

Candidate Name	Centre Number	Candidate Number

WELSH JOINT EDUCATION COMMITTEE
General Certificate of Secondary Education



CYD-BWYLLGOR ADDYSG CYMRU
Tystysgrif Gyffredinol Addysg Uwchradd

MATHEMATICS
SPECIMEN EXAMINATION
HIGHER TIER PAPER 1
SUMMER 2009
(2 Hours)

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER
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INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3.14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

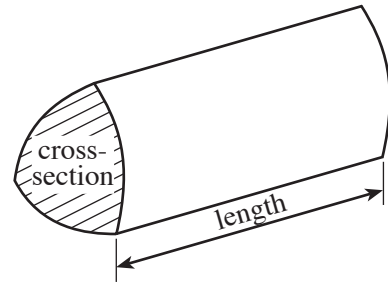
The number of marks is given in brackets at the end of each question or part-question.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	5	
2	3	
3	7	
4	8	
5	3	
6	7	
7	4	
8	4	
9	5	
10	2	
11	2	
12	4	
13	3	
14	3	
15	4	
16	2	
17	4	
18	7	
19	3	
20	4	
21	2	
22	4	
23	4	
24	4	
25	2	
TOTAL MARK		

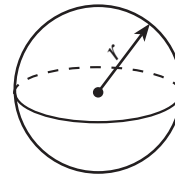
Formula List

Volume of prism = area of cross-section \times length



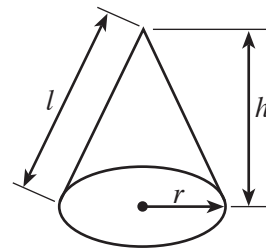
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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

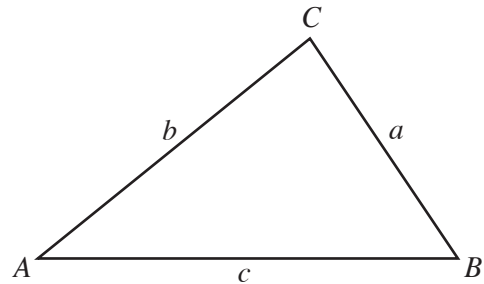


In any triangle ABC

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Standard Deviation

Standard deviation for a set of numbers

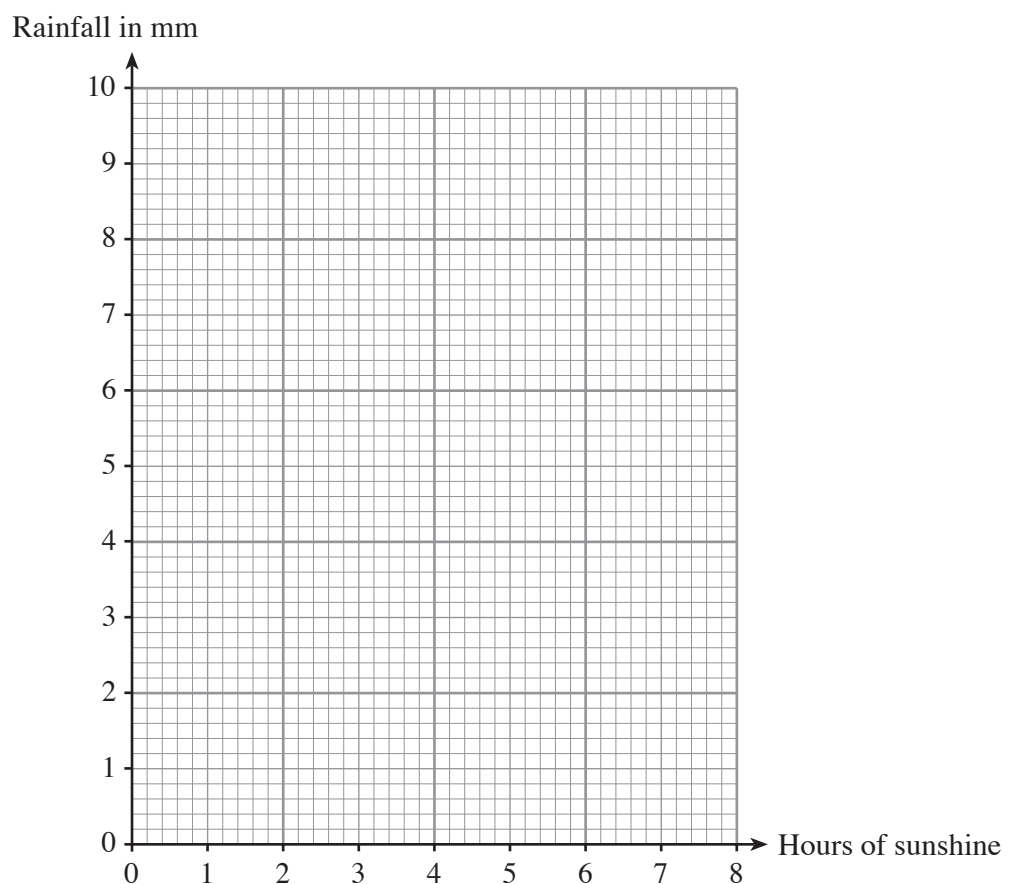
x_1, x_2, \dots, x_n , having a mean of \bar{x} is given by

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n}} \quad \text{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{ \frac{\sum x}{n} \right\}^2}$$

1. The number of millimetres of rainfall and number of hours of sunshine are recorded by a group of students every Monday for 5 weeks. The table below shows the results.

Number of hours of sunshine	5.5	6.5	6.0	7.9	3.0
Millimetres of rainfall	3.5	1.0	2.5	0.0	9.5

- (a) On the graph paper below draw a scatter diagram of these results. [2]



- (b) Describe the correlation between the number of hours of sunshine and the amount of rainfall.

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[1]

- (c) Draw a line of best fit on your scatter diagram. [1]

- (d) Use your line of best fit to find an estimate for the number of hours of sunshine on a day with 5 mm of rainfall.

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[1]

2. Simplify $3(a + 2b) + 7a - 8b$.

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[3]

3. The diagram below shows a shape.

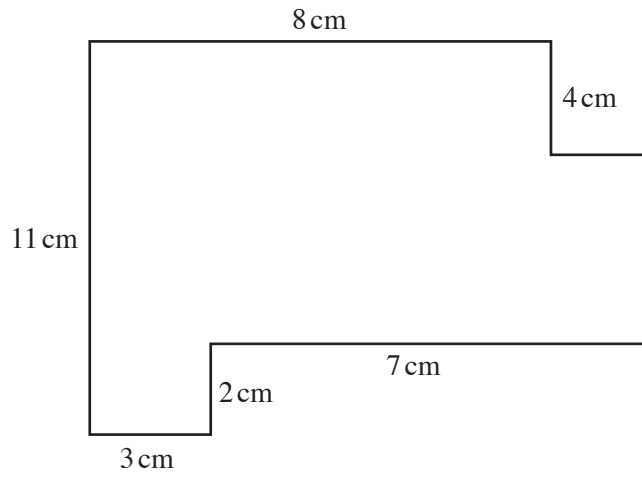


Diagram not drawn to scale.

(a) Find the perimeter of the shape.

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[4]

(b) Find the area of the shape.

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[3]

4. (a) The diagram shows three parallel lines and another line that crosses the parallel lines. Find the angles marked a , b , c and d .

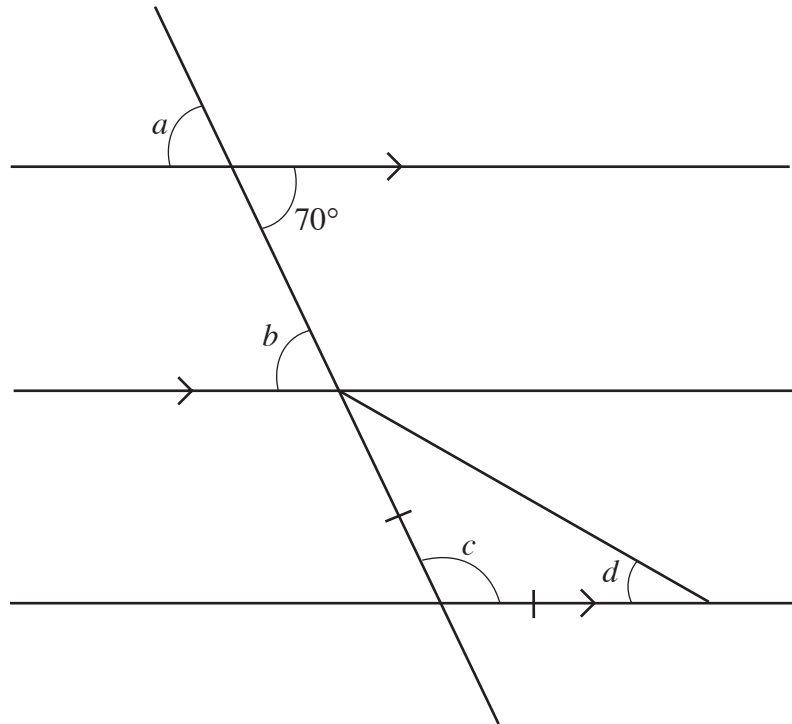


Diagram not drawn to scale.

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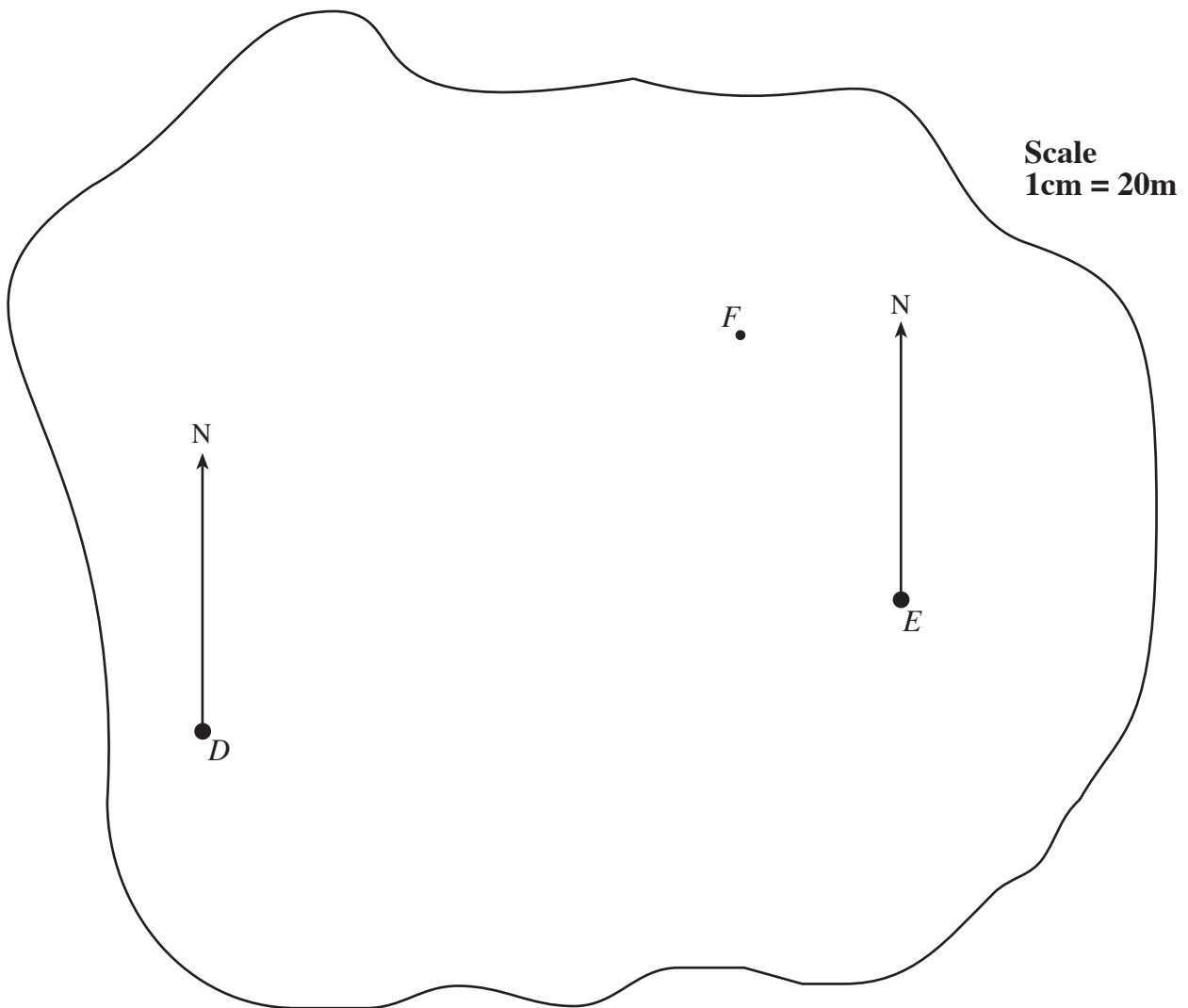
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$$a = \dots\dots\dots^\circ \quad b = \dots\dots\dots^\circ \quad c = \dots\dots\dots^\circ \quad d = \dots\dots\dots^\circ$$

[4]

(b) The following diagram is drawn to scale. The scale used is 1 cm represents 20 m.



- (i) Write down the bearing of point F from point E .

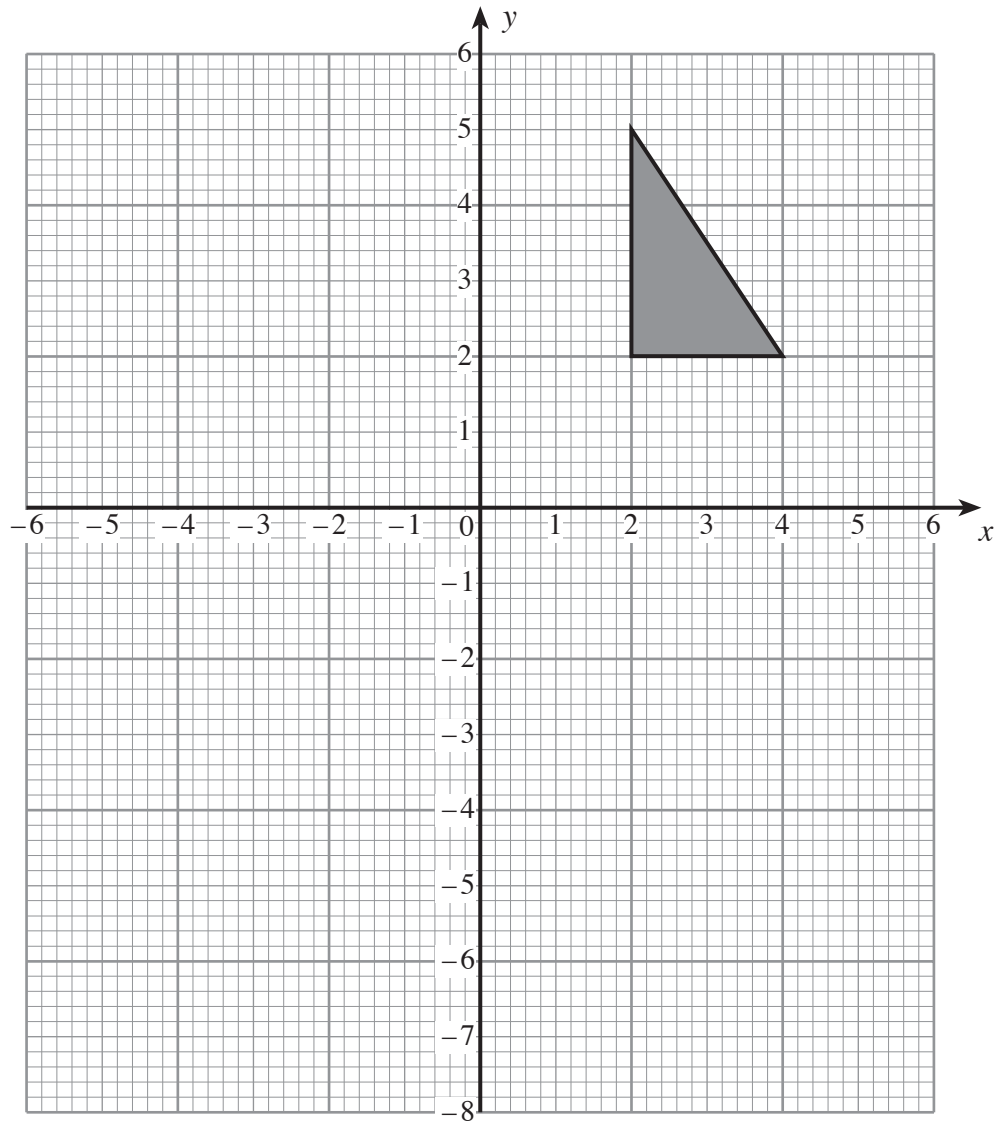
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- (ii) A point G is to be plotted on the above plan. The bearing of G from D is 036° , and the bearing of G from E is 285° . Find and mark the position of G on the above plan.

[3]

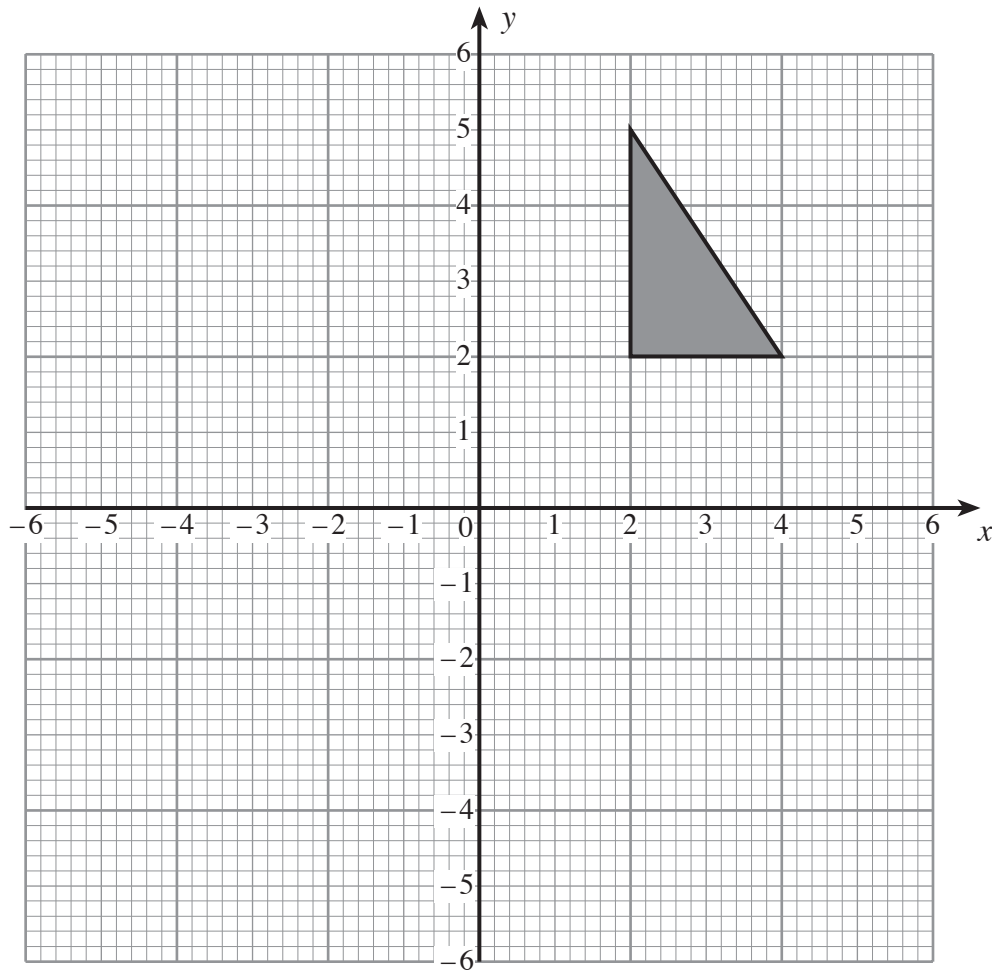
5. (a) Reflect the triangle shown in the line $y = -1$.

[2]



(b) Translate the triangle shown 4 to the left and 2 down.

[1]



- 6. (a) The cost of a stand season ticket last year was £200. This year it has increased to £250. Find the percentage increase in the cost of the stand season ticket.

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[3]

- (b) Two friends, Nigel and Paul, decide to share the cost of a £100 field season ticket in the ratio 4:1.

- (i) How much **each** should Nigel and Paul pay towards the cost of the ticket?

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Nigel pays Paul pays

[2]

- (ii) In the season there are 45 matches to attend. Nigel suggests that they take it in turns to attend every other match. Would this be a fair suggestion? You must explain your answer giving an alternative suggestion if you decide that this would not be a fair method.

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[2]

7. The table shows some of the values of $y = x^3 + 3$ for values of x from -3 to 3 .

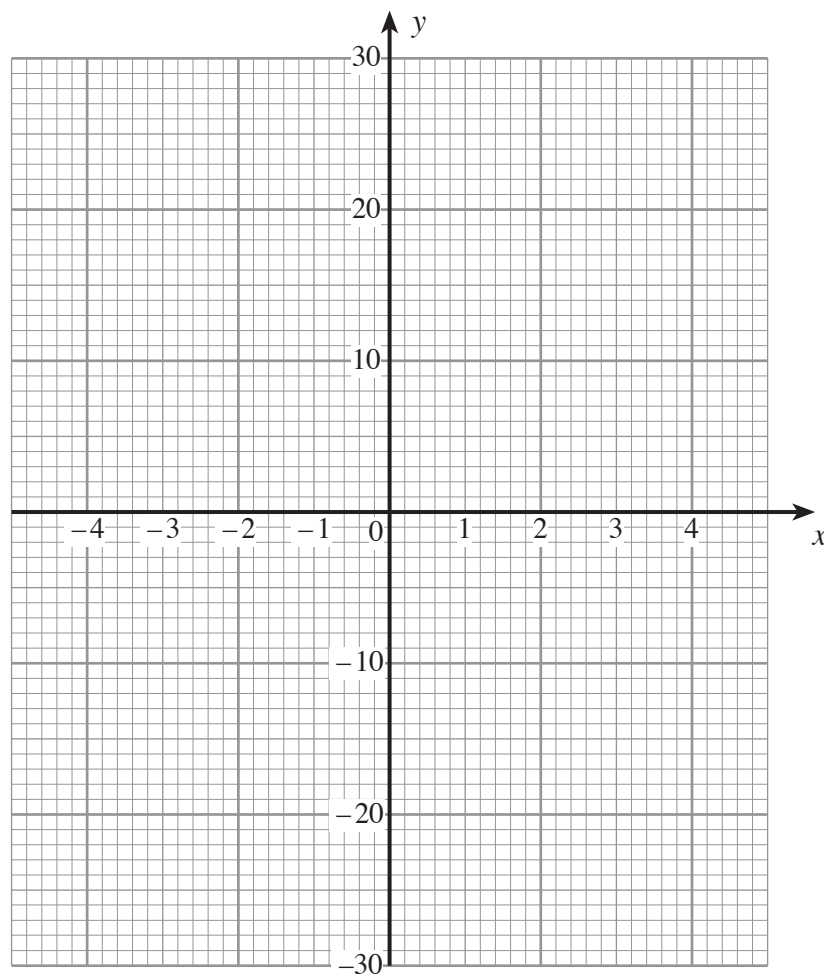
(a) Complete the table by finding the value of y for $x = -1$ and $x = 2$.

x	-3	-2	-1	0	1	2	3
$y = x^3 + 3$	-24	-5		3	4		30

[2]

(b) On the graph paper below, draw the graph of $y = x^3 + 3$ for values of x from -3 to 3 .

[2]



8. (a) Express 360 as a product of prime numbers in index form.

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[3]

- (b) Explain why $2^5 \times 3^4$ is **not** a perfect square.

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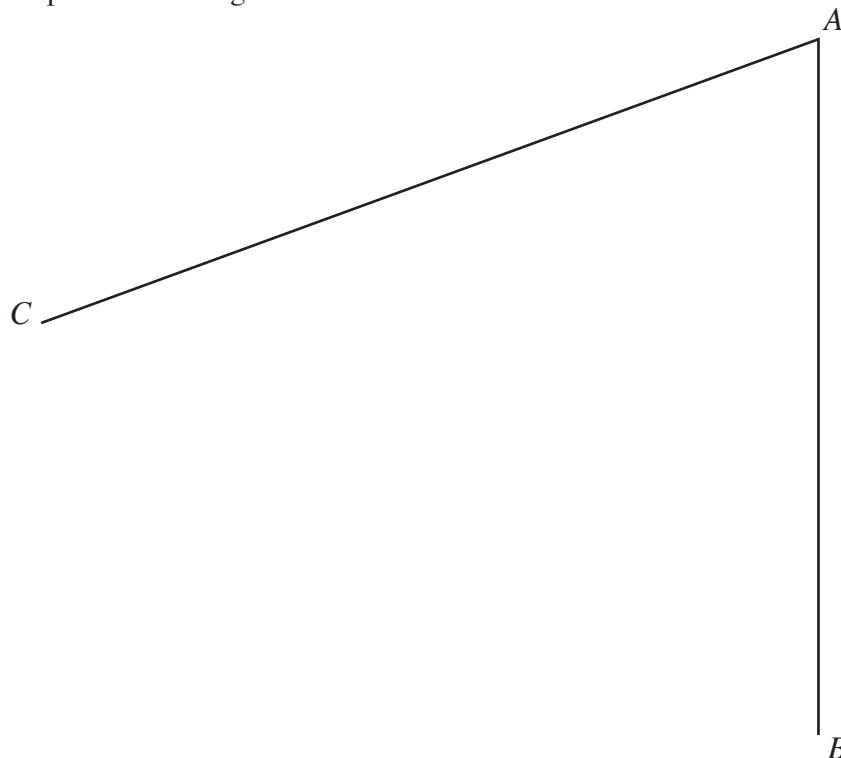
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[1]

9. (a) The diagram below shows two straight lines AB and AC . Find and **shade** the region which satisfies **both** of the following conditions.

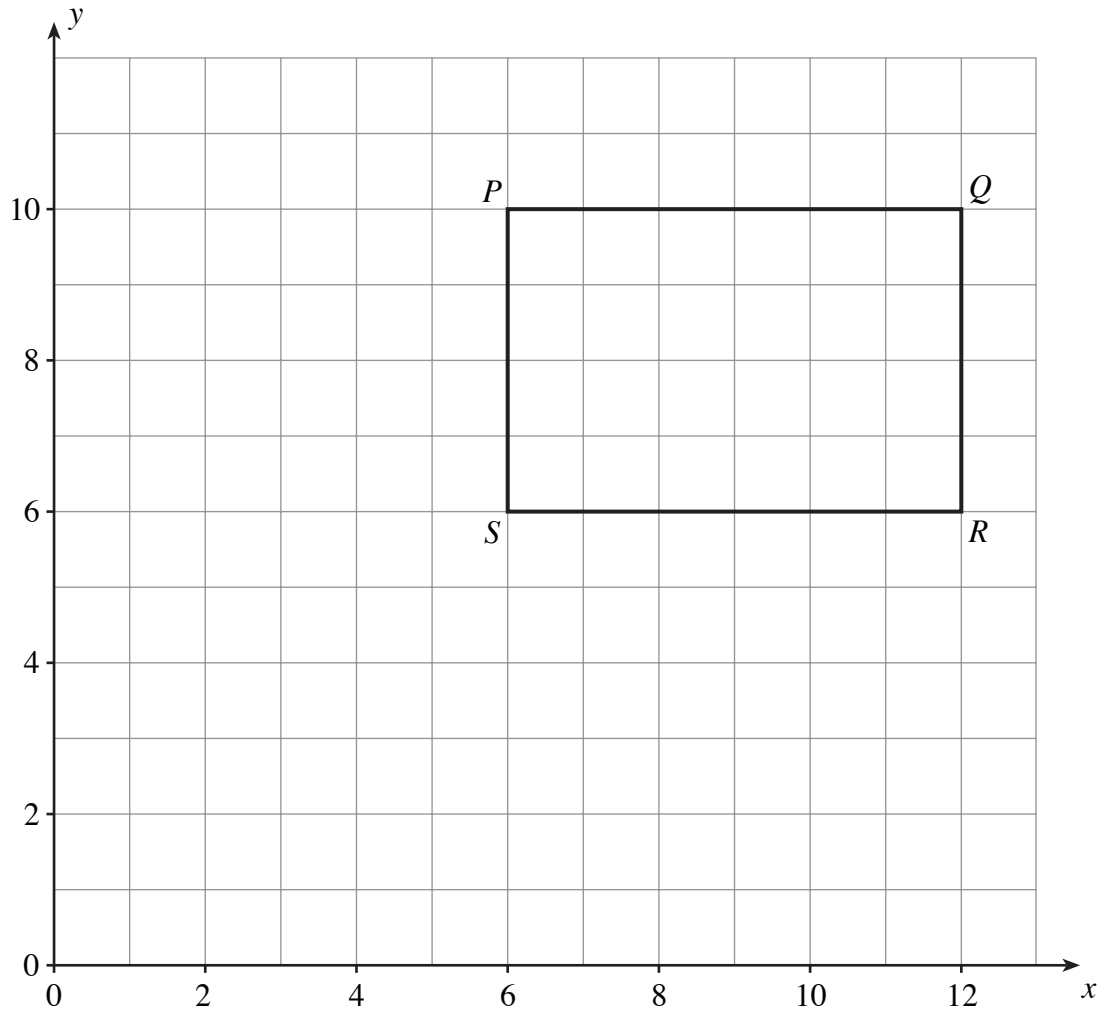
- (i) All points in the region are nearer to AC than to AB .
- (ii) All points in the region are less than 6 cm from B .



[3]

- (b) Enlarge the rectangle $PQRS$ by a scale factor $\frac{1}{2}$ using $(0, 0)$ as the centre of enlargement.

[2]

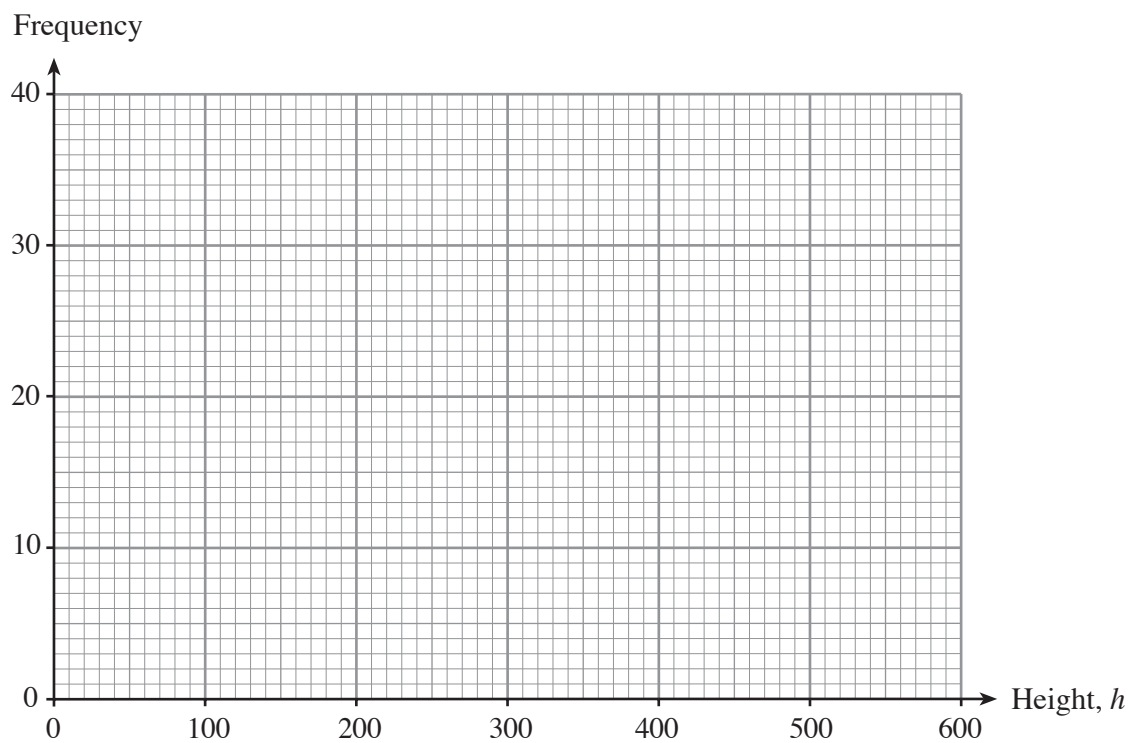


10. The heights of 100 trees were measured. The table below shows a grouped frequency distribution of the results.

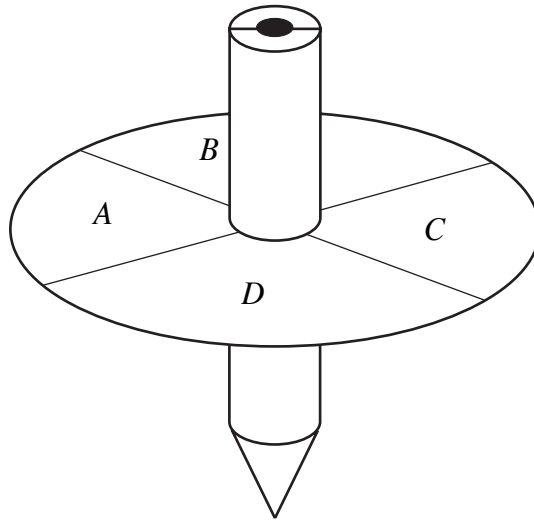
Height, h	$100 < h \leq 200$	$200 < h \leq 300$	$300 < h \leq 400$	$400 < h \leq 500$	$500 < h \leq 600$
Frequency	6	20	34	30	10

On the graph paper below, draw a frequency polygon to show this data.

[2]



11. A spinner is labelled A , B , C and D .



The table shows the probability of the spinner landing on the different letters.

Letter	A	B	C	D
Probability	0.18	0.36	0.12	0.34

What is the probability that the spinner lands on the letter C or the letter D ?

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[2]

12. (a) Simplify $(\sqrt{8})^2$.

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[1]

(b) Express $\frac{2}{9}$ as a recurring decimal.

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[1]

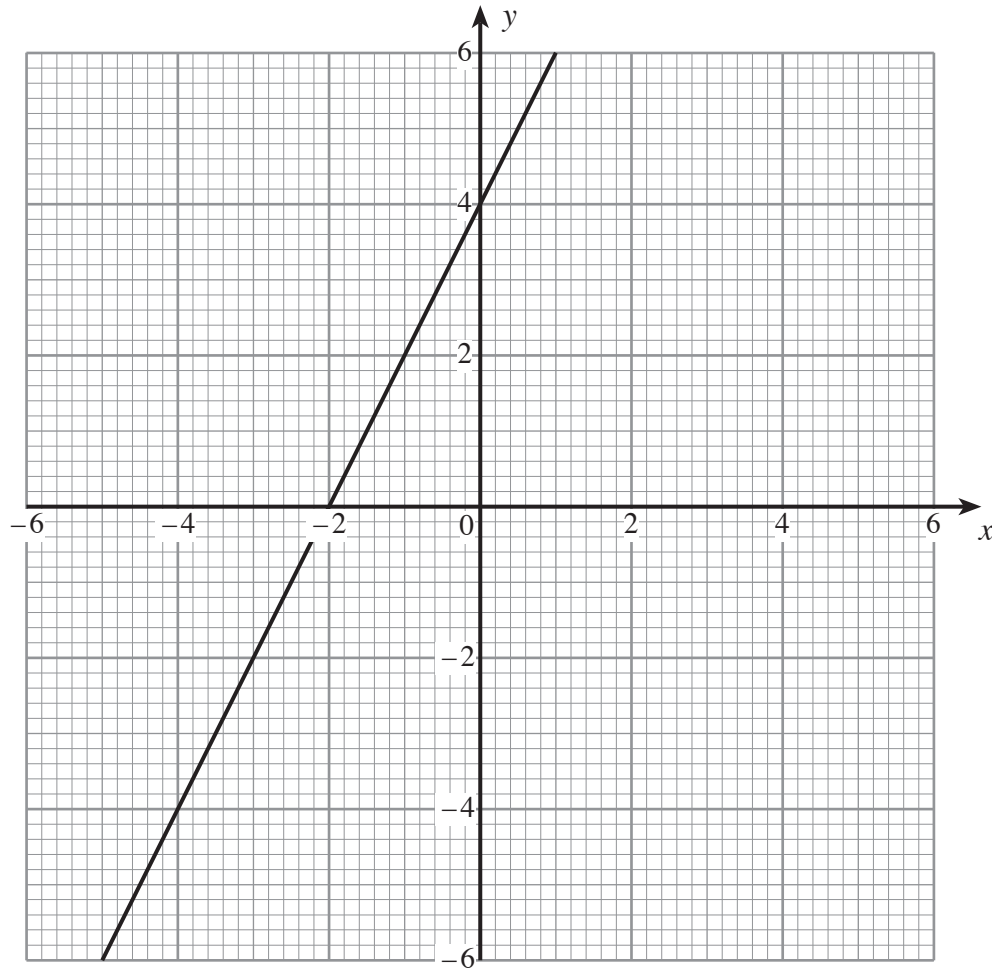
(c) Evaluate

(i) 2^{-2} ,

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(ii) 7^0 .

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[2]

13. Write down the equation of the straight line shown in the following diagram in the form $y = mx + c$.



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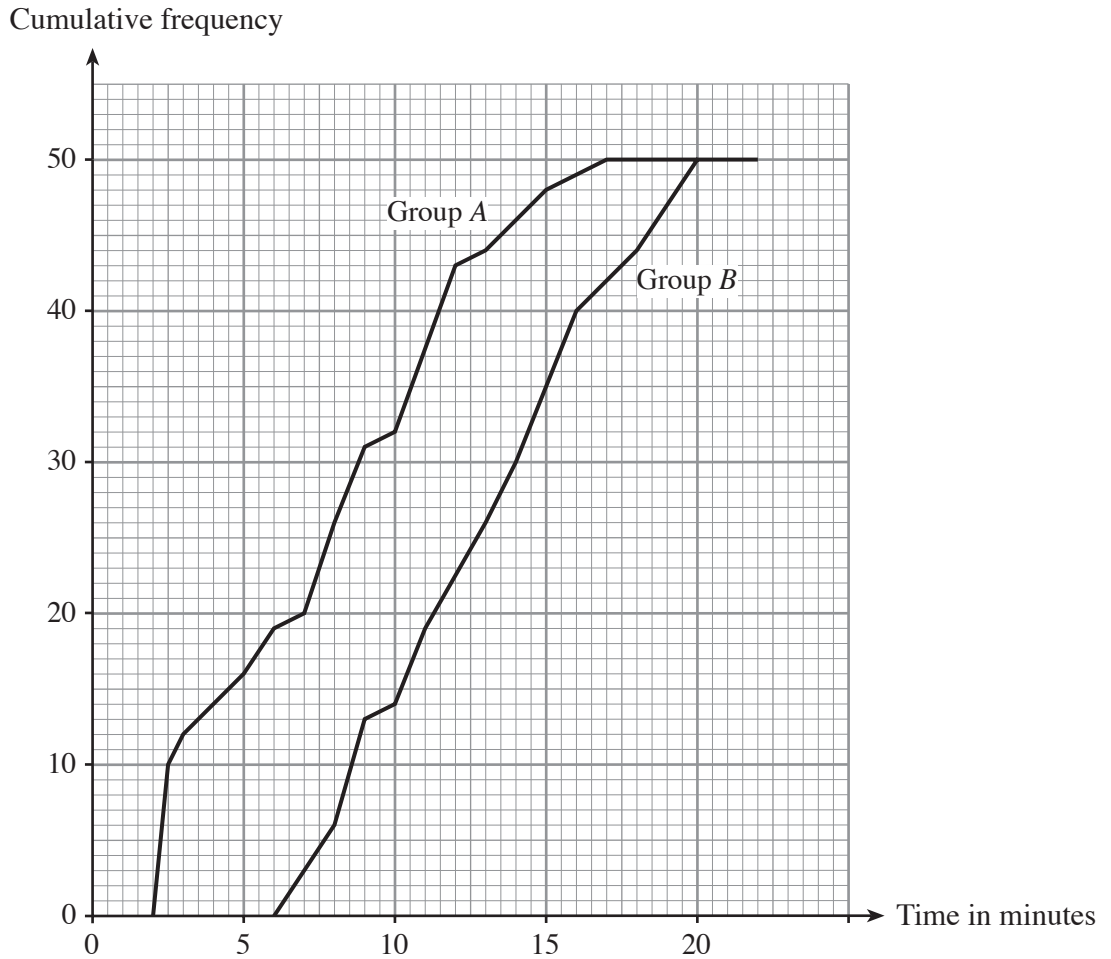
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Equation of the straight line is $y = \dots\dots\dots x + \dots\dots\dots$

[3]

14. The cumulative frequency diagram shows the length of time taken by two different groups of 50 students, *A* and *B* to complete a task successfully.



- (a) State which group of students, *A* or *B*, was quicker at successfully completing the task. Give a reason for your decision.

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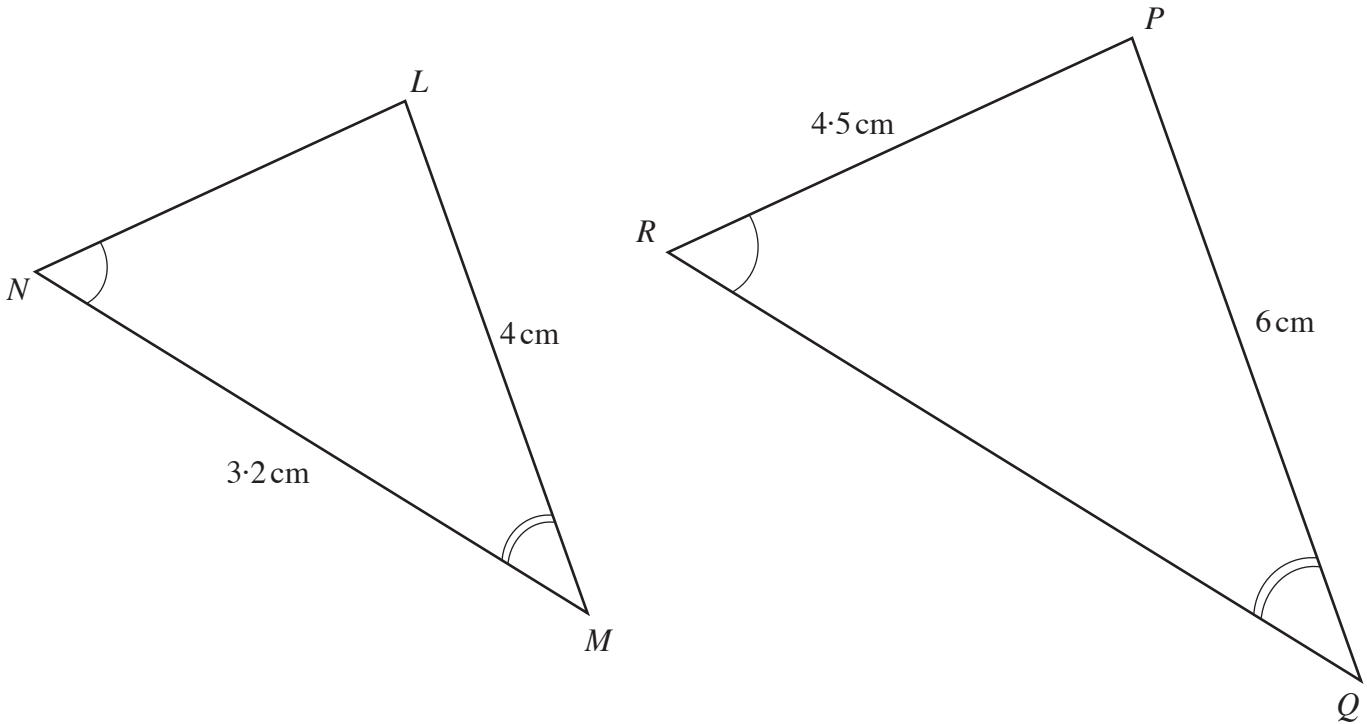
[2]

- (b) State the median of the times taken for successfully completing the task for Group *A*.

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[1]

15. Triangles LMN and PQR are similar, with $\widehat{LMN} = \widehat{PQR}$, $\widehat{MNL} = \widehat{QRP}$, $LM = 4$ cm, $MN = 3.2$ cm, $PR = 4.5$ cm and $PQ = 6$ cm.



Diagrams not drawn to scale.

Showing all your working, find the length of

- (a) RQ ,

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[2]

- (b) LN .

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[2]

16. Expand the following expression, simplifying your answer as far as possible.

$$(x + 8)(x - 2)$$

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[2]

17. Mrs. Jones is buying bottles of still and sparkling water. She buys x bottles of still water and y bottles of sparkling water. Altogether she buys 23 bottles of water.

Still water costs 50p per bottle and sparkling water costs 65p per bottle. Altogether she spends £13.15.

Write down a pair of simultaneous equations and solve them to find out how many bottles of still water and sparkling water Mrs. Jones buys.

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18. (a) Make x the subject of the formula

$$5(x + y) = 8y + 5.$$

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- (b) Make k the subject of the formula

$$5(2k - m) = ck + 5.$$

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19. Completely factorise the expression $3xy + 6x^2 - py - 2px$.

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[3]

20. Given that g is inversely proportional to h^2 , explain what happens to g when the value of h is halved.

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21. A survey is being carried out. Explain why selecting every tenth person in a queue will not give a random sample.

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[2]

22. A box contains 11 cartons of fruit juice. There are 5 cartons of lime juice, 4 cartons of blackcurrant juice and 2 cartons of raspberry juice.

Two cartons are selected at random from the box.

(a) Calculate the probability that both selected cartons contain lime juice.

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[2]

(b) Calculate the probability that neither of the cartons contains blackcurrant juice.

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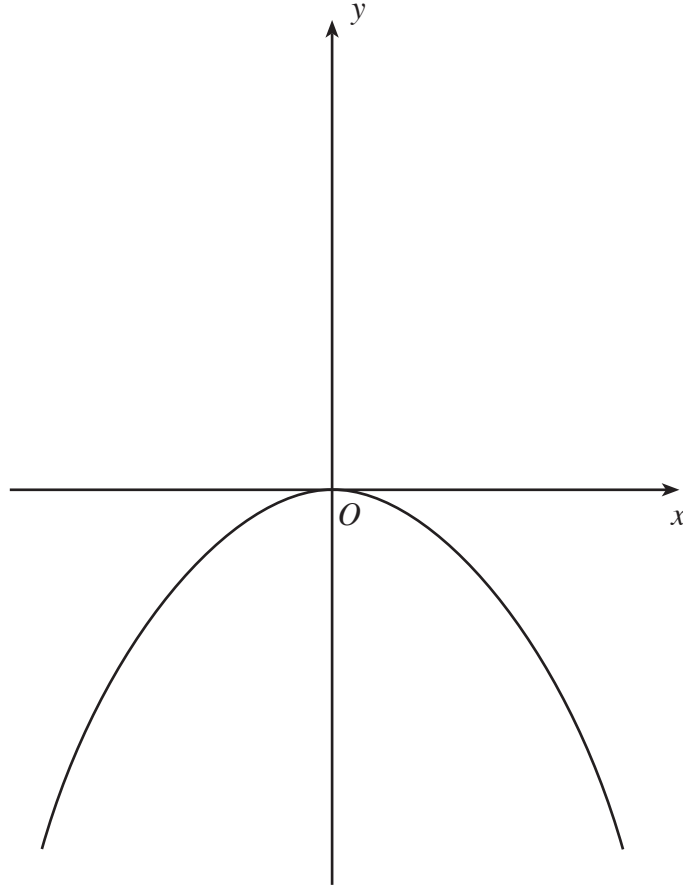
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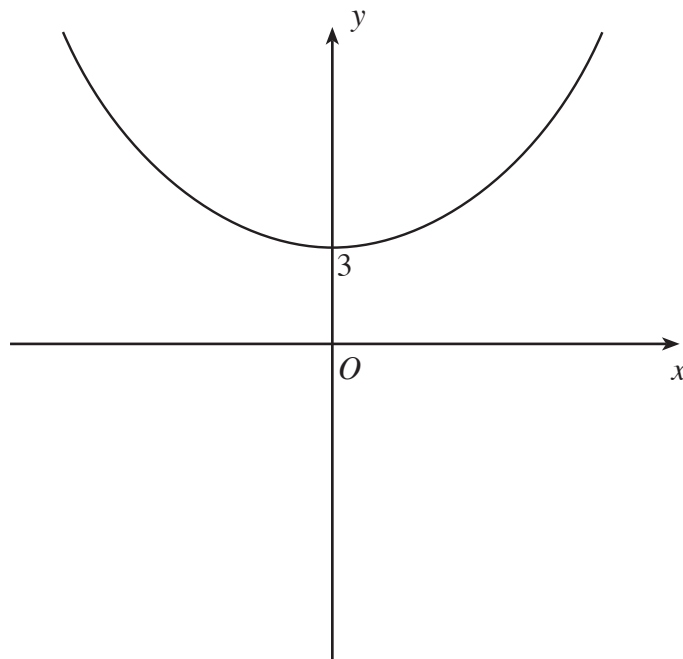
23. (a) The diagram shows the sketch of $y = -x^2$.
On the same diagram, sketch the curve

- (i) $y = x^2$.
(ii) $y = 4x^2$.



[2]

- (b) The diagram shows a sketch of $y = f(x)$.
On the same diagram, sketch the curve $y = f(x) - 6$.
Mark clearly the coordinates of the point where the curve crosses the y-axis.



[2]

