

1. A 200 ml tin of pink paint is made by mixing 150 ml of white paint and 50 ml of red paint. Find how much white paint is needed to make a 300 ml tin of the pink paint.

$$\frac{150}{200} \times 300 = \frac{450}{2} = 225 \text{ ml}$$

White paint ml

[2]

2. Simplify $5(x - 3y) + 6x - 10y$.

$$5x - 15y + 6x - 10y$$

$$11x - 25y$$

[3]

3. Calculate the size of **each** of the angles marked x , y and z in the diagram below.

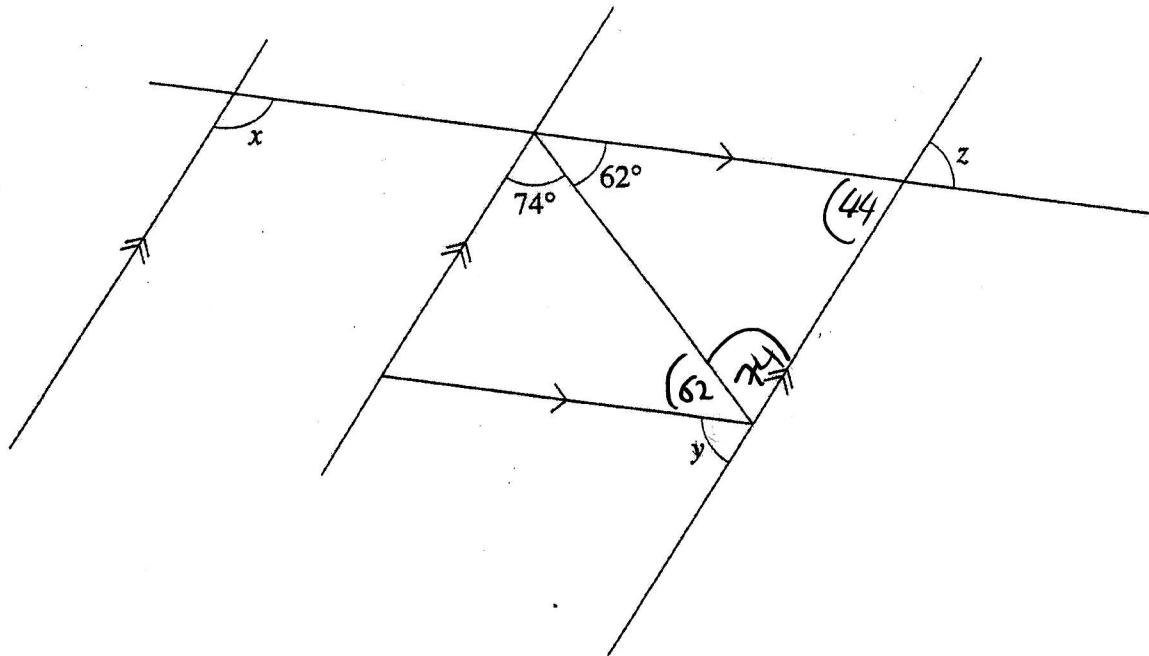


Diagram not drawn to scale.

$$x = 74 + 62 = 136$$

$x = \dots\dots\dots$

$$y = 180 - 62 - 74 = 44$$

$y = \dots\dots\dots$

$$z = 44$$

$z = \dots\dots\dots$

[4]

4. The diagram shows a triangle ABC with $BC = 8$ cm, $\hat{AXB} = 90^\circ$ and $AX = 3$ cm

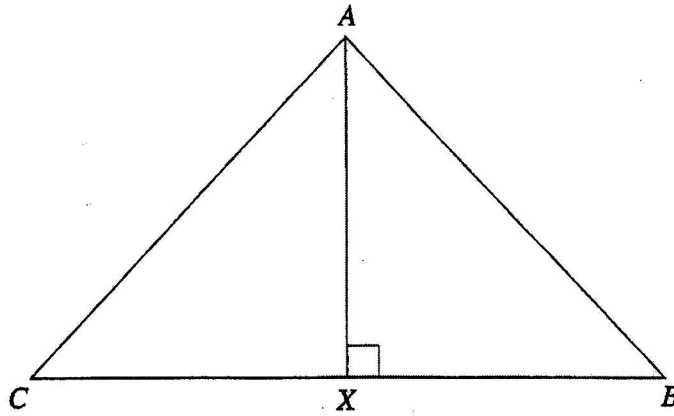


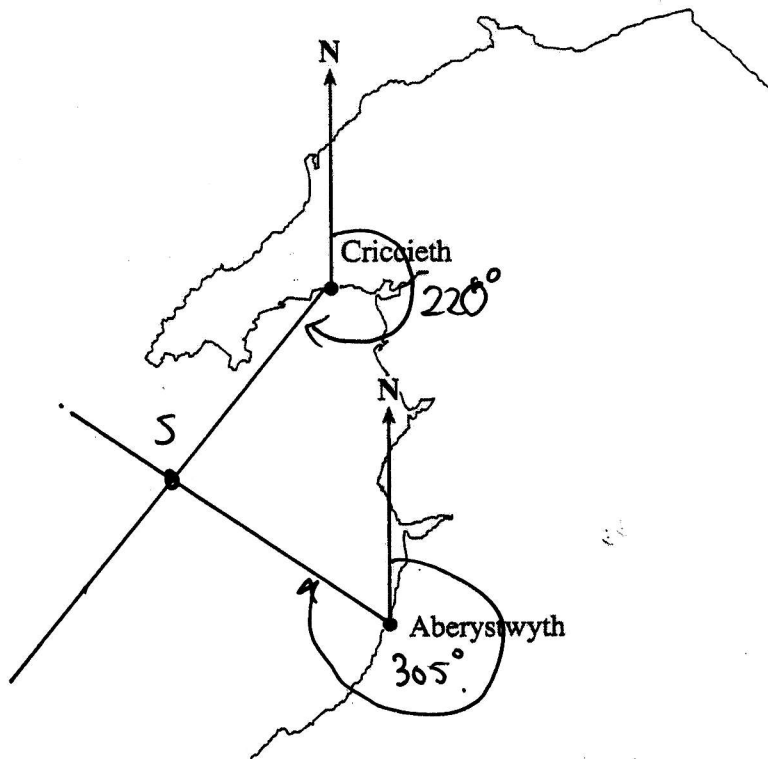
Diagram not drawn to scale.

Find the area of the triangle ABC . State appropriate units for your answer.

$$\frac{1}{2} \times 8 \times 3 = 12 \text{ cm}^2$$

[3]

5.



A ship, S, is on a bearing of 220° from Criccieth and on a bearing of 305° from Aberystwyth.

By drawing suitable lines on the above diagram, mark the position of S.

[3]

6. Jane scored 140 out of 200 in a Mathematics test. In an English test she scored 48 out of 60. Work out the percentage score that Jane had

(a) in the Mathematics test,

$$\frac{140}{200} = \frac{70}{100} = 70\%$$

[2]

(b) in the English test.

$$\frac{48}{60} \times \frac{100}{100} = 80\%$$

[1]

7. The following diagram shows a card in the shape of a trapezium, with a circular hole of radius 10 cm cut out of the card. The lengths of the parallel sides of the trapezium are 55 cm and 45 cm and the perpendicular distance between the parallel sides is 30 cm.

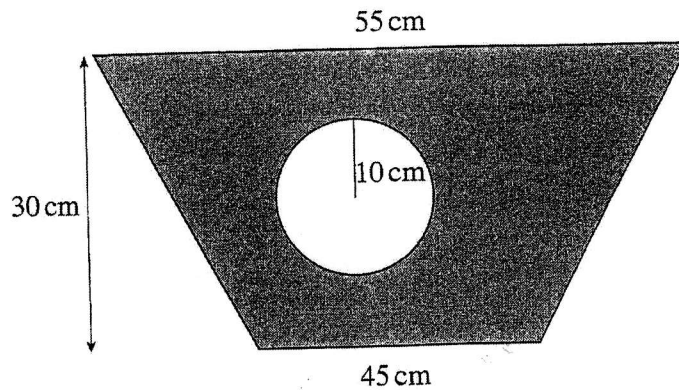


Diagram not drawn to scale.

Using the value of π as 3.14, calculate

- (a) the circumference of the circular hole,

$$3.14 \times 20 = 62.8 \text{ cm}$$

[2]

- (b) the area of the shaded part of the card.

$$\text{Area of } \square = \frac{1}{2} (45 + 55) \times 30 = 50 \times 30 = 1500 \text{ cm}^2$$

$$\text{Area of } \bigcirc = \pi \times 10 \times 10 = 3.14 \times 100 = 314 \text{ cm}^2$$

$$\text{Area of shaded} = 1500 - 314 = 1186 \text{ cm}^2$$

[5]

8. In a particular street of 50 houses, a survey of the number of pets in each house was carried out. The following frequency distribution was obtained.

Number of pets per house		Number of houses
0	X	15
1	X	13
2	X	10
3	X	8
4	X	2
5	X	2

0
13
20
24
8
10 +
75

Calculate the mean number of pets per house.

$$\text{Mean} = \frac{75}{50} = \frac{7.5}{5} = 1.5 \text{ pets per house}$$

[3]

9. Showing all your working ESTIMATE the value of:

$$\frac{202 \times 60.3}{0.191}$$

$$\frac{200 \times 60}{0.2} = \frac{12000}{0.2} \times \frac{10}{10} = \frac{120000}{2} = 60000$$

[3]

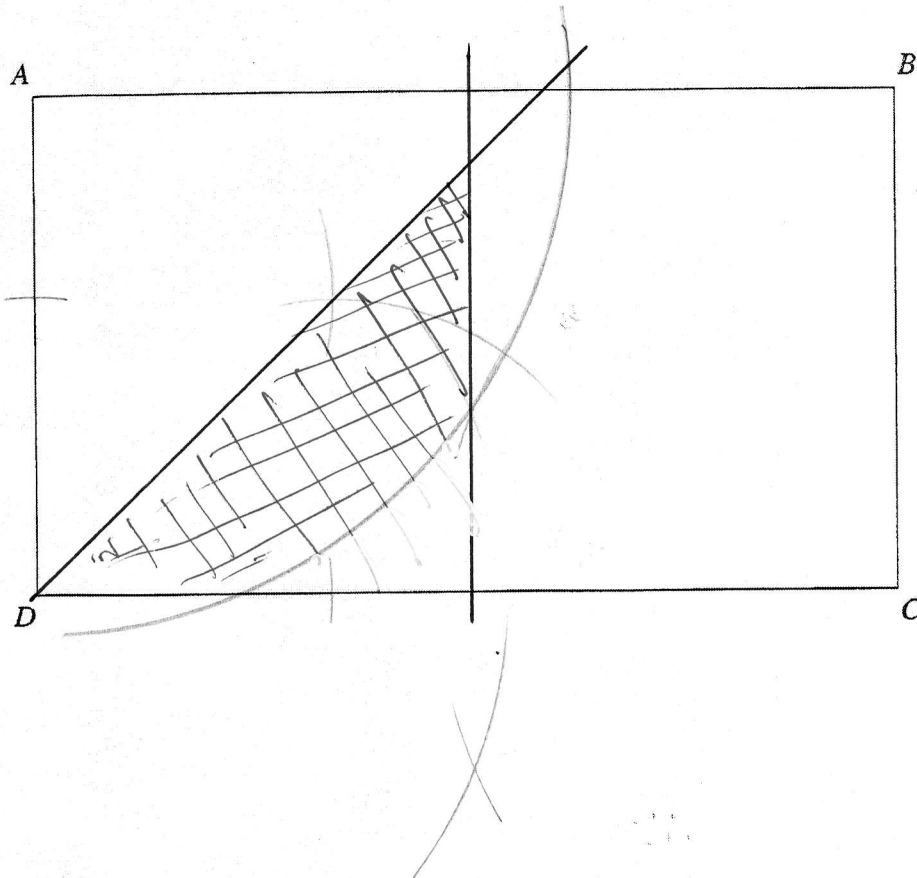
10. In the following diagram, shade the region which satisfies **all** of the following conditions.

The distance from AD is greater than the distance from DC .

The distance from D is less than the distance from C .

The distance from A is less than 7 cm.

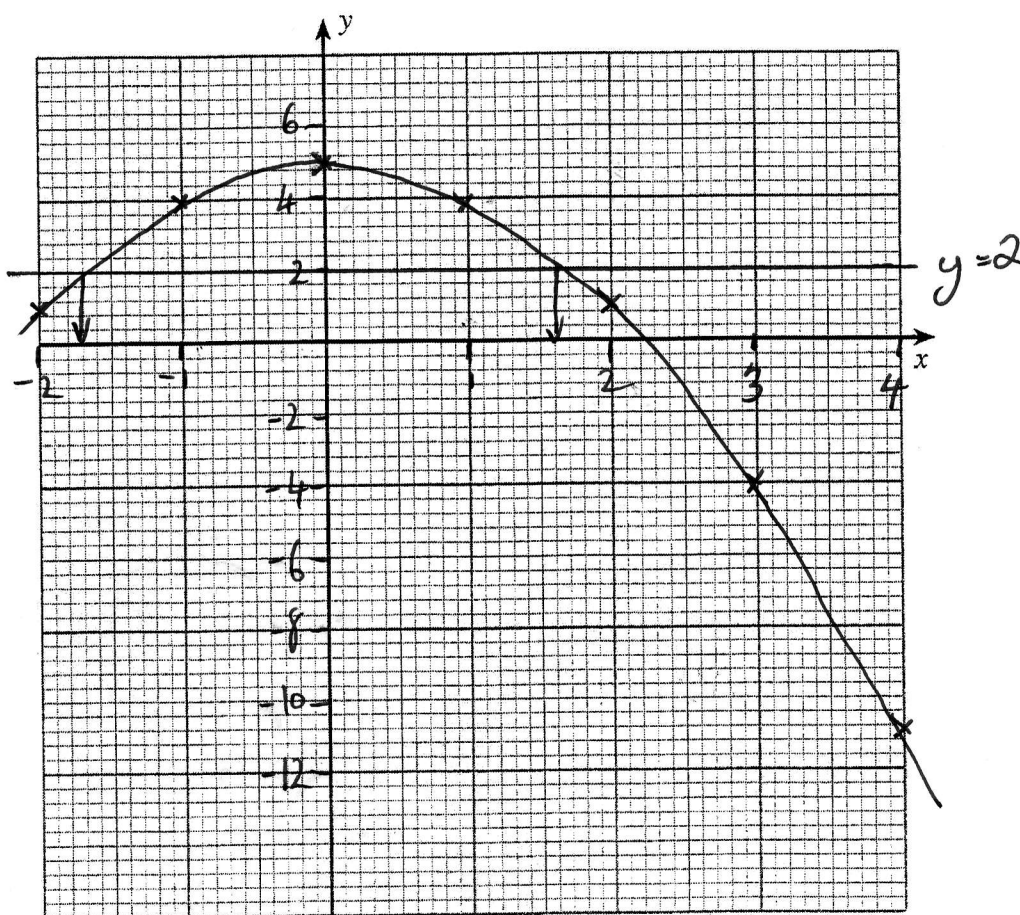
[4]



11. (a) Complete the following table which gives values of $y = 5 - x^2$ for values of x from -2 to 4 . [1]

x	-2	-1	0	1	2	3	4
$y = 5 - x^2$	1	4	5	4	1	-4	-11

- (b) Using suitable scales draw the graph of $y = 5 - x^2$ for values of x from -2 to 4 on the graph paper below. [3]

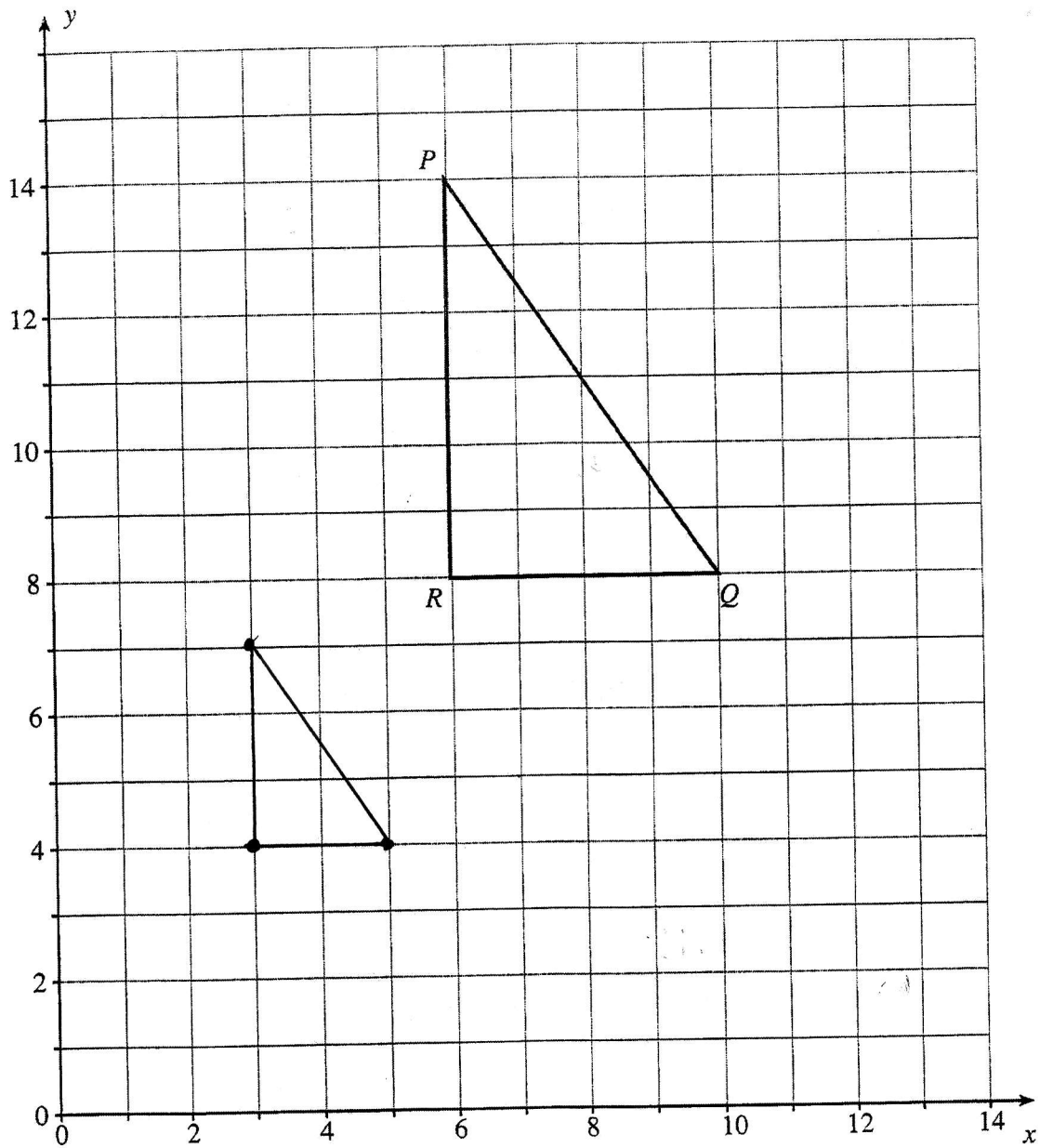


- (c) Draw the line $y = 2$ on the graph paper and write down the x -values of the points where the two graphs intersect. [2]

$x = -1.7$ and $x = 1.6$

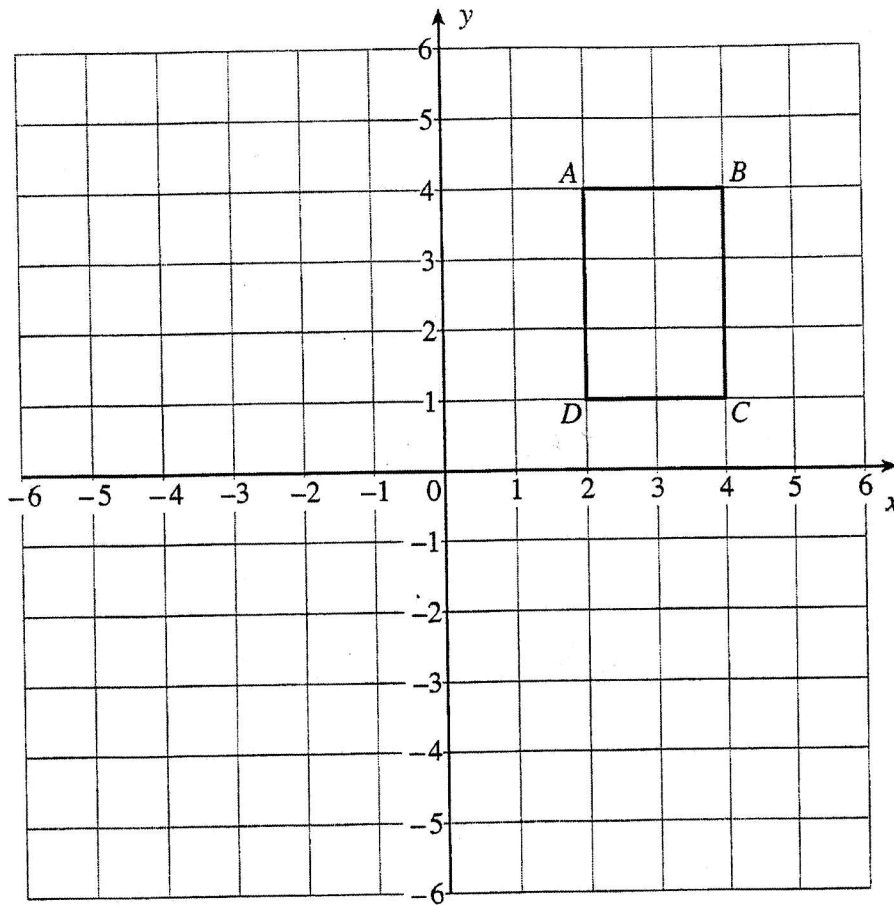
12. (a) Enlarge the triangle PQR using centre $(0, 0)$ by a scale factor of $\frac{1}{2}$.

[2]

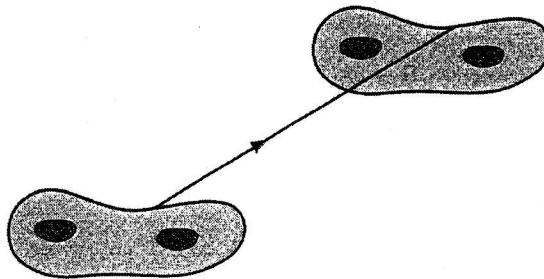


- (b) Rotate the rectangle $ABCD$ through 90° clockwise about the point $(2, 0)$.

[2]



- (c) The diagram below shows a teacher's sketch of a transformation.



What is the name of this type of transformation?

This is a translation

[1]

13. Solve the equation $5(x + 4) - 3(x - 2) = 0$.

$$5x + 20 - 3x + 6 = 0$$

$$2x + 26 = 0$$

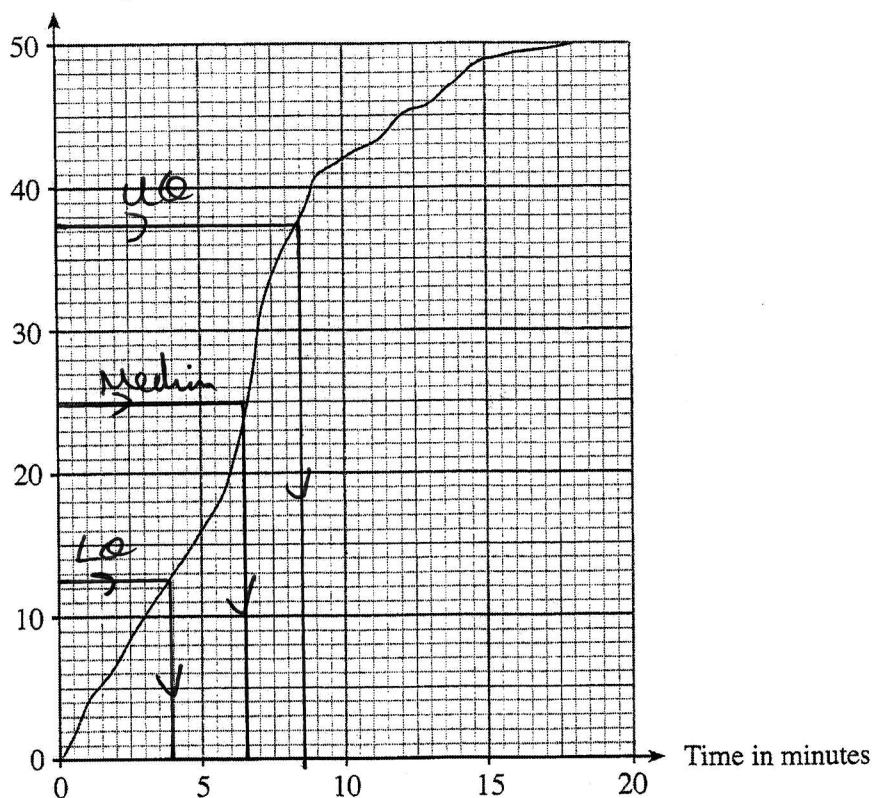
$$2x = -26$$

$$x = \frac{-26}{2} = -13$$

[4]

14. The time taken by each of 50 students to sew a button on a shirt was recorded. A summary of the results is shown in the cumulative frequency diagram.

Cumulative frequency



- (a) Estimate the median of the times taken by these students to sew a button on to a shirt.

6.5 mins.

[1]

- (b) Estimate the interquartile range for the times to sew a button on a shirt.

UQ = 8.5 LQ = 4

IQR = 4.5 mins

[2]

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

$$\begin{array}{rcl} 6x + 5y = 23 & \text{---} & \textcircled{1} \\ 4x + 3y = 18 & \text{---} & \textcircled{2} \end{array}$$

$$\textcircled{1} \times 4 \quad 24x + 20y = 92 \quad \text{---} \textcircled{3}$$

$$\textcircled{2} \times 6 \quad 24x + 18y = 108 \quad \text{---} \textcircled{4}$$

$$\begin{array}{rcl} \textcircled{3} - \textcircled{4} & & 2y = -16 \\ & & y = \frac{-16}{2} = -8 \end{array}$$

$$\text{in } \textcircled{1} \quad 6x + 5(-8) = 23$$

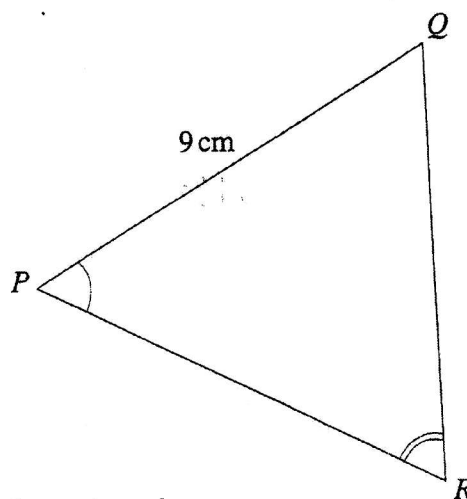
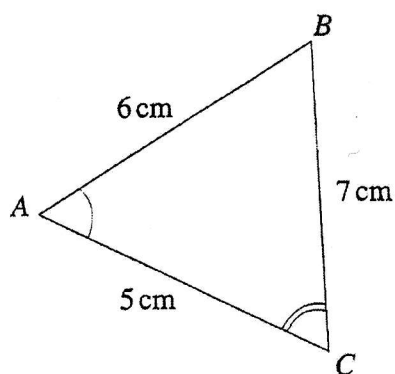
$$6x - 40 = 23$$

$$6x = 23 + 40$$

$$6x = 63 \quad x = \frac{63}{6} = \frac{21}{2}$$

[4]

16. Triangles ABC and PQR are similar, with $\hat{BAC} = \hat{QPR}$, $\hat{BCA} = \hat{QRP}$, $AB = 6$ cm, $BC = 7$ cm, $AC = 5$ cm and $PQ = 9$ cm.



Diagrams not drawn to scale.

Showing all your working, find the length of QR .

$$\frac{QR}{7} = \frac{9}{6}$$

$$QR = \frac{9 \times 7}{6} = \frac{21}{2} = 10.5 \text{ cm}$$

[2]

17. (a) Simplify

(i) 85^0 ,

1

(ii) $(\sqrt{7})^2$.

7

[2]

(b) Express $\frac{5}{11}$ as a recurring decimal.

$$\begin{array}{r} 0.454545\ldots \\ 11 \overline{) 5.00000} \\ \underline{44} \\ 60 \\ \underline{55} \\ 500 \\ \underline{440} \\ 600 \\ \underline{550} \\ 500 \end{array}$$

[1]

(c) Evaluate 3^{-3} . Express your answer as a fraction.

$$\frac{1}{3^3} = \frac{1}{27}$$

[1]

(d) Evaluate $3\frac{2}{5} \times 1\frac{2}{3}$.

$$\frac{17}{5} \times \frac{5}{3} = \frac{17}{3} = 5\frac{2}{3}$$

[2]

(e) Find the lowest common multiple (LCM) and the highest common factor (HCF) of 12 and 18.

$$\begin{array}{l} \text{LCM} \quad 12 \quad 18 \\ \quad 24 \quad (36) \\ \quad (36) \end{array}$$

$$\begin{array}{l} \text{HCF} \quad 12, (6), 4, 3, 2, 1 \\ \quad 18, 9, 2, (6), 3, 1 \end{array}$$

LCM 36

HCF 6

[2]

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

$$x^2 + 3y = 8y + 13.$$

$$x^2 = 8y + 13 - 3y$$

$$x^2 = 5y + 13$$

$$x = \sqrt{5y + 13}$$

[3]

- (b) Factorise $3x^2 + 10x - 8$ and hence solve the equation $3x^2 + 10x - 8 = 0$.

$$-24x$$

$$3x^2 + 12x - 2x - 8$$

$$3x(x+4) - 2(x+4)$$

$$(3x-2)(x+4) = 0$$

$$\text{either } 3x-2=0 \quad \text{or} \quad x+4=0$$

$$x = \frac{2}{3}$$

$$x = -4$$

[3]

19. Given that y is inversely proportional to x , and that $y = 4$ when $x = 6$,

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

$$y \propto \frac{1}{x}$$

$$y = \frac{k}{x}$$

when $y=4, x=6$ $4 = \frac{k}{6}$ $k=24$ $\therefore y = \frac{24}{x}$

[3]

(b) complete the following table for values of x and y .

x	$\frac{1}{2}$	6	8
y	48	4	3

$$y = \frac{24}{x} \quad y = \frac{24}{\frac{1}{2}} = 24 \times 2 = 48$$

$$3 = \frac{24}{x} \quad x = \frac{24}{3} \quad x = 8$$

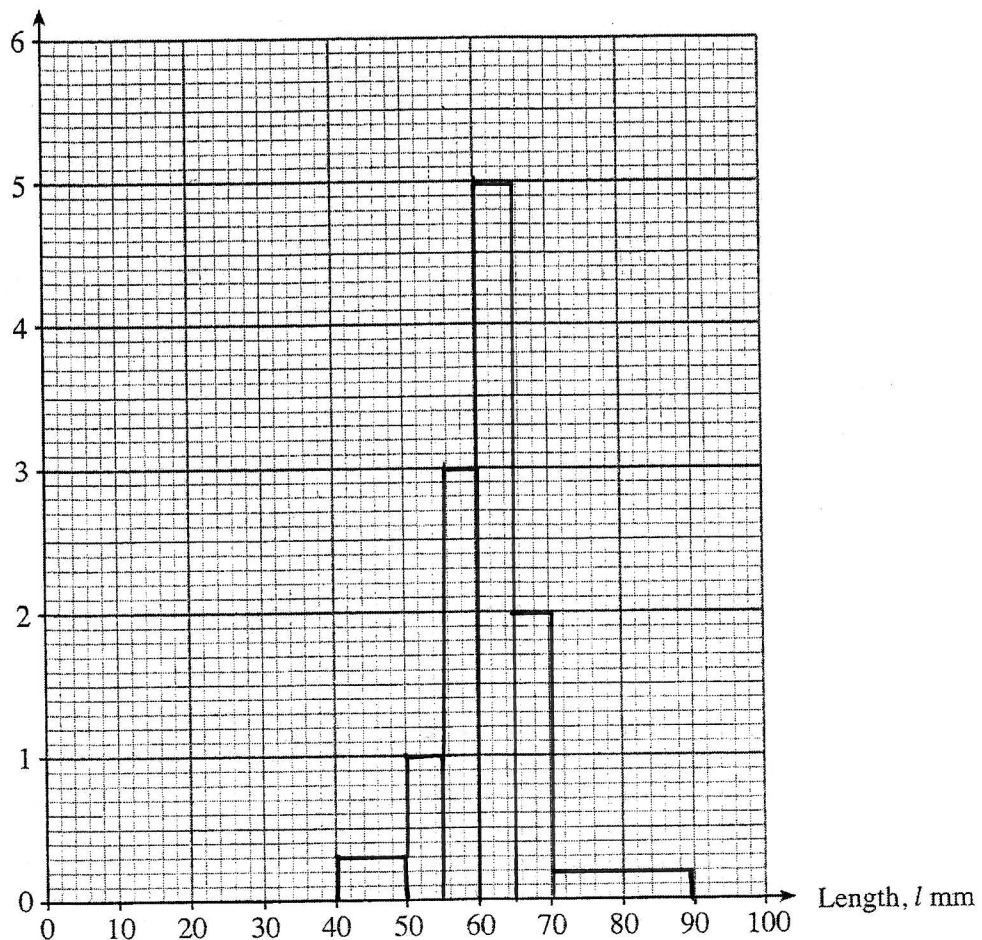
[2]

20. A survey was carried out to find the distribution of the lengths of index fingers. The data was recorded in a grouped frequency table.

Length of index finger, l mm	Frequency	Frequency density
$0 \leq l < 40$	0	0
$40 \leq l < 50$	3	0.3
$50 \leq l < 55$	5	1
$55 \leq l < 60$	15	3
$60 \leq l < 65$	25	5
$65 \leq l < 70$	10	2
$70 \leq l < 90$	2	0.2

Complete the frequency density column in the table above and hence draw the histogram for the data using the axes below. [3]

Frequency density



21. A bag contains 20 marbles. There are 13 yellow, 6 green and 1 red marbles in the bag. Two marbles are selected at random from the bag.

(a) Calculate the probability that both the selected marbles are green.

$$\frac{6}{20} \times \frac{5}{19} = \frac{30}{380}$$

[2]

(b) Calculate the probability that at least one of the selected marbles is yellow.

At least one yellow = 1 - no marbles are yellow

$$P(\text{no marbles yellow}) = \frac{7}{20} \times \frac{6}{19} = \frac{42}{380}$$

$$\frac{380}{380} - \frac{42}{380} = \frac{338}{380}$$

[3]

22. (a) Expand $(5 + 3\sqrt{2})^2$. Simplify your answer.

$$\begin{aligned}(5 + 3\sqrt{2})(5 + 3\sqrt{2}) &= 25 + 15\sqrt{2} + 15\sqrt{2} + (9 \times 2) \\ &= 25 + 30\sqrt{2} + 18 \\ &= 43 + 30\sqrt{2}\end{aligned}$$

[2]

- (b) Express $0.\dot{2}4\dot{3}$ as a fraction.

$$x = 0.2434343$$

$$10x = 2.434343$$

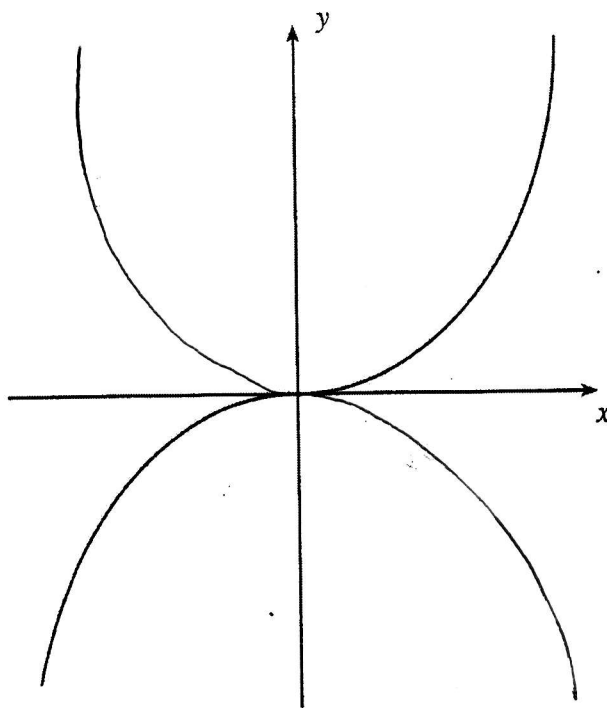
$$1000x = 243.434343$$

$$990x = 241$$

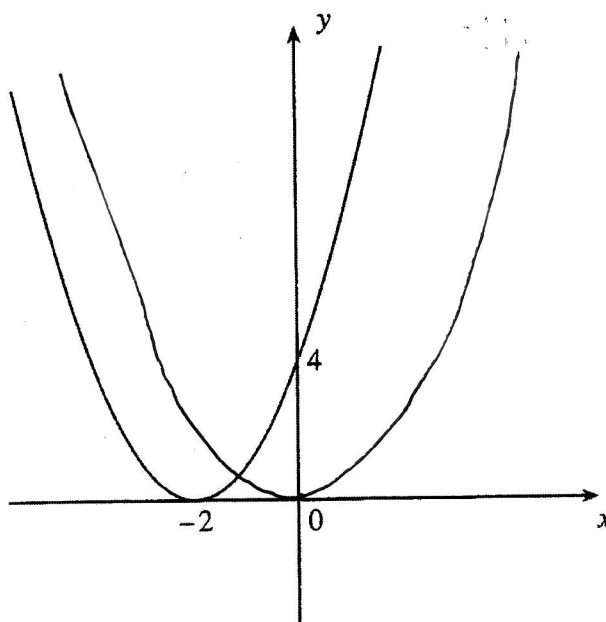
$$x = \frac{241}{990}$$

[2]

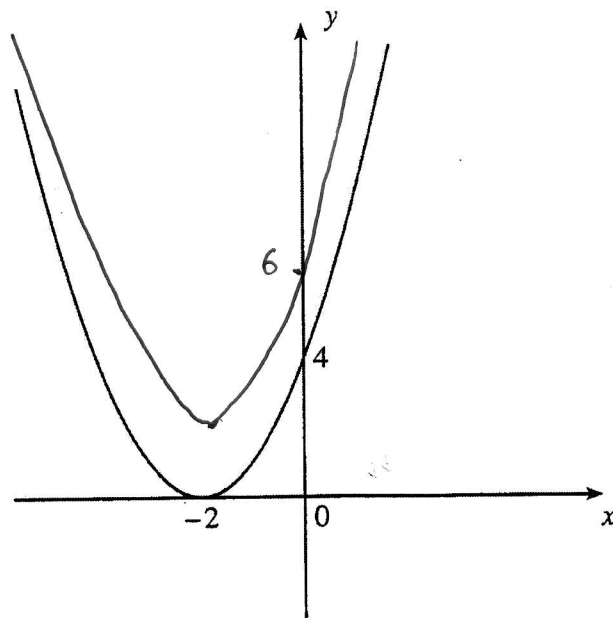
23. (a) The diagram shows the sketch of $y = x^3$. On the same diagram, sketch the curve $y = -x^3$. [1]



- (b) The diagram shows a sketch of $y = f(x)$. On the same diagram, sketch the curve $y = f(x - 2)$. Mark clearly the coordinates of the points where the curve crosses or touches the x -axis or y -axis. [2]



- (c) The diagram shows a sketch of $y = f(x)$. On the same diagram sketch the curve $y = f(x) + 2$. Mark clearly the coordinates of the points where the curve crosses or touches the x -axis or y -axis. [2]



24. Solve the equation $\frac{4x}{3x+2} + \frac{2}{x} = 1$.

$$\frac{4x^2 + 2(3x+2)}{(3x+2)x} = 1$$

$$4x^2 + 6x + 4 = 3x^2 + 2x$$

$$4x^2 - 3x^2 + 6x - 2x + 4 = 0$$

$$x^2 + 4x + 4 = 0$$

$$(x+2)(x+2) = 0$$

$$x = -2.$$

[5]