

1. (a) Express 700 as a product of prime numbers in index form.

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[3]

- (b) Use your result in part (a) to write down the smallest multiple of 700 which is a perfect square.

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[1]

2. Solve the equation

$$16x - 5 = 3(4x + 7).$$

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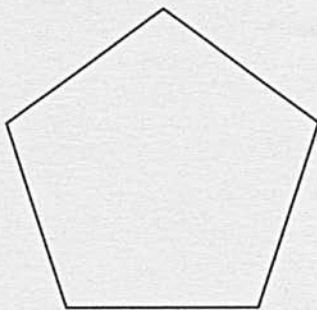
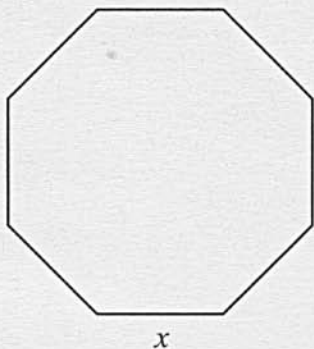
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[3]

3.



The sides of a regular octagon are  $x$  cm long. Each side of a regular pentagon is 6 cm longer than each side of the octagon. The perimeter of the octagon is 3 cm longer than the perimeter of the pentagon.

(a) Write down an equation that  $x$  satisfies.

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[2]

(b) Solve the equation and hence find the length of a side of the pentagon.

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[3]

4. Jill and Alan invest some money and share any profit made in the ratio of 5:4.

(a) How much does Jill get when they make a profit of £270?

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[2]

(b) On another occasion, Alan received £136. How much profit were they sharing?

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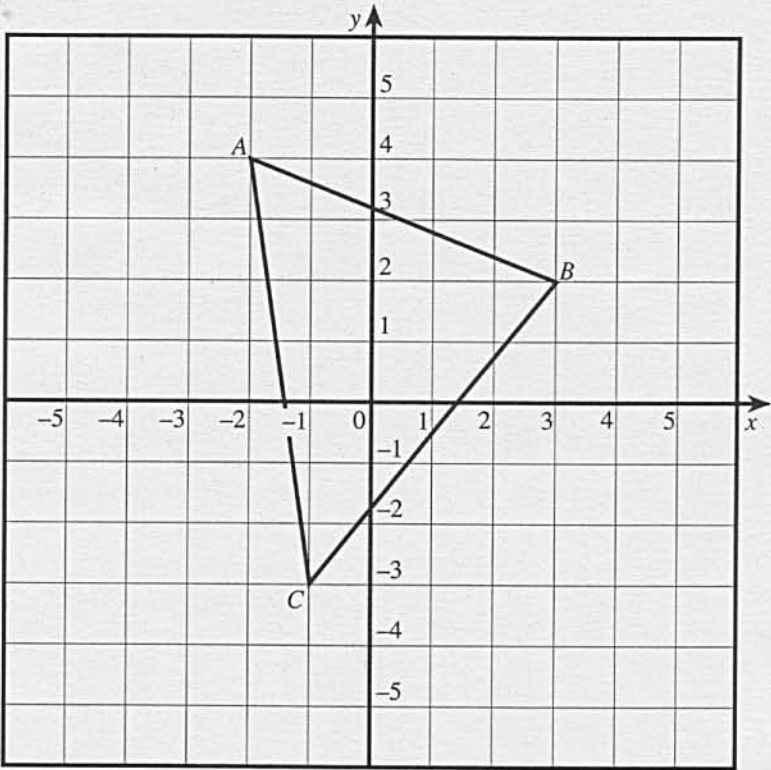
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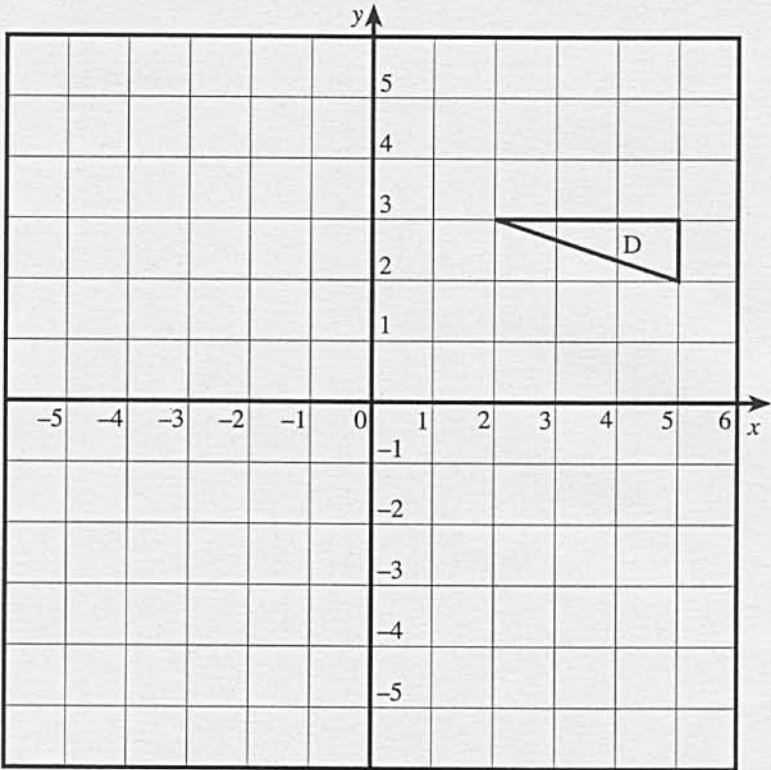
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[2]

5. (a) Draw the image when the triangle  $ABC$  is reflected in the line  $y = -x$ . [2]



(b) Draw the image when the triangle marked D is rotated through  $90^\circ$  anticlockwise about the point  $(1, -1)$ . [2]



6. A sample of boys and girls at a school yielded the following results for their eye colour.

	Blue	Brown	Green	Other	Total
Boys	28	40	10	22	100
Girls	32	30	8	10	80

There are 930 boys and 720 girls at the school. Use the results of the sample and these totals to find an estimate for the total number of pupils in the school with brown eyes.

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7. Solve the following simultaneous equations by an algebraic (not graphical) method.  
Show all your working.

$$3x - 4y = 22$$

$$2x + 3y = -8$$

[4]

8. Factorise

(a)  $3xy^2 - 6xy$ ,

[2]

(b)  $x^2 + 2x - 8$ .

[2]



9. The times taken by 160 pupils to travel to school were measured and the results are summarised in the following table.

Time taken (to the nearest minute)	1-10	11-20	21-30	31-40	41-50	51-60	61-70
Number of pupils	12	56	44	20	16	8	4

(a) Complete the following cumulative frequency table.

Time taken (less than)	10·5	20·5	30·5	40·5	50·5	60·5	70·5
Cumulative frequency							

[1]

(b) On the graph paper opposite, draw a cumulative frequency diagram to show this information. [3]

(c) Use your cumulative frequency diagram to find the interquartile range.

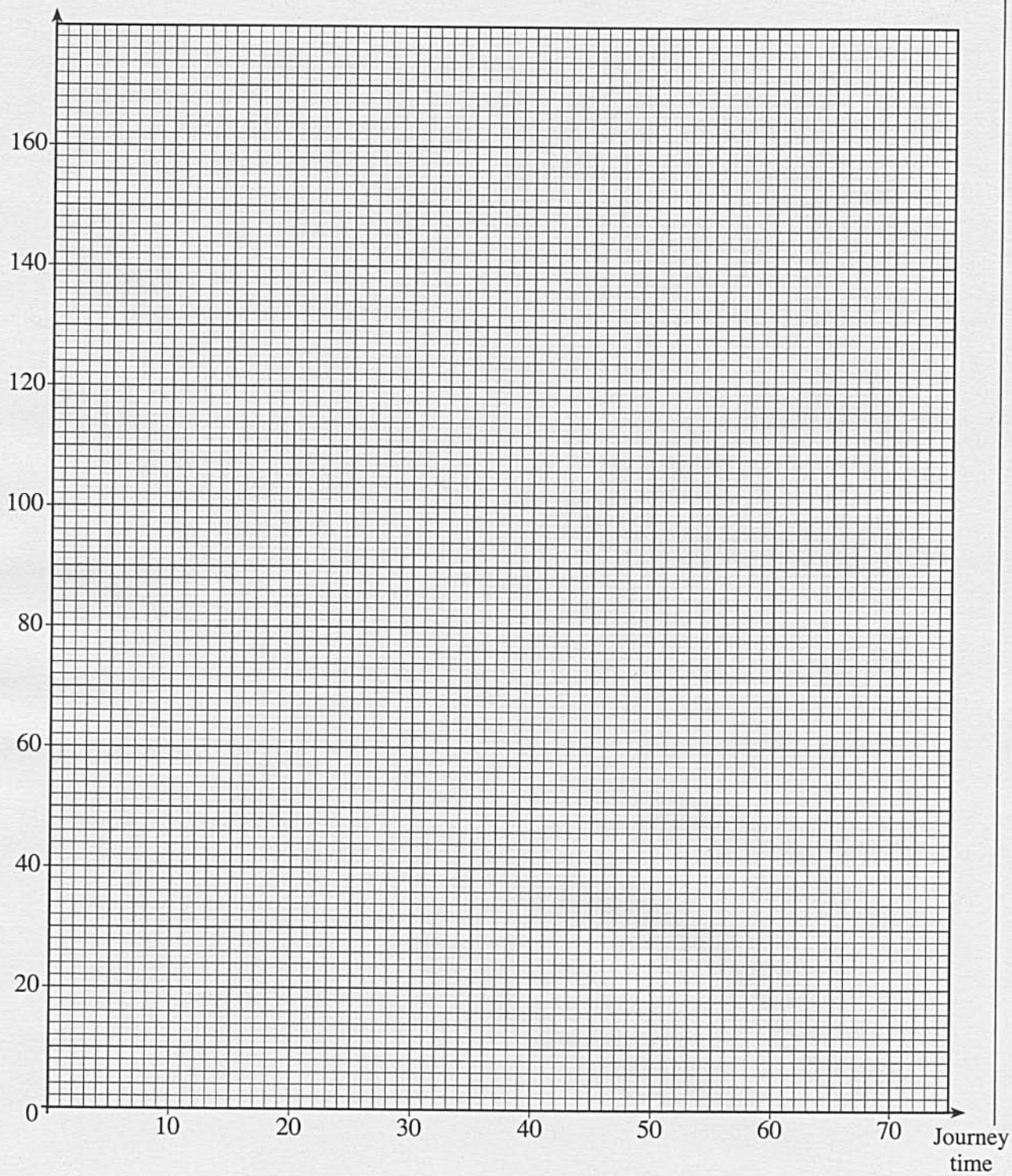
[2]

(d) Use your cumulative frequency diagram to complete the following statement.

60% of the pupils took less than ..... minutes to travel to school. [1]

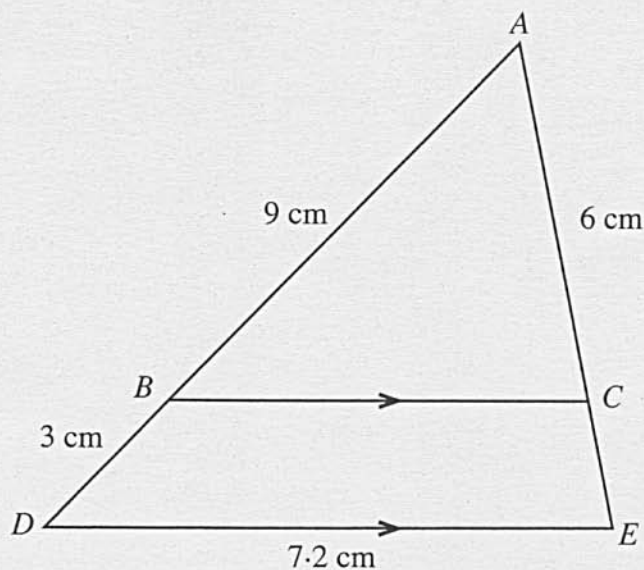
For use with Question 9

Cumulative  
frequency





10.



*Diagram not drawn to scale.*

In the diagram,  $BC$  is parallel to  $DE$ , and the triangles  $ABC$  and  $ADE$  are similar.  
 $AB = 9\text{ cm}$ ,  $AC = 6\text{ cm}$ ,  $BD = 3\text{ cm}$  and  $DE = 7.2\text{ cm}$ .

Showing all your working, find the length of

(a)  $BC$ ,

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[2]

(b)  $AE$ .

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[2]

11. In each of the following formulae, every letter stands for the measurement of a length. By considering the dimensions implied by each formula, write down, for each case, whether the formula could be for a length, an area, a volume or none of these.

The first one has been done for you.

	<u>Formula could be for</u>
$4d^2 + 2dh$	area
$10r^3 + 5hr^2$	.....
$4h + 2d - 8h$	.....
$(r^2 - 7hd)h$	.....
$r^2 + 8dh + 3hr$	.....

12. (a) Rearrange the inequality  $35 - 3n > 2n + 7$  into the form  $n < \text{some number}$ .

[2]

- (b) Given that  $n$  also satisfies the inequality  $3n > 1$ , write down all the integer values of  $n$  that satisfy both inequalities.

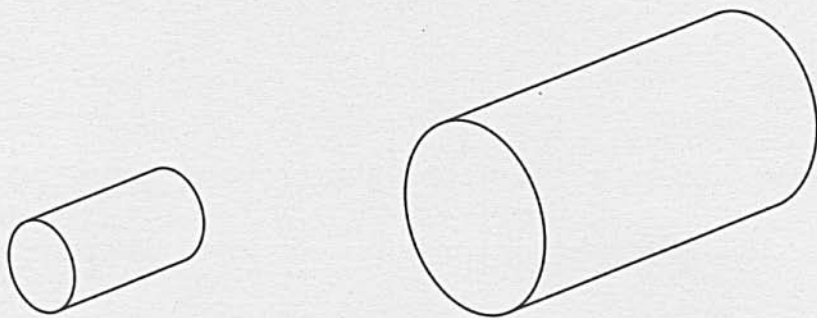
[2]

13. Make  $p$  the subject of the following formula.

$$a(3t - 2p) = p(3b - w) - w$$

[4]

14. The diagram shows two **similar** cylinders.  
The radius of the smaller cylinder is half the radius of the larger cylinder.  
The volume of the smaller cylinder is  $200 \text{ cm}^3$ .



*Diagrams not drawn to scale.*

Find the volume of the larger cylinder.

[2]

15. The graph of  $y = x^2 - x - 5$  has been drawn on the graph paper opposite.

(a) Use the graph of  $y = x^2 - x - 5$  to estimate the gradient

(i) at the point where  $x = \frac{1}{2}$ ,

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[1]

(ii) at the point where  $x = 1$ .

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[3]

(b) On the same axes plot the graph of  $y = -x^2$  for values of  $x$  from  $x = -2$  to  $x = 2$ .

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[2]

(c) Use the graphs of  $y = x^2 - x - 5$  and  $y = -x^2$  to solve  $2x^2 - x - 5 = 0$ .

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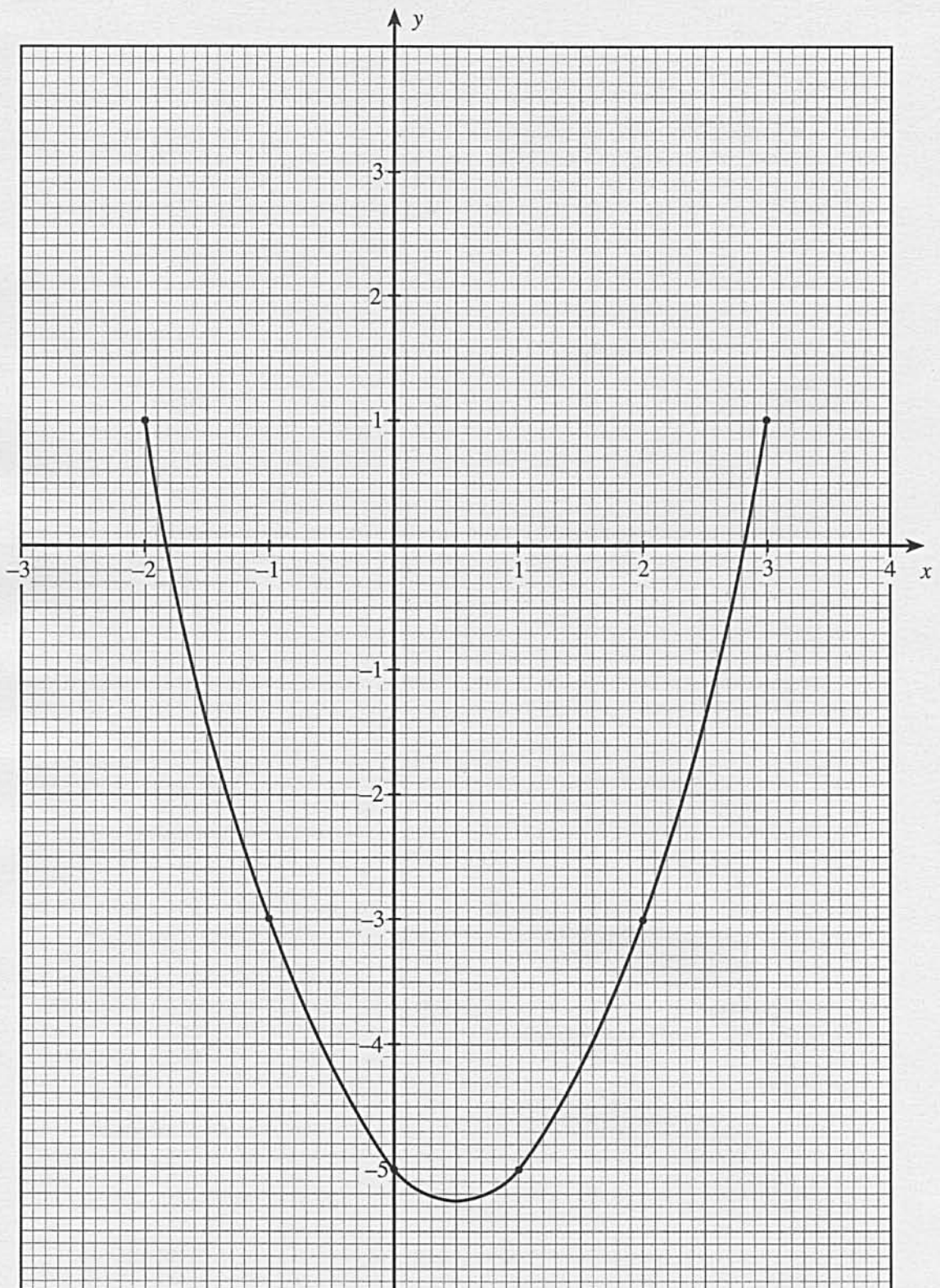
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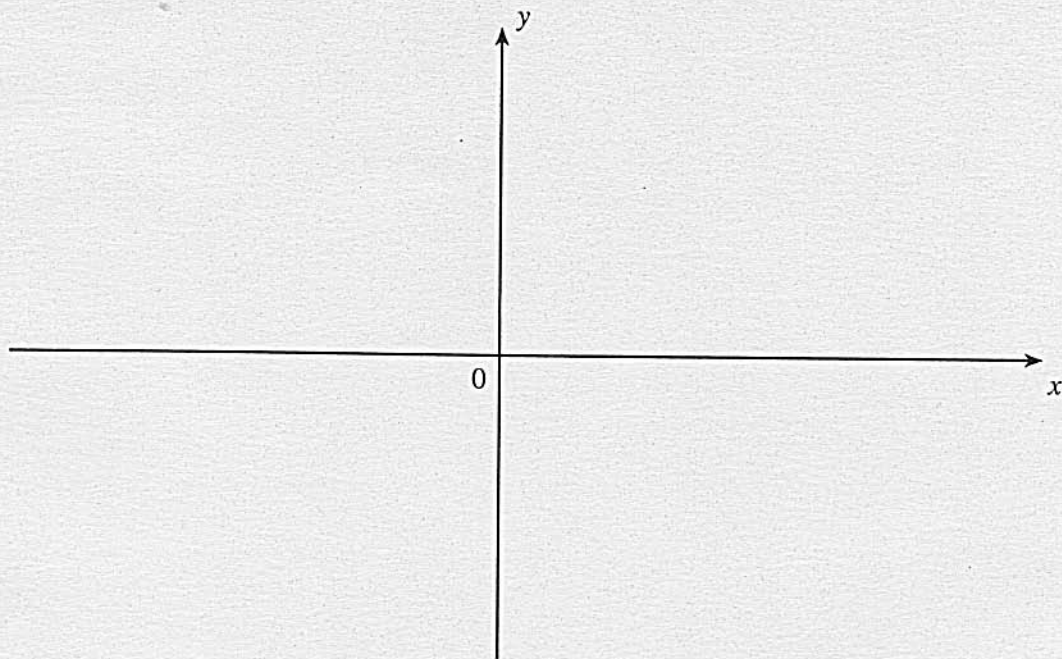
[2]



For use with Question 15



16. (a) On the axes below sketch the graph of  $y = \sin x$  for values of  $x$  between  $-180^\circ$  and  $180^\circ$ . You must show the values  $-180^\circ$  and  $180^\circ$  on the  $x$ -axis.



[1]

- (b) Write down the minimum and maximum values of  $y$ .

Minimum value of  $y$  is .....

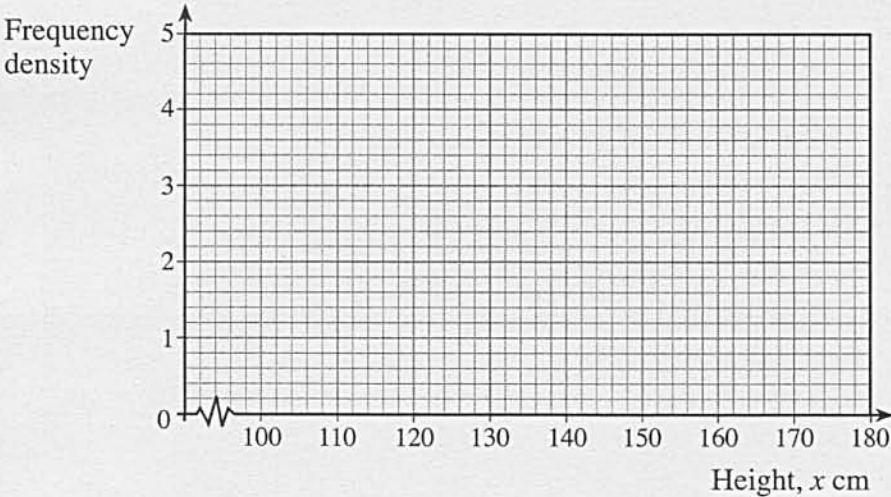
Maximum value of  $y$  is .....

[2]

17. The heights of a group of children are summarised in the grouped frequency distribution below.

Height, $x$ cm	Number of children	Frequency density
$100 \leq x < 120$	8	0.4
$120 \leq x < 130$	15	1.5
$130 \leq x < 140$	18	
$140 \leq x < 150$	40	
$150 \leq x < 160$	25	
$160 \leq x < 180$	10	

(a) Complete the frequency density column in the table and draw a histogram.



[3]

(b) Calculate an estimate for the number of children in the group whose heights are at least 142 cm.

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[3]

18. (a) Express  $0.\overline{624}$  as a fraction.

[2]

(b) Show that  $(\sqrt{72} - \sqrt{2})^2 = 50$ .

[2]

(c) Simplify

(i)  $16^{-\frac{1}{2}}$ ,

(ii)  $125^{\frac{2}{3}}$ .

[4]



(d) Simplify the following expressions.

(i)  $(4y^2x^3)^3$

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(ii) 
$$\frac{a^{\frac{13}{3}} \times a^{-\frac{4}{3}}}{a^{-3}}$$

[2]

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[2]

19. A survey of the cost per litre of unleaded petrol at garages in a particular area was carried out. It was calculated that the mean was 76.8p and the standard deviation was 2.8p. Following a price cut all the garages then reduced the price of unleaded petrol by 1p per litre. Write down the mean and standard deviation of the unleaded petrol following the price cut.

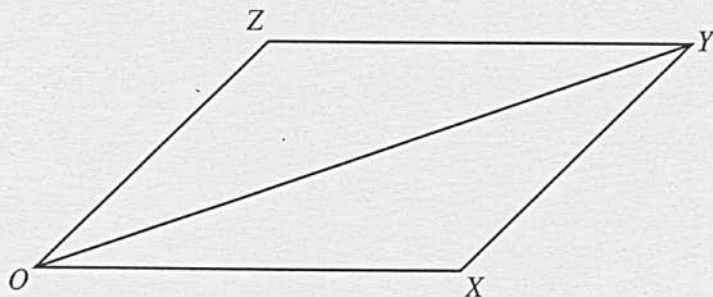
Mean .....

Standard deviation .....

[2]



20. The diagram shows a parallelogram  $OXYZ$ .



*Diagram not drawn to scale.*

The point  $P$  is on  $OX$  such that  $OP : PX = 1 : 2$ .

The point  $R$  is on  $OY$  such that  $OR : RY = 1 : 5$ .

- (a) Given that  $\mathbf{OX} = \mathbf{x}$  and  $\mathbf{OY} = \mathbf{y}$ , express each of the following in terms of  $\mathbf{x}$  and  $\mathbf{y}$ .

(i)  $\mathbf{OP}$

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(ii)  $\mathbf{OR}$

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.....

(iii)  $\mathbf{YX}$

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.....

.....

(b) Show that  $ZX = 6RP$ .

[3]

(c) Describe fully the geometrical relationship between  $ZX$  and  $RP$ .

[2]

21. A candidate sits a multiple choice examination. For each question in the examination, five possible answers are given but only one of these answers is correct. The candidate knows 70% of the facts tested in the examination and for each question based on these facts she selects the correct answer. On all other questions she selects at random one of the five possible answers.

(a) A question is selected at random from the paper. Calculate the probability that the candidate correctly answers the question.

[4]

(b) The examination has 150 questions. Calculate how many questions you might expect the candidate to answer correctly.

[2]