Centre No.						Surname	Initial(s)
Candidate No.						Signature	

Paper Reference(s)

4400/4H

Examiner's use only

Team Leader's use only

London Examinations IGCSE

Mathematics

Paper 4H

Higher Tier

Monday 7 November 2005 – Morning

Time: 2 hours

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

Page Number	Leave Blank
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18	
19	
20	
Total	

Instructions to Candidates

In the boxes above, write your centre number and candidate number, your surname, initial(s) and signature.
The paper reference is shown at the top of this page. Check that you have the correct question paper.
Answer **ALL** the questions in the spaces provided in this question paper.
Show all the steps in any calculations.

Information for Candidates

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

Advice to Candidates

Write your answers neatly and in good English.

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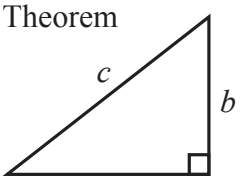
IGCSE MATHEMATICS 4400
FORMULA SHEET – HIGHER TIER

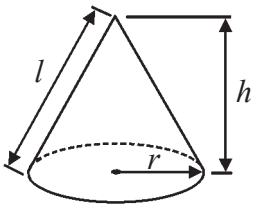
Pythagoras' Theorem



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

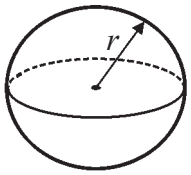
Volume of cone = $\frac{1}{3}\pi r^2 h$

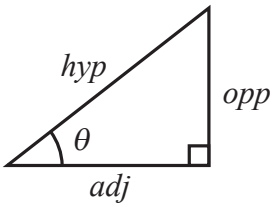
Curved surface area of cone = $\pi r l$



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

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





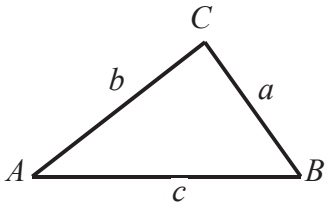
adj = hyp × cos θ
opp = hyp × sin θ
opp = adj × tan θ

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

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

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

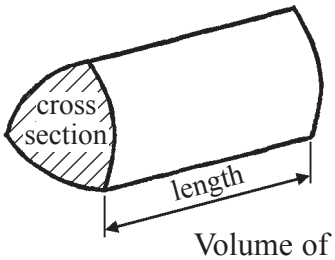
In any triangle ABC



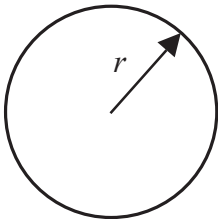
Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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



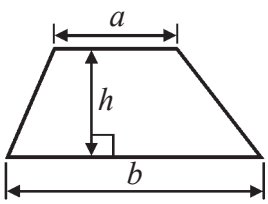
Volume of prism = area of cross section × length

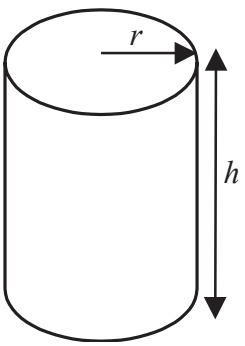


Circumference of circle = $2\pi r$

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 TWENTY ONE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1. A = {Prime numbers between 10 and 16}
B = {Multiples of 3 between 10 and 16}

(a) List the members of $A \cup B$.

.....

(2)

(b) What is $A \cap B$?

.....

(1)

(c) Is it true that $11 \in B$?

.....

Explain your answer.

.....

.....

(1)

Q1

(Total 4 marks)

Leave blank

2. Two fruit drinks, *Fruto* and *Tropico*, are sold in cartons.

(a) *Fruto* contains only orange and mango.
The ratio of orange to mango is 3 : 2
A carton of *Fruto* contains a total volume of 250 cm^3.

Find the volume of orange in a carton of *Fruto*.

..... cm^3
(3)

(b) *Tropico* contains only lemon, lime and grapefruit.
The ratios of lemon to lime to grapefruit are 1 : 2 : 5
The volume of grapefruit in a carton of *Tropico* is 200 cm^3.

Find the total volume of *Tropico* in a carton.

..... cm^3
(3) **Q2**

(Total 6 marks)

3. (a) Factorise $x^2 - 5x$

.....
(1)

(b) Multiply out $x(2x + 3y)$

.....
(2)

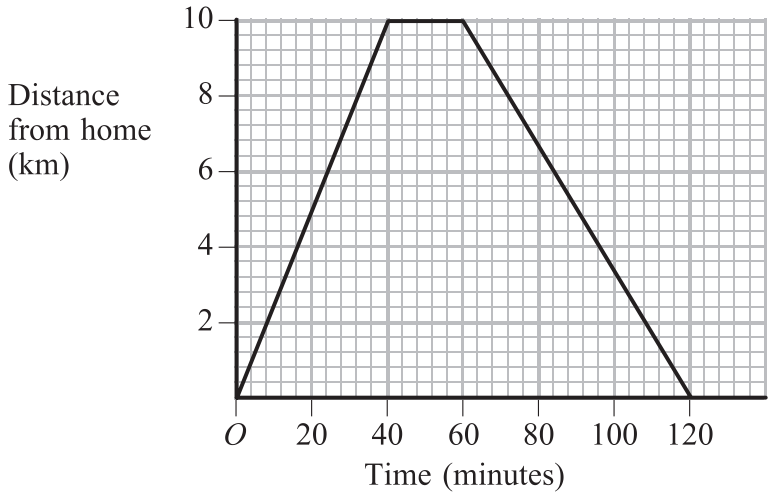
(c) Expand and simplify $(x - 4)(x + 2)$

.....
(2) **Q3**

(Total 5 marks)

Leave blank

4. Jodi went on a trip by cycle from his home.
The diagram shows his distance/time graph.



(a) At what times was Jodi 6 km from home?

..... minutes

..... minutes

(2)

(b) Where was Jodi after 120 minutes?

.....

(1)

(c) Between what times was Jodi moving fastest?

..... minutes, ... minutes

(1)

(d) Calculate Jodi's speed during the first 20 minutes of his trip.
Give your answer in kilometres per hour.

..... km/h

(2)

(e) At what time had Jodi cycled 14 km?

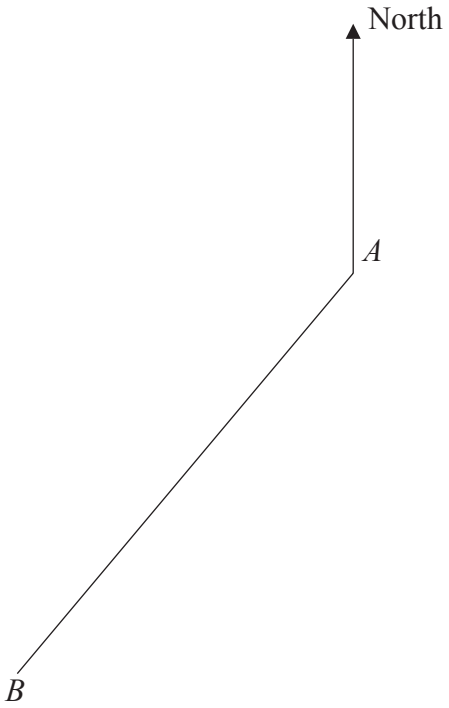
..... minutes

(1) **Q4**

(Total 7 marks)

Leave blank

5. The diagram shows two towns, *A* and *B*.



(a) Measure the bearing of *B* from *A*.

.....°

(2)

(b) A plane flies along the perpendicular bisector of the line *AB*.
Use ruler and compasses to construct the perpendicular bisector of *AB*.
Show all your construction lines.

(2)

(c) The bearing of another town, *C*, from *A* is 120°.
Work out the bearing of *A* from *C*.

.....°

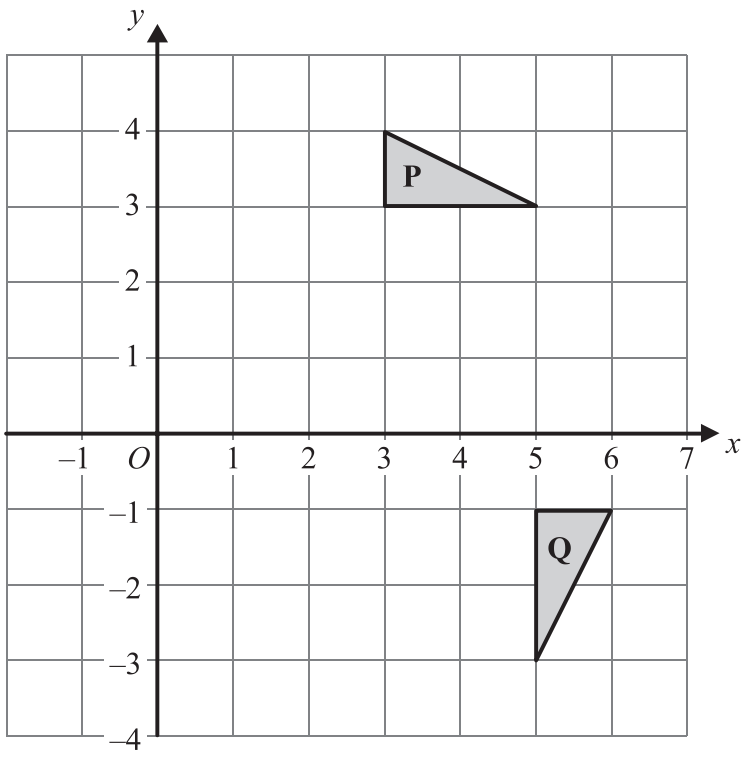
(1)

Q5

(Total 5 marks)

Leave blank

6.



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

.....

.....

(3)

(b) Another shape, **R**, is enlarged by scale factor 2 to give shape **S**.

Write down whether each of the following statements is a true statement or a false statement.

(i) The lengths in **R** and **S** are the same. .....

(ii) The angles in **R** and **S** are the same. .....

(iii) Shapes **R** and **S** are similar. .....

(iv) Shapes **R** and **S** are congruent. .....

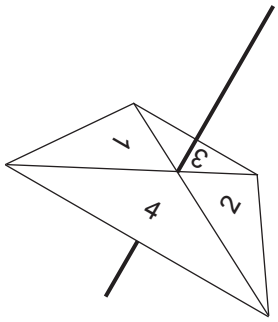
(2)

Q6

(Total 5 marks)

Leave blank

7. Here is a four sided spinner.



Its sides are labelled 1, 2, 3 and 4

The spinner is biased.
The probability that the spinner lands on each of the numbers 1, 2 and 3 is given in the table.

Number	Probability
1	0.25
2	0.25
3	0.1
4	

The spinner is spun once.

(a) Work out the probability that the spinner lands on 4

.....

(2)

(b) Work out the probability that the spinner lands on either 2 or 3

.....

(2) **Q7**

(Total 4 marks)

Leave blank

8. The table gives information about the heights of some plants.

Height, h cm	Frequency
$0 < h \leqslant 5$	4
$5 < h \leqslant 10$	6
$10 < h \leqslant 15$	8
$15 < h \leqslant 20$	2

Calculate an estimate of the mean height.

..... cm

Q8

(Total 4 marks)

9.

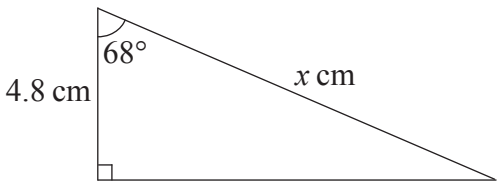


Diagram **NOT** accurately drawn

Calculate the value of x.

$x =$ .....

Q9

(Total 3 marks)

Leave blank

10. The table shows the populations of five countries.

Country	Population
The Gambia	1.4×10^6
Kenya	3.2×10^7
Mali	1.2×10^7
Nigeria	1.4×10^8
Swaziland	1.2×10^6

(a) Which of these countries has the largest population?

.....

(1)

(b) Calculate the difference between the population of Kenya and the population of Nigeria.
Give your answer in standard form.

.....

(2)

(c) The population of South Africa is 30 times the population of The Gambia.
Calculate the population of South Africa.
Give your answer in standard form.

.....

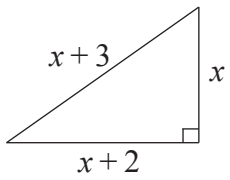
(1)

Q10

(Total 4 marks)

Leave blank

11. A right-angled triangle has sides of length x cm, $(x + 2)$ cm and $(x + 3)$ cm.



(a) Use Pythagoras' theorem to write down an equation in x.

.....

(1)

(b) Show that your equation simplifies to $x^2 - 2x - 5 = 0$

(2)

(c) By solving the equation $x^2 - 2x - 5 = 0$, find the length of each side of the triangle. Give your answers correct to one decimal place.

..... cm, ... cm, ... cm

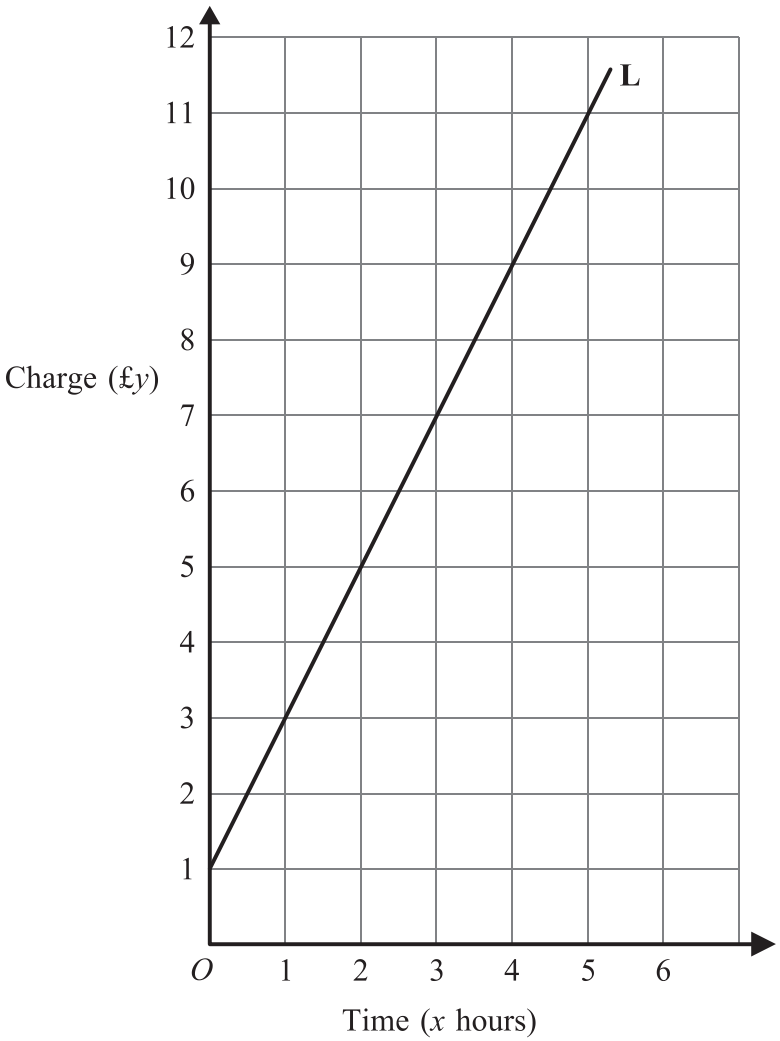
(3)

Q11

(Total 6 marks)

Leave blank

12. The charge, £y, for hiring a bike for x hours can be found from the straight line **L**.



(a) (i) Find the gradient of the line **L**.

.....

(ii) Give an interpretation of your gradient.

.....

.....

.....

(3)

Leave blank

(b) Write down the equation of the line **L**.

.....

(2)

(c) Another bike hire shop charges £3 with an additional charge of £1.50 per hour.
Find the time for which the two shops' charges are equal.

..... hours

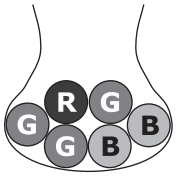
(2)

Q12

(Total 7 marks)

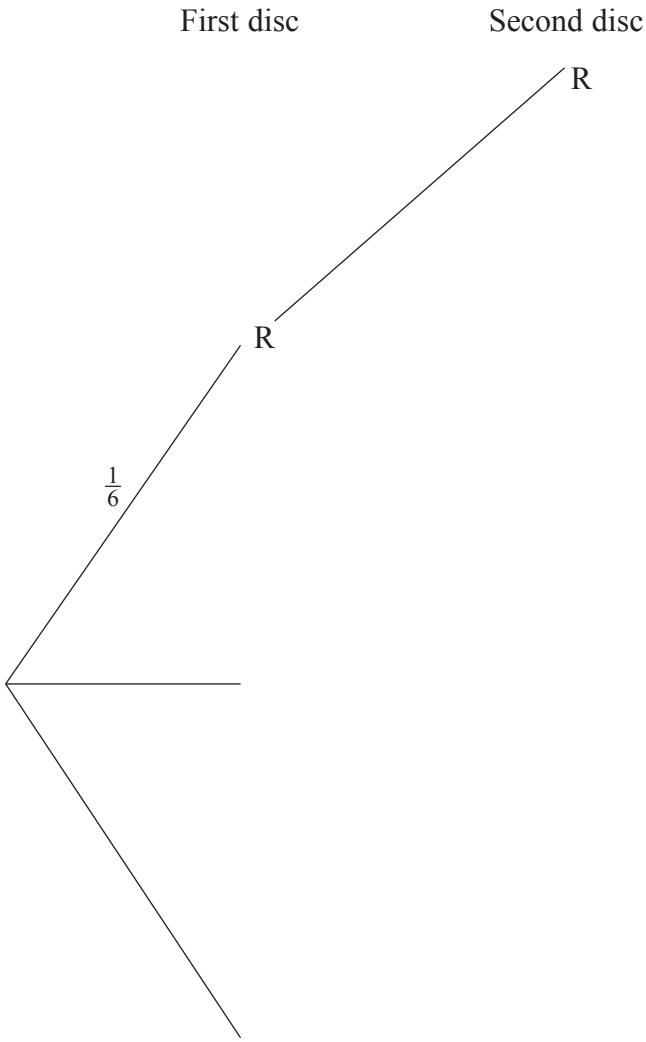
Leave blank

13. A bag contains 1 red disc, 2 blue discs and 3 green discs.



Xanthe chooses a disc at random from the bag. She notes its colour and replaces it. Then Xanthe chooses another disc at random from the bag and notes its colour.

(a) Complete the probability tree diagram showing all the probabilities.



(3)

Leave blank

(b) Calculate the probability that both discs are the same colour.

.....

(3)

(c) Calculate the probability that **neither** disc is red.

.....

(2)

Q13

(Total 8 marks)

14. The volume of oil in a tank is 1000 litres, correct to the nearest 10 litres.
The oil is poured into tins of volume 2.5 litres, correct to one decimal place.

Calculate the upper bound of the number of tins which will be required.

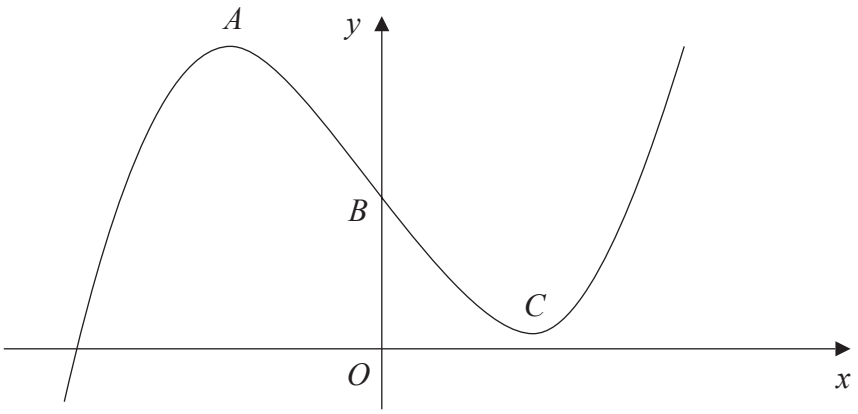
.....

Q14

(Total 3 marks)

Leave blank

15. The diagram shows the graph of $y = x^3 - 12x + 17$
A is the maximum point on the curve.
C is the minimum point on the curve.
The curve crosses the y axis at B.



For the equation $y = x^3 - 12x + 17$

(a) find $\frac{dy}{dx}$,

.....

(2)

(b) find the gradient of the curve at B,

.....

(2)

(c) find the coordinates of A and C.

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

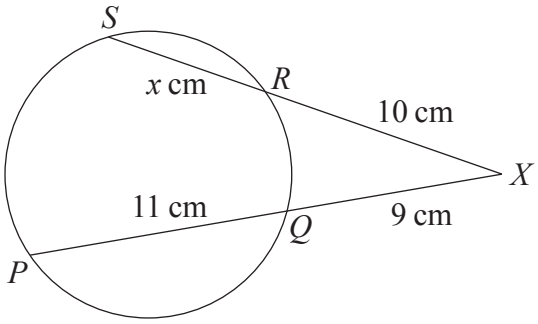
C (..... , ...)

(4) **Q15**

(Total 8 marks)

Leave blank

16.



The diagram shows a circle, *PQRS*.
SRX and *PQX* are straight lines.
PQ = 11 cm. *QX* = 9 cm. *RX* = 10 cm. *SR* = *x* cm.

Find the value of *x*.

x = ...

Q16

(Total 3 marks)

Leave blank

17. Three functions are defined as follows:

$$\text{f: } x \mapsto \cos x^\circ \quad \text{for the domain } 0 \leqslant x \leqslant 180$$
$$\text{g: } x \mapsto \sin x^\circ \quad \text{for the domain } 0 \leqslant x \leqslant 90$$
$$\text{h: } x \mapsto \tan x^\circ \quad \text{for the domain } p \leqslant x \leqslant q$$

(a) Find the range of f.

.....

(2)

(b) Given that the range of h is the same as the range of g, find a value of p and a value of q.

$p =$ ..... $q =$ .....

(3) **Q17**

(Total 5 marks)

18. (a) Express $\sqrt{2} + \sqrt{8}$ in the form $a\sqrt{2}$, where a is an integer.

.....

(1)

(b) Express $\left(\frac{1}{\sqrt{2}}\right)^9$ in the form $\frac{\sqrt{b}}{c}$, where b and c are integers.

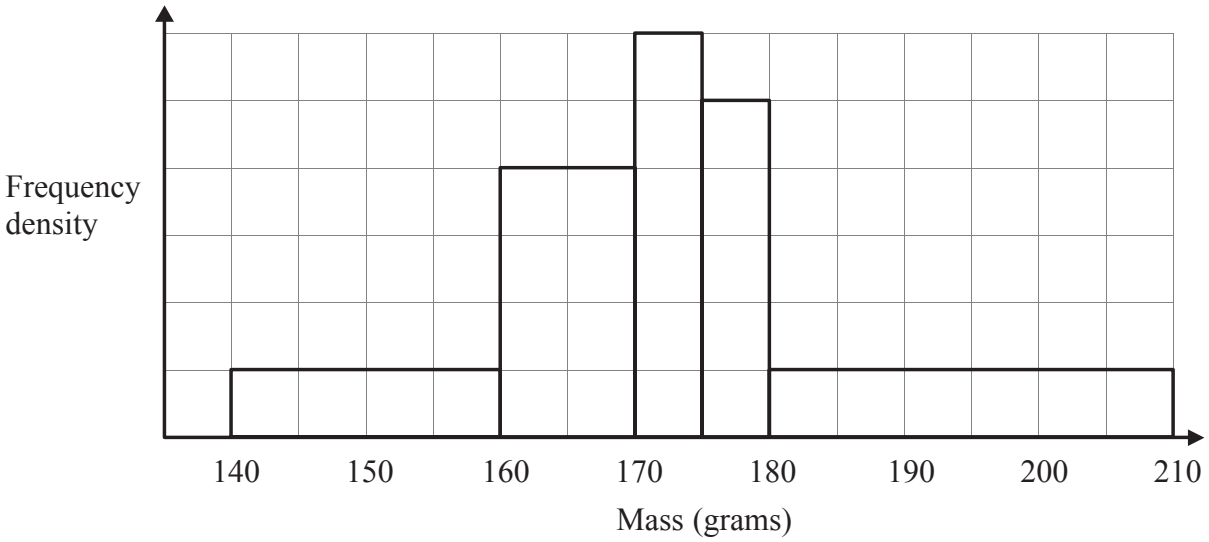
.....

(3) **Q18**

(Total 4 marks)

Leave blank

19. The histogram gives information about the masses of some stones.



The number of stones in the 170 g – 175 g class is 24 more than the number of stones in the 140 g – 160 g class.

Calculate the total number of stones.

.....

(Total 3 marks)

Q19

20. A is the point with coordinates (2, 3).

$\overrightarrow{AB} = \begin{pmatrix} 5 \\ -4 \end{pmatrix}$.

Find the coordinates of B.

(....., ...)

(Total 2 marks)

Q20

Turn over for the last question

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21.

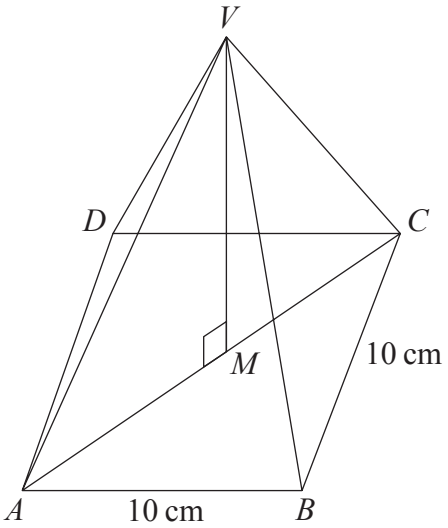

Diagram **NOT** accurately drawn

The diagram shows a pyramid.
The base, $ABCD$, is a horizontal square of side 10 cm.
The vertex, V, is vertically above the midpoint, M, of the base.
$VM = 12$ cm.

Calculate the size of angle VAM.

..... °

(Total 4 marks)

Q21

TOTAL FOR PAPER: 100 MARKS

END