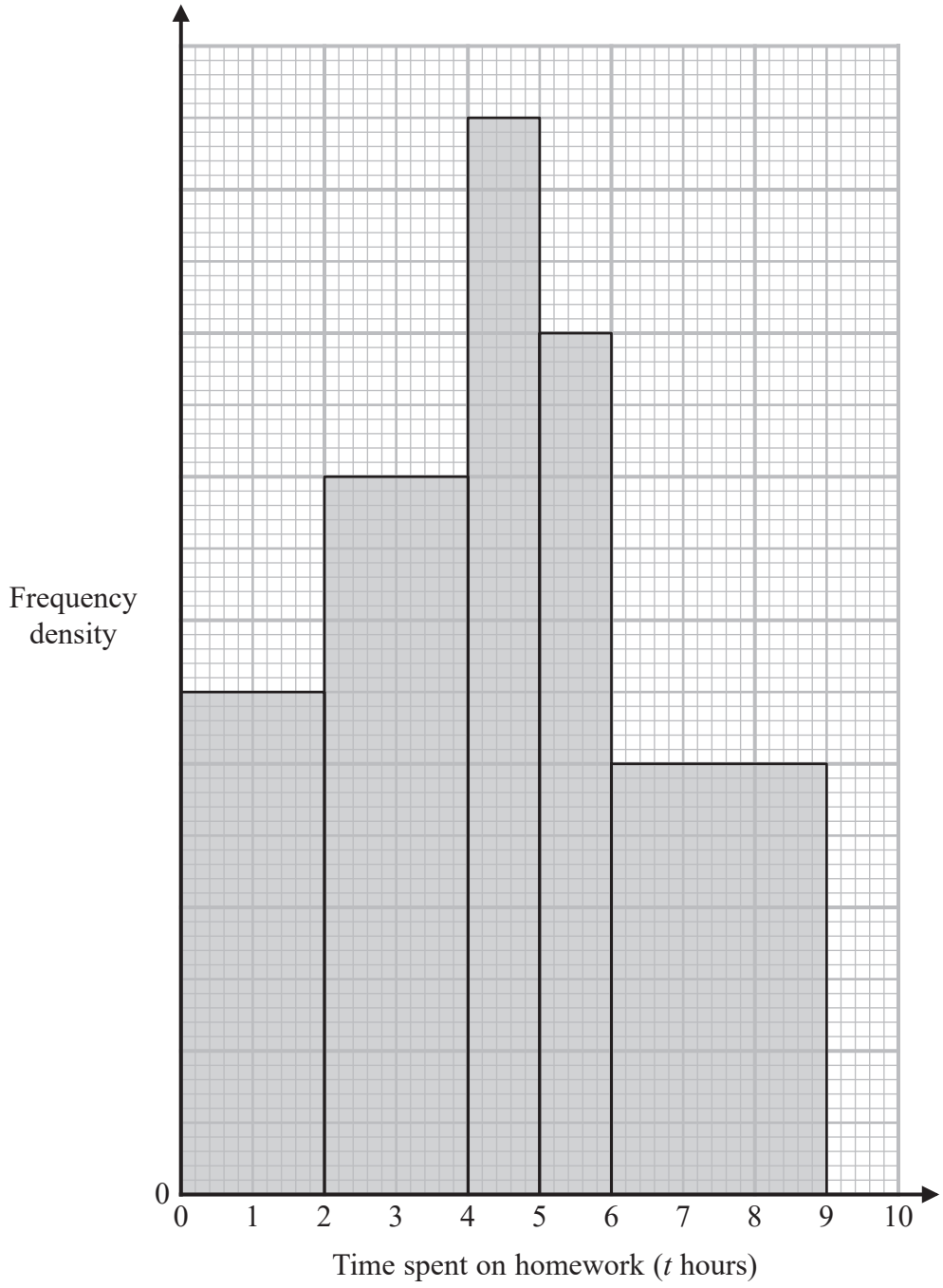
Show clear algebraic working.

.....

(Total for Question 17 is 5 marks)

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18 The histogram and the table give some information about the amounts of time, in hours, that Year 11 students at Bergdesh Academy spent, in total, on their homework last week. No student in Year 11 spent longer than 9 hours on their homework.



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Time spent on homework (t hours)	Frequency
$0 < t \leqslant 2$	28
$2 < t \leqslant 4$	
$4 < t \leqslant 5$	
$5 < t \leqslant 6$	
$6 < t \leqslant 9$	

Using the information in the histogram and in the table, work out an estimate for the mean amount of time the Year 11 students spent on their homework last week.
Give your answer in hours correct to 3 significant figures.

..... hours

(Total for Question 18 is 5 marks)

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19 $k = \dfrac{t}{a - h}$

t = 14 correct to 2 significant figures
a = 7.8 correct to 2 significant figures
h = 3.4 correct to 2 significant figures

Work out the lower bound for the value of k.
Show your working clearly.

.....

(Total for Question 19 is 3 marks)

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20 A particle P is moving along a straight line.
The fixed point O lies on the line.

At time t seconds ($t \geqslant 0$), the displacement of P from O is s metres where

$$s = t^3 - 9t^2 + 33t - 6$$

Find the minimum speed of P.

..... m/s

(Total for Question 20 is 5 marks)

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21 The nth term of an arithmetic series is u_n where $u_n > 0$ for all n
The sum to n terms of the series is S_n

Given that $u_4 = 6$ and that $S_{11} = (u_6)^2 + 18$

find the value of u_{20}

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.....

(Total for Question 21 is 6 marks)

Turn over for Question 22

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22 ABC is an isosceles triangle with $AB = AC$.

B is the point with coordinates $(-1, 5)$
C is the point with coordinates $(2, 10)$
M is the midpoint of BC.

Find an equation of the line through the points A and M.
Give your answer in the form $py + qx = r$ where p, q and r are integers.

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.....

(Total for Question 22 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

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