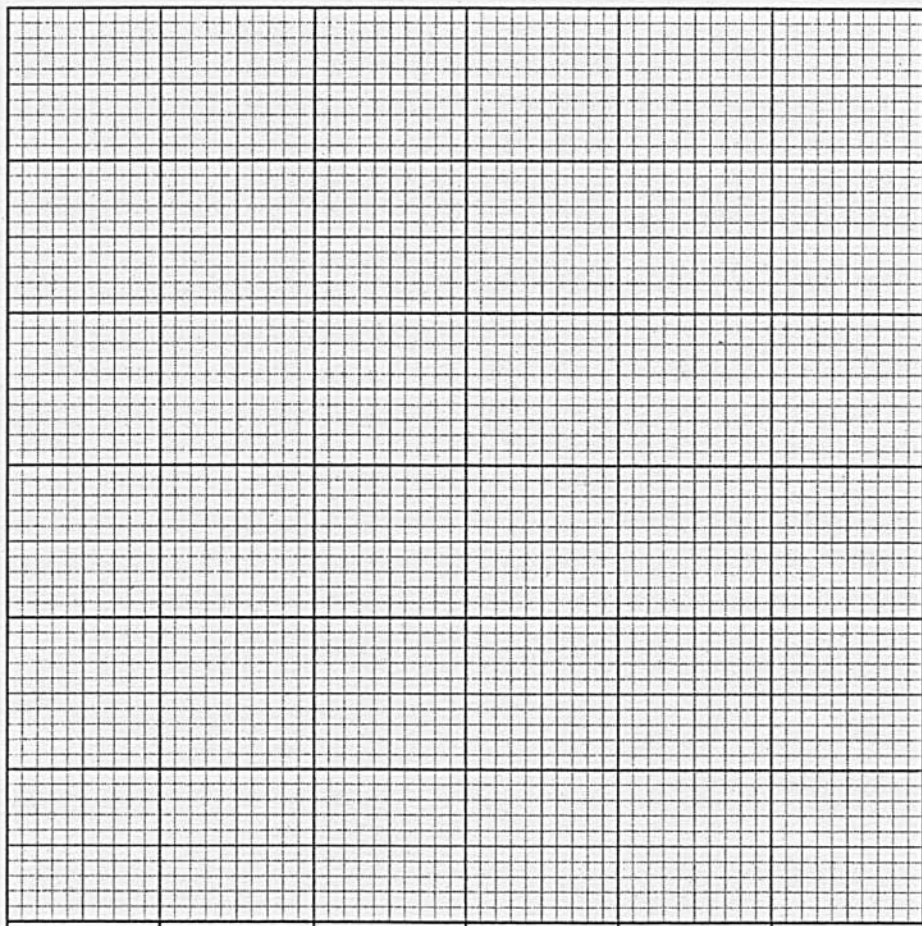1. The heights of 70 pupils were measured to the nearest cm. The table below shows a grouped frequency distribution of the results.

Height, h (to the nearest cm)	$130 < h \leqslant 140$	$140 < h \leqslant 150$	$150 < h \leqslant 160$	$160 < h \leqslant 170$	$170 < h \leqslant 180$
Frequency	8	15	24	13	10

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

[3]

2. The table shows some of the values of $y = 2x^2 - 5x - 3$ for values of x from -2 to 4.

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

x	-2	-1	0	1	2	3	4
$y = 2x^2 - 5x - 3$	15		-3	-6	-5	0	9

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[1]

(b) On the graph paper opposite, draw the graph of $y = 2x^2 - 5x - 3$ for values of x between -2 and 4.

[3]

(c) Draw the line $y = 3$ on the graph paper and write down the x-values of the points where your two graphs intersect.

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[2]

(d) Write down the equation in x whose solutions are the x-values you found in (c).

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[1]
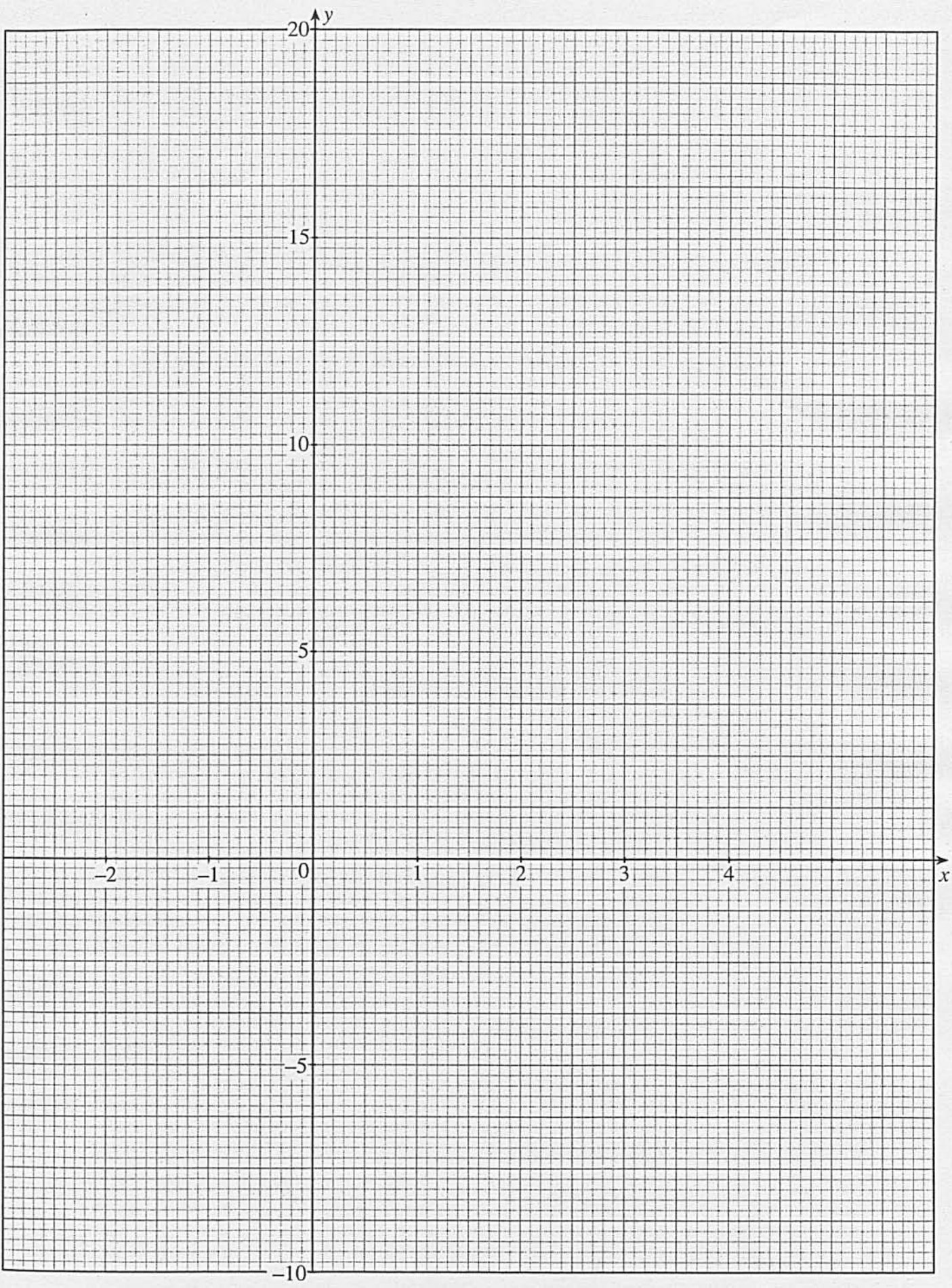
4. (a) Solve the following equation.

$$5x - 6 = 3(10 - x).$$

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[3]

(b) Expand and simplify: $4(2y - 3) - 3(y + 5)$

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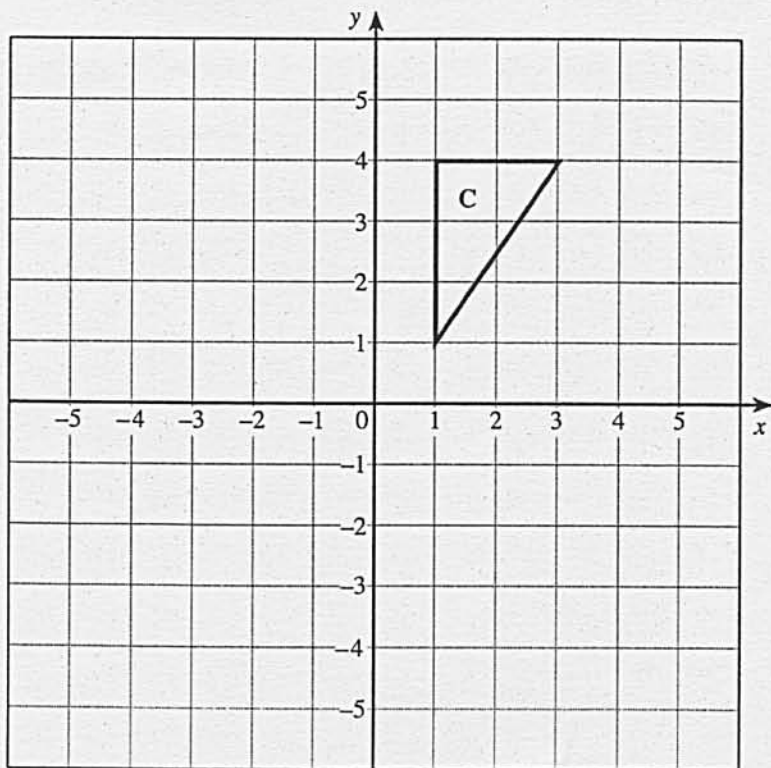
[2]

5. (a) Draw the image of the triangle **A** after a translation of –3 units in the x-direction and 4 in the y-direction. Label the image **B**.

[2]
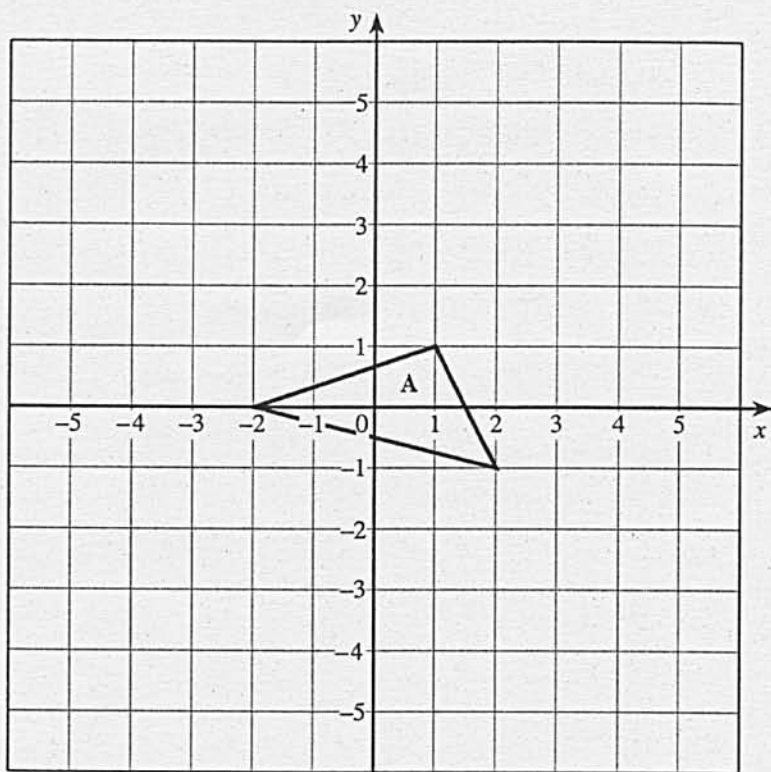
(b) Rotate the triangle **C** through 90° clockwise about the point (–2, 1). Label the image **D**.

[2]

6. The capacity of a jug is 250 ml, measured to the nearest 10 ml.

   (a) Write down the least and greatest value of the capacity of the jug.

   Least capacity .... ml   Greatest capacity .... ml

   [2]

   (b) The capacity of a bucket is 5·1 litres, measured correct to the nearest $\frac{1}{10}$ of a litre.

   The jug is filled with water and then the water is poured into the bucket. This is done 20 times in all. Explain, showing all your calculations, why it is not always possible for the bucket to hold all this water.

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   [5]

7. (a) Expand the following expression, simplifying your answer as far as possible.

$$(x-3)(x-4)$$

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[2]

(b) Make t the subject of the formula:

$$2n + 5 = 3(8 - 3t)$$

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[3]

(c) (i) Factorise $x^2 + 7x - 18$.

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(ii) Hence solve the equation

$$x^2 + 7x - 18 = 0.$$

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[3]

8. *(a)* Explain clearly why triangles *ABC* and *DEF* are similar.
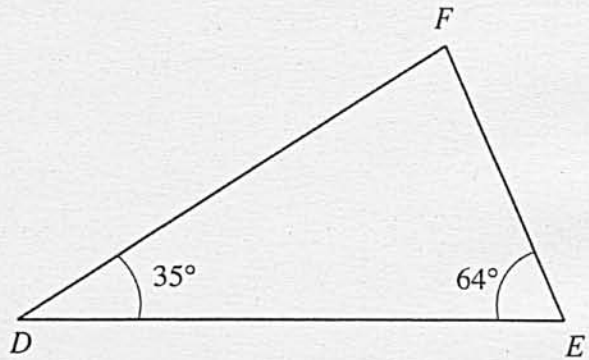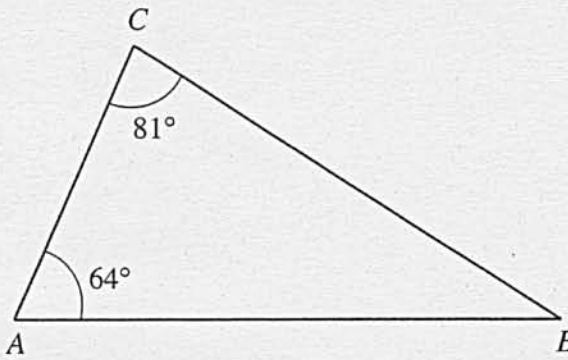
Diagrams not drawn to scale.

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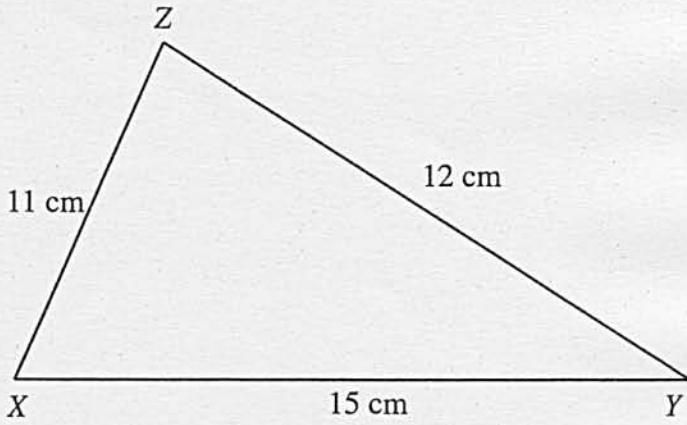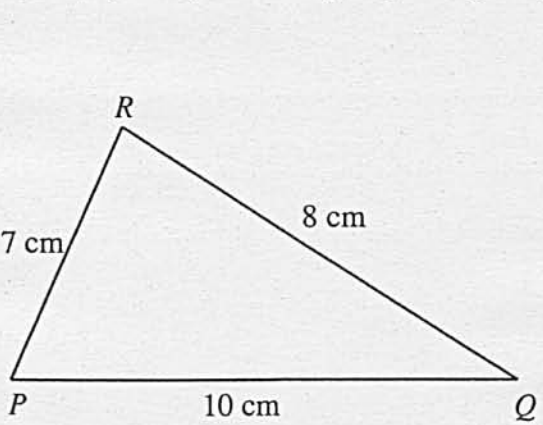..

[1]

(b) Explain clearly why triangles *PQR* and *XYZ* are **not** similar.

Diagrams not drawn to scale.

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[3]

9. A factory has two machines, A and B, which it uses to make large numbers of a certain item. Machine A is used to make 60% of the factory's total output and Machine B is used for the remainder. The probability that an item made on Machine A is rejected is 0·1. The probability that an item made on Machine B is rejected is 0·2.

   (a) Complete the following tree diagram.

   Machine used   Item

A   0·1   Rejected

    Accepted

B   Rejected
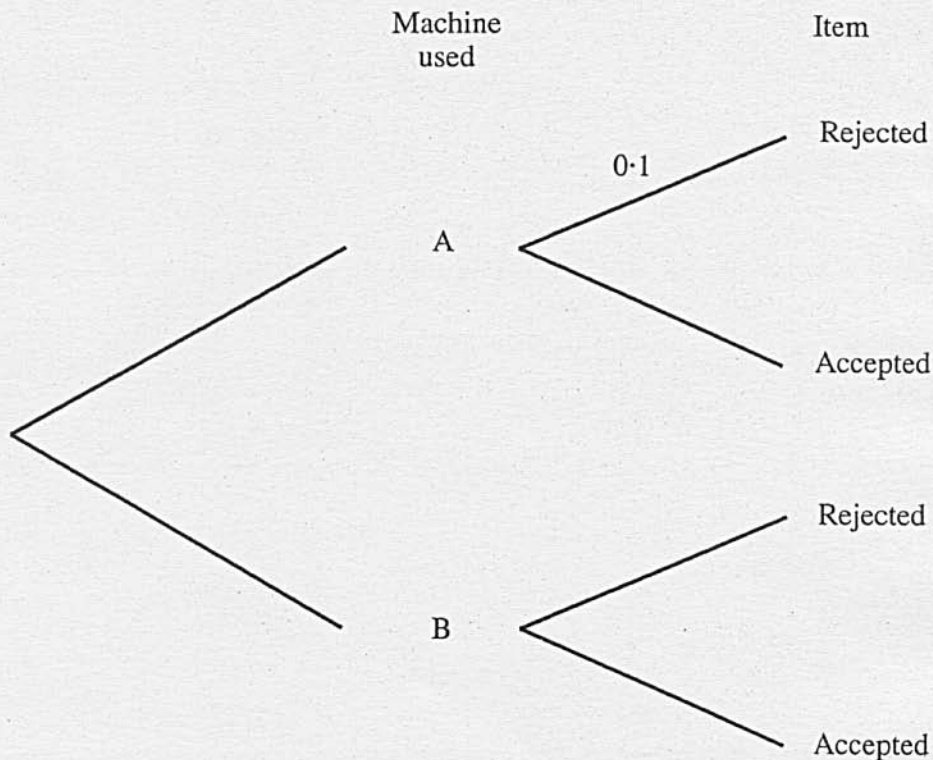
    Accepted

[2]

   (b) Calculate the probability that an item chosen at random is accepted.

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[2]

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

The first one has been done for you.

Formulae could be for:

$3d^3 - dhr$ volume

$5d - 7h + 3r$ ....

$7rdh - 6dr + d^2$ ....

$(d + 2h)r$ ....

$6r^2h + 5h^2r$ ....

[2]

11. Solve the following equation.

$$\frac{4x - 1}{4} + \frac{x + 8}{2} = \frac{3}{4}$$

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[3]

12. Given that y is inversely proportional to x^2, and that $y = 2$ when $x = 5$,

(a) find an expression for y in terms of x,

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[3]

(b) calculate

    (i)   the value of y when $x = 2$,

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[1]

    (ii)   a value of x when $y = 0 \cdot 5$.

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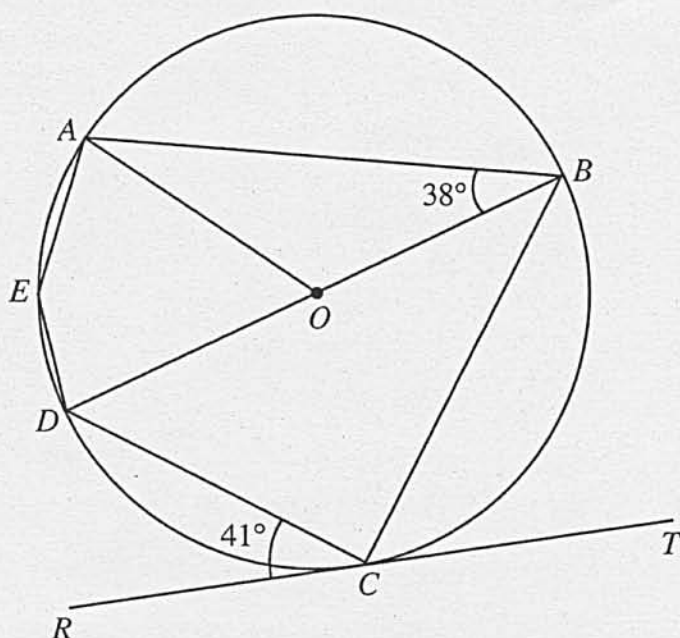
[2]

13.

Diagram not drawn to scale.

Five points A, B, C, D and E lie on the circumference of the circle centre O with BOD a straight line.

The tangent RT touches the circle at C.
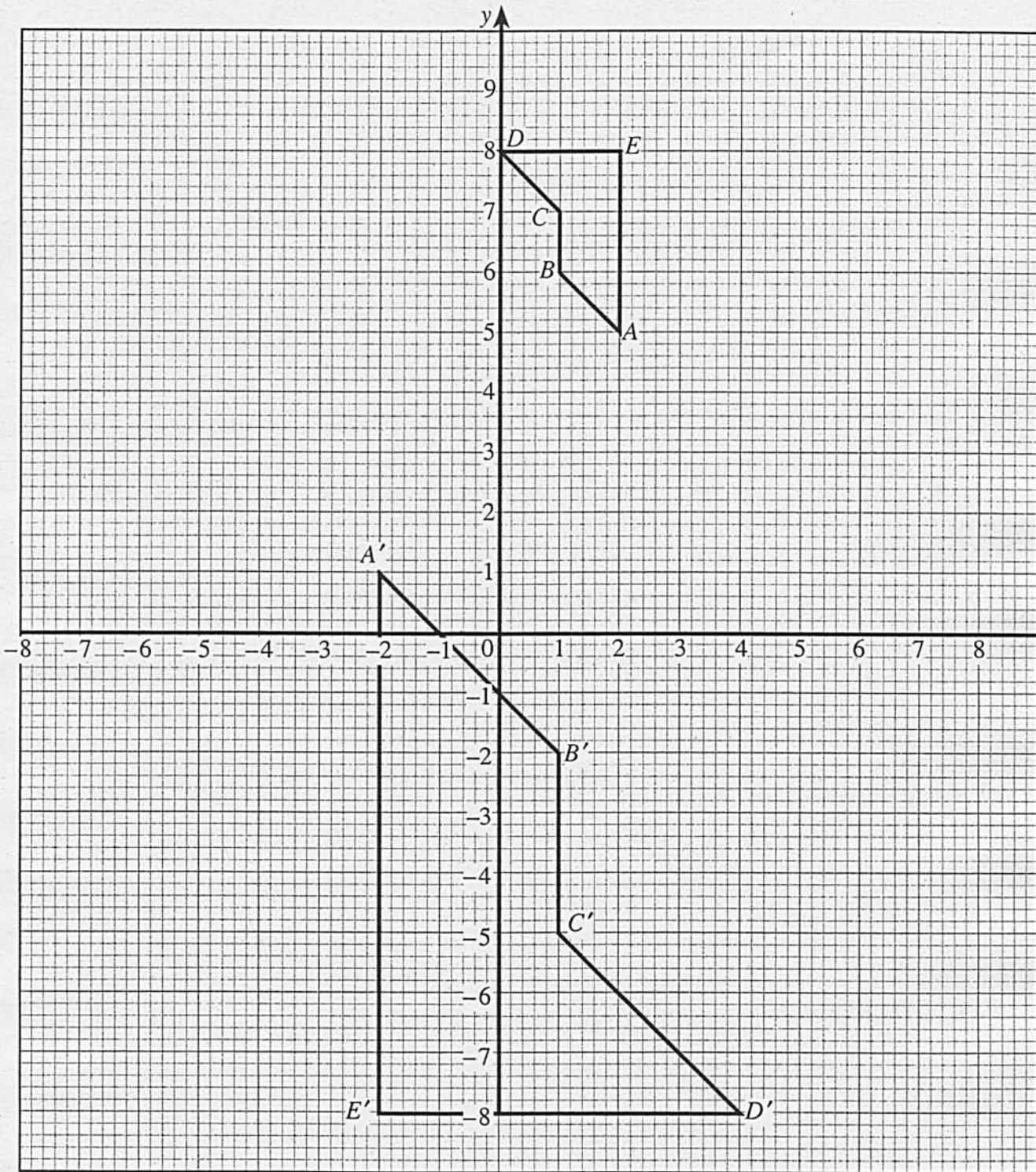
$\widehat{ABD} = 38°$ and $\widehat{DCR} = 41°$.

Find **each** of the following angles, giving reasons for your answers.

(a) $\widehat{AED}$

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(b) $\widehat{AOD}$

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(c) $\widehat{BDC}$

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[4]

14. The diagram shows shapes $ABCDE$ and $A'B'C'D'E'$ drawn to scale.

[3]

Find the **single** transformation which takes shape $ABCDE$ to shape $A'B'C'D'E'$.

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[3]

15. Factorise the expression $4x^2 - 81$ and hence solve the equation $4x^2 - 81 = 0$.

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[3]

16. A circle of radius $2x$ cm is cut out of a rectangular piece of paper with length $6x$ cm and width $5x$ cm. Find, in terms of x and π, the area of paper remaining after the circle has been removed.

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[4]

17. *(a)* Express $0.\overset{\cdot\cdot}{3427}$ as a fraction.

[2]

(b) Write down a value of x for which $x^{\frac{3}{2}}$ is rational.

[1]

(c) Give an example of an irrational number

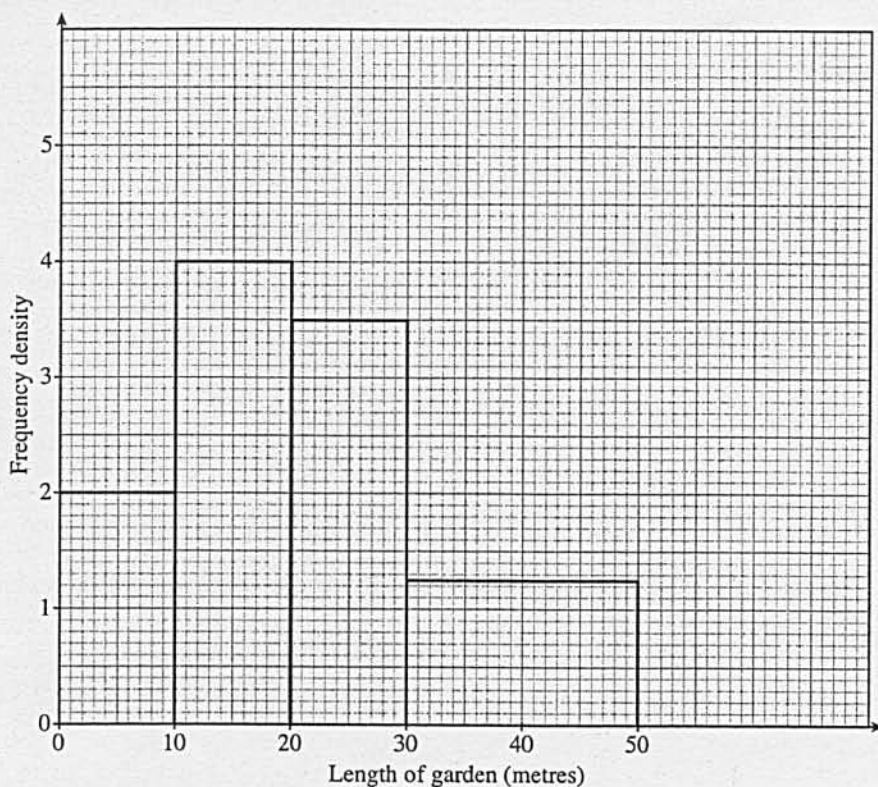 (i) whose square is rational,

[1]

  (ii) whose square is irrational.

[1]

(d) Find the value of $(\sqrt{32}+\sqrt{2})^2$.

[2]

18. A survey was carried out to measure the lengths of the gardens of a number of houses.
The histogram shows the results of the survey.

Length of garden (metres)

(a) Use the histogram to calculate the number of gardens measured.

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[3]

(b) Find the length exceeded by 50% of the gardens measured.

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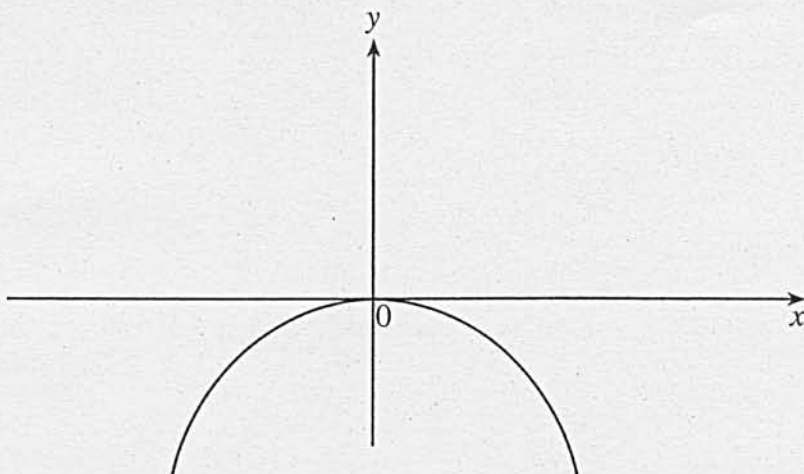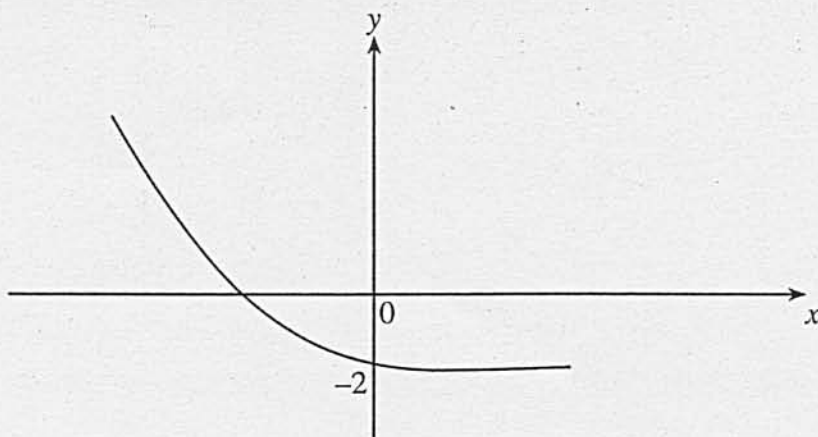
[1]

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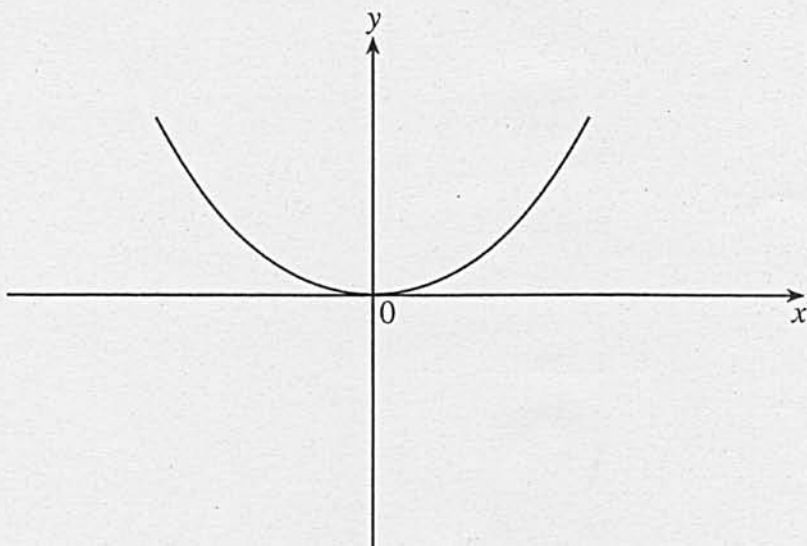Mark clearly the coordinates of the point where the curve touches the x-axis.

[2]

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

[2]

(c) The diagram shows the sketch of $y = x^2$.
On the same diagram, sketch the curves

    (i) $y = -2x^2$,
    (ii) $y = 3 - 2x^2$.

[3]

20. A clown has seven pairs of shoes, one pair in each of the colours of the rainbow.
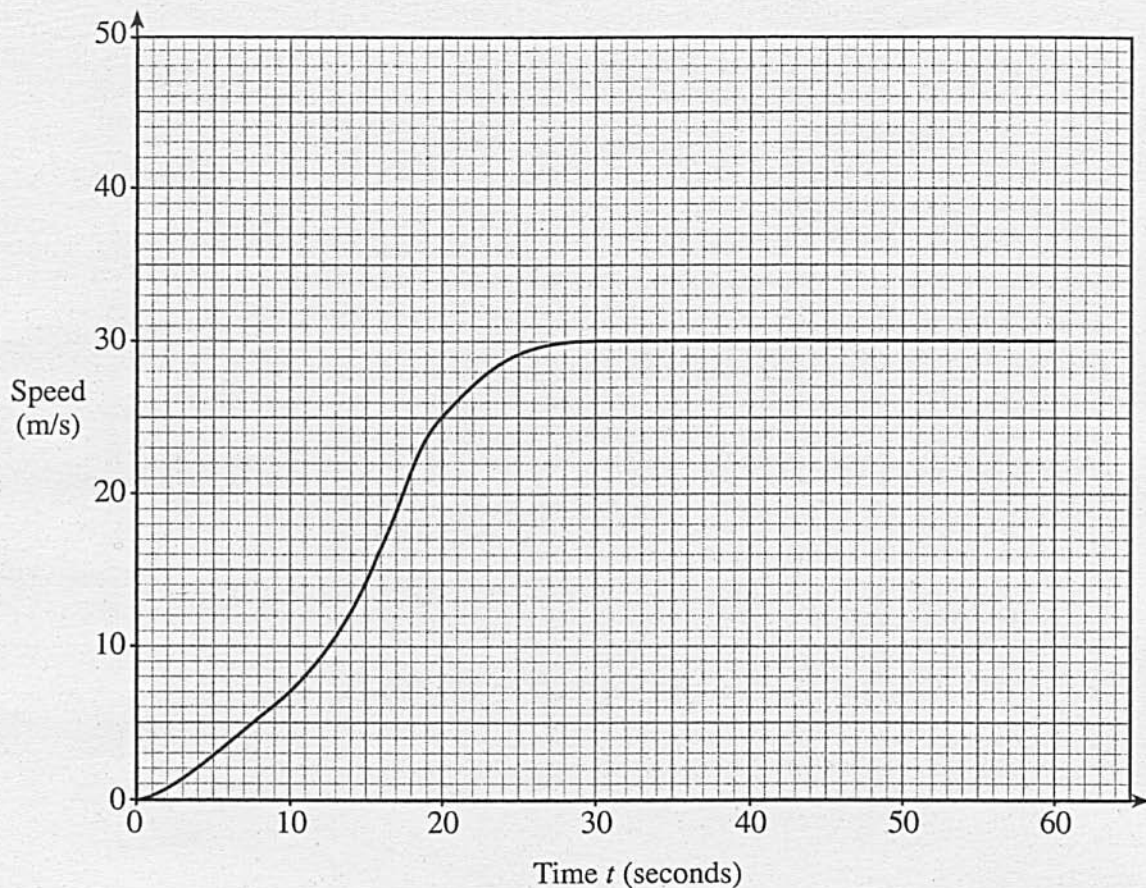The shoes are kept in a trunk in a dark room. The clown selects two shoes at random.

(a) What is the probability that the clown selects one left shoe and one right shoe?

[3]

(b) What is the probability of selecting a matching pair of shoes?

[2]

21. The graph below shows the speed of a train, in m/s, over a period of 60 seconds starting at time $t = 0$ seconds.

Speed (m/s) vs Time t (seconds)

(a) Estimate the acceleration of the train at time $t = 25$ seconds.

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[3]

(b) The table below gives the speed of the train between $t = 0$ to $t = 30$.

Time t (seconds)	0	10	20	30
Speed (m/s)	0	7	25	30

(i) Use the trapezium rule with values taken from the table to estimate the distance, in kilometres, travelled by the train between $t = 0$ and $t = 30$ seconds.

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[3]

(ii) Hence estimate the total distance travelled during the 60 seconds.

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[1]