# Maths

# 10P1 & 10Q1

Pixi MATHS

Name: _____

# Contents

## Surds

**Things to remember:**

- $\sqrt{}$ means square root;
- To simplify surds, find all its factors;
- To rationalise the denominator, find an equivalent fraction where the denominator is rational.

**Questions:**

**1.** Work out

$$\frac{(5+\sqrt{3})(5-\sqrt{3})}{\sqrt{22}}$$

Give your answer in its simplest form.

.....

**(Total 3 marks)**

**2.** (a) Rationalise the denominator of $\frac{1}{\sqrt{3}}$

.....

**(1)**

(b) Expand $(2+\sqrt{3})(1+\sqrt{3})$

Give your answer in the form $a+b\sqrt{3}$ where *a* and *b* are integers.

.....

**(2)**

**(Total 3 marks)**

**3.** (a) Rationalise the denominator of $\frac{1}{\sqrt{7}}$

.....

**(2)**

(b) (i) Expand and simplify $(\sqrt{3} + \sqrt{15})^2$
Give your answer in the form $a + b\sqrt{3}$ where *a* and *b* are integers.

.....

(ii) All measurements on the triangle are in centimetres.
*ABC* is a right-angled triangle.
*k* is a positive integer.

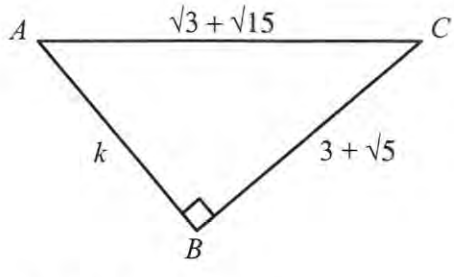



Diagram **NOT** accurately drawn

Find the value of *k*.

*k* = .....

**(5)**
**(Total 7 marks)**

**4.** Expand and simplify $(\sqrt{3} - \sqrt{2})(\sqrt{3} - \sqrt{2})$

.....

**(Total 2 marks)**

**5.** (a) Write down the value of $49^{1/2}$

.....

**(1)**

(b) Write $\sqrt{45}$ in the form $k\sqrt{5}$, where $k$ is an integer.

.....

**(1)**

**(Total 2 marks)**

**6.** Write $\dfrac{\sqrt{18} + 10}{\sqrt{2}}$ in the form $a + b\sqrt{3}$ where $a$ and $b$ are integers.

$a$ = .....

$b$ = .....

**(Total 2 marks)**

**7.** Expand and simplify $(2 + \sqrt{3})(7 - \sqrt{3})$

Give your answer in the form $a + b\sqrt{3}$ where *a* and *b* are integers.

.....

**(Total 3 marks)**

**8.** Rationalise the denominator of $\dfrac{4 + \sqrt{2})(4 - \sqrt{2)}}{\sqrt{7}}$

Give your answer in its simplest form.

.....

**(Total for question = 3 marks)**

**9.** Show that $\dfrac{4 - \sqrt{3})(4 + \sqrt{3})}{\sqrt{13}}$ simplifies to $\sqrt{13}$

**(Total for question = 2 marks)**

## Bounds Calculations

**Things to remember:**

- Calculating bounds is the opposite of rounding – they are the limits at which you would round up instead of down, and vice versa.
- When dividing bounds, UB = UB ÷ LB and LB = LB ÷ UB

**Questions:**

**1.** A piece of wood has a length of 65 centimetres to the nearest centimetre.

(a) What is the least possible length of the piece of wood?

.....

**(1)**

(b) What is the greatest possible length of the piece of wood?

.....

**(1)**

**(Total for Question is 2 marks)**

**2.** Chelsea's height is 168 cm to the nearest cm.

(a) What is Chelsea's minimum possible height?

..... cm

**(1)**

(b) What is Chelsea's maximum possible height?

..... cm

**(1)**

**(Total for Question is 2 marks)**

**3.** $I = \frac{V}{R}$

$V$ = 250 correct to the nearest 5

$R$ = 3900 correct to the nearest 100

Work out the lower bound for the value of $I$.

Give your answer correct to 3 decimal places.

You must show your working.

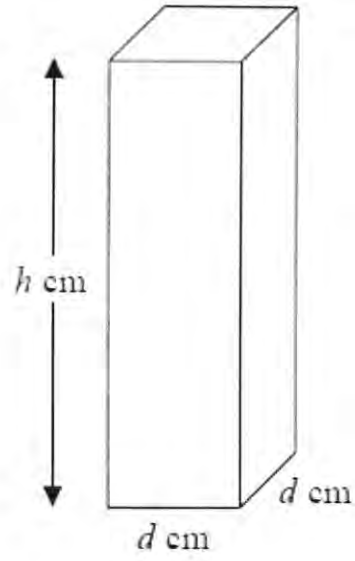
.....

**(Total for question = 3 marks)**

**4.** Here is a solid bar made of metal.
The bar is in the shape of a cuboid.
The height of the bar is $h$ cm.
The base of the bar is a square of side $d$ cm.
The mass of the bar is $M$ kg.

$d = 8.3$ correct to 1 decimal place.
$M = 13.91$ correct to 2 decimal places.
$h = 84$ correct to the nearest whole number.

Find the value of the density of the metal to an appropriate degree of accuracy.
Give your answer in g/cm$^3$.
You must explain why your answer is to an appropriate degree of accuracy.




**(Total for question = 5 marks)**

**5.** Steve travelled from Ashton to Barnfield.
He travelled 235 miles, correct to the nearest 5 miles.
The journey took him 200 minutes, correct to the nearest 5 minutes.
Calculate the lower bound for the average speed of the journey.
Give your answer in **miles per hour**, correct to 3 significant figures.
You must show all your working.

..... mph

**(Total for question = 4 marks)**

**6.** The value of $p$ is 4.3
The value of $q$ is 0.4
Both $p$ and $q$ are given correct to the nearest 0.1

(a) Write down the lower bound for $p$.

.....

**(1)**

$$r = p + \frac{1}{q}$$

(b) Work out the upper bound for $r$.
You must show all your working.

.....

**(3)**

**(Total for question = 4 marks)**

**7.** $$m = \frac{\sqrt{s}}{t}$$

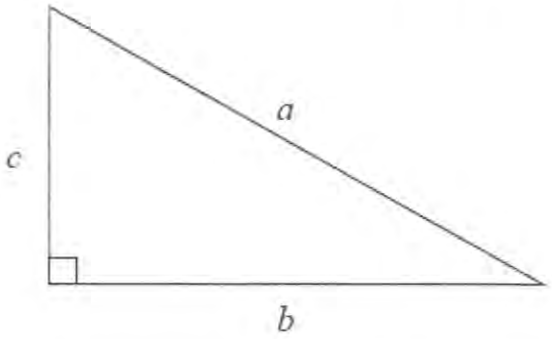
$s = 3.47$ correct to 3 significant figures

$t = 8.132$ correct to 4 significant figures

By considering bounds, work out the value of $m$ to a suitable degree of accuracy.
Give a reason for your answer.

**(Total for question = 5 marks)**

**8.** *a* is 8.3 cm correct to the nearest mm
*b* is 6.1 cm correct to the nearest mm




Calculate the upper bound for *c*.
You must show your working.

..... cm
**(Total for question = 4 marks)**

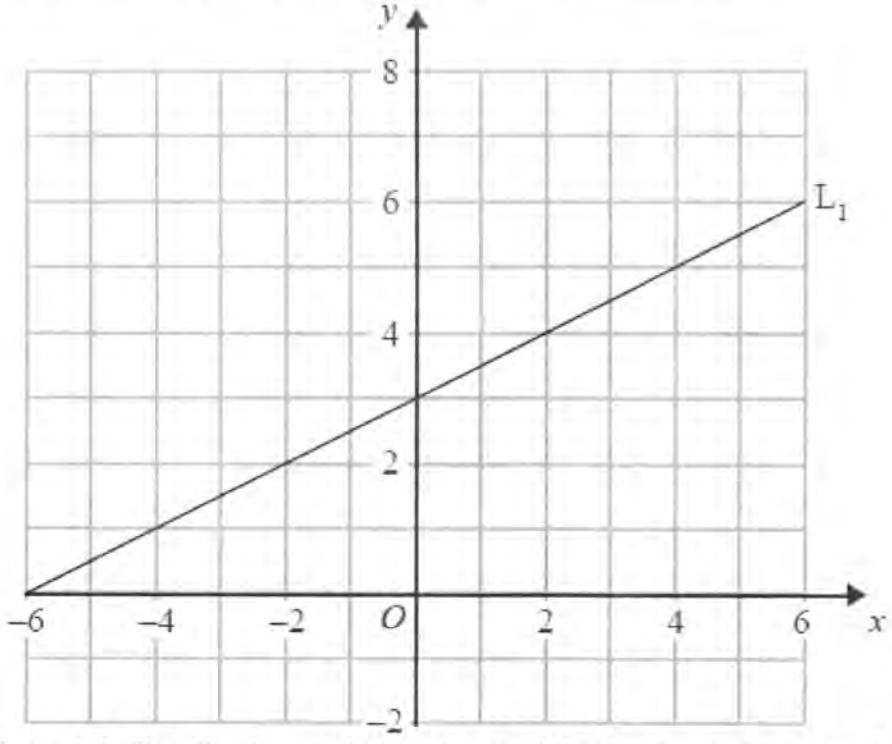
## Parallel and Perpendicular Graphs

**Things to remember:**

- The general equation of a linear graph is given by y = mx + c, where m is the gradient and c is the y-intercept.
- Parallel graphs have the same gradient.
- Gradients of perpendicular graphs have a product of -1.

**Questions:**

**1.** The diagram shows a straight line, $L_1$, drawn on a grid.




A straight line, $L_2$, is parallel to the straight line $L_1$ and passes through the point (0, −5).
Find an equation of the straight line $L_2$.

.....

**(Total for Question is 3 marks)**

**2.** The straight line **L** has equation $y = 2x - 5$
Find an equation of the straight line perpendicular to **L** which passes through (−2, 3).

.....

**(Total for Question is 3 marks)**

**3.** In the diagram, *ABC* is the line with equation $y = -\frac{1}{2}x + 5$
*AB* = *BC*
*D* is the point with coordinates (−13, 0)

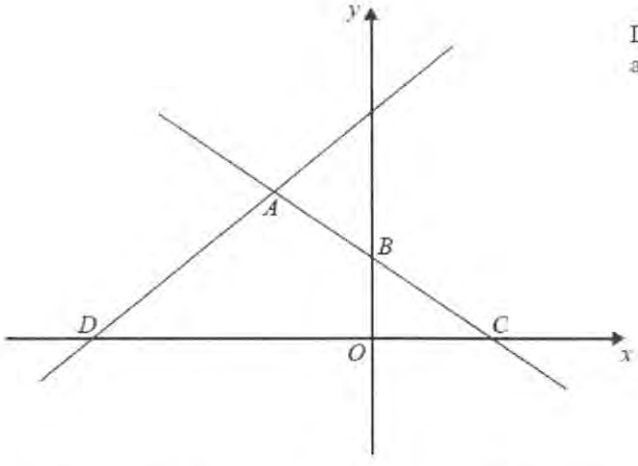



Diagram **NOT** accurately drawn

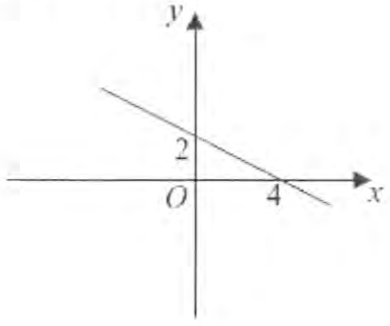
Find an equation of the line through *A* and *D*.

.....

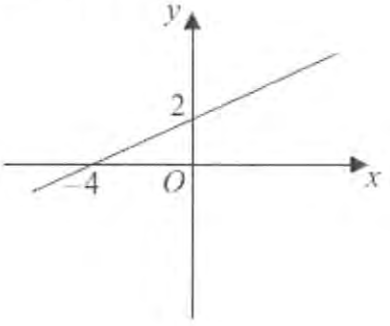
**(Total for question = 5 marks)**

**4.** Here are the graphs of 6 straight lines.

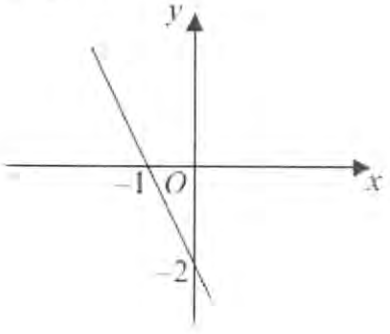
Graph **A**



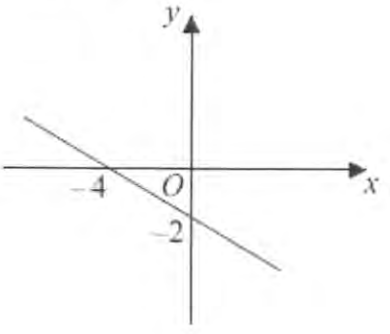

Graph **B**



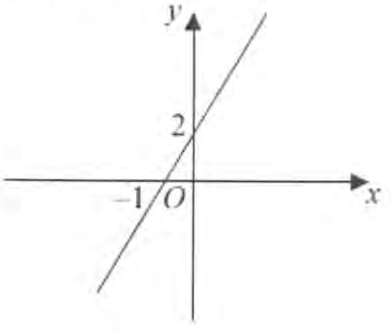

Graph **C**



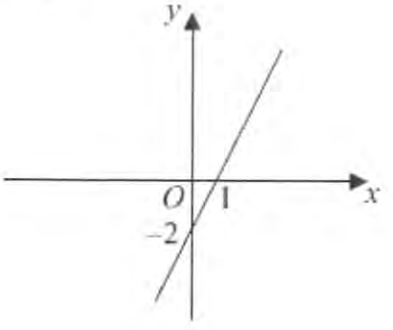

Graph **D**




Graph **E**




Graph **F**




Match each of the graphs **A**, **B**, **C**, **D**, **E** and **F** to the equations in the table.

| **Equation** | $y=\frac{1}{2}x+2$ | $y=2x-2$ | $y=-\frac{1}{2}x+2$ | $y=-2x-2$ | $y=2x+2$ | $y=-\frac{1}{2}x-2$ |
|---|---|---|---|---|---|---|
| **Graph** | | | | | | |

**(Total for Question is 3 marks)**

**5.** In the diagram, A is the point (-2, 0)
B is the point (0, 4)
C is the point (5, -1)

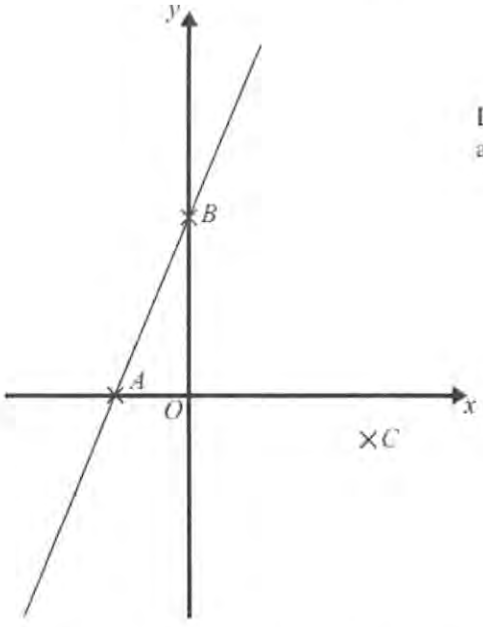



Diagram **NOT** accurately drawn

Find an equation of the line that passes through $C$ and is perpendicular to $AB$.

.....

**(Total for Question is 4 marks)**

**6.** Find an equation of the straight line that is perpendicular to the straight line $x + 2y = 5$ and that passes through the point (3, 7).

.....

**(Total for Question is 4 marks)**

*7. **A** and **B** are straight lines.
Line **A** has equation $2y = 3x + 8$
Line **B** goes through the points $(-1, 2)$ and $(2, 8)$

Do lines **A** and **B** intersect?
You must show all your working.

**(Total for Question is 3 marks)**

8. A straight line, ***L***, is perpendicular to the line with equation $y = 1 - 3x$.
The point with coordinates $(6, 3)$ is on the line ***L***.
Find an equation of the line ***L***.

.....

**(Total for Question is 3 marks)**

## Transformations of graphs

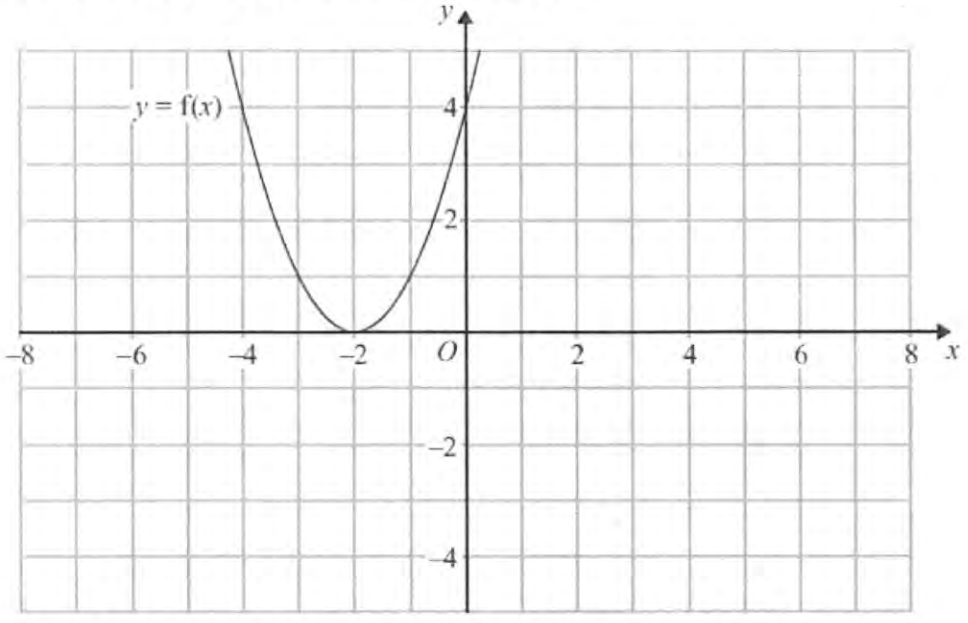
**Things to remember:**

- f(x) means the function of x.
- -f(x) is a reflection in the x-axis.
- f(-x) is a reflection in the y-axis.
- f(x – a) is a translation in the x-axis, a units.
- f(x) + b is a translation in the y-axis, b units.
- cf(x) is an enlargement in the y-axis, scale factor c.
- f(dx) is an enlargement in the x-axis, scale factor $\frac{1}{d}$.

**Questions:**

**1.** $y = f(x)$

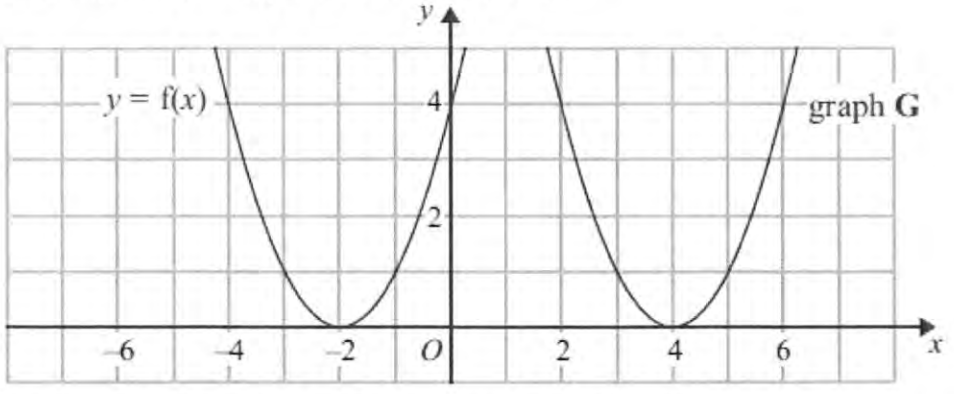
The graph of $y = f(x)$ is shown on the grid.




(a) On the grid above, sketch the graph of $y = -f(x)$.

**(2)**

The graph of $y = f(x)$ is shown on the grid.




The graph **G** is a translation of the graph of $y = f(x)$.

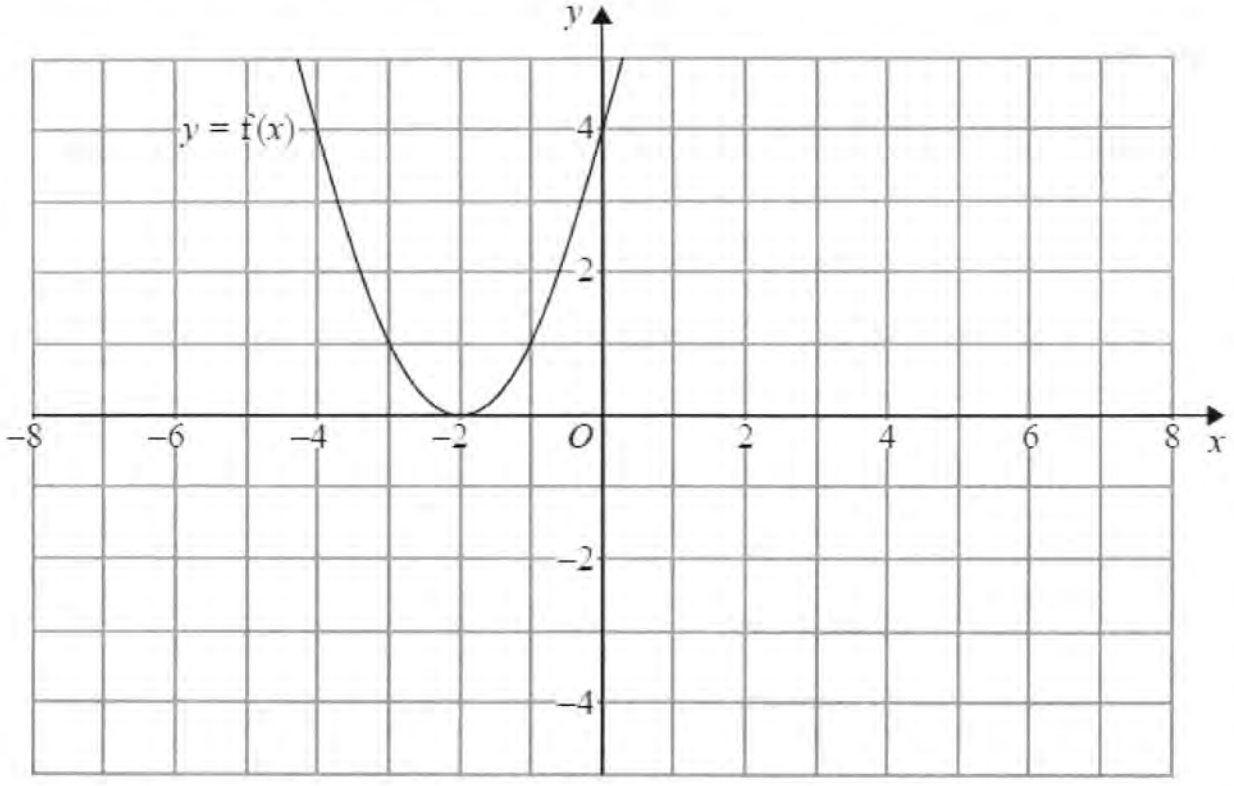
(b) Write down the equation of graph **G**.

.....

**(2)**

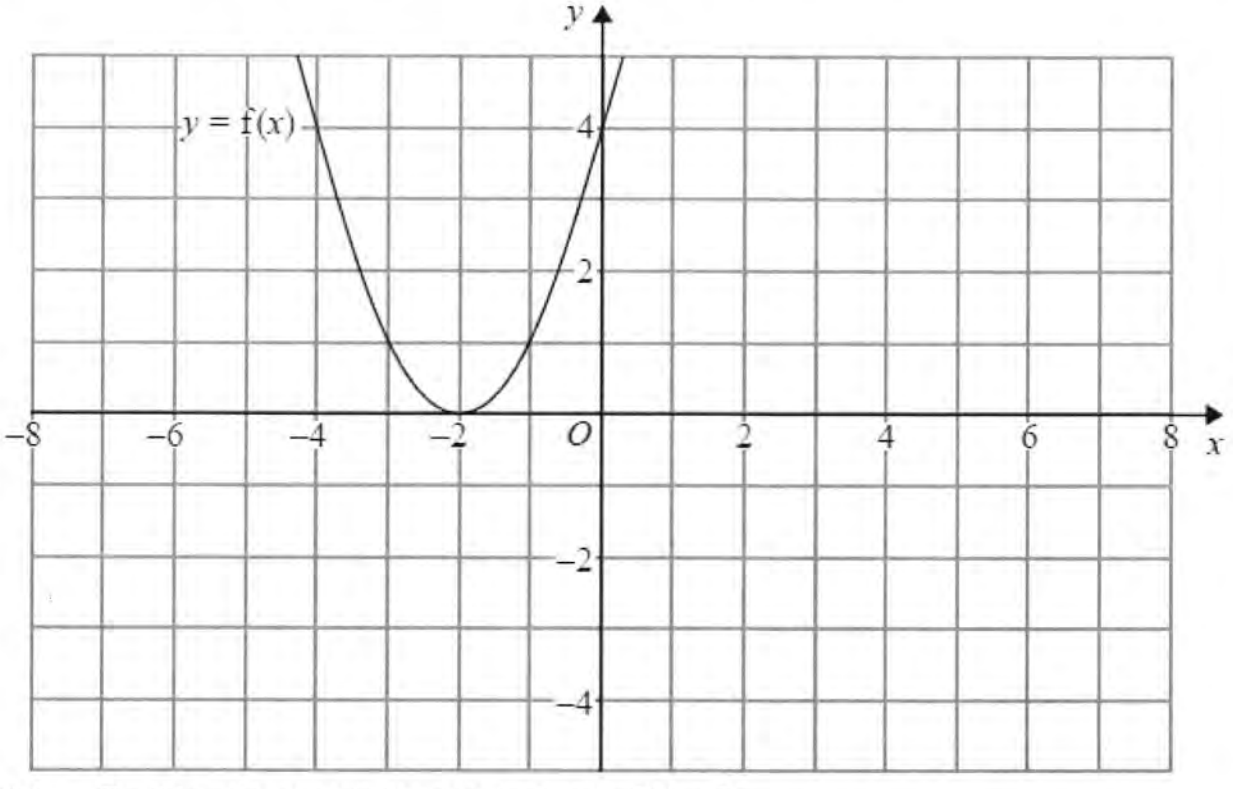
**(Total for Question is 3 marks)**

**2.** The graph of $y = f(x)$ is shown on both grids below.




(a) On the grid above, sketch the graph of $y = f(-x)$

**(1)**



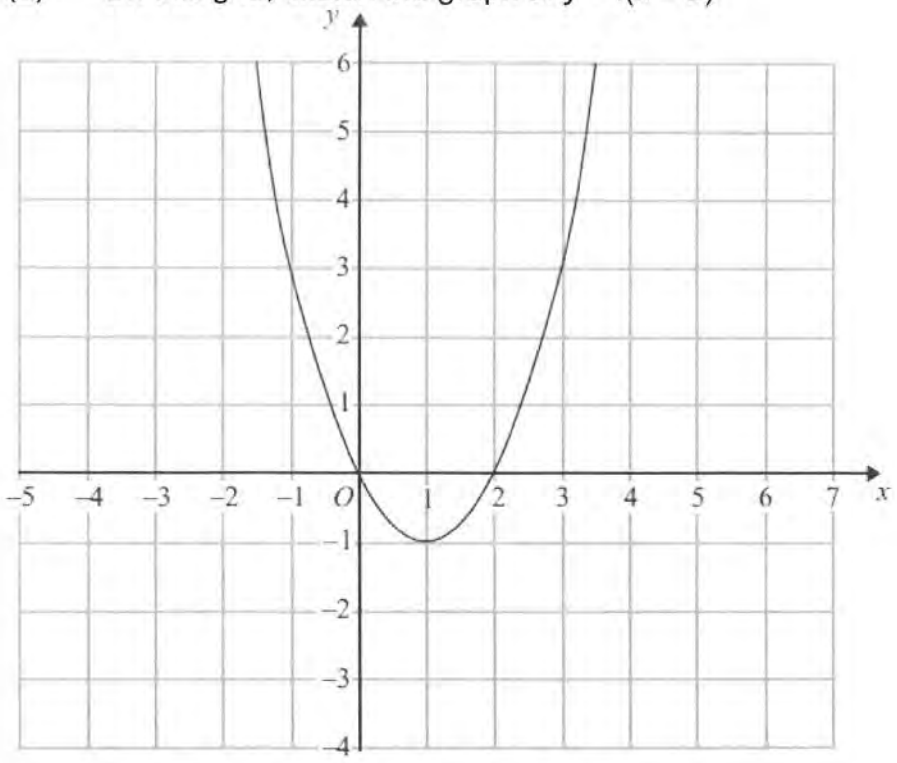

(b) On this grid, sketch the graph of $y = -f(x) + 3$

**(1)**

**(Total for question = 2 marks)**

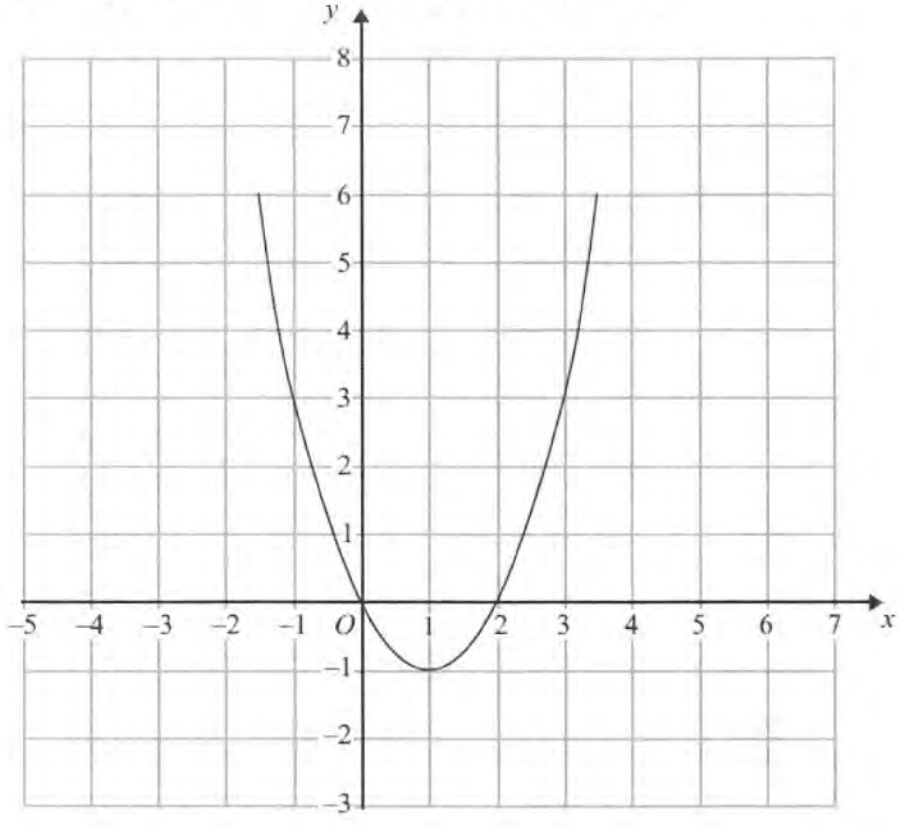
**3.** The graph of $y = f(x)$ is shown on each of the grids.

(a) On this grid, sketch the graph of $y = f(x - 3)$




**(2)**

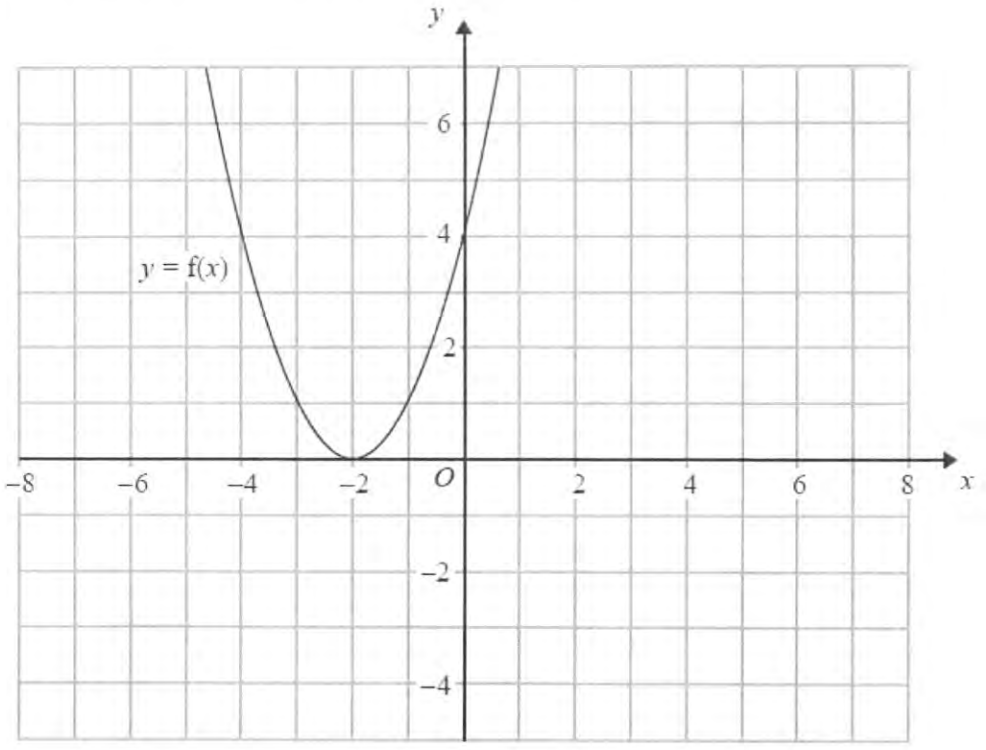
(b) On this grid, sketch the graph of $y = 2f(x)$




**(2)**

**(Total for Question is 4 marks)**

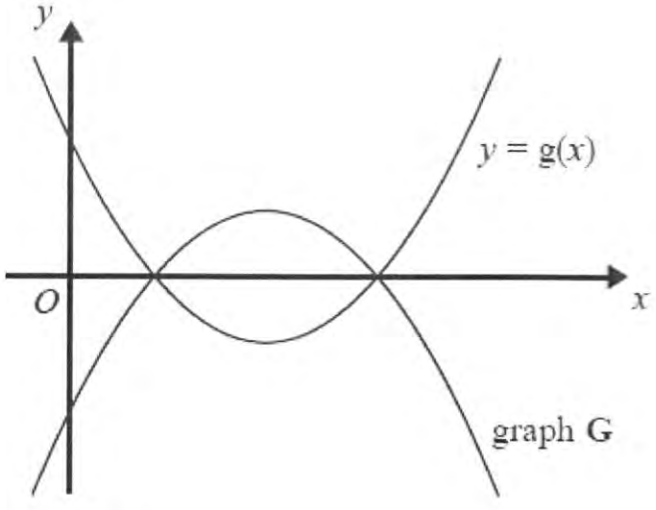
**4.** The graph of $y = f(x)$ is shown on the grid.




(a) On the grid above, sketch the graph of $y = f(x + 3)$

**(2)**

The graph of $y = g(x)$ is shown below.




The graph **G** is the reflection of $y = g(x)$ in the $x$-axis.

(b) Write down an equation of graph **G**.

.....

**(1)**

**(Total for question = 3 marks)**

## Algebraic Fractions – Simplifying

**Things to remember:**

- Factorise the numerator and denominator;
- Cancel common factors;
- Then add/subtract/multiply divide if necessary.

**Questions:**

**1.** Simplify $\frac{p^2-9}{2p+6}$

.....

**(Total 3 marks)**

**2.** Simplify fully $\frac{6x^2+3x}{4x^2-1}$

.....

**(Total 3 marks)**

**3.** Simplify $\frac{x^2+2x+1}{x^2+3x+2}$

.....

**(Total 3 marks)**

**4.** Simplify fully $\dfrac{x^2+x-6}{x^2-7x+10}$

/

.....

**(Total 3 marks)**

**5.** Simplify fully $\dfrac{x^2-8x+15}{2x^2-7x-15}$

.....

**(Total 3 marks)**

**6.** Simplify fully $\dfrac{2x^2+3x+1}{x^2-3x-4}$

.....

**(Total 3 marks)**

**7.** (a) Simplify $\frac{2x+4}{x^2+4x+4}$

.....

**(3)**

(b) Write $\frac{1}{x+4} + \frac{2}{x-4}$ as a single fraction in its simplest form.

.....

**(3)**

**(Total 6 marks)**

**8.** Simplify fully $\frac{x+3}{4} + \frac{x-5}{3}$

.....

**(Total 3 marks)**

## Algebraic fractions – solving

**Things to remember:**

- Multiply every term by the product of the denominators;
- Solve to find x.

**Questions:**

**1.** Solve $\frac{5(2x+1)}{3} = 4x + 7$

$x =$ .....

**(Total 3 marks)**

**2.** (a) Show that the equation $\frac{5}{x+2} = \frac{4-3x}{x-1}$

can be rearranged to give $3x^2 + 7x - 13 = 0$

**(3)**

(b) Solve $3x^2 + 7x - 13 = 0$

Give your solutions correct to 2 decimal places.

$x =$ ..... or $x =$ .....

**(3)**

**(Total 6 marks)**

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

$x =$ .....

**(Total 5 marks)**

**4.** Solve the equation $\frac{3}{x+3} - \frac{4}{x-3} = \frac{5x}{x^2-9}$

$x =$ .....

**(Total 4 marks)**

**5.** (a) Solve $\frac{3}{x} + \frac{3}{2x} = 2$

*x*=.....

**(2)**

(b) Using your answer to part (a), or otherwise, solve $\frac{3}{(y-1)^2} + \frac{3}{2(y-1)^2} = 2$

*y* = ..... or *y* = .....

**(3)**

**(Total 5 marks)**

## Solving Quadratic Inequalities

**Things to remember:**

- Start by solving the quadratic to find the values of x, then sketch the graph to determine the inequality.

**Questions:**

**1.** Solve $x^2 > 3x + 4$

.....

**(Total for question = 3 marks)**

**2.** Solve the inequality $x^2 > 3(x + 6)$

.....

**(Total for question = 4 marks)**

**3.** Solve the inequality $x^2 + 5x > 6$

.....

**(Total for question = 3 marks)**

**4.** Solve the inequality $x^2 - 2x + 8 < 0$

.....

**(Total for question = 3 marks)**

**5.** Solve the inequality $x^2 - x \geq 12$

.....

**(Total for question = 3 marks)**

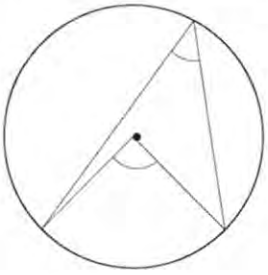
**6.** Solve the inequality $x^2 \leq 4(2x + 5)$

.....

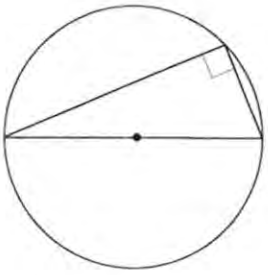
**(Total for question = 4 marks)**

## Circle theorems

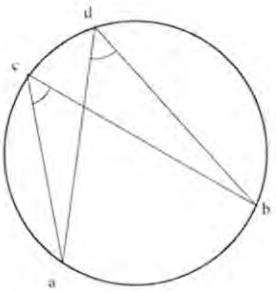
### Things to remember:



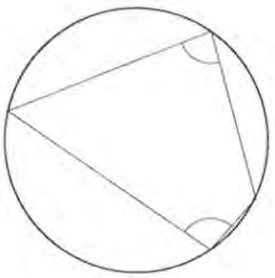
The angle at the centre is twice the angle at the circumference.



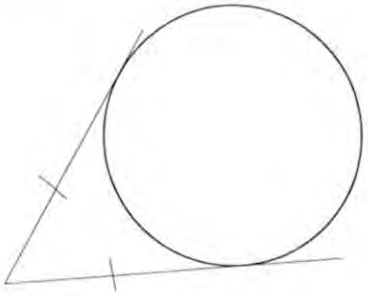
The angle in a semi-circle is 90°.



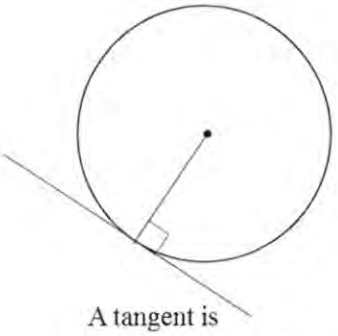

Angles subtended by the same arc are equal.



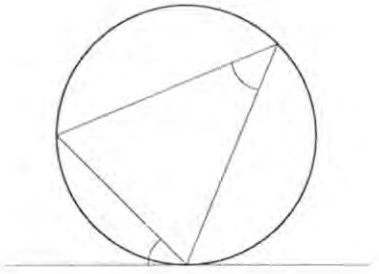
Opposite angles in a cyclic quadrilateral sum to 180°.



Tangents from a point are equal.



A tangent is perpendicular to a radius.



Angles in alternate segments are equal.

### Questions:

**1.**

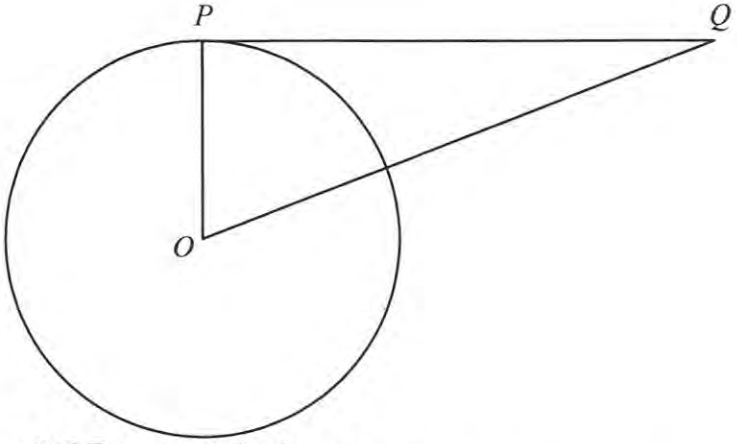



Diagram **NOT** accurately drawn

*P* is a point on the circumference of the circle, centre *O*.

*PQ* is a tangent to the circle.

(i) Write down the size of angle *OPQ*.

..... °

(ii) Give a reason for your answer.

.....

.....

**(Total 2 marks)**

**2.**

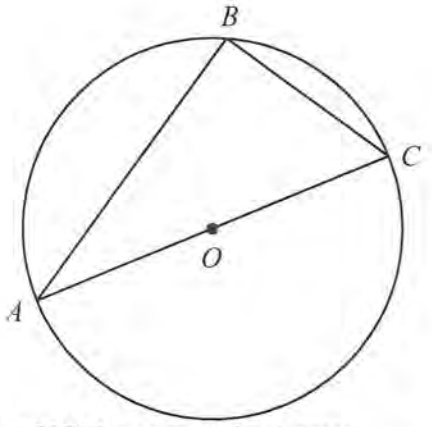



Diagram **NOT** accurately drawn

*A*, *B* and *C* are points on the circumference of a circle, centre *O*.

*AC* is a diameter of the circle.

(a) (i) Write down the size of angle *ABC*.

..... °

(ii) Give a reason for your answer.

.....

.....

**(2)**

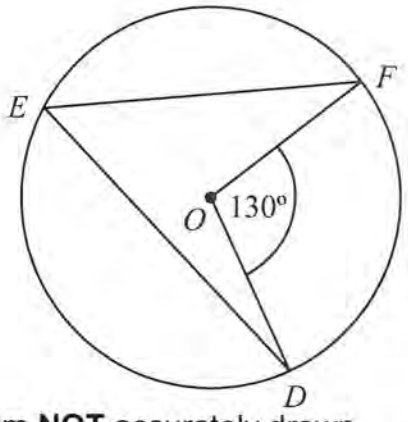



Diagram **NOT** accurately drawn

*D*, *E* and *F* are points on the circumference of a circle, centre *O*.

Angle *DOF* = 130°.

(b) (i) Work out the size of angle *DEF*.

..... °

(ii) Give a reason for your answer.

.....

.....

**(2)**

**(Total 4 marks)**

**3.**

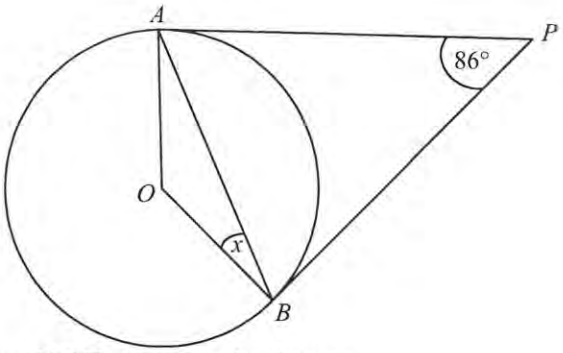



Diagram **NOT** accurately drawn

*A* and *B* are points on the circumference of a circle, centre *O*.
*PA* and *PB* are tangents to the circle.
Angle *APB* is 86°.
Work out the size of the angle marked *x*.

..... °

**(Total 2 marks)**

**4.**

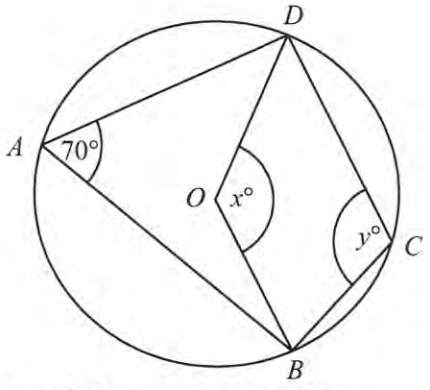



Diagram **NOT** accurately drawn

In the diagram, *A*, *B*, *C* and *D* are points on the circumference of a circle, centre *O*.
Angle *BAD* = 70°.
Angle *BOD* = *x*°.
Angle *BCD* = *y*°.

(a) (i) Work out the value of *x*.

..... °

(ii) Give a reason for your answer.

.....

.....

**(2)**

(b) (i) Work out the value of *y*.

..... °

(ii) Give a reason for your answer.

.....

.....

**(2)**

**(Total 4 marks)**

**5.**

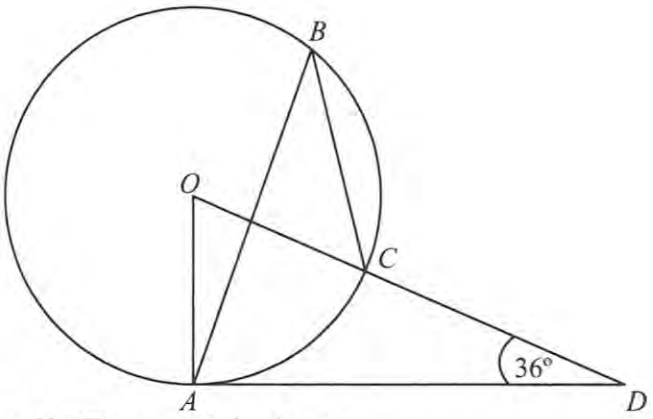



Diagram **NOT** accurately drawn

The diagram shows a circle centre *O*.
*A*, *B* and *C* are points on the circumference.
*DCO* is a straight line.
*DA* is a tangent to the circle.
Angle *ADO* = 36°

(a) Work out the size of angle *AOD*.

..... °

**(2)**

(b) (i) Work out the size of angle *ABC*.

..... °

(ii) Give a reason for your answer.

.....

.....

**(3)**

**(Total 5 marks)**

## Vectors

**Things to remember:**

- Use the letter provided in the question.
- Going against the arrow is a negative.
- Vectors need to be written in bold or underlined.
- They can be manipulated similarly to algebra.

**Questions:**

**1.** The diagram shows a regular hexagon *ABCDEF* with centre *O*.

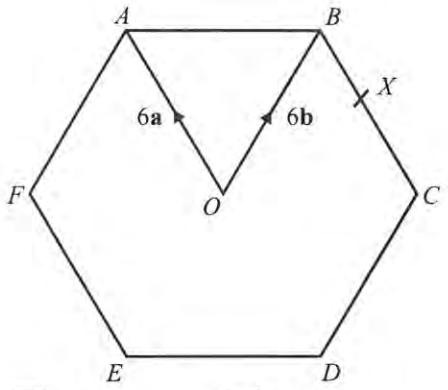



Diagram **NOT** accurately drawn

$\overrightarrow{OA}$ = 6**a** $\overrightarrow{OB}$ = 6**b**

(a) Express in terms of **a** and/or **b**

(i) $\overrightarrow{AB}$,

.....

(ii) $\overrightarrow{EF}$.

.....

**(2)**

*X* is the midpoint of *BC*.

(b) Express $\overrightarrow{EX}$ in terms of **a** and/or **b**

.....

**(2)**

*Y* is the point on *AB* extended, such that *AB* : *BY* = 3:2

(c) Prove that *E*, *X* and *Y* lie on the same straight line.

**(3)**

**(Total 7 marks)**

**2.** $T$ is the point on $PQ$ for which $PT : TQ = 2 : 1$.

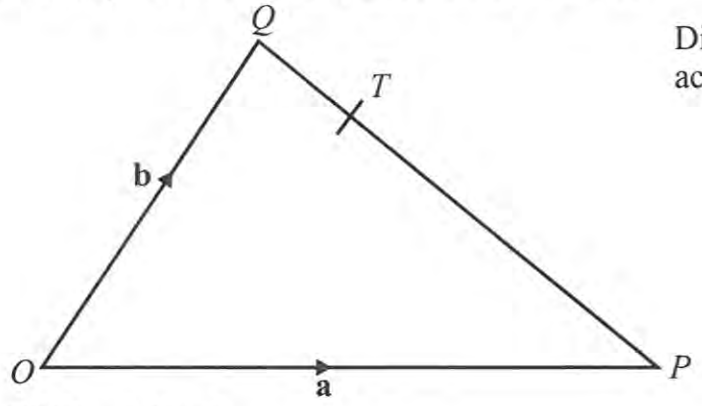



Diagram **NOT** accurately drawn

$OPQ$ is a triangle.

$\overrightarrow{OP}$ = **a** and $\overrightarrow{OQ}$ = **b**.

(a) Write down, in terms of **a** and **b**, an expression for $\overrightarrow{PQ}$.

$\overrightarrow{PQ}$ = .....

**(1)**

(b) Express $\overrightarrow{OT}$ in terms of **a** and **b**.
Give your answer in its simplest form.

$\overrightarrow{OT}$ = .....

**(2)**

**(Total 3 marks)**

**3.** *OABC* is a parallelogram.

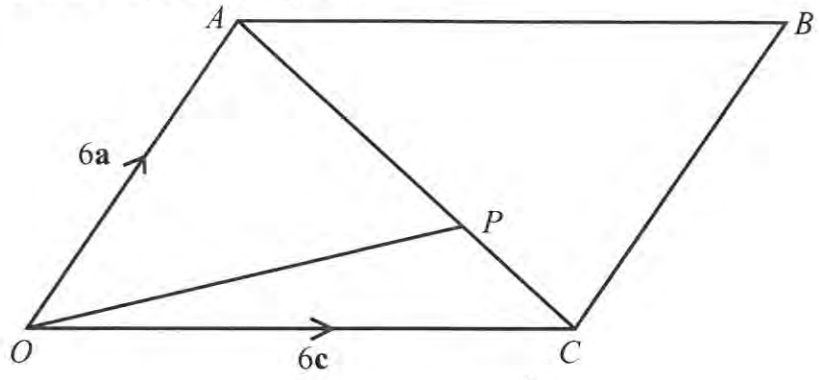



Diagram **NOT** accurately drawn

$P$ is the point on $AC$ such that $AP = \frac{2}{3} AC$.

$\overrightarrow{OA} = 6\mathbf{a}$. $\overrightarrow{OC} = 6\mathbf{c}$.

(a) Find the vector $\overrightarrow{OP}$.
Give your answer in terms of **a** and **c**.

.....

**(3)**

The midpoint of *CB* is *M*.

(b) Prove that *OPM* is a straight line.

**(2)**
**(Total 5 marks)**

**4.** *OPQ* is a triangle.
*R* is the midpoint of *OP*.
*S* is the midpoint of *PQ*.
$\overrightarrow{OP}$ = **p** and $\overrightarrow{OQ}$ = **q**

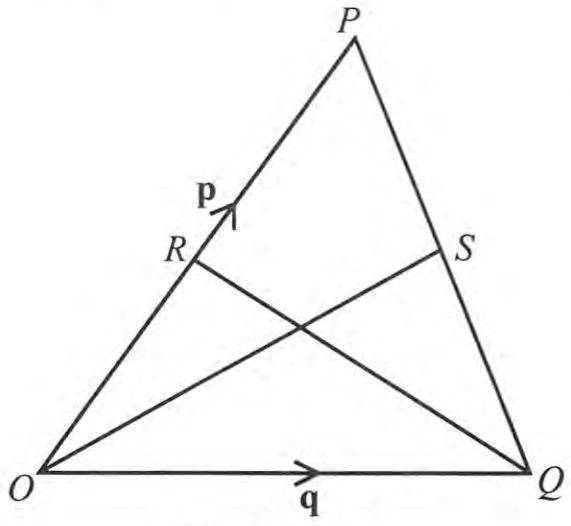



Diagram **NOT** accurately drawn

(i) Find $\overrightarrow{OS}$ in terms of **p** and **q**.

$\overrightarrow{OS}$ = .....

(ii) Show that *RS* is parallel to *OQ*.

**(Total 5 marks)**

**5.** *OPQR* is a trapezium with *PQ* parallel to *OR*.

$\overrightarrow{OP} = 2\mathbf{b}$ $\overrightarrow{PQ} = 2\mathbf{a}$ $\overrightarrow{OR} = 6\mathbf{a}$

*M* is the midpoint of *PQ* and *N* is the midpoint of *OR*.

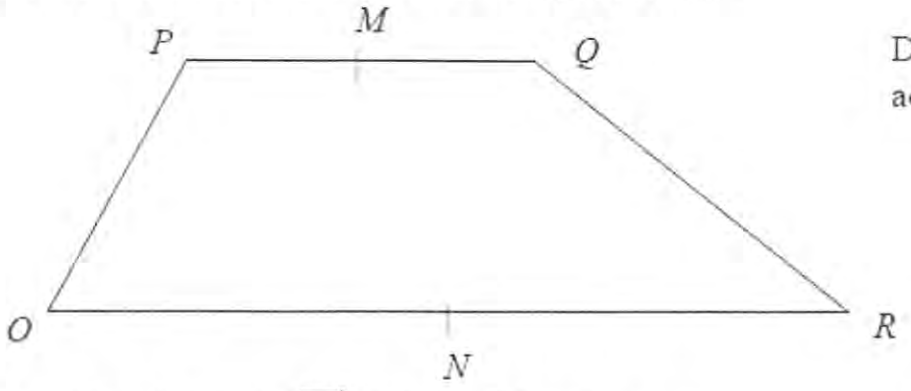



Diagram **NOT** accurately drawn

(a) Find the vector $\overrightarrow{MN}$ in terms of **a** and **b**.

$\overrightarrow{MN}$ = .....

**(2)**

*X* is the midpoint of *MN* and *Y* is the midpoint of *QR*.

(b) Prove that *XY* is parallel to *OR*.

**(2)**
**(Total 4 marks)**

**6.** *ABCD* is a straight line.

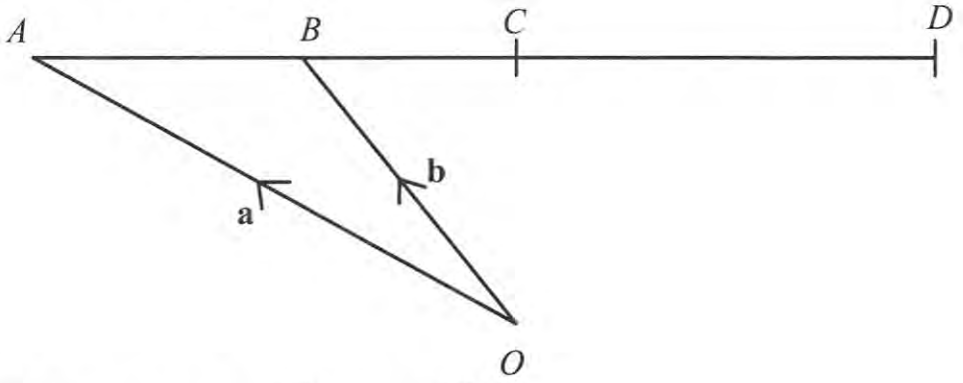



Diagram **NOT** accurately drawn

*O* is a point so that $\overrightarrow{OA} = \mathbf{a}$ and $\overrightarrow{OB} = \mathbf{b}$.

*B* is the midpoint of *AC*.

*C* is the midpoint of *AD*.

Express, in terms of **a** and **b**, the vectors

(i) $\overrightarrow{AC}$

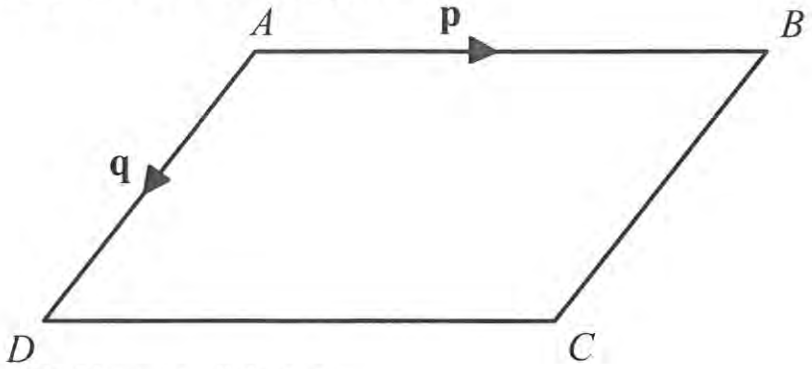
.....

(ii) $\overrightarrow{OD}$

.....

**(Total 3 marks)**

**7.** Diagram **NOT** accurately drawn




*ABCD* is a parallelogram.
*AB* is parallel to *DC*.
*AD* is parallel to *BC*.

$\vec{AB}$ = **p**

$\vec{AD}$ = **q**

(a) Express, in terms of p and q

(i) $\vec{AC}$

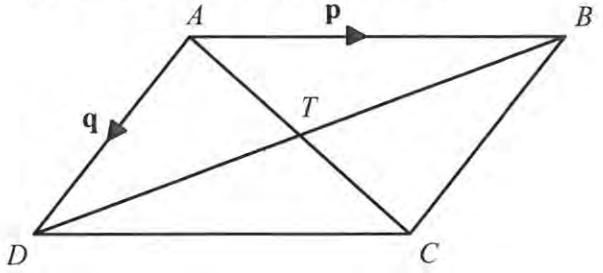
.....

(ii) $\vec{BD}$

.....

**(2)**

Diagram **NOT** accurately drawn




*AC* and *BD* are diagonals of parallelogram *ABCD*.
*AC* and *BD* intersect at *T*.

**(b)** Express $\overrightarrow{AT}$ in terms of **p** and **q.**

.....

**(1)**
**(Total 3 marks)**

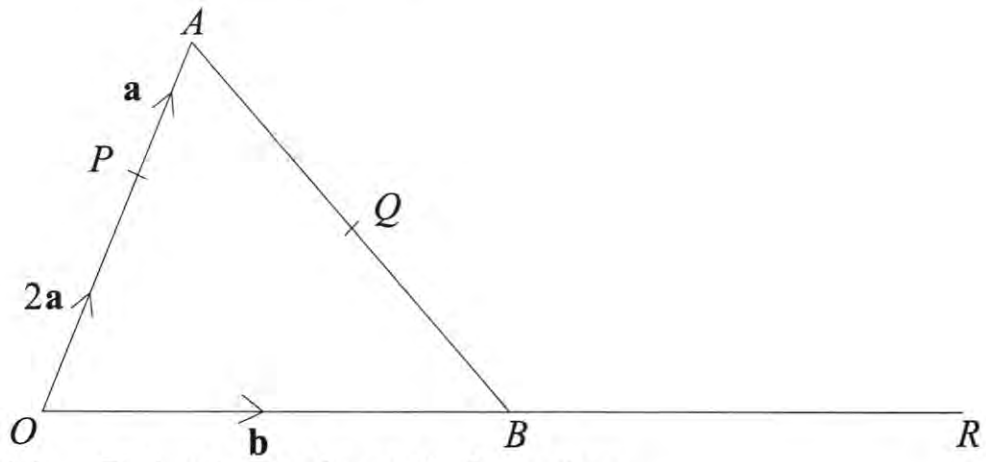
**8.** Diagram **NOT** accurately drawn

*OAB* is a triangle.

*B* is the midpoint of *OR*.

*Q* is the midpoint of *AB*.

$\overrightarrow{OP} = 2\mathbf{a}$ $\overrightarrow{PA} = \mathbf{a}$ $\overrightarrow{OB} = \mathbf{b}$




(a) Find, in terms of **a** and **b**, the vectors

(i) $\overrightarrow{AB}$,

.....

(ii) $\overrightarrow{PR}$,

.....

(iii) $\overrightarrow{PQ}$.

.....

**(4)**

(b) Hence explain why *PQR* is a straight line.

**(2)**

The length of *PQ* is 3 cm.

(c) Find the length of *PR*.

..... cm

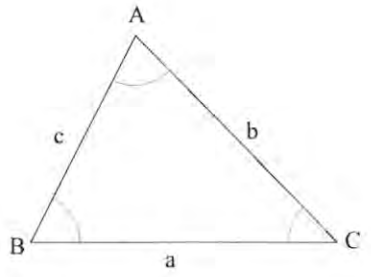
**(1)**

**(Total 7 marks)**

## Sine and Cosine Rules

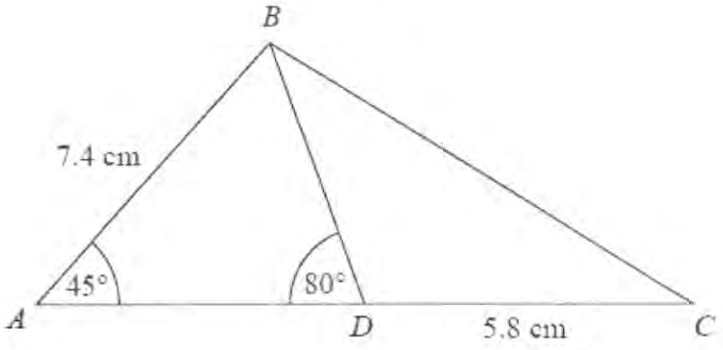
**Things to remember:**

- For any triangle ABC, $a^2 = b^2 + c^2 - 2bc\cos A$
- For any triangle ABC, $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
- For any triangle ABC, area = ½ a b sinC




**Questions:**

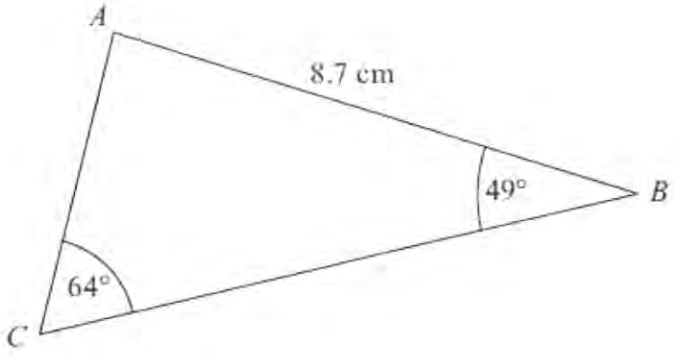
**1.** Diagram **NOT** accurately drawn
*ABC* is a triangle.
*D* is a point on *AC*.
Angle *BAD* = 45°
Angle *ADB* = 80°
*AB* = 7.4 cm
*DC* = 5.8 cm
Work out the length of *BC*.
Give your answer correct to 3 significant figures.




..... cm

**(Total for question = 5 marks)**

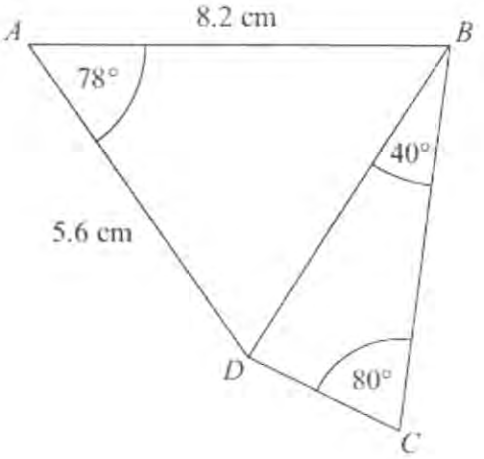
**2.** Diagram **NOT** accurately drawn
*ABC* is a triangle.
*AB* = 8.7 cm.
Angle *ABC* = 49°.
Angle *ACB* = 64°.
Calculate the area of triangle *ABC*.
Give your answer correct to 3 significant figures.




..... $cm^2$

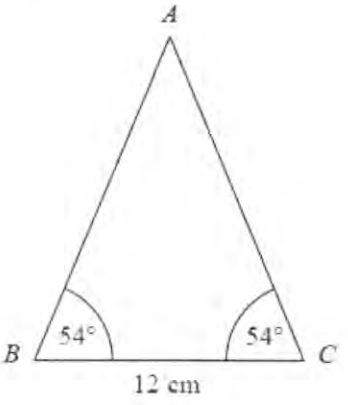
**(Total for Question is 5 marks)**

**3.** *ABCD* is a quadrilateral.
Diagram **NOT** accurately drawn
Work out the length of *DC*.
Give your answer correct to 3 significant figures.



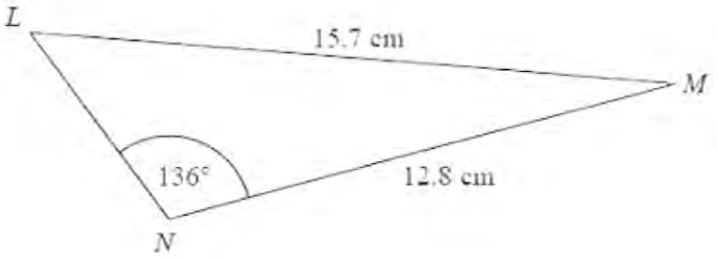

..... cm
**(Total for Question is 6 marks)**

**4.** Diagram **NOT** accurately drawn
*ABC* is an isosceles triangle.
Work out the area of the triangle.
Give your answer correct to 3 significant figures.




..... $cm^2$
**(Total for Question is 4 marks)**

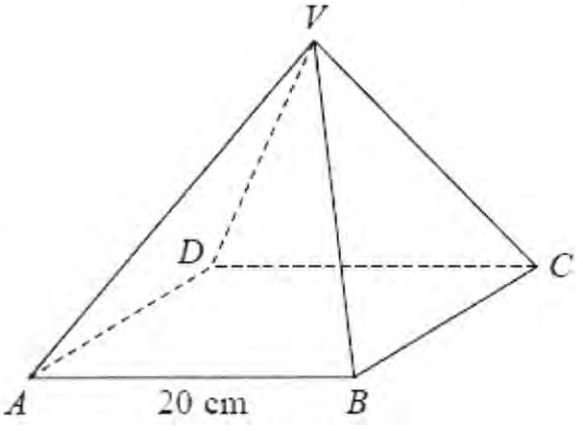
**5.** Diagram **NOT** accurately drawn
The diagram shows triangle *LMN*.
Calculate the length of *LN*.
Give your answer correct to 3 significant figures.




..... cm

**(Total for Question is 5 marks)**

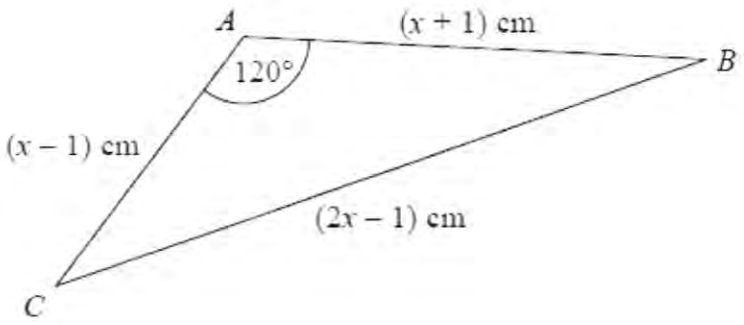
**6.** *VABCD* is a solid pyramid.
*ABCD* is a square of side 20 cm.
The angle between any sloping edge and the plane *ABCD* is 55°
Calculate the surface area of the pyramid.
Give your answer correct to 2 significant figures.




.....$cm^2$

**(Total for question = 5 marks)**

**7.** The diagram shows triangle *ABC*.
The area of triangle *ABC* is $k\sqrt{3}$ cm$^2$.
Find the exact value of *k*.

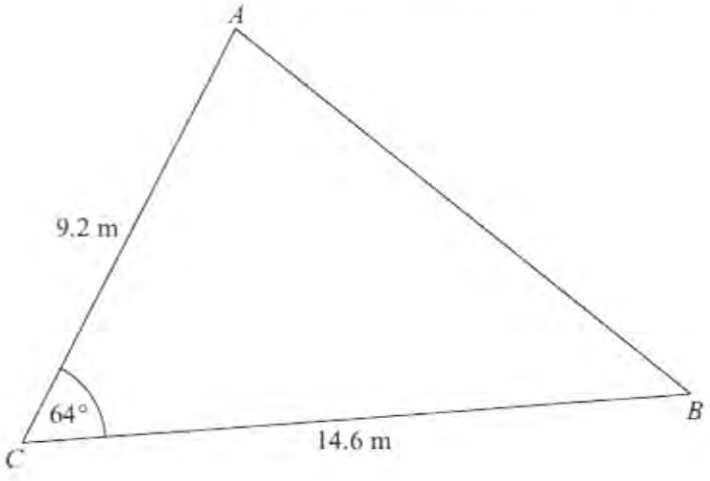



k = .....

**(Total for question = 7 marks)**

**8.** Diagram **NOT** accurately drawn
*AC* = 9.2 m
*BC* = 14.6 m
Angle *ACB* = 64°

(a) Calculate the area of the triangle *ABC*.
Give your answer correct to 3 significant figures.




..... m$^2$

**(2)**

(b) Calculate the length of *AB*.
Give your answer correct to 3 significant figures.

.....

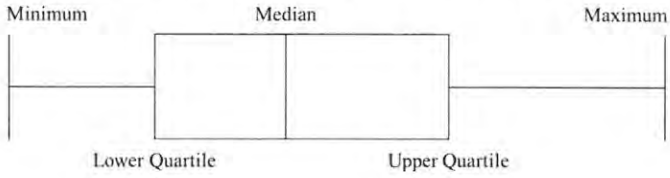
**(3)**

**(Total for Question is 5 marks)**

# Cumulative frequency and box plots

**Things to remember:**

- Use a running total – adding on to complete the cumulative frequency column;
- Plot at the end of the group;
- Join up with a smooth curve;
- To find the median find the value half way down the cumulative frequency, draw across to the line and then vertically down to find the value – always show these working lines;
- To find the interquartile range find the upper quartile and the lower quartile and subtract them.
- To draw a box plot →
- When comparing box plots, use the median and the IQR and keep words consistent with the question.




**Questions:**

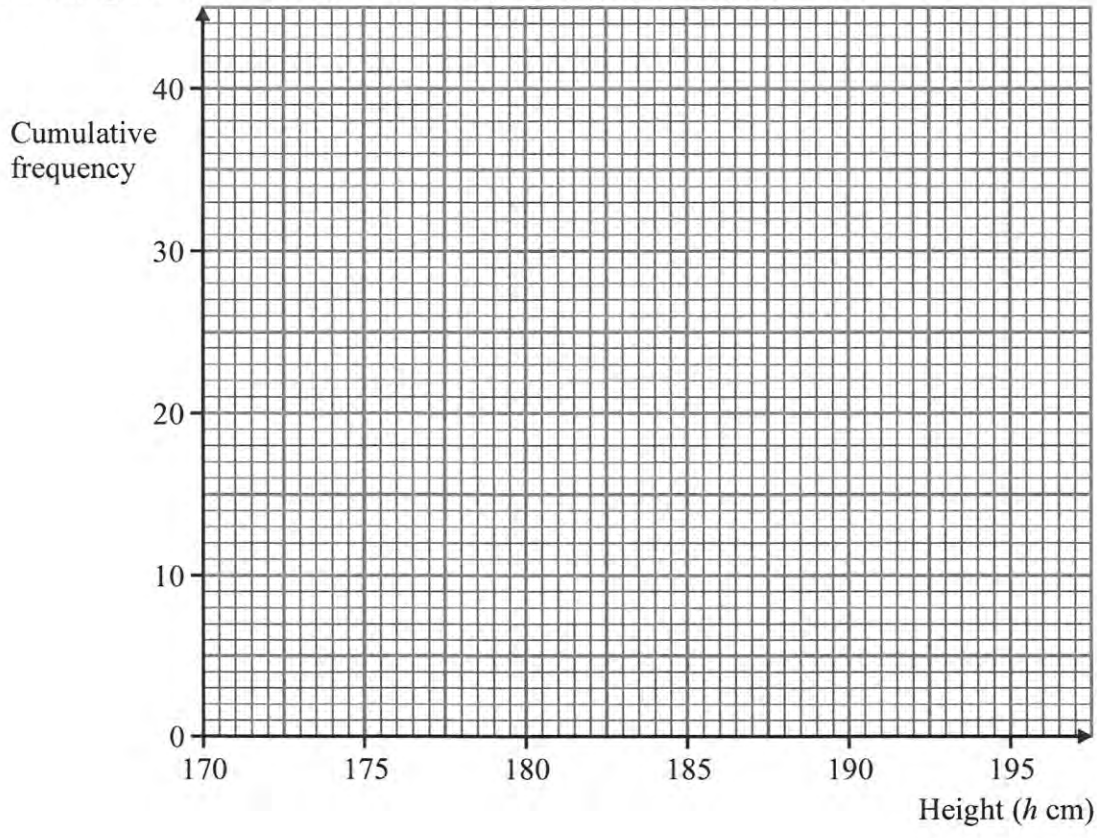
**1.** The table shows information about the heights of 40 bushes.

| Height ($h$ cm) | Frequency | Cumulative Frequency |
|---|---|---|
| $170 \leq h < 175$ | 5 | |
| $175 \leq h < 180$ | 18 | |
| $180 \leq h < 185$ | 12 | |
| $185 \leq h < 190$ | 4 | |
| $190 \leq h < 195$ | 1 | |

(a) Complete the cumulative frequency table above.

**(1)**

(b) On the grid, draw a cumulative frequency graph for your table.




**(2)**

**(Total 3 marks)**

**2.** The table gives information about the ages of 160 employees of an IT company.

| **Age ($A$) in years** | **Frequency** | **Cumulative Frequency** |
|---|---|---|
| $15 < A \leq 25$ | 44 | |
| $25 < A \leq 35$ | 56 | |
| $35 < A \leq 45$ | 34 | |
| $45 < A \leq 55$ | 19 | |
| $55 < A \leq 65$ | 7 | |

(a) Write down the modal class interval.

.....

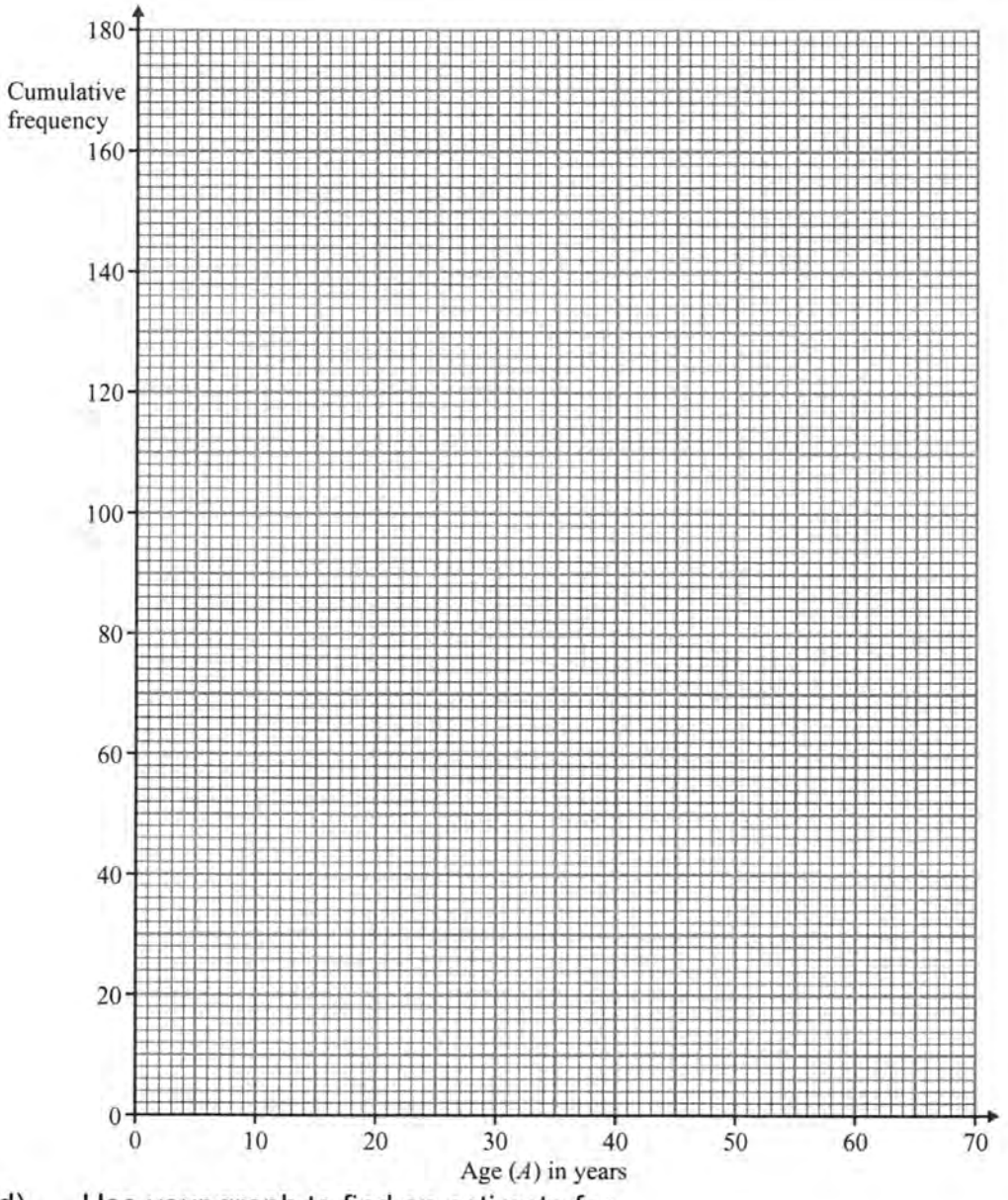
**(1)**

(b) Complete the cumulative frequency table.

**(1)**

(c) On the grid below, draw a cumulative frequency graph for your table.

**(2)**




(d) Use your graph to find an estimate for

(i) the median age of the employees,

..... years

(i) the interquartile range of the ages of the employees.

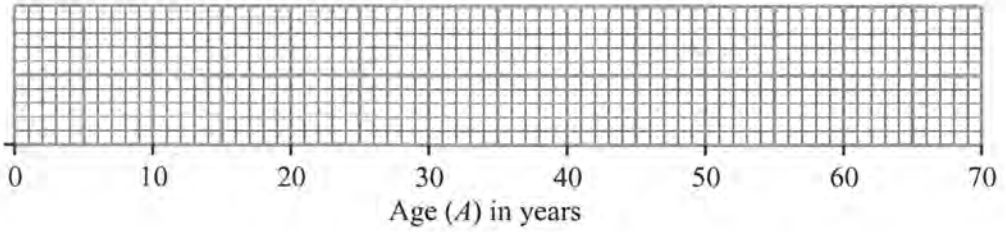
..... years

**(3)**

Another IT company has 80 employees. The age of the youngest employee is 24 years. The age of the oldest employee is 54 years. The median age is 38 years. The lower quartile age is 30 years. The upper quartile age is 44 years.

(e) On the grid below, draw a box plot to show information about the ages of the employees.

**(2)**




**(Total 9 marks)**

**3.** A company tested 100 batteries. The table shows information about the number of hours that the batteries lasted.

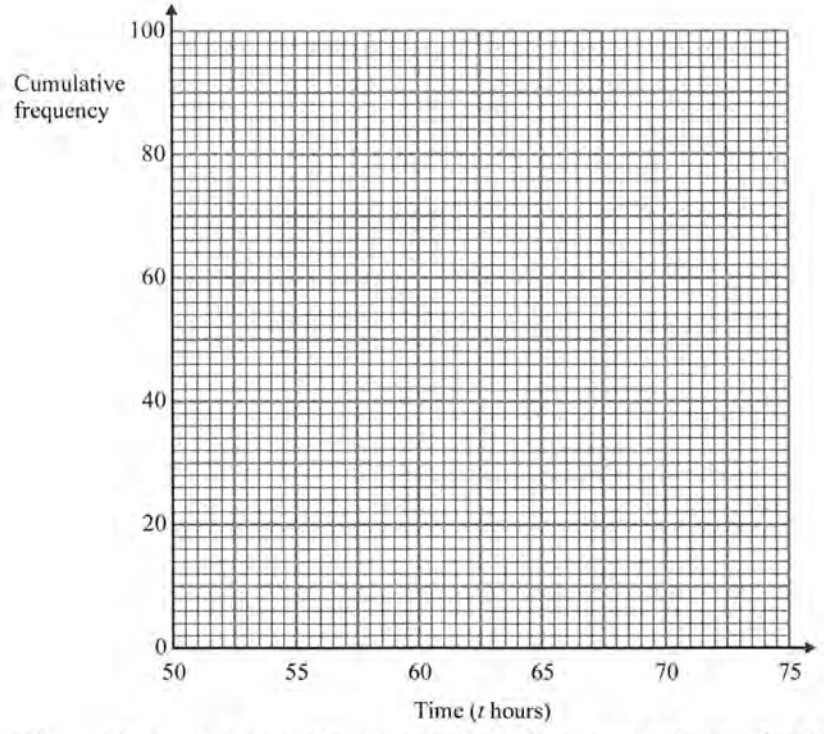
| Time ($t$ hours) | Frequency | Cumulative Frequency |
|---|---|---|
| $50 \leq t < 55$ | 12 | |
| $55 \leq t < 60$ | 21 | |
| $60 \leq t < 65$ | 36 | |
| $65 \leq t < 70$ | 23 | |
| $70 \leq t < 75$ | 8 | |

(a) Complete the cumulative frequency table for this information.

**(1)**

(b) On the grid, draw a cumulative frequency graph for your completed table.

**(2)**




(c) Use your completed graph to find an estimate for the median time. You must state the units of your answer.

.....

**(2)**

**(Total 5 marks)**

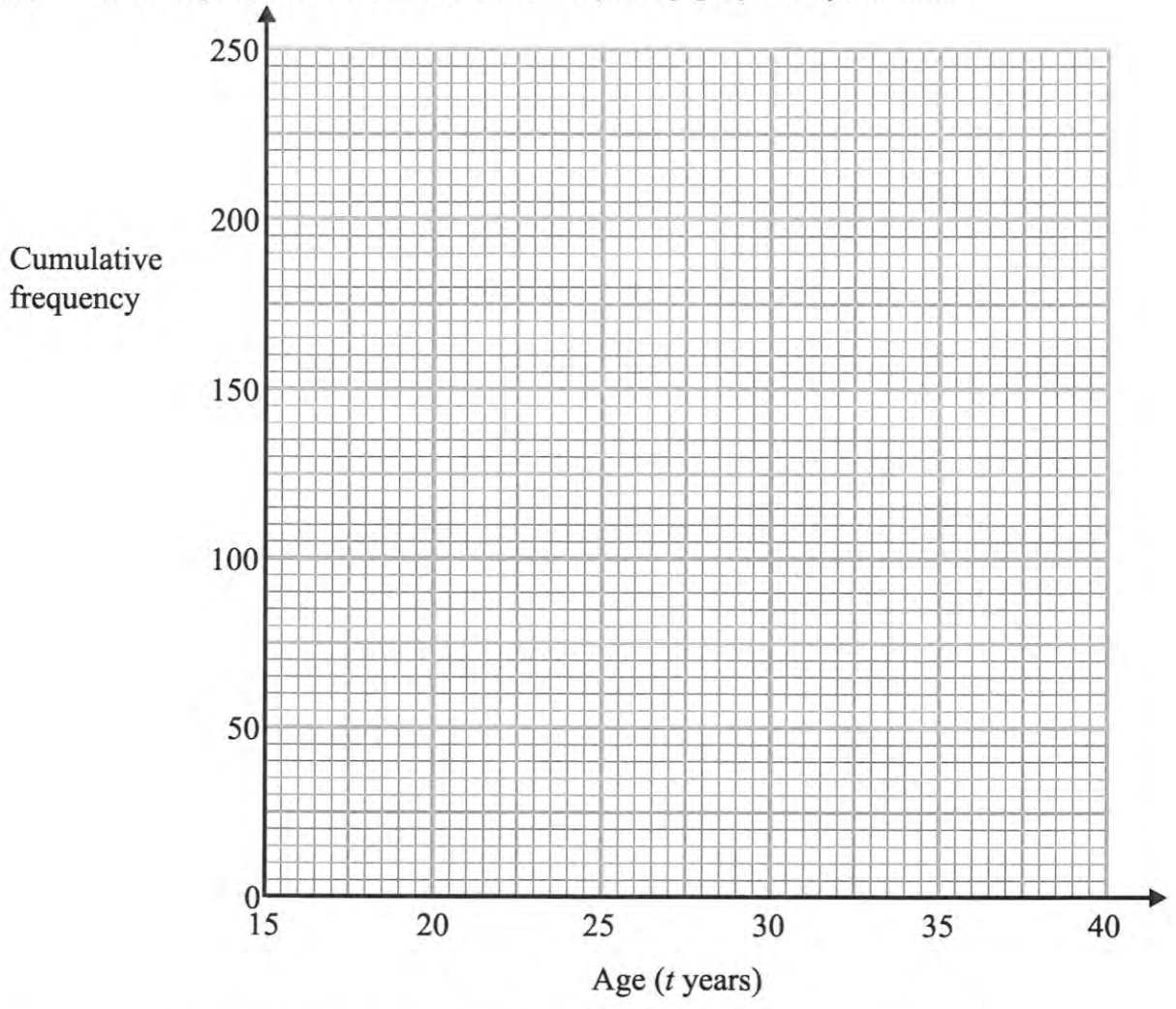
**4.** The table shows information about the ages of the 240 people at a club.

| Age ($t$ years) | Frequency | Cumulative Frequency |
|---|---|---|
| $15 \leq t < 20$ | 95 | |
| $20 \leq t < 25$ | 90 | |
| $25 \leq t < 30$ | 35 | |
| $30 \leq t < 35$ | 15 | |
| $35 \leq t < 40$ | 5 | |

(a) Complete the cumulative frequency table.

**(1)**

(b) On the grid, draw the cumulative frequency graph for your table.




**(2)**

(c) Use your graph to find an estimate for the median age of the people.

..... years

**(1)**

**(Total 4 marks)**

**5.** An operator took 100 calls at a call centre. The table gives information about the time ($t$ seconds) it took the operator to answer each call.

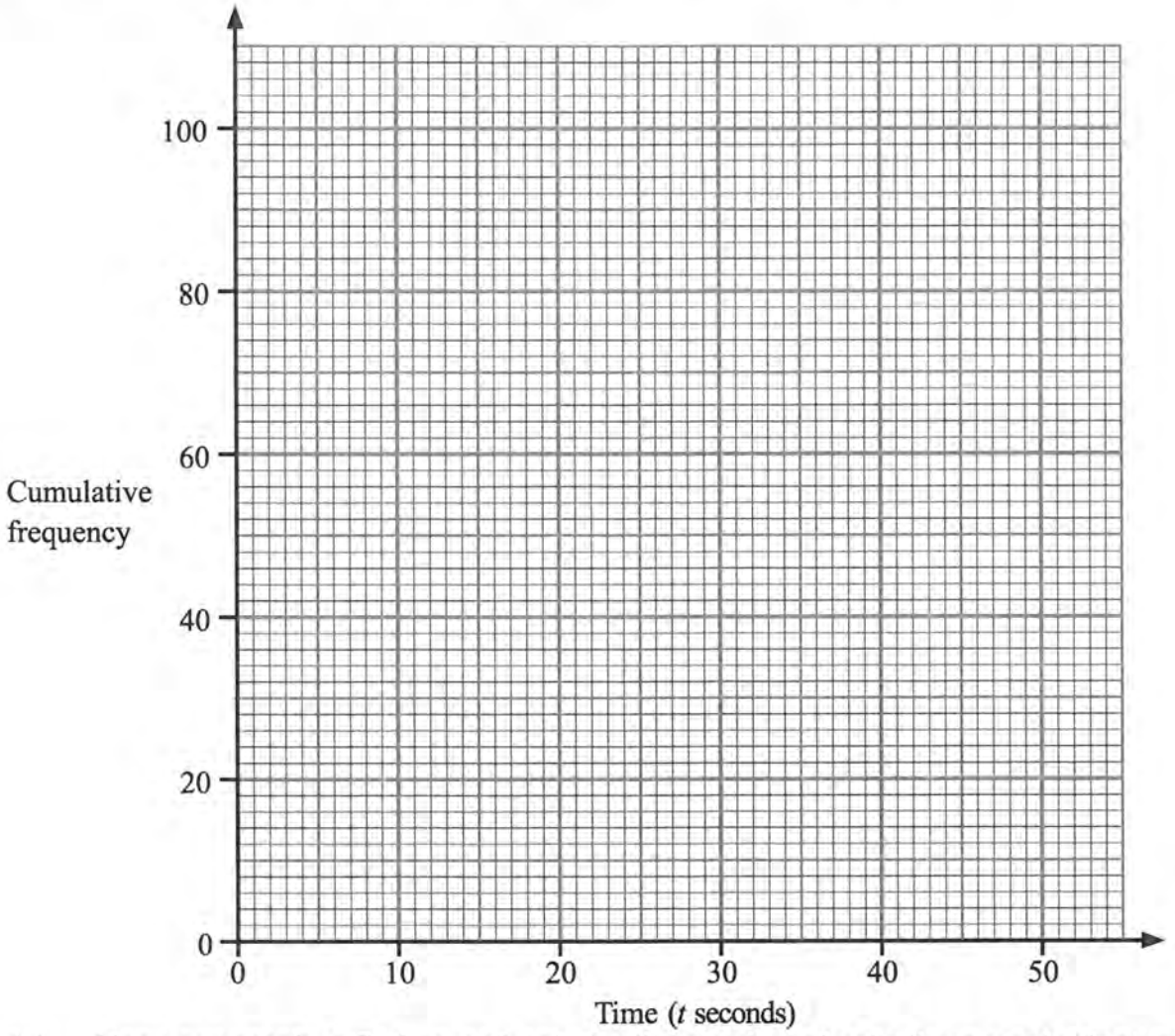
| Time ($t$ seconds) | Frequency | Cumulative Frequency |
|---|---|---|
| $0 < t \leq 10$ | 16 | |
| $10 < t \leq 20$ | 34 | |
| $20 < t \leq 30$ | 32 | |
| $30 < t \leq 40$ | 14 | |
| $40 < t \leq 50$ | 4 | |

(a) Complete the cumulative frequency table.

**(1)**

(b) On the grid, draw a cumulative frequency graph for your table.

**(2)**



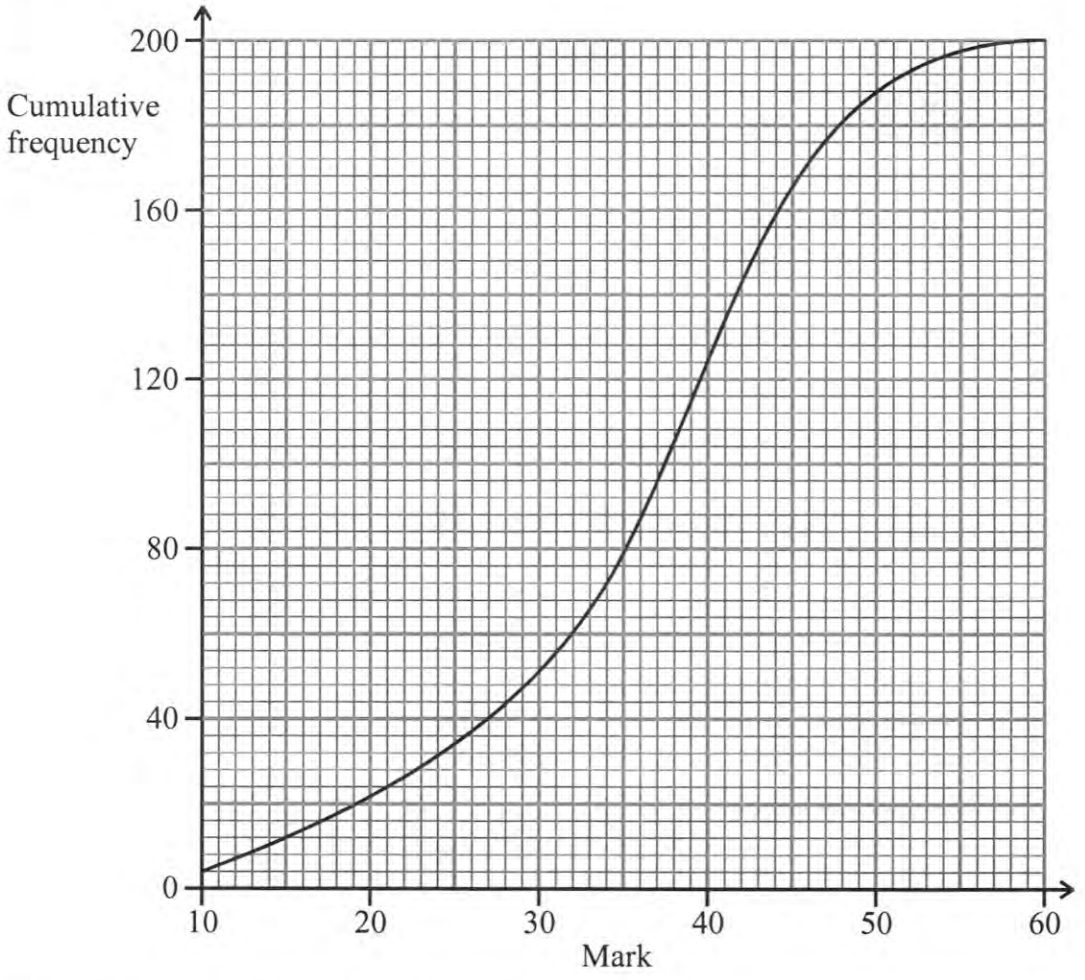

(c) Use your graph to find an estimate for the number of calls the operator took **more** than 18 seconds to answer.

.....

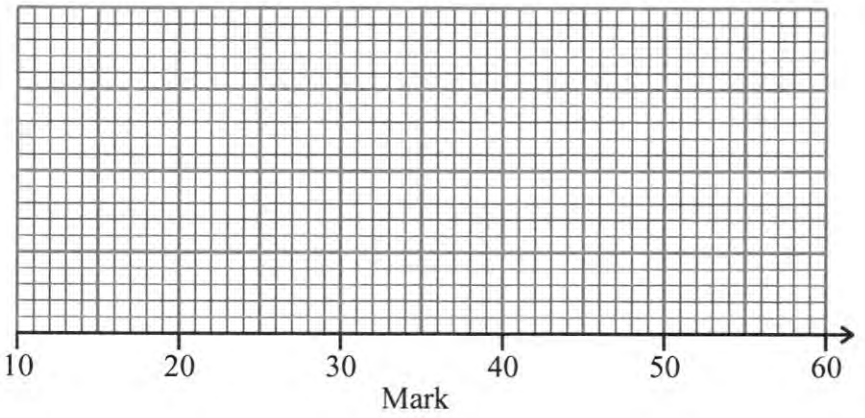
**(2)**

**(Total 5 marks)**

**6.** 200 students took a test. The cumulative frequency graph gives information about their marks.




The lowest mark scored in the test was 10.
The highest mark scored in the test was 60.
Use this information and the cumulative frequency graph to draw a box plot showing information about the students' marks.

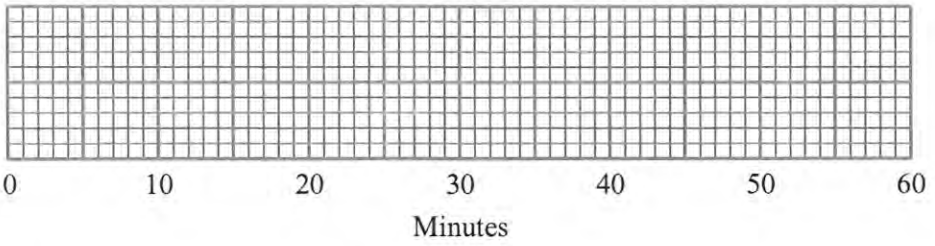



**(Total 3 marks)**

**7.** On Friday, Peter went to the airport.
He recorded the number of minutes that each plane was delayed.
He used his results to work out the information in this table.

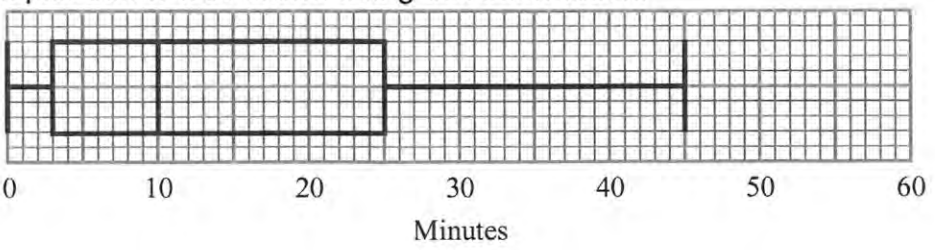
| | **Minutes** |
|---|---|
| Shortest delay | 0 |
| Lower quartile | 2 |
| Median | 8 |
| Upper quartile | 18 |
| Longest delay | 41 |

(a) On the grid, draw a box plot to show the information in the table.




**(2)**

Peter also went to the airport on Saturday.
He recorded the number of minutes that each plane was delayed.
The box plot below was drawn using this information.




(b) Make two comparisons between the distributions of plane delays on Friday and on Saturday.

.....

.....

.....

.....

**(2)**
**(Total 4 marks)**

## Histograms

**Things to remember:**

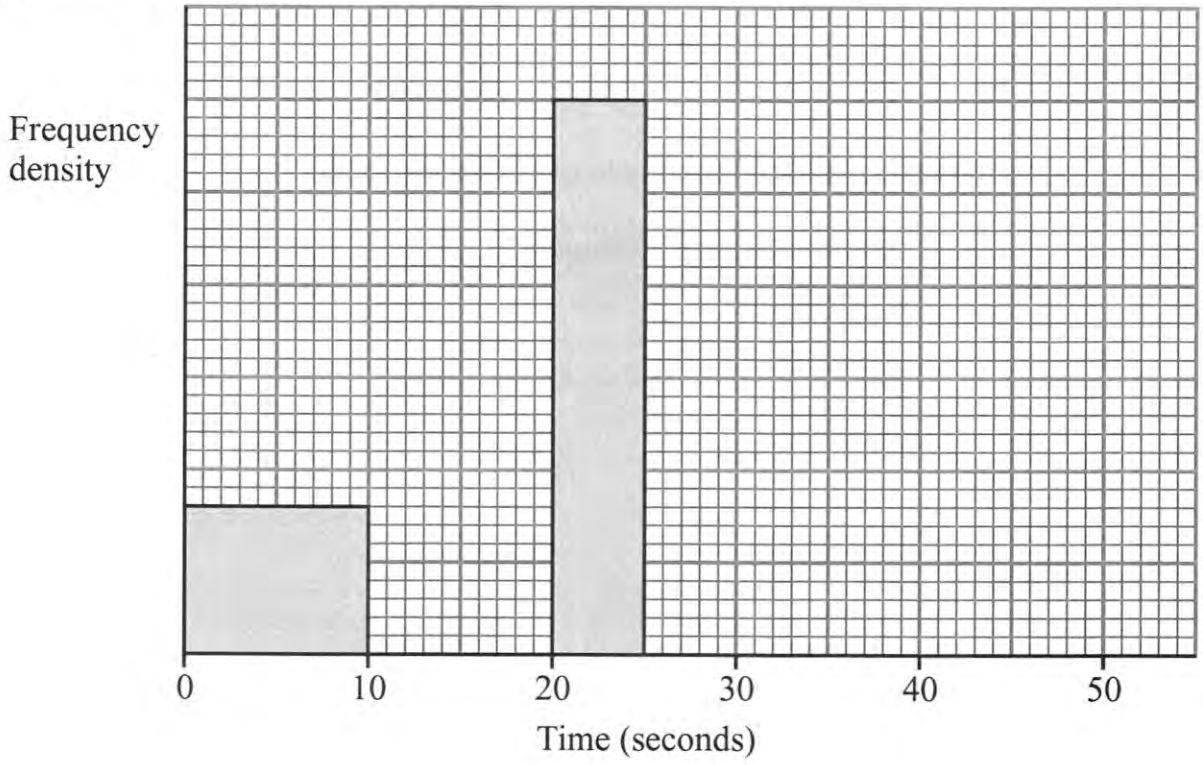
- Frequency = Frequency Density x Class Width;
- The y-axis will always be labelled "frequency density";
- The x-axis will have a continuous scale.

**Questions:**

**1.** One Monday, Victoria measured the time, in seconds, that individual birds spent on her bird table. She used this information to complete the frequency table.

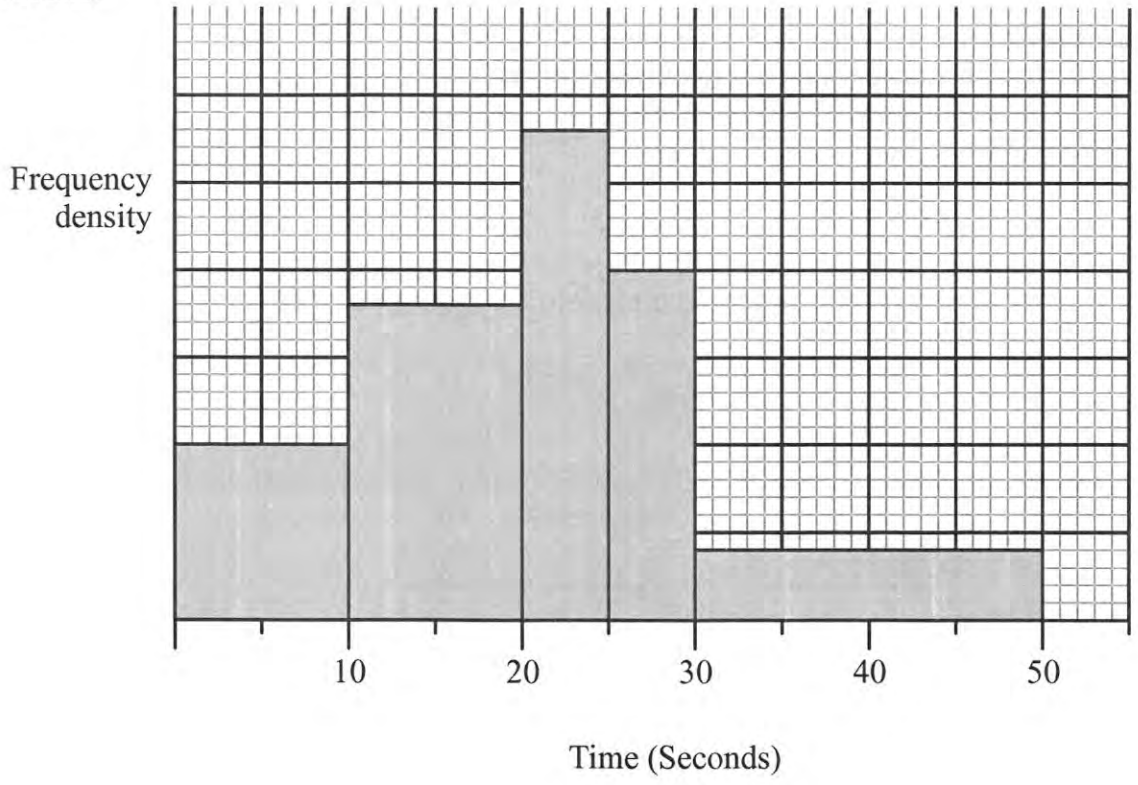
| Time ($t$ seconds) | Frequency |
|---|---|
| $0 < t \leq 10$ | 8 |
| $10 < t \leq 20$ | 16 |
| $20 < t \leq 25$ | 15 |
| $25 < t \leq 30$ | 12 |
| $30 < t \leq 50$ | 6 |

(a) Use the table to complete the histogram.




**(3)**

On Tuesday she conducted a similar survey and drew the following histogram from her results.

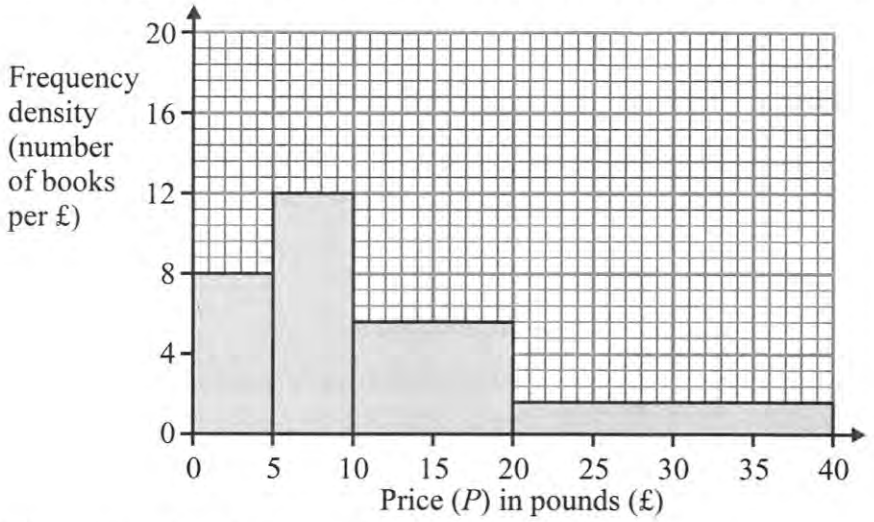



(b) Use the histogram for Tuesday to complete the table.

| Time ($t$ seconds) | Frequency |
|---|---|
| $0 < t \leq 10$ | 10 |
| $10 < t \leq 20$ | |
| $20 < t \leq 25$ | |
| $25 < t \leq 30$ | |
| $30 < t \leq 50$ | |

**(2)**
**(Total 5 marks)**

**2.** This histogram gives information about the books sold in a bookshop one Saturday.




(a) Use the histogram to complete the table.

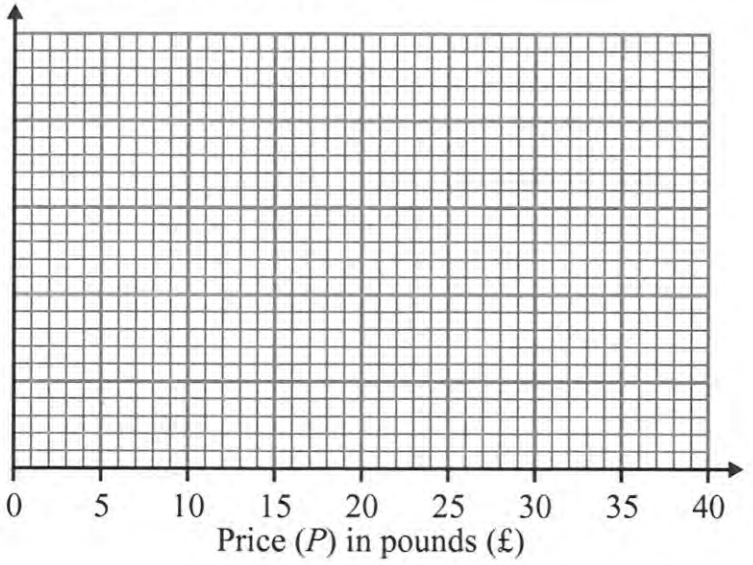
| **Price (*P*) in pounds (£)** | **Frequency** |
|---|---|
| $0 < P \leq 5$ | |
| $5 < P \leq 10$ | |
| $10 < P \leq 20$ | |
| $20 < P \leq 40$ | |

**(2)**

The frequency table below gives information about the books sold in a second bookshop on the same Saturday.

| **Price (*P*) in pounds (£)** | **Frequency** |
|---|---|
| $0 < P \leq 5$ | 80 |
| $5 < P \leq 10$ | 20 |
| $10 < P \leq 20$ | 24 |
| $20 < P \leq 40$ | 96 |

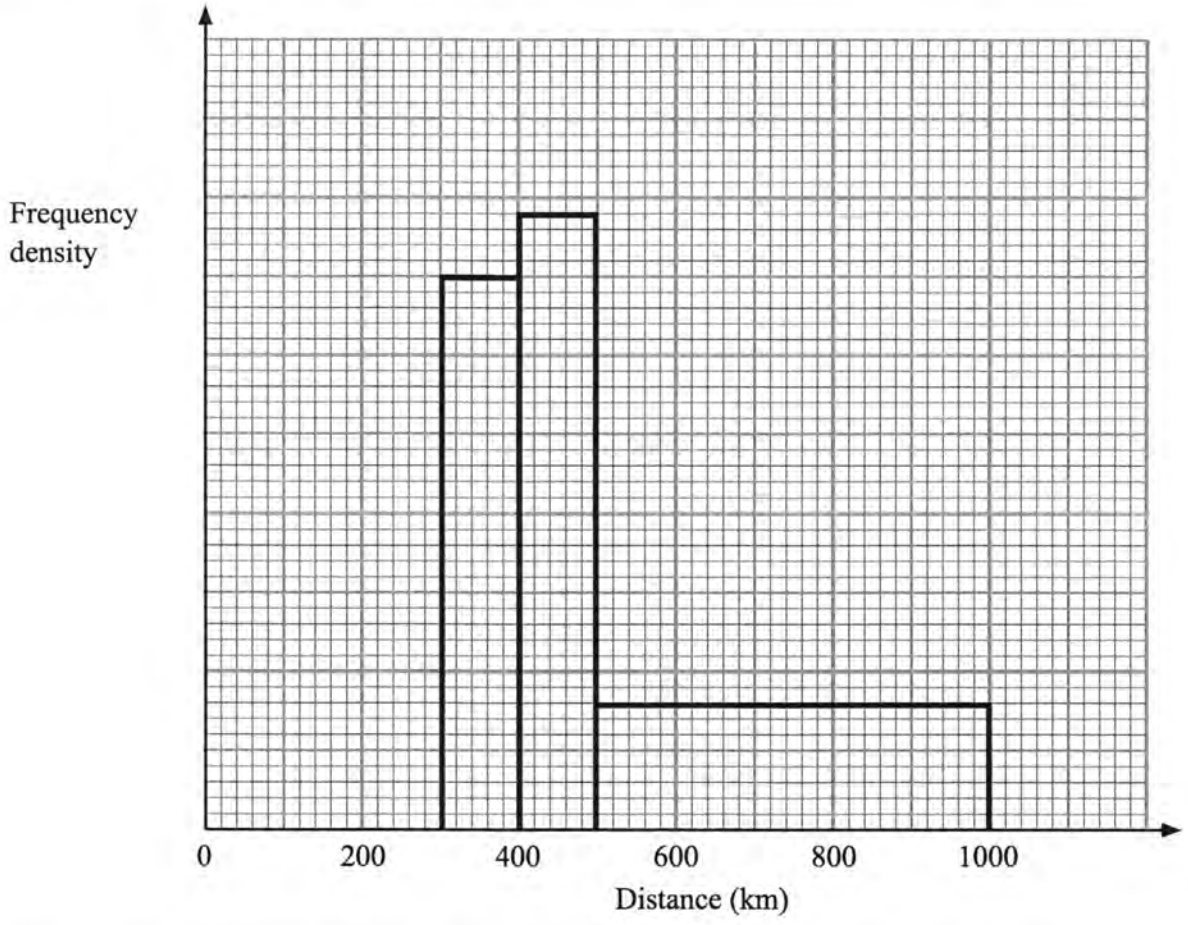
(b) On the grid below, draw a histogram to represent the information about the books sold in the second bookshop.




**(3)**

**(Total 5 marks)**

**3.** The incomplete table and histogram give some information about the distances walked by some students in a school in one year.




(a) Use the information in the histogram to complete the frequency table.

| Distance (d) in km | Frequency |
|---|---|
| $0 < d \leq 300$ | 210 |
| $300 < d \leq 400$ | 350 |
| $400 < d \leq 500$ | |
| $500 < d \leq 1000$ | |

**(2)**

(b) Use the information in the table to complete the histogram.

**(1)**

**(Total 3 marks)**

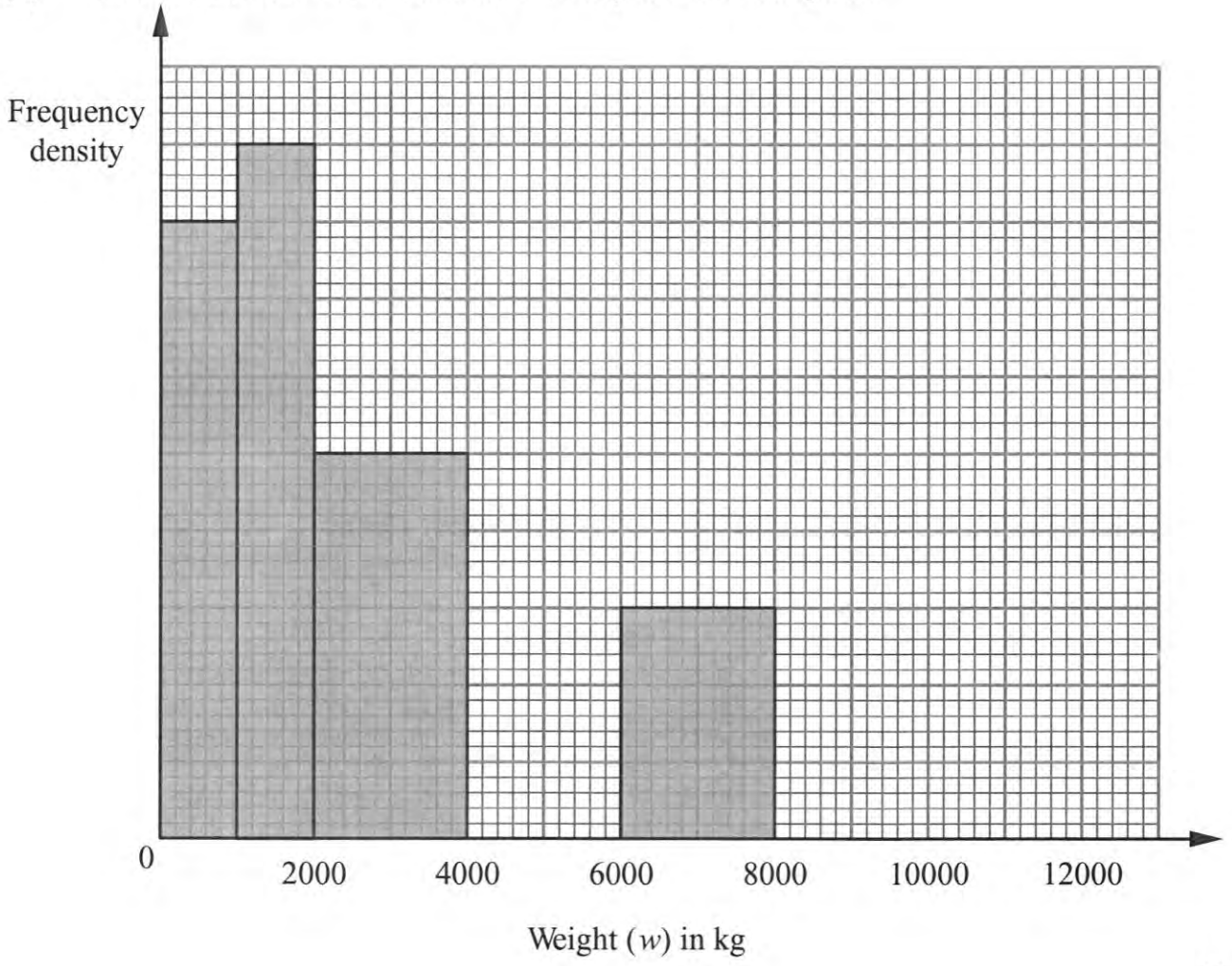
**4.** The incomplete histogram and table show information about the weights of some containers.

| Weight ($w$) in kg | Frequency |
|---|---|
| $0 < w \leq 1000$ | 16 |
| $1000 < w \leq 2000$ | |
| $2000 < w \leq 4000$ | |
| $4000 < w \leq 6000$ | 16 |
| $6000 < w \leq 8000$ | |
| $8000 < w \leq 12000$ | 8 |

(a) Use the information in the histogram to complete the table.

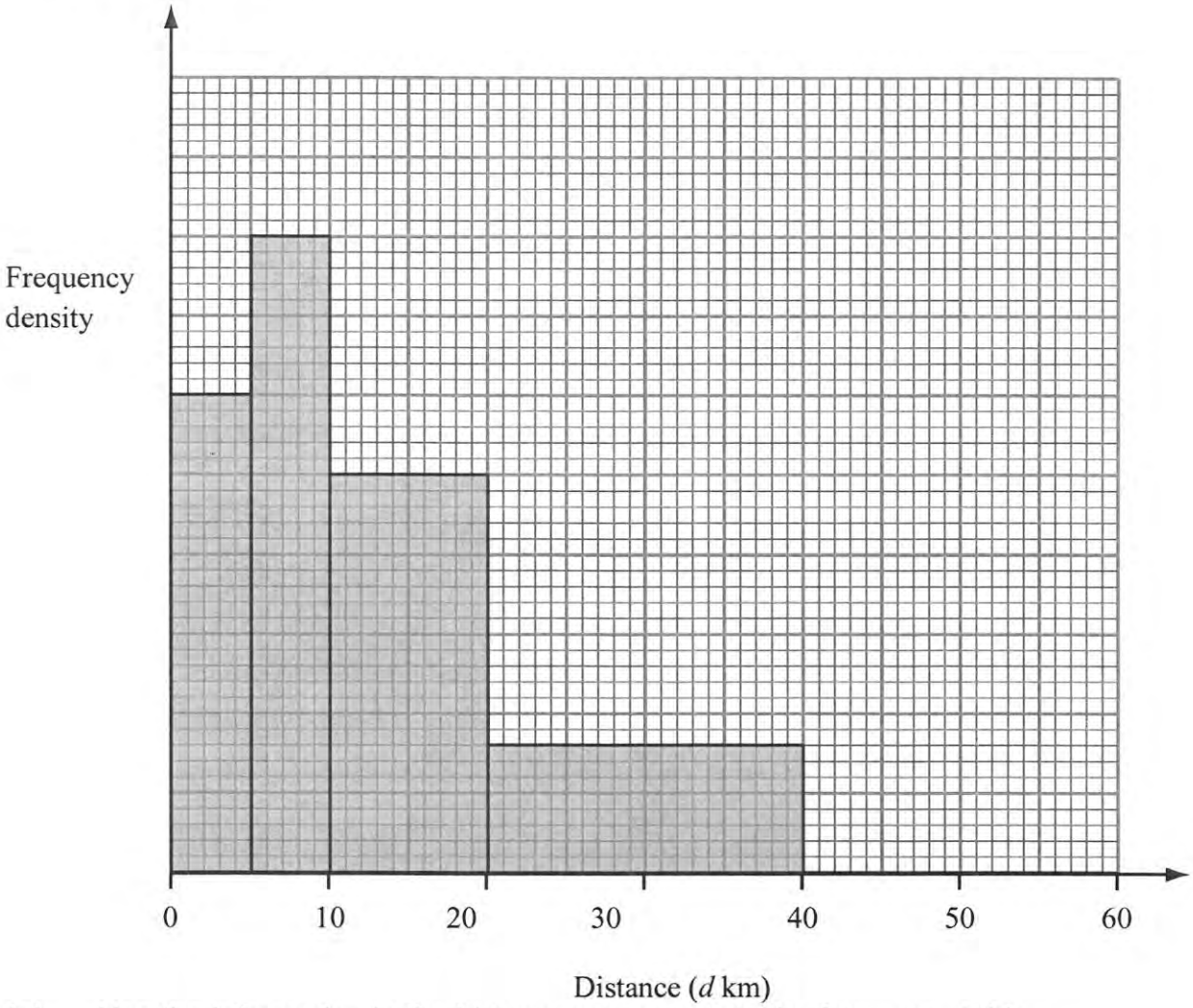
**(2)**

(b) Use the information in the table to complete the histogram.




**(2)**
**(Total 4 marks)**

**5.** The incomplete histogram and table give some information about the distances some teachers travel to school.




(a) Use the information in the histogram to complete the frequency table.

| Distance ($d$km) | Frequency |
|---|---|
| $0 < d \leq 5$ | 15 |
| $5 < d \leq 10$ | 20 |
| $10 < d \leq 20$ | |
| $20 < d \leq 40$ | |
| $40 < d \leq 60$ | 10 |

**(2)**

(b) Use the information in the table to complete the histogram.

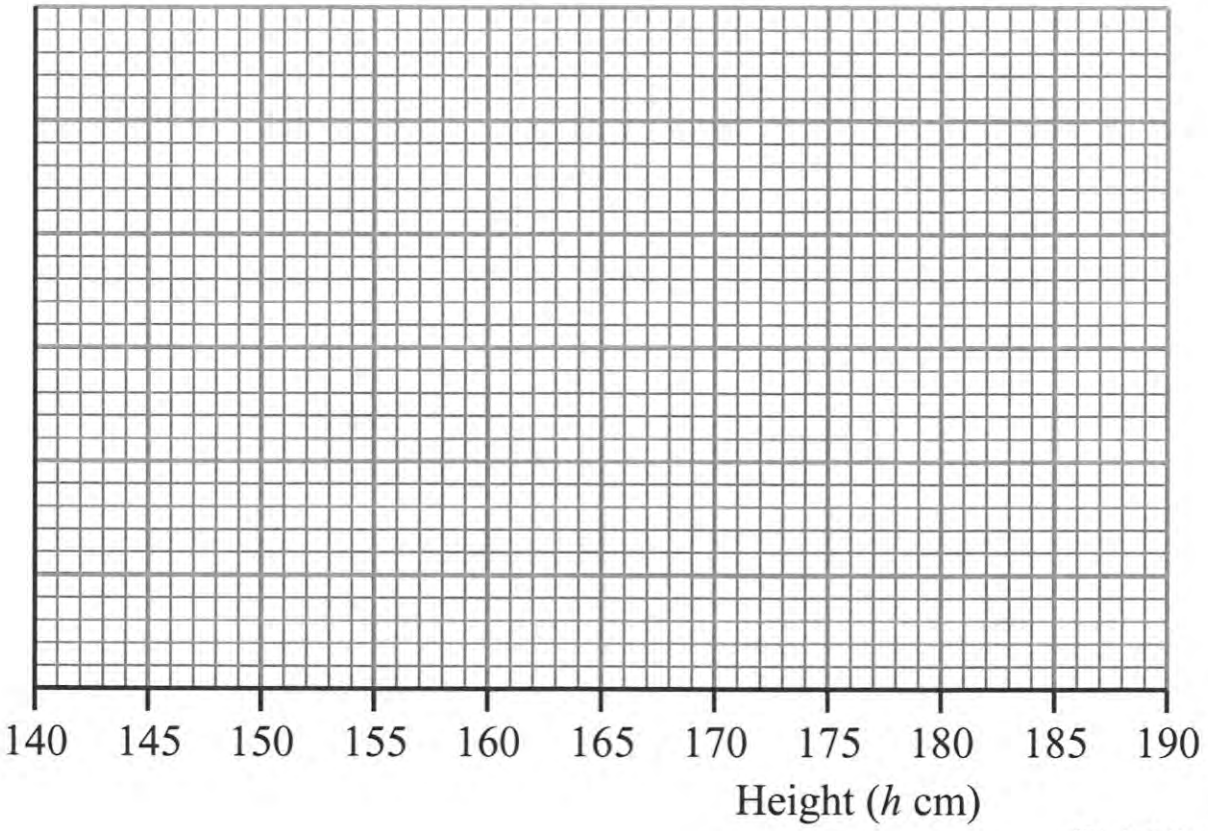
**(1)**

**(Total 3 marks)**

**6.** The table gives information about the heights, in centimetres, of some 15 year old students.

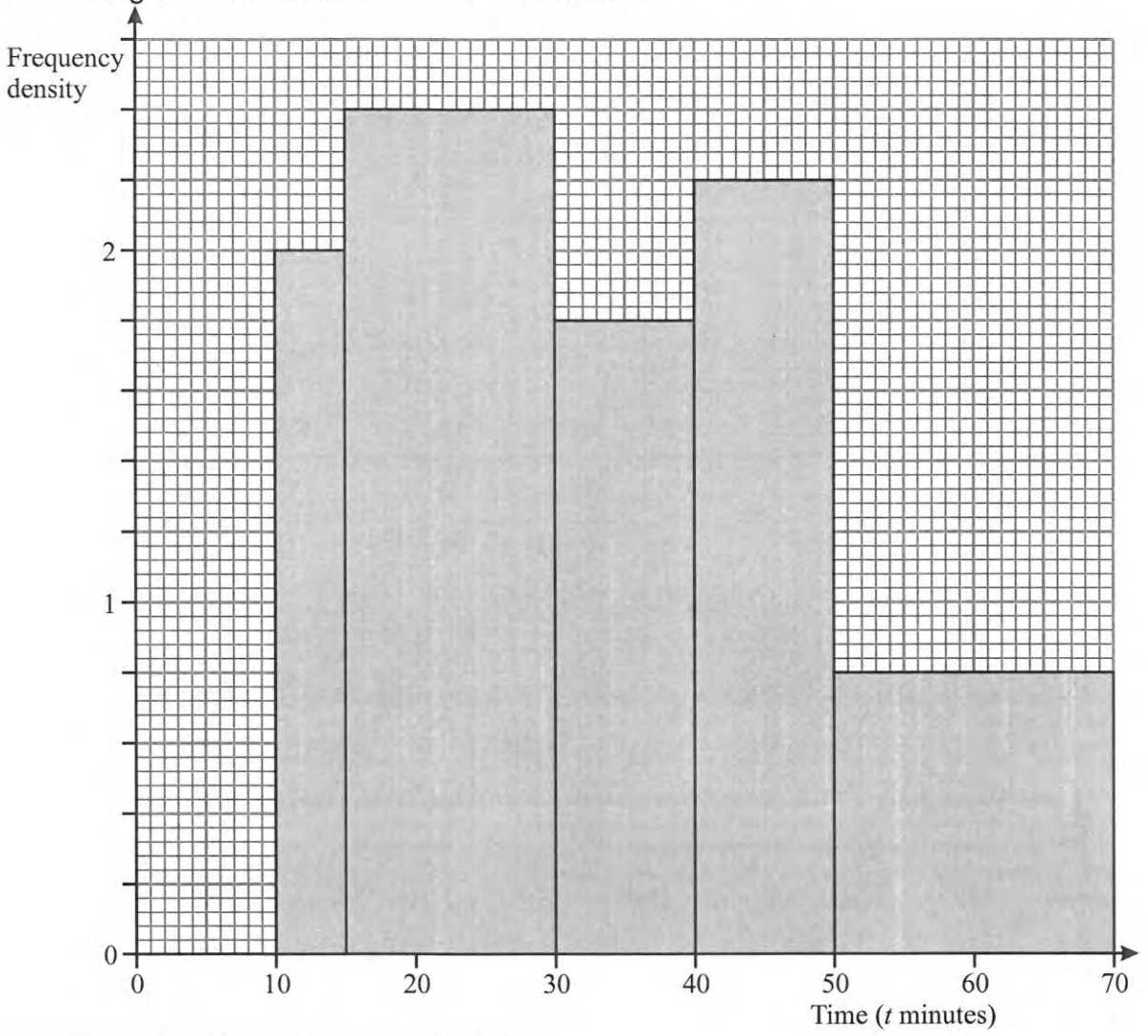
| Height ($h$ cm) | $145 < h \leq 155$ | $155 < h \leq 175$ | $175 < h \leq 190$ |
|---|---|---|---|
| Frequency | 10 | 80 | 24 |

Use the table to draw a histogram.




**(Total 3 marks)**

**7.** A teacher asked some year 10 students how long they spent doing homework each night. The histogram was drawn from this information.



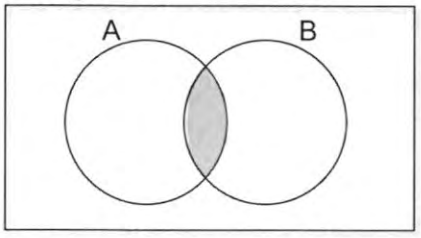

Use the histogram to complete the table.

| Time ($t$ minutes) | Frequency |
|---|---|
| $10 \leq t < 15$ | 10 |
| $15 \leq t < 30$ | |
| $30 \leq t < 40$ | |
| $40 \leq t < 50$ | |
| $50 \leq t < 70$ | |

**(Total 2 marks)**

## Set Theory

**Things to remember:**

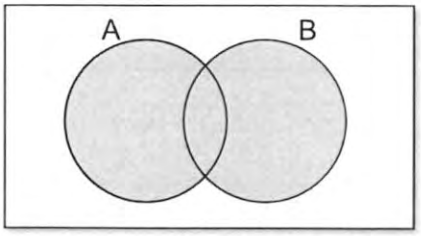



The **intersection** is where two sets overlap.

$A \cap B$

This means **A and B**.

AND rule

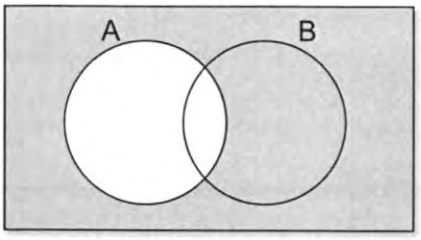



If you put two sets together, you get the **union**.

$A \cup B$

This means **A or B**.

OR rule




The **complement of A** is the region that is not A.

$A'$

This means **not A**.

**Questions:**

**1.**

$\mathscr{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{multiples of } 2\}$

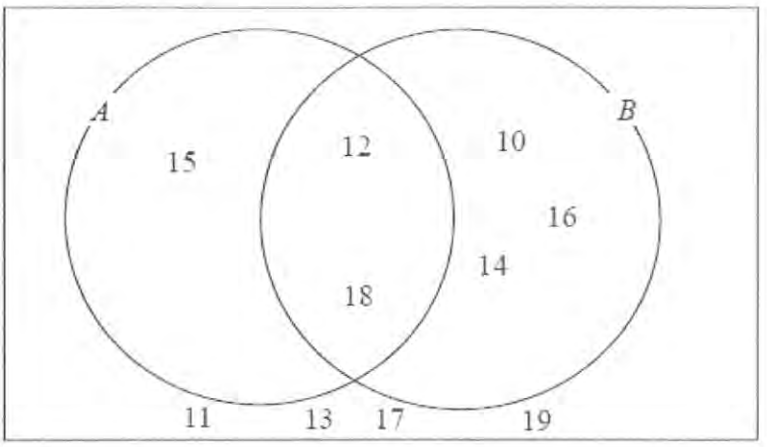
$A \cap B = \{2, 6\}$

$A \cup B = \{1, 2, 3, 4, 6, 8, 9, 10\}$

Draw a Venn diagram for this information.

**(Total for question is 4 marks)**

**2.** Here is a Venn diagram.




(a) Write down the numbers that are in set

(i) $A \cup B$

.....

(ii) $A \cap B$

.....

**(2)**

One of the numbers in the diagram is chosen at random.

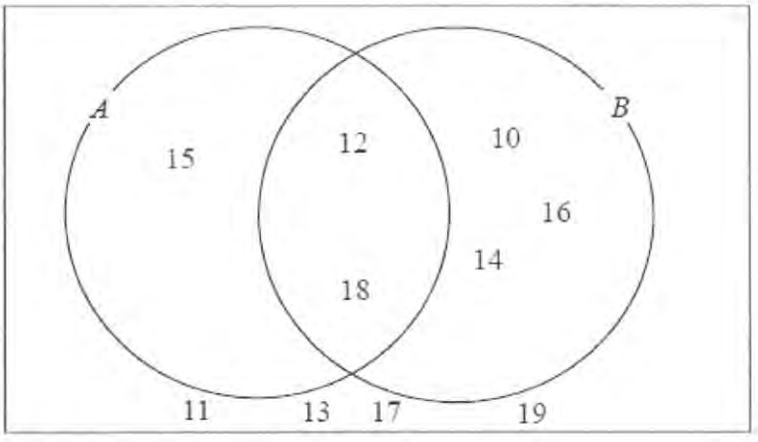
(b) Find the probability that the number is in set $A'$

.....

**(2)**

**(Total for question = 4 marks)**

**3.** Here is a Venn diagram.




(a) Write down the numbers that are in set

(i) $A \cup B$

.....

(ii) $A \cap B$

.....

**(2)**

One of the numbers in the diagram is chosen at random.

(b) Find the probability that the number is in set $A'$

.....

**(2)**

**(Total for question = 4 marks)**

**4.** Sami asked 50 people which drinks they liked from tea, coffee and milk.
All 50 people like at least one of the drinks
19 people like all three drinks.
16 people like tea and coffee but do not like milk.
21 people like coffee and milk.
24 people like tea and milk.
40 people like coffee.
1 person likes only milk.
Sami selects at random one of the 50 people.

(a) Work out the probability that this person likes tea.

.....

**(4)**

(b) Given that the person selected at random from the 50 people likes tea, find the probability that this person also likes exactly one other drink.

.....

**(2)**

**(Total for question = 6 marks)**

## Proportion

**Things to remember:**

- Start by checking the question for squares, cubes and roots;
- "x is directly proportional to y" looks like $\mathbf{x \propto y}$ or $\mathbf{x = ky}$
- "x is inversely proportional to y" looks like $\mathbf{x \propto \frac{1}{y}}$ or $\mathbf{x = \frac{k}{y}}$

**Questions:**

**1.** The shutter speed, $S$, of a camera varies inversely as the square of the aperture setting, $f$.
When $f = 8$, $S = 125$

(a) Find a formula for $S$ in terms of $f$.

.....

**(3)**

(b) Hence, or otherwise, calculate the value of $S$ when $f = 4$

$S =$ .....

**(1)**

**(Total 4 marks)**

**2.** In a factory, chemical reactions are carried out in spherical containers.
The time, $T$ minutes, the chemical reaction takes is directly proportional to the square of the radius, $R$ cm, of the spherical container.
When $R = 120$, $T = 32$
Find the value of $T$ when $R = 150$

$T =$ .....

**(Total 4 marks)**

**3.** $d$ is directly proportional to the square of $t$.
$d = 80$ when $t = 4$

(a) Express $d$ in terms of $t$.

.....

**(3)**

(b) Work out the value of $d$ when $t = 7$

$d =$ .....

**(1)**

(c) Work out the positive value of $t$ when $d = 45$

$t =$ .....

**(2)**

**(Total 6 marks)**

**4.** The distance, $D$, travelled by a particle is directly proportional to the square of the time, $t$, taken. When $t = 40$, $D = 30$

(a) Find a formula for $D$ in terms of $t$.

$D =$ .....

**(3)**

(b) Calculate the value of $D$ when $t = 64$

.....

**(1)**

(c) Calculate the value of $t$ when $D = 12$
Give your answer correct to 3 significant figures.

.....

**(2)**

**(Total 6 marks)**

**5.** The time, $T$ seconds, it takes a water heater to boil some water is directly proportional to the mass of water, $m$ kg, in the water heater. When $m = 250$, $T = 600$

(a) Find T when $m = 400$

$T =$ .....

**(3)**

The time, $T$ seconds, it takes a water heater to boil a constant mass of water is inversely proportional to the power, $P$ watts, of the water heater.
When $P = 1400$, $T = 360$

(b) Find the value of $T$ when $P = 900$

$T =$ .....

**(3)**

**(Total 6 marks)**

**6.** A ball falls vertically after being dropped.
The ball falls a distance $d$ metres in a time of $t$ seconds.
$d$ is directly proportional to the square of $t$.
The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for $d$ in terms of $t$.

$d =$ .....

**(3)**

(b) Calculate the distance the ball falls in 3 seconds.

..... m

**(1)**

(c) Calculate the time the ball takes to fall 605 m.

..... seconds

**(3)**

**(Total 7 marks)**

**7.** In a spring, the tension ($T$ newtons) is directly proportional to its extension ($x$ cm). When the tension is 150 newtons, the extension is 6 cm.

(a) Find a formula for $T$ in terms of $x$.

$T =$ .....

**(3)**

(b) Calculate the tension, in newtons, when the extension is 15 cm.

.....newtons

**(1)**

(c) Calculate the extension, in cm, when the tension is 600 newtons.

.....cm

**(1)**

**(Total 5 marks)**

**8.** $f$ is inversely proportional to $d$.
When $d = 50$, $f = 256$
Find the value of $f$ when $d = 80$

$f =$ .....

**(Total 3 marks)**

## Percentages – compound interest

**Things to remember:**

- New amount = original amount x multiplier$^n$ ← Number of years

**Questions:**

**1.** Henry invests £4500 at a compound interest rate of 5% per annum.
At the end of *n* complete years the investment has grown to £5469.78.
Find the value of *n*.

.....

**(Total 2 marks)**

**2.** Bill buys a new machine.
The value of the machine depreciates by 20% each year.

(a) Bill says 'after 5 years the machine will have no value'.
Bill is **wrong.** Explain why.

.....

.....

.....

**(1)**

Bill wants to work out the value of the machine after 2 years.

(b) By what single decimal number should Bill multiply the value of the machine when new?

.....

**(2)**

**(Total 3 marks)**

**3.** Gwen bought a new car. Each year, the value of her car depreciated by 9%.
Calculate the number of years after which the value of her car was 47% of its value when new.

.....

**(Total 3 marks)**

**4.** The value of a car depreciates by 35% each year.
At the end of 2007 the value of the car was £5460
Work out the value of the car at the end of 2006

£ .....

**(Total 3 marks)**

**5.** Toby invested £4500 for 2 years in a savings account.
He was paid 4% per annum compound interest.
(a) How much did Toby have in his savings account after 2 years?

£ .....

**(3)**

Jaspir invested £2400 for *n* years in a savings account.
He was paid 7.5% per annum compound interest.
At the end of the *n* years he had £3445.51 in the savings account.
(a) Work out the value of *n*.

.....

**(2)**
**(Total 5 marks)**

**6.** Mario invests £2000 for 3 years at 5% per annum **compound** interest.
Calculate the value of the investment at the end of 3 years.

£ .....

**(Total 3 marks)**

**7.** Toby invested £4500 for 2 years in a savings account.
He was paid 4% per annum compound interest.
How much did Toby have in his savings account after 2 years?

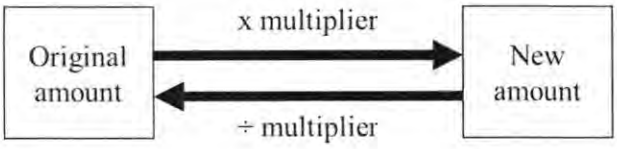
£ .....

**(Total 3 marks)**

## Percentages – reverse

**Things to remember:**

- Work out what the multiplier would have been;




**Questions:**

**1.** Loft insulation reduces annual heating costs by 20%.
**After** he insulated his loft, Curtley's annual heating cost was £520.
Work out Curtley's annual heating cost would have been, if he had not insulated his loft.

£ .....
**(Total 3 marks)**

**2.** In a sale, normal prices are reduced by 20%.

SALE - 20% OFF

Andrew bought a saddle for his horse in the sale.
The sale price of the saddle was £220.
Calculate the normal price of the saddle.

£ .....
**(Total 3 marks)**

**3.** Hajra's weekly pay this year is £240
This is 20% more than her weekly pay last year.
Bill says 'This means Hajra's weekly pay last year was £192'.
Bill is wrong,

(a) Explain why.

.....

.....
**(1)**

(b) Work out Hajra's weekly pay last year.

£ .....
**(2)**
**(Total 3 marks)**

**4.** The price of all rail season tickets to London increased by 4%.

(a) The price of a rail season ticket from Cambridge to London increased by £121.60
Work out the price before this increase.

£ .....

**(2)**

(b) After the increase, the price of a rail season ticket from Brighton to London was £2828.80
Work out the price before this increase.

£ .....

**(3)**

**(Total 5 marks)**

**5.** In a sale, normal prices are reduced by 25%.
The sale price of a saw is £12.75
Calculate the normal price of the saw.

£ .....

**(Total 3 marks)**

**6.** In a sale, normal prices are reduced by 12%.
The sale price of a DVD player is £242.
Work out the normal price of the DVD player.

£ .....

**(Total 3 marks)**

**7.** A garage sells cars.
It offers a discount of 20% off the normal price for cash.
Dave pays £5200 cash for a car.
Calculate the normal price of the car.

£ .....

**(Total 3 marks)**

# Useful websites:

**www.mathswatchvle.com**

*(Video explanations and questions)*

Centre ID: twgash

Username: firstname

Password: lastname

**www.methodmaths.com**

*(Past papers online that get instantly marked)*

Centre ID: wga

Username: firstname

Password: lastname

**www.hegartymaths.com**

*(Online tutorials and quizzes)*

Login: first name and last name are backwards and case sensitive

**www.bbc.co.uk/schools/gcsebitesize/maths**

Remember: Do your best; it is all you can do ☺

# 10P2, 10P3, 10Q2 & 10Q3

Name: _____

# Contents

## HCF and LCM

**Things to remember:**

- A factor is a whole number that divides exactly into another number.
- A multiple is a number that may be divided by another a certain number of times without a remainder.
- A prime number only has 2 factors – 1 and itself.
- HCF is an abbreviation of Highest Common Factor and LCM of Lowest Common Multiple.

**Questions:**

**1.** Tom and Amy set the alarms on their phones to sound at 6.45 am.
Both alarms sound together at 6.45 am.
Tom's alarm then sounds every 9 minutes.
Amy's alarm then sounds every 12 minutes.
At what time will both alarms next sound together?

.....

**(Total for question = 3 marks)**

**2.** Caroline is making some table decorations.
Each decoration is made from a candle and a holder.
Caroline buys some candles and some holders each in packs.
There are 30 candles in a pack of candles.
There are 18 holders in a pack of holders.
Caroline buys exactly the same number of candles and holders.

(i) How many packs of candles and how many packs of holders does Caroline buy?

candle and holder

..... packs of candles

..... packs of holders

Caroline uses all her candles and all her holders.

(ii) How many table decorations does Caroline make?

..... table decorations

**(Total for question = 5 marks)**

3. Buses to Acton leave a bus station every 24 minutes.
Buses to Barton leave the same bus station every 20 minutes.
A bus to Acton and a bus to Barton both leave the bus station at 9 00 am.
When will a bus to Acton and a bus to Barton next leave the bus station at the same time?

.....

**(Total for Question is 3 marks)**

4. Rita is going to make some cheeseburgers for a party.
She buys some packets of cheese slices and some boxes of burgers.
There are 20 cheese slices in each packet.
There are 12 burgers in each box.
Rita buys exactly the same number of cheese slices and burgers.

(i) How many packets of cheese slices and how many boxes of burgers does she buy?

..... packets of cheese slices

..... boxes of burgers

Rita wants to put one cheese slice and one burger into each bread roll.
She wants to use all the cheese slices and all the burgers.

(ii) How many bread rolls does Rita need?

..... bread rolls

**(Total for Question is 4 marks)**

**5.** Veena bought some food for a barbecue.
She is going to make some hot dogs.
She needs a bread roll and a sausage for each hot dog.
There are 40 bread rolls in a pack.
There are 24 sausages in a pack.
Veena bought exactly the same number of bread rolls and sausages.

(i) How many packs of bread rolls and packs of sausages did she buy?

..... packs of bread rolls

..... packs of sausages.

(ii) How many hot dogs can she make?

.....

**(Total for Question is 5 marks)**

**6.** Find the highest common factor (HCF) of 32, 48 and 72

.....

**(Total for question = 2 marks)**

**7.** Write 504 as a product of powers of its prime factors.

.....

**(Total for question = 3 marks)**

**8.** John buys some boxes of pencils and some packets of pens for people to use at a conference.
There are 40 pencils in a box.
There are 15 pens in a packet.
John gives one pencil and one pen to each person at the conference.
He has no pencils left.
He has no pens left.
How many boxes of pencils and how many packets of pens did John buy?

..... boxes of pencils

..... packets of pens

**(Total for question = 3 marks)**

## Laws of Indices

**Things to remember:**

- The exam question will use the word "simplify"
- When multiplying, add the indices
- When dividing, subtract the indices
- With brackets, multiply the indices
- If the exam question has the words "work out the value of", or "evaluate" it means the answer is a number.
- Anything to the power zero is 1
- Anything to the power one is itself
- Anything to a negative power becomes a reciprocal

**Questions:**

**1.** (a) Write down the reciprocal of 5

.....

**(1)**

(b) Evaluate $3^{-2}$

.....

**(1)**

**(Total for Question is 2 marks)**

**2.** (a) Write down the value of $\sqrt{81}$

.....

**(1)**

(b) Work out the value of $5^2 + 2^3$

.....

**(2)**

**(Total for Question is 3 marks)**

**3.** Write these numbers in order of size. Start with the smallest number.

$5^{-1}$ 0.5 -5 $5^0$

.....

**(Total for Question is 2 marks)**

**4.** (a) Solve $3x^2 = 147$

.....

**(2)**

(b) Work out the value of $2^{-3}$

.....

**(1)**

(c) Simplify $(3x^2)^3$

.....

**(2)**

**(Total for question = 5 marks)**

**5.** (a) Simplify $a^4 \times a^5$

.....

**(1)**

(b) Simplify $\dfrac{45e^6f^8}{5ef^2}$

.....

**(2)**

(c) Write down the value of $9^{\frac{1}{2}}$

.....

**(1)**

**(Total for Question is 4 marks)**

**6.** (a) Simplify $5^4 \times 5^6$

.....

**(1)**

(b) Simplify $7^5 \div 7^2$

.....

**(1)**

**(Total for Question is 2 marks)**

**7.** Write down the value of

(i) $7^\circ$

.....

(ii) $5^{-1}$

.....

(iii) $9^{\frac{1}{2}}$

.....

**(Total for Question is 3 marks)**

**8.** (a) Work out $3^4$

.....

**(1)**

(b) Write down the cube root of 64

.....

**(1)**

**(Total for Question is 2 marks)**

## Rounding

**Things to remember:**

- If the next number is less than 5, round down.
- If the next number is 5 or more, round up.

**Questions:**

**1.** Write the number 2.738 correct to 2 decimal places.

.....

**(Total for Question is 1 mark)**

**2.** Write the number **7378** to the nearest hundred.

.....

**(Total for Question is 1 mark)**

**3.** 28569 people watch a football match. Write 28569 to the nearest hundred.

.....

**(Total for Question is 1 mark)**

**4.** (a) Write 5643 to the nearest hundred.

.....

**(1)**

(b) Write 197 768 to the nearest thousand.

.....

**(1)**

**(Total for Question is 2 marks)**

**5.** (a) Write the number 28.75 to the nearest whole number.

.....

**(1)**

(b) Write the number 7380 to the nearest thousand.

.....

**(1)**

**(Total for Question is 4 marks)**

**6.** Write down 157 correct to the nearest 10

.....

**(Total for Question is 1 mark)**

**7.** Write 6431 to the nearest thousand.

.....

**(Total for Question is 1 mark)**

**8.** Write 6718 correct to the nearest hundred.

.....

**(Total for Question is 1 mark)**

## BIDMAS

**Things to remember:**

- BIDMAS is the order in which operations need to be carried out.
- Brackets, indices, division, multiplication, addition, subtraction.

**Questions:**

**1.** Work out

(i) $2 \times 3 + 4$

.....

(ii) $10 - 2 \times 5$

.....

(iii) $16 \div (2 \times 4)$

.....

**(Total 3 marks)**

**2.** Beth says $20 - 5 \times 3$ is 45

Pat says $20 - 5 \times 3$ is 5

(a) Who is right?

Give a reason for your answer.

..... is right because

.....

.....

**(1)**

(b) Work out $(12 + 9) \div 3$

.....

**(1)**

**(Total 2 marks)**

**3.** Work out

(i) $3 \times 3 - 5$

.....

(ii) $20 \div (12 - 2)$

.....

(iii) $7 + 8 \div 4$

.....

**(Total 3 marks)**

**4.** (a) Work out $2 \times (11 + 9)$

.....

**(1)**

(b) Work out $3 \times 5 + 4$

.....

**(1)**

(c) Work out $20 - 5 \times 3$

.....

**(1)**

**(Total 3 marks)**

**5.** (a) Work out $4 \times 5 - 8$

.....

**(1)**

(b) Work out $18 + 2 \times 3$

.....

**(1)**

(c) Work out $(4 + 3) \times 7$

.....

**(1)**

**(Total 3 marks)**

**6.** (a) Work out the value of $(2 + 3) \times 4 + 5$

.....

**(1)**

(b) Add brackets ( ) to make each statement correct.
You may use more than one pair of brackets in each statement.

(i) $2 + 3 \times 4 + 5 = 29$

(ii) $2 + 3 \times 4 + 5 = 45$

**(2)**

**(Total 3 marks)**

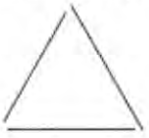
## nth term

**Things to remember:**

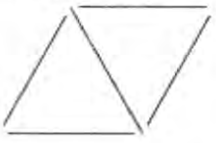
- The gap between the numbers is the number that goes in front of n e.g. 4n
- Then add on the zero term.
- If you're asked to write down terms of a sequence – use n=1, n=2, n=3 etc.

**Questions:**

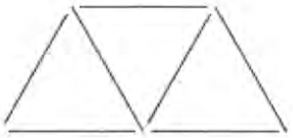
**1.** Here are some patterns made from sticks.



Pattern number 1



Pattern number 2



Pattern number 3

In the space below, draw Pattern number 4

**(1)**

(b) Complete the table.

| Pattern number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Number of sticks | 3 | 5 | 7 | | |

**(1)**

(c) How many sticks make Pattern number 15?

.....

**(1)**

**(Total for Question is 3 marks)**

**2.** Here are the first four terms of a number sequence.

6 10 14 18

**(2)** Write down the next term in this sequence.

.....

**(1)**

(b) Find the $10^{th}$ term in this sequence.

.....

**(1)**

(c) The number 102 is **not** a term in this sequence. Explain why.

.....

.....

**(1)**

**(Total for Question is 3 marks)**

**3.** Here are the first four terms of a number sequence.

3 7 11 15

**(2)** Write down the next term of this sequence.

.....

**(1)**

The 50th term of this number sequence is 199

(b) Write down the 51st term of this sequence.

.....

**(1)**

The number 372 is **not** a term of this sequence.

(c) Explain why.

.....

.....

**(1)**

**(Total for Question is 3 marks)**

**4.** Here are the first 5 terms of an arithmetic sequence.

6, 11, 16, 21, 26

Find an expression, in terms of $n$, for the $n$th term of the sequence.

.....

**(Total 2 marks)**

**5.** Here are the first five terms of a number sequence.

3 7 11 15 19

(a) Work out the 8th term of the number sequence.

.....

**(1)**

(b) Write down an expression, in terms of $n$, for the $n$th term of the number sequence.

.....

**(2)**

**(Total 3 marks)**

**6.** The first five terms of an arithmetic sequence are

2 9 16 23 30

Find, in terms of $n$, an expression for the $n$th term of this sequence.

.....

**(Total 2 marks)**

**7.** Here are the first four terms of a number sequence.

2 7 12 17

(a) Write down the **6th** term of this number sequence.

.....

**(1)**

The *n*th term of a different number sequence is $4n + 5$

(b) Work out the first three terms of this number sequence.

..... ..... .....

**(2)**

**(Total 3 marks)**

**8.** The *n*th term of a number sequence is given by $3n + 1$

(a) Work out the first **two** terms of the number sequence.

.....

**(1)**

Here are the first four terms of another number sequence.

1 5 9 13

(b) Find, in terms of n, an expression for the nth term of this number sequence.

.....

**(2)**

**(Total 3 marks)**

## Sketching Linear Graphs

**Things to remember:**

- Draw a table of values with x and y.
- Work out the value of y when x = 0, x = 1, x = 2, then use the pattern to work out the rest.
- Don't forget to connect the coordinates with a straight line.

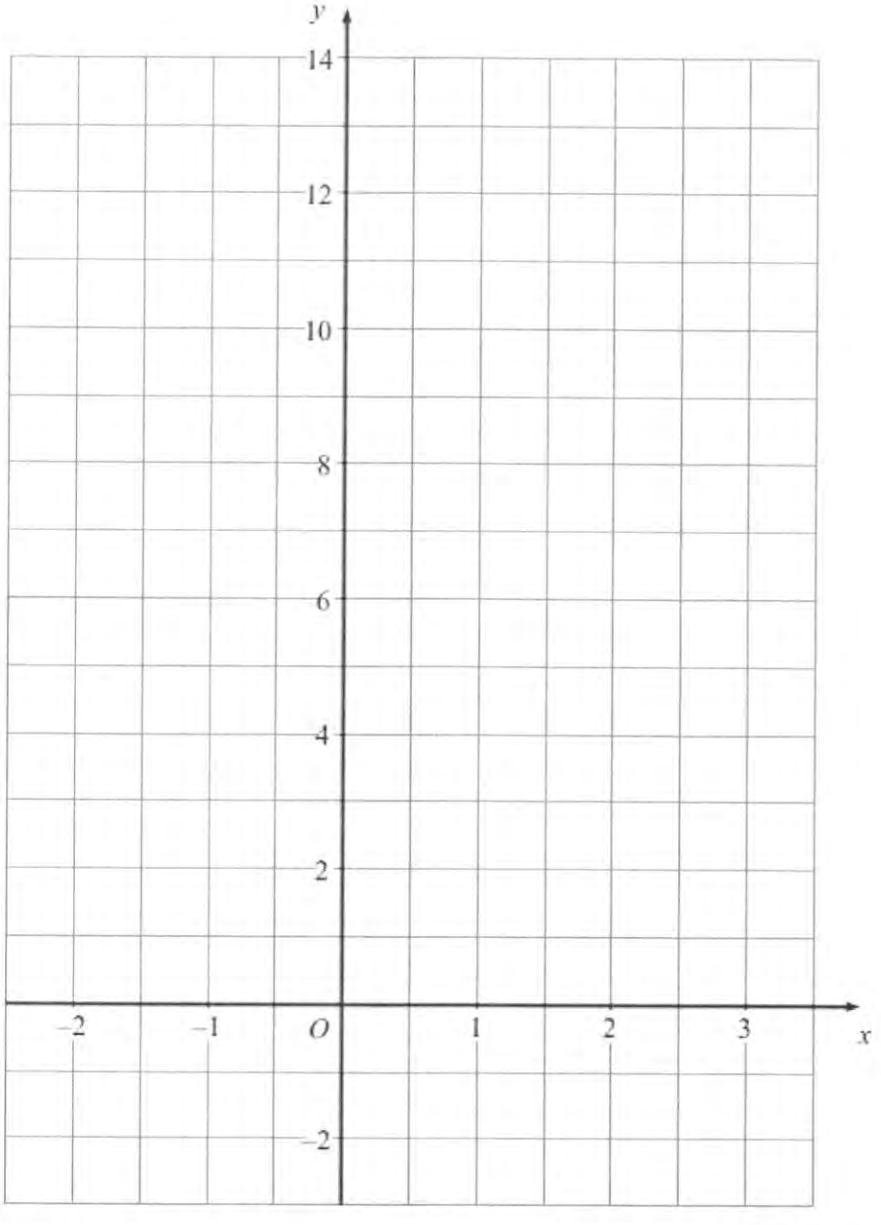
**Question:**

**1.** (a) Complete the table of values for $y = 3x + 4$

| $x$ | –2 | –1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | | 1 | | | | 13 |

**(2)**

(b) On the grid, draw the graph of $y = 3x + 4$



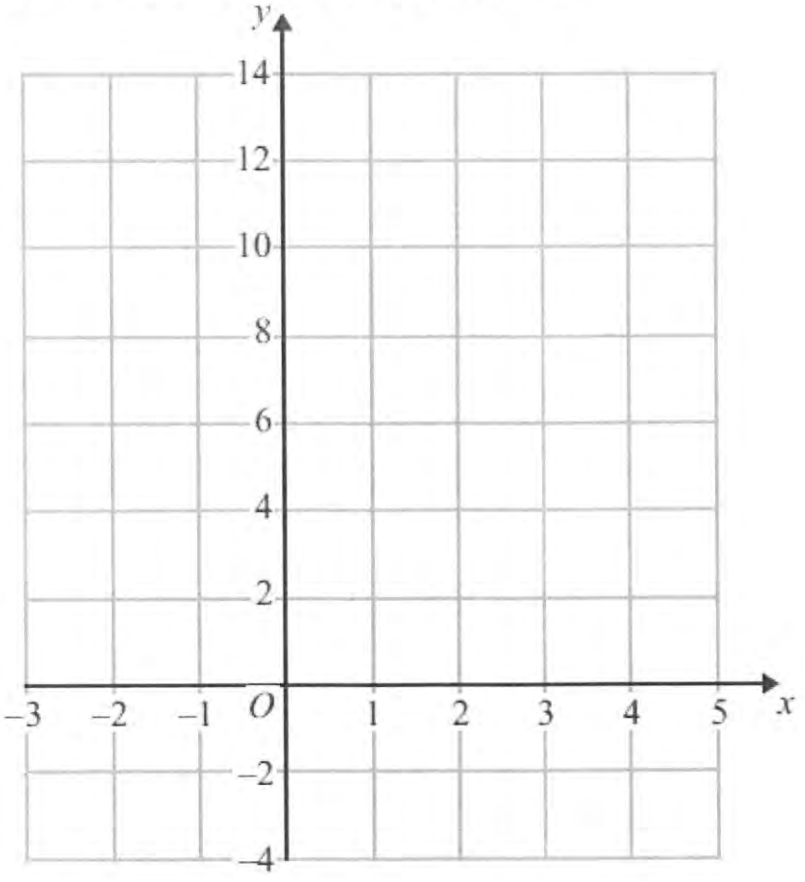

**(2)**

**(Total for Question is 4 marks)**

**2.** (a) Complete the table of values for $y = 2x + 2$

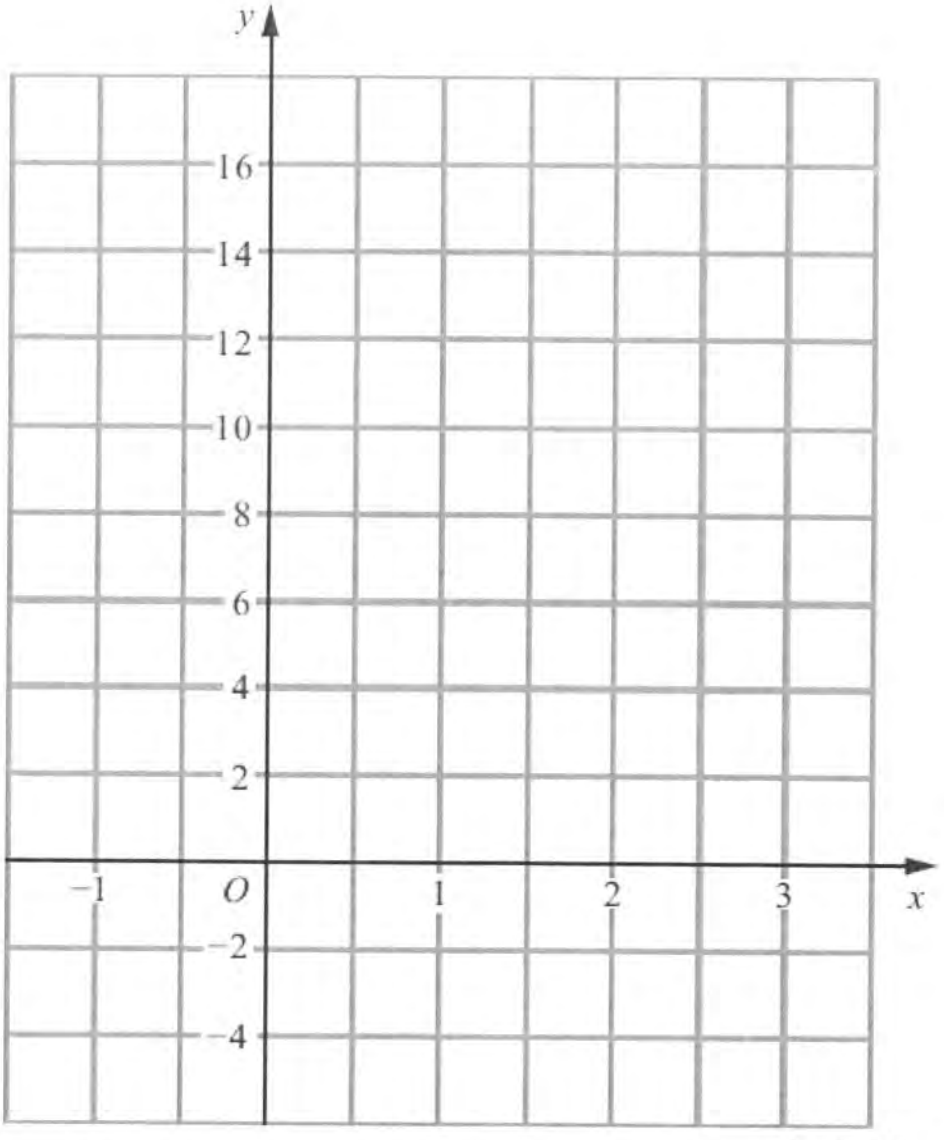
| $x$ | −2 | −1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| $y$ | −2 | | | | 6 | | |

(b) On the grid, draw the graph of $y = 2x + 2$



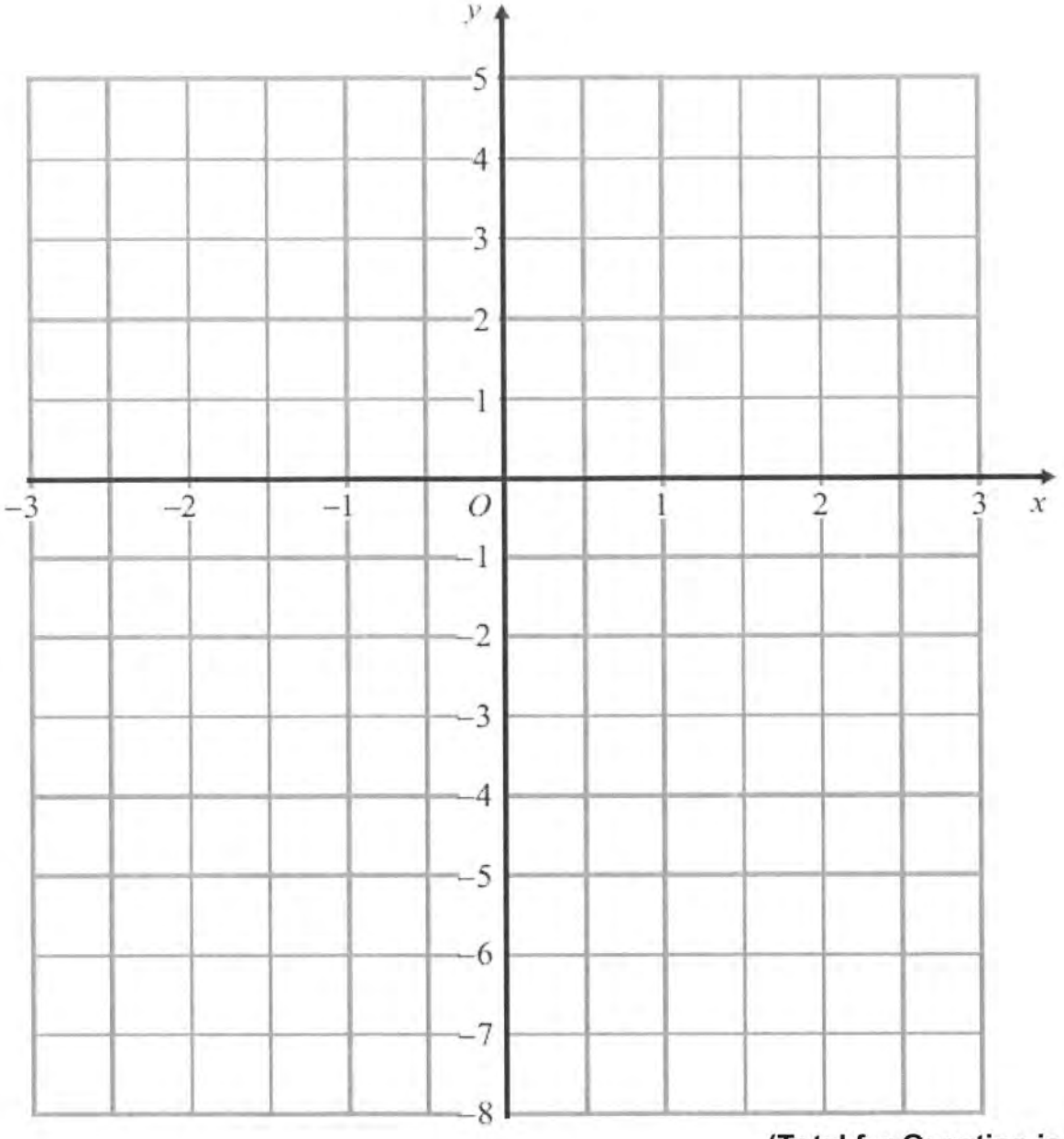

**(2)**
**(Total for Question is 4 marks)**

**3.** On the grid, draw the graph of $y = 4x + 2$ from $x = -1$ to $x = 3$



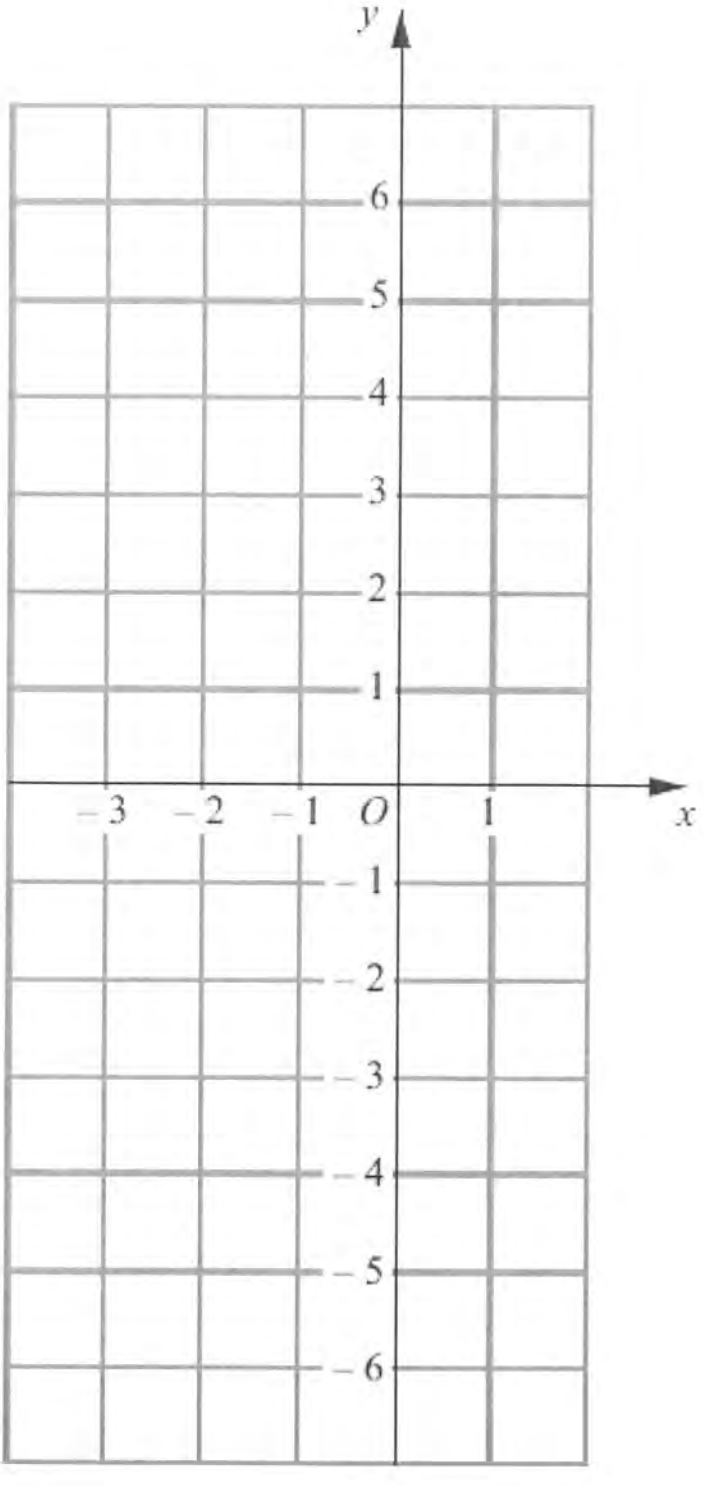

**(Total for Question is 3 marks)**

**4.** On the grid, draw the graph of $y = 2x - 3$ for values of $x$ from $-2$ to 2



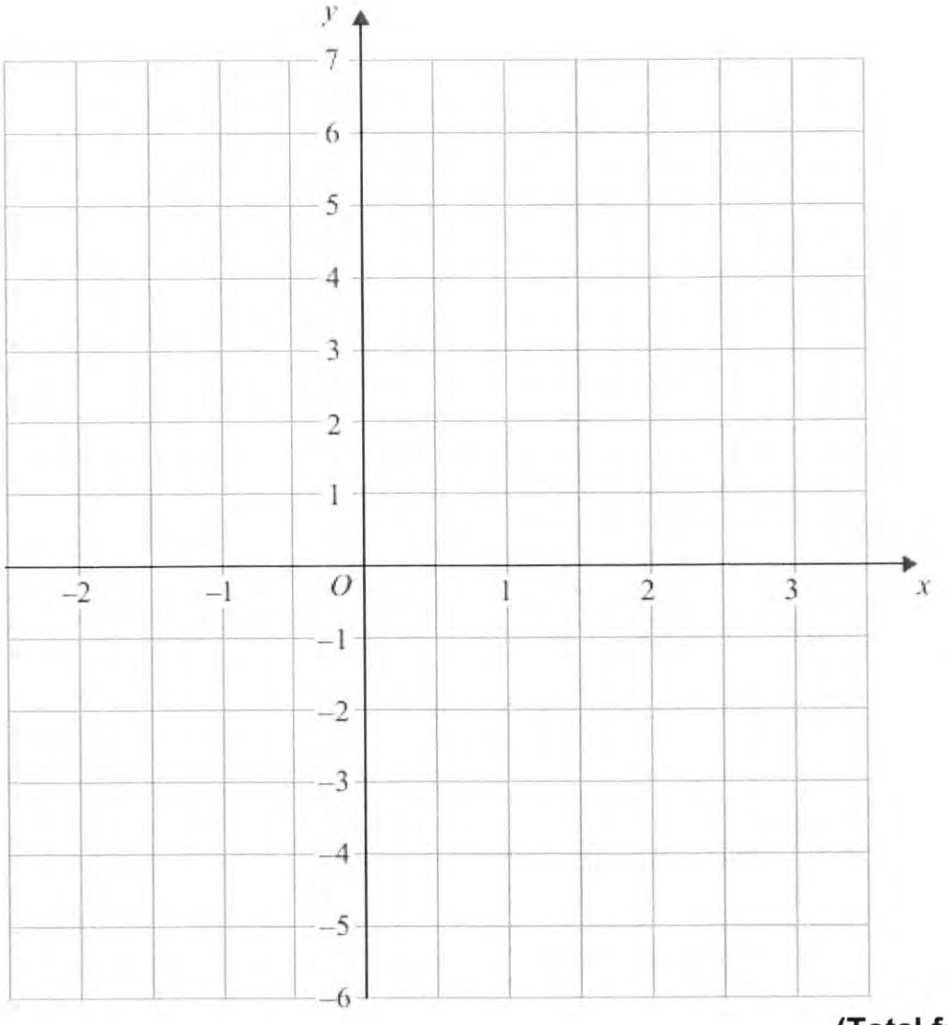

**(Total for Question is 3 marks)**

**5.** On the grid, draw the graph of $y = 2x + 3$ for values of $x$ from $x = -3$ to $x = 1$



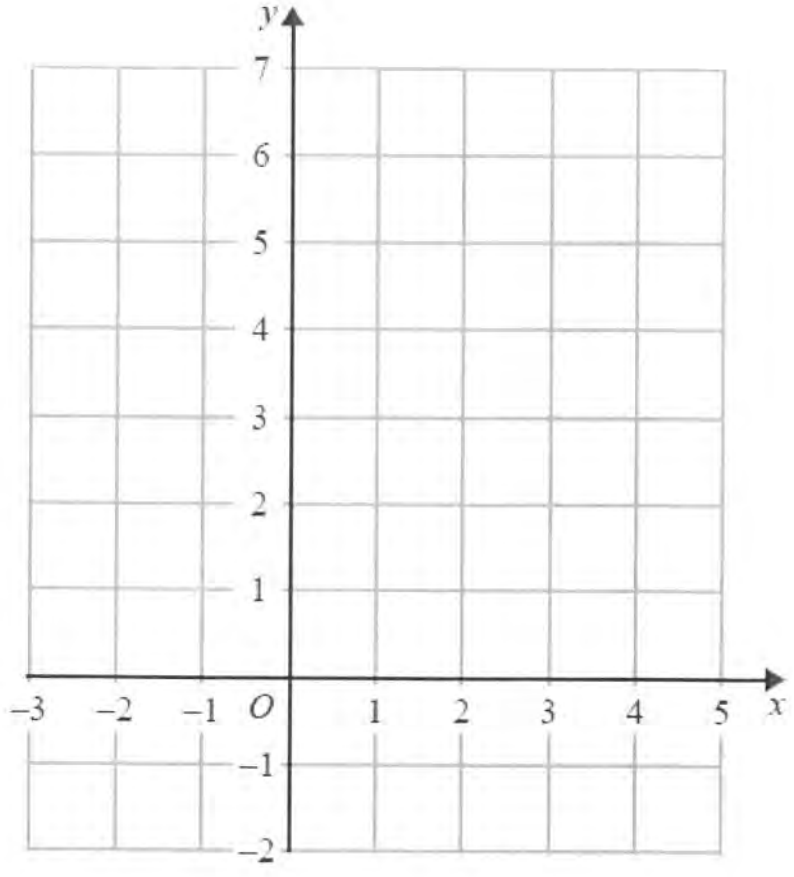

**(Total for Question is 3 marks)**

**6.** On the grid, draw the graph of $y = 2x - 1$ for values of $x$ from $-2$ to 3



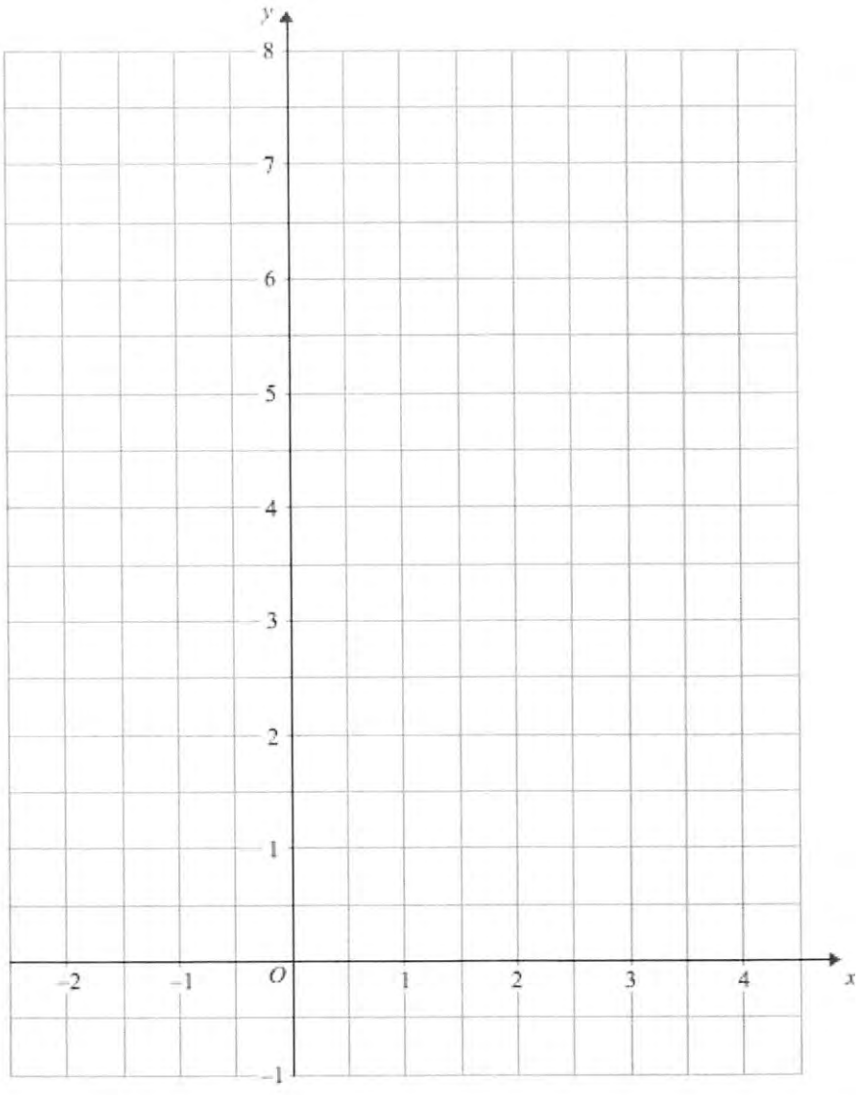

**(Total for Question is 3 marks)**

**7.** On the grid, draw the graph of $y = \frac{1}{2}x + 3$ for values of $x$ from $-2$ to 4




**(Total for question = 3 marks)**

**8.** On the grid, draw the graph of $y = \frac{1}{2}x + 5$ for values of $x$ from $-2$ to 4




**(Total for Question is 3 marks)**

## Expanding and Factorising (Single Brackets)

**Things to remember:**

- Expand brackets means to multiply what is outside the bracket with everything inside the bracket.
- Factorising is the opposite of expanding – put the HCF outside the brackets to factorise fully.

**Questions:**

**1.** (a) Expand $5(m + 2)$

.....

**(1)**

(b) Factorise $y^2 + 3y$

.....

**(1)**

(c) Simplify $a^5 \times a^4$

.....

**(1)**

**(Total for Question is 3 marks)**

**2.** (a) Expand $2m(m + 3)$

.....

**(1)**

(b) Factorise fully $3xy^2 - 6xy$

.....

**(2)**

**(Total for Question is 3 marks)**

**3.** (a) Expand $3(x + 4)$

.....

**(1)**

(b) Expand $x(x^2 + 2)$

.....

**(2)**

(c) Factorise $x^2 - 6x$

.....

**(1)**

**(Total for Question is 4 marks)**

**4.** (a) Expand and simplify $5(x + 7) + 3(x - 2)$

.....

**(2)**

(b) Factorise completely $3a^2b + 6ab^2$

.....

**(2)**

**(Total for Question is 4 marks)**

**5.** (a) Expand $3(2y - 5)$

.....

**(1)**

(b) Factorise completely $8x^2 + 4xy$

.....

**(2)**

**(Total for Question is 3 marks)**

**6.** (a) Factorise $3x + 6$

.....

**(1)**

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

.....

**(2)**

**(Total for Question is 3 marks)**

**7.** (a) Factorise $4x + 10y$

.....

**(1)**

(b) Factorise $x^2 + 7x$

.....

**(1)**

**(Total for Question is 2 marks)**

## Solving Equations

**Things to remember:**

- "Solve" means to find the value of the variable (what number the letter represents).
- The inverse of + is – and the inverse of x is ÷
- Work one step at a time, keeping you = signs in line on each new row of working.

**Questions:**

**1.** Solve $4x + 3 = 19$

$x =$.....

**(Total 2 marks)**

**2.** (a) Solve $6x - 7 = 38$

$x =$ .....

**(2)**

(b) Solve $4(5y - 2) = 40$

$y =$ .....

**(3)**

**(Total 5 marks)**

**3.** Solve $5(2y + 3) = 20$

$y =$ .....

**(Total 3 marks)**

**4.** (a) Solve $7x + 18 = 74$

$x =$ .....

**(2)**

(b) Solve $4(2y - 5) = 32$

$y =$ .....

**(2)**

(c) Solve $5p + 7 = 3(4 - p)$

$p =$ .....

**(3)**

**(Total 7 marks)**

**5.** (a) Solve $7p + 2 = 5p + 8$

$p =$ .....

**(2)**

(b) Solve $7r + 2 = 5(r - 4)$

$r =$ .....

**(2)**

**(Total 4 marks)**

**6.** Solve
$4y + 1 = 2y + 8$

$y =$.....
**(Total 2 marks)**

**7.** Solve $4y + 3 = 2y + 8$

$y =$ .....
**(Total 2 marks)**

## Inequalities

**Things to remember:**

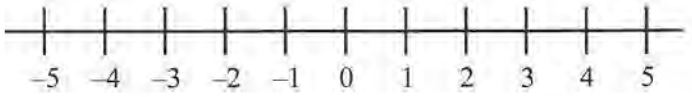
- < means less than
- > means greater than
- ≤ means less than or equal to
- ≥ means greater than or equal to
- An integer is a whole number
- On a number line, use a full circle to show a value can be equal, and an empty circle to show it cannot.

**Questions:**

**1.** (i) Solve the inequality
$5x - 7 < 2x - 1$

.....

(ii) On the number line, represent the solution set to part (i).




**(Total 3 marks)**

**2.** (a) List all the possible integer values of $n$ such that
$-2 \leq n < 3$

.....

**(2)**

(b) Solve the inequality
$4p - 8 < 7 - p$

**(2)**
**(Total 4 marks)**

**3.** (a) $-3 \leq n < 2$
$n$ is an integer.
Write down all the possible values of $n$.

.....

**(2)**

(b) Solve the inequality
$5x < 2x - 6$

.....

**(2)**
**(Total 4 marks)**

**4.** (a) Solve the inequality
$3t + 1 < t + 12$

.....

**(2)**

(b) $t$ is a whole number.
Write down the largest value of $t$ that satisfies
$3t + 1 < t + 12$

.....

**(1)**

**(Total 3 marks)**

**5.** Solve $4 < x - 2 \leq 7$

.....

**(Total 3 marks)**

**6.** Solve $5x + 3 > 19$

.....

**(Total 2 marks)**

## Substitution

**Things to remember:**

- There is always 1 mark just for writing down the numbers you have had to put into the expression.
- Your answer must be a number – don't forget to finish the sum
- The question will always use the words "Work out the value of"

**Questions:**

**1.** (a) Work out the value of $3x - 4y$ when $x = 3$ and $y = 2$

.....

**(2)**

(b) Work out the value of $\frac{p(q-3)}{4}$ when $p = 2$ and $q = -7$

.....

**(3)**

**(Total 5 marks)**

**2.** Find the value of
$t^2 - 4t$ when $t = -3$

.....

**(Total 2 marks)**

**3.** $P = x^2 - 7x$
Work out the value of P when $x = -5$

P = .....

**(Total 2 marks)**

**4.** T, x and y are connected by the formula

$T = 5x + 2y$

$x = -3$ and $y = 4$

(a) Work out the value of T.

T = .....

**(2)**

$T = 16$ and $x = 7$

(b) Work out the value of y.

y = .....

**(3)**

**(Total 5 marks)**

**5.** $P = 4k - 10$

$P = 50$

(a) Work out the value of k.

.....

**(2)**

$y = 4n - 3d$

$n = 2$

$d = 5$

(b) Work out the value of y.

.....

**(2)**

**(Total 4 marks)**

**6.** $h = 5t^2 + 2$

(i) Work out the value of h when $t = -2$

.....

(ii) Work out a value of t when $h = 47$

.....

**(Total 3 marks)**

## Angle Rules

**Things to remember:**

- Angles in a triangle sum to 180°
- Angles on a straight line sum to 180°
- Angles around a point sum to 360°
- Vertically opposite angles are equal
- Alternate angles are equal
- Corresponding angles are equal
- Supplementary angles sum to 180°

**Questions:**

***1.** *ABC* is parallel to *EFGH*.
*GB* = *GF*
Angle *ABF* = 65°

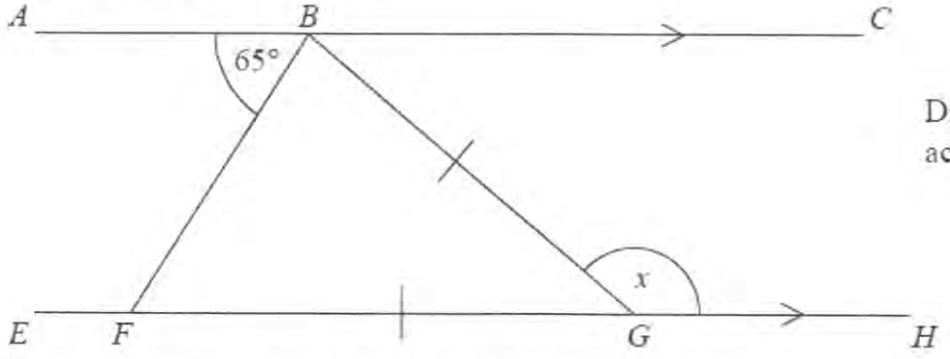



Diagram **NOT** accurately drawn

Work out the size of the angle marked *x*.
Give reasons for your answer.

**(Total for Question is 4 marks)**

***2.** *ABCD* and *EFG* are parallel lines.
*BC* = *CF*
Angle *BFE* = 70°

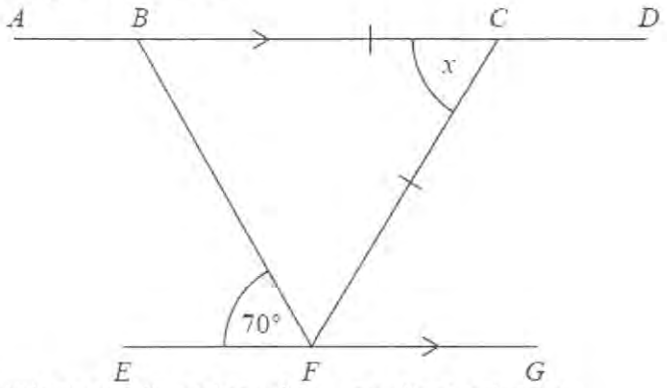



Diagram **NOT** accurately drawn

Work out the size of the angle marked *x*.
Give reasons for each stage of your working.

**(Total for question = 4 marks)**

**3.** *AFB* and *CHD* are parallel lines.
*EFD* is a straight line.

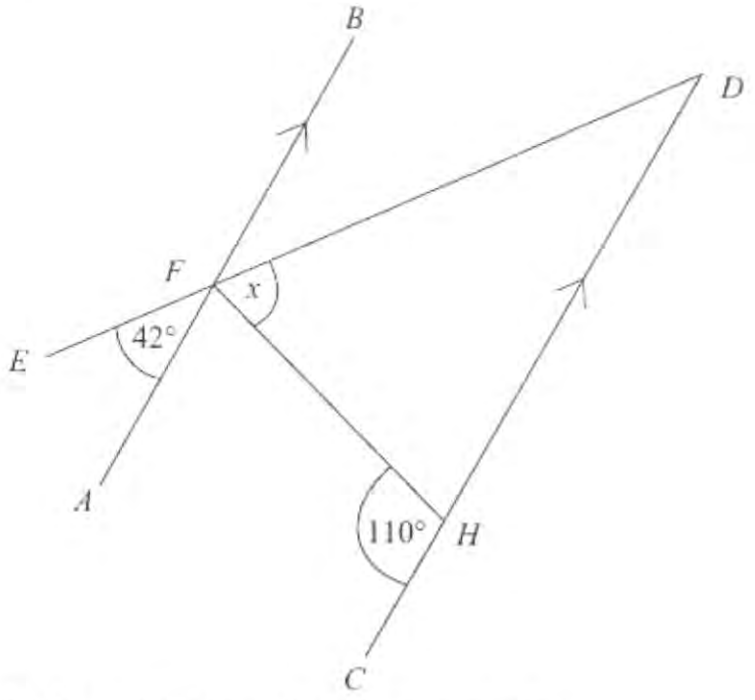



Diagram NOT accurately drawn

Work out the size of the angle marked *x*.

*x* = .....

**(Total for Question is 3 marks)**

***4.** *ABC* is a straight line.
*DEFG* is a straight line.
*AC* is parallel to *DG*.
*EF* = *BF*.
Angle *BEF* = 50°.

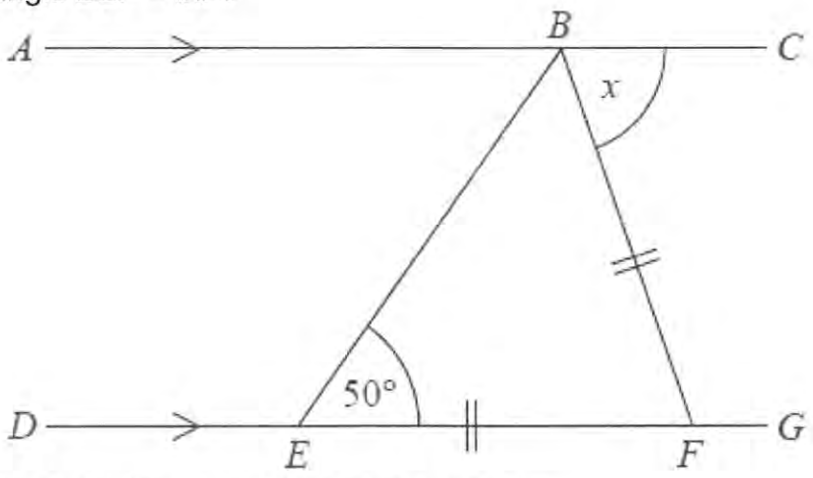



Diagram **NOT** accurately drawn

Work out the size of the angle marked *x*.
Give reasons for your answer.

.....°

**(Total for Question is 4 marks)**

**5.**

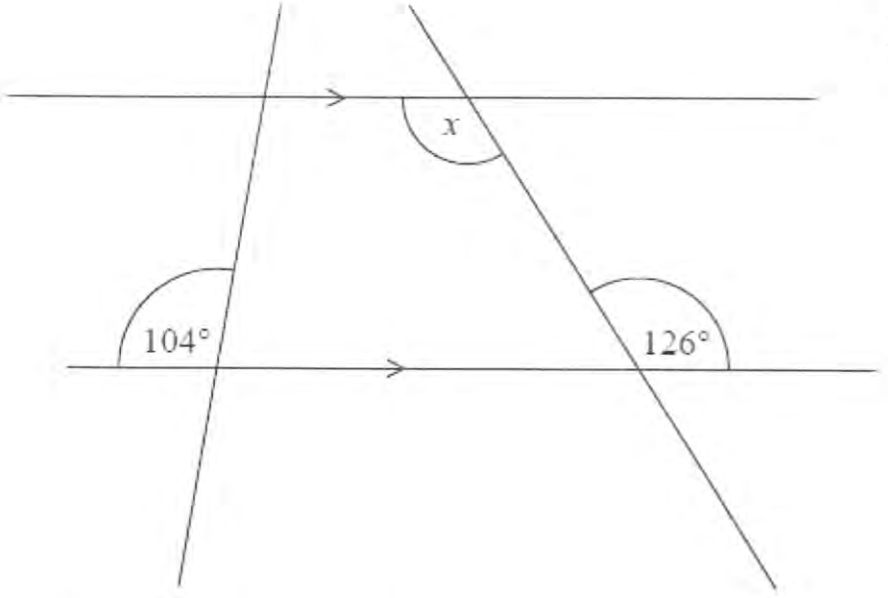



Diagram **NOT** accurately drawn

(i) Find the size of the angle marked *x*.

..... °

(ii) Give a reason for your answer.

.....

.....

**(Total for Question is 2 marks)**

**6.** *ABC* and *DEF* are parallel lines.
*BEG* is a straight line.
Angle *GEF* = 47°.

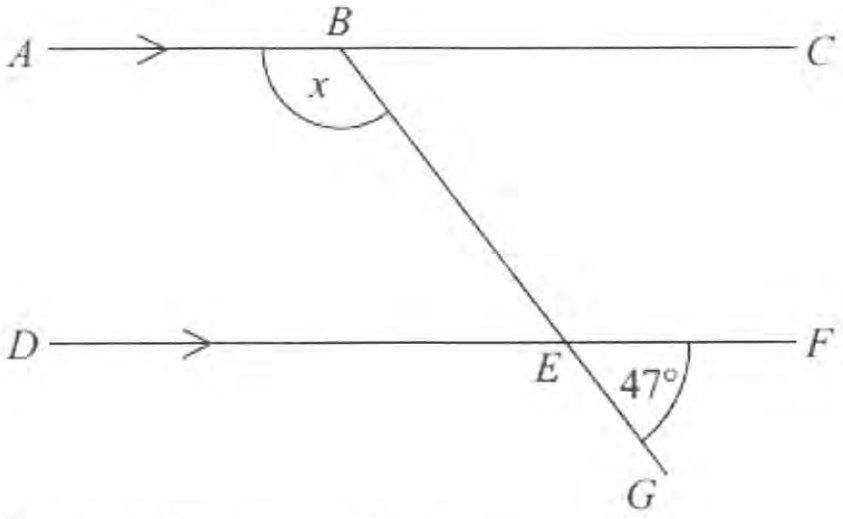



Diagram NOT accurately drawn
Work out the size of the angle marked *x*.
Give reasons for your answer.

..... °

**(Total for Question is 3 marks)**

## Constructing Triangles

**Things to remember:**

- If you are given angles, you can use a protractor.
- If you are not given angles, you will need to use compasses.

**Questions:**

**1.** In the space below, use ruler and compasses to **construct** an equilateral triangle with sides of length 8 cm.
You must show all your construction lines.
One side of the triangle has already been drawn for you.

**(Total for Question is 2 marks)**

**2.** In the space below, use a ruler and compasses to construct an equilateral triangle with sides of length 5 cm.
You must show all your construction lines.
One side of the triangle has been drawn for you.

**(Total for question = 2 marks)**

**3.** Here is a triangle.

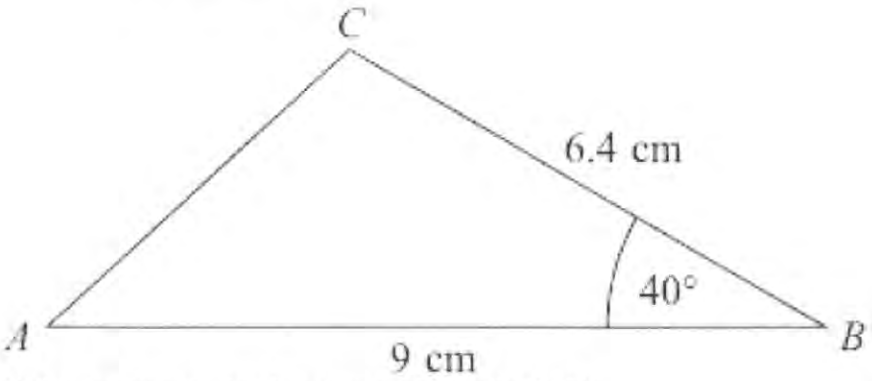



Diagram **NOT** accurately drawn

Make an accurate drawing of triangle *ABC*.
The line *AB* has already been drawn for you.

**(Total for Question is 2 marks)**

## Bearings

**Things to remember:**

- Always measure bearing clockwise from the North line and give your answer 3 digits.
- If the diagram is drawn accurately, use the given scale.
- If the diagram is not drawn accurately, use the fact that the North lines are all parallel.

**Questions:**

1. Martin and Janet are in an orienteering race.
   Martin runs from checkpoint *A* to checkpoint *B*, on a bearing of 065°
   Janet is going to run from checkpoint *B* to checkpoint *A*.
   Work out the bearing of *A* from *B*.

.....°

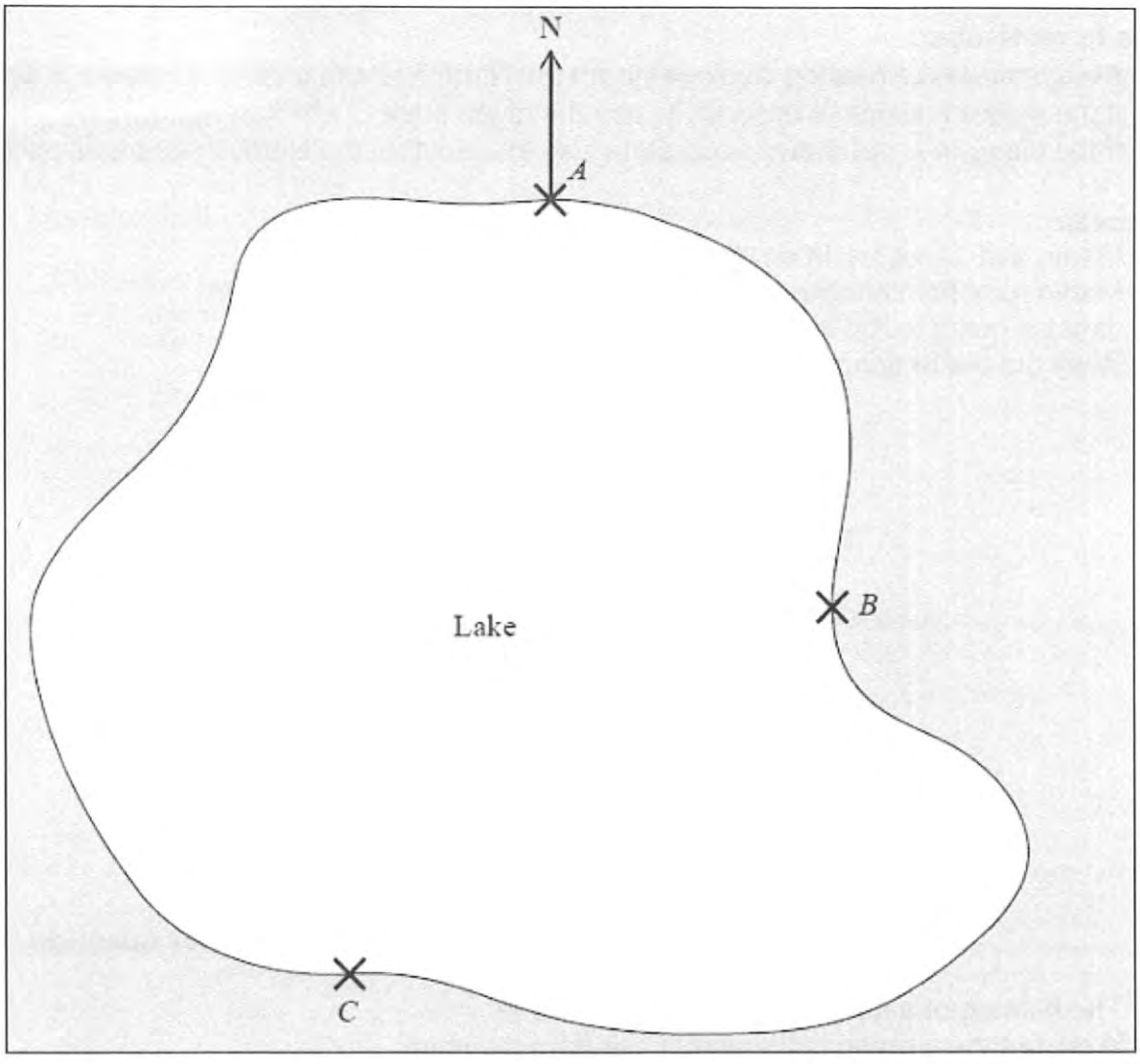
**(Total for question = 2 marks)**

2. The bearing of a ship from a lighthouse is 050°
   Work out the bearing of the lighthouse from the ship.

.....°

**(Total for Question is 2 marks)**

**3.** The map shows the positions of three places *A*, *B* and *C* on the edge of a lake.




Scale 1 cm represents 2 km

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

..... °

**(1)**

A ferry travels in a straight line from *A* to *B*.
It then travels in a straight line from *B* to *C*.
A speedboat travels in a straight line from *A* to *C*.

(b) How many more kilometres does the ferry travel than the speedboat?
You must show your working.

..... km

**(4)**

**(Total for Question is 5 marks)**

**4.** The diagram shows part of a map.

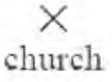

(a) Find the bearing of the church from the tower.

..... °

**(1)**

The scale of the map is 1 cm represents 2.5 km.

(b) Work out the real distance between the tower and the church.




..... km

**(2)**

A school is 15 km due North of the church.

(c) On the diagram, mark with a cross (×) the position of the school. Label your cross S.

**(2)**

**(Total for Question is 5 marks)**

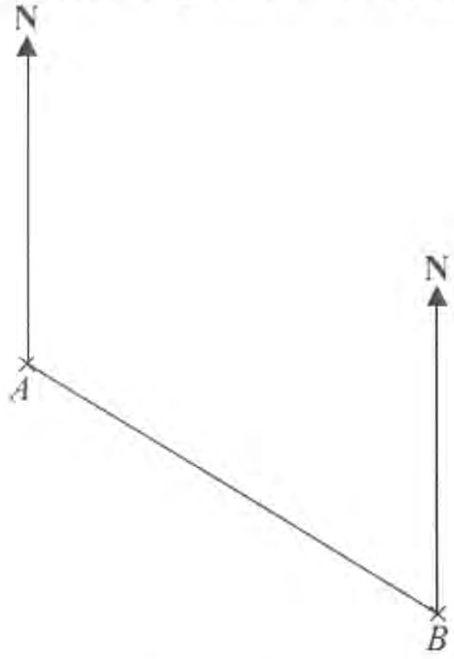
**5.** The diagram shows the positions of a lighthouse and a harbour on a map.



A boat is on a bearing of
300° from the lighthouse
040° from the harbour.
On the diagram, mark with a cross (×) the position of the boat.
Label the boat *B*.

**(Total for question = 3 marks)**

**6.** The scale diagram shows the positions of two towns, *A* and *B*.




Scale: 1 cm represents 10 km

(a) Measure and write down the bearing of town *B* from town *A*.

..... °

**(1)**

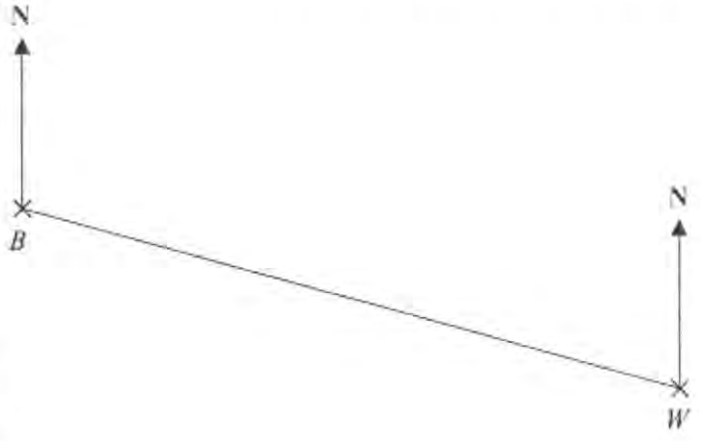
(b) What is the real distance from town A to town B?
Give your answer in km.

..... km

**(3)**

**(Total for Question is 4 marks)**

**7.** The diagram shows the positions of two villages, Beckhampton (*B*) and West Kennett (*W*).
Scale: 4 cm represents 1 km.




(a) Work out the real distance, in km, of Beckhampton from West Kennett.

..... km

**(2)**

The village, Avebury (*A*), is on a bearing of 038° from Beckhampton.
On the diagram, *A* is 6 cm from *B*.

(b) On the diagram, mark *A* with a cross (×).
Label the cross *A*.

**(2)**

**(Total for Question is 4 marks)**

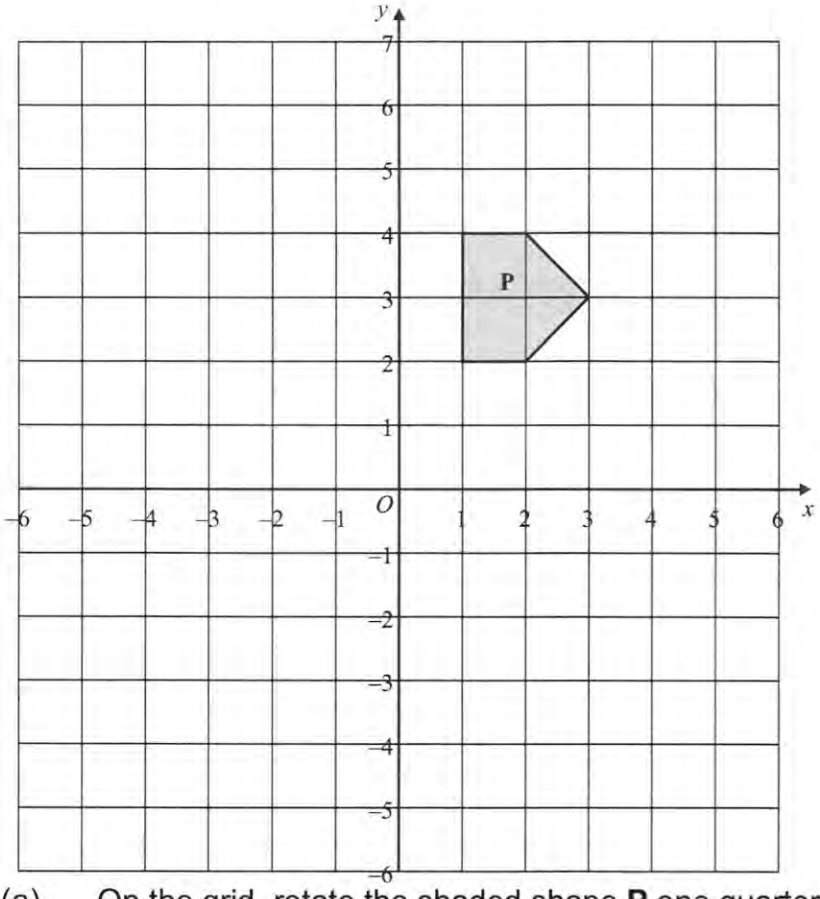
## Transformations

**Things to remember:**

- Reflection – the shape is flipped in a mirror line
- Rotation – the shape is turned a number of degrees, around a centre, clockwise or anti-clockwise
- Translation – the shape is moved by a vector $\begin{pmatrix} x \\ y \end{pmatrix}$
- Enlargement – the shape is made bigger or smaller by a scale factor from a centre.

**Questions:**

**1.**




(a) On the grid, rotate the shaded shape **P** one quarter turn anticlockwise about *O*. Label the new shape **Q**.

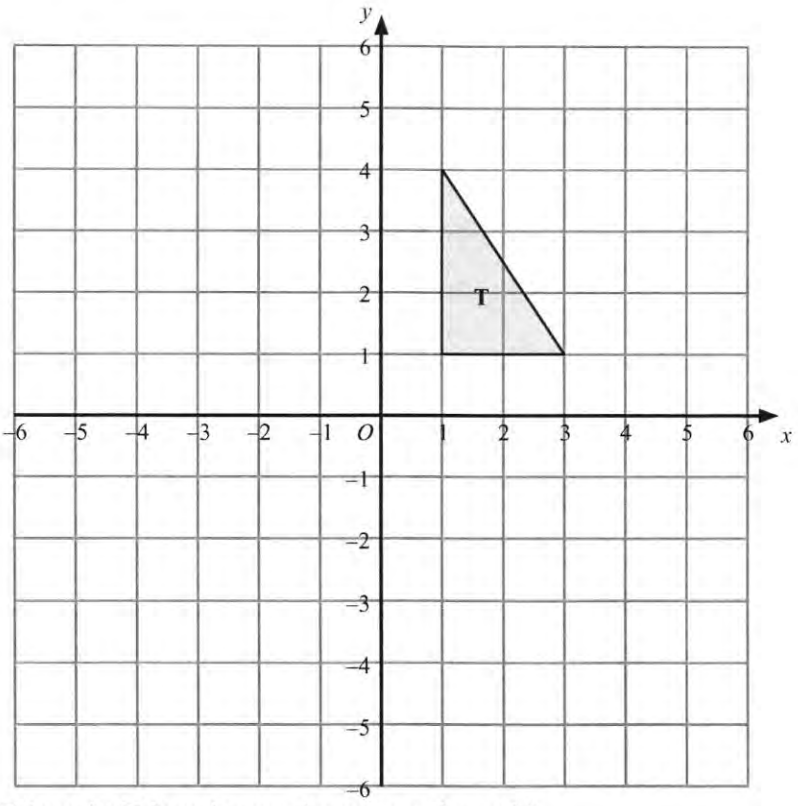
**(3)**

(b) On the grid, translate the shaded shape **P** by 2 units to the right and 3 units up. Label the new shape **R.**

**(1)**

**(Total 4 marks)**

**2.**



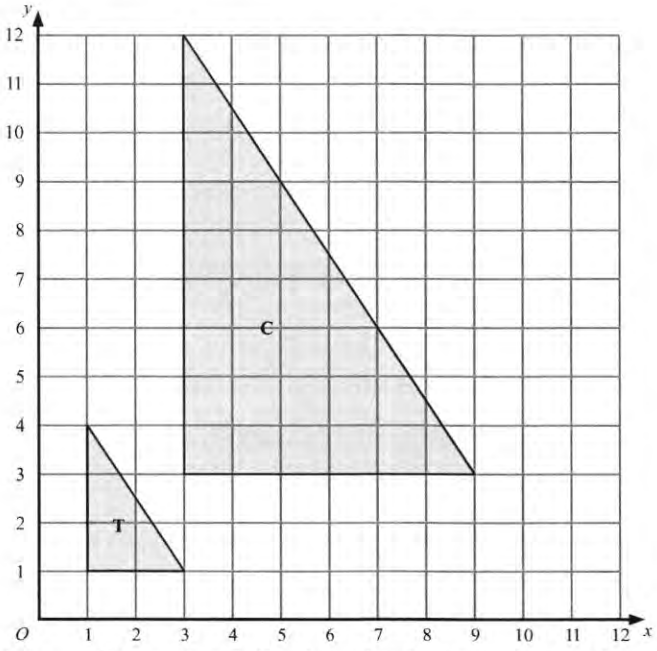

Triangle **T** has been drawn on the grid.

(a) Reflect triangle **T** in the *y*-axis.
Label the new triangle **A**.

**(1)**

(b) Rotate triangle **T** by a half turn, centre *O*.
Label the new triangle B.

**(2)**

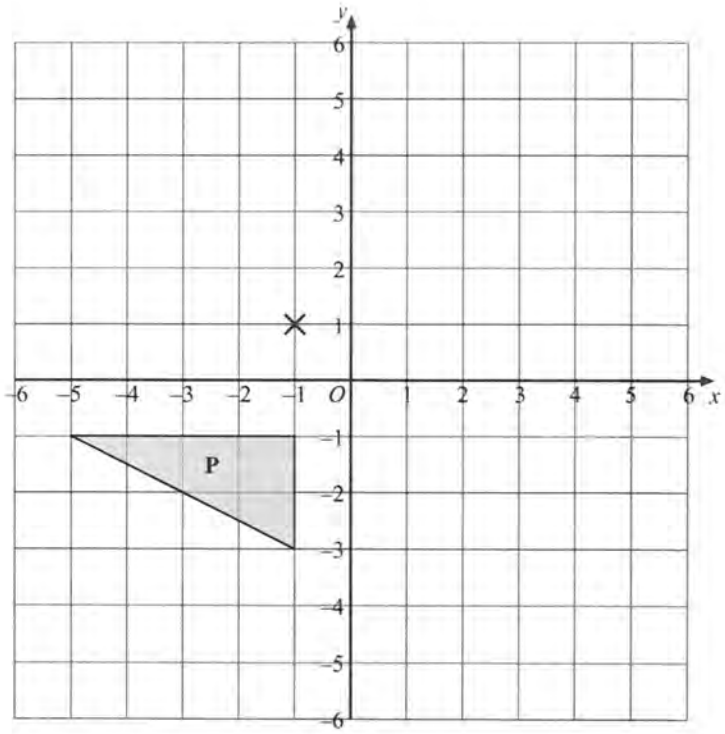



(c) Describe fully the single transformation which maps triangle **T** onto triangle **C**.

.....

**(3)**
**(Total 6 marks)**

**3.**

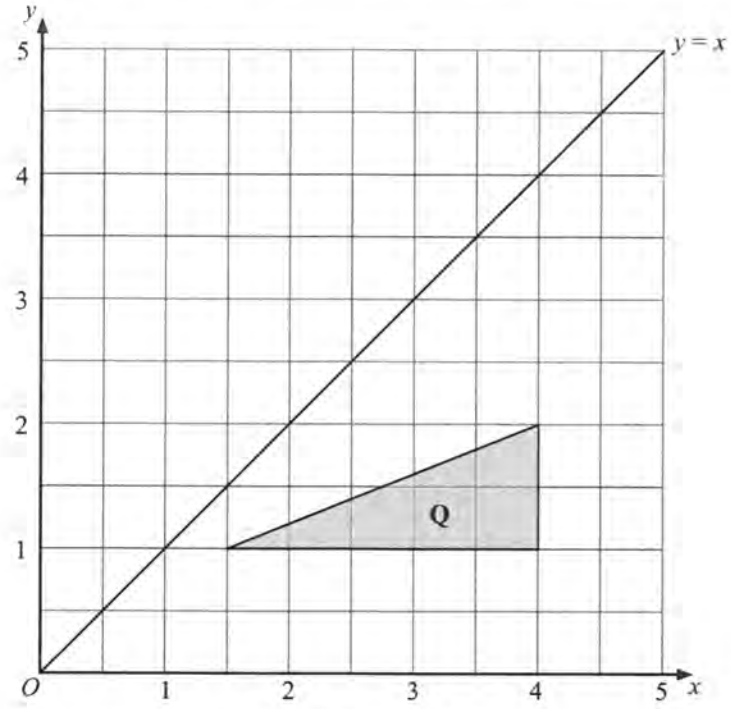



(a) Rotate triangle **P** 180° about the point (–1, 1).
Label the new triangle **A**.

**(2)**

(b) Translate triangle **P** by the vector $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$.
Label the new triangle **B**.

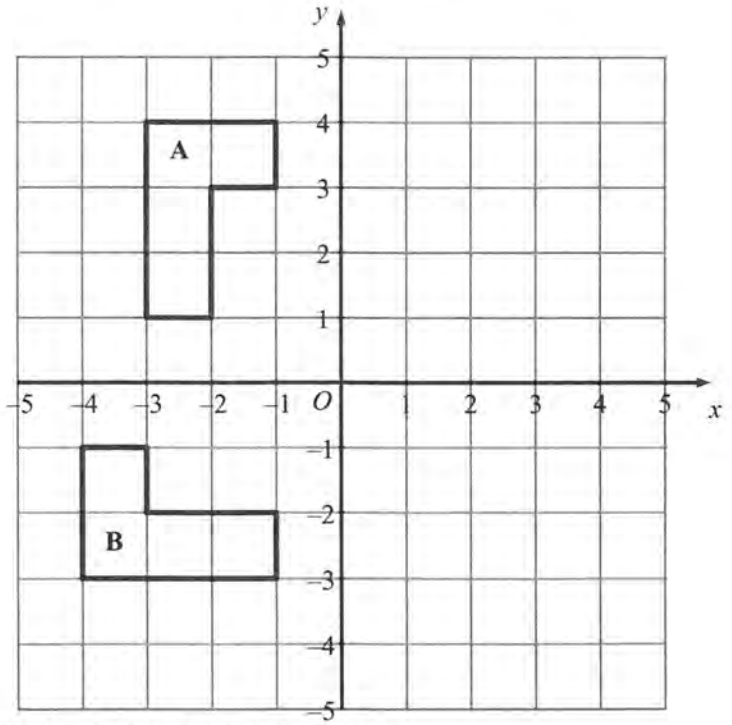
**(1)**




(c) Reflect triangle **Q** in the line $y = x$.
Label the new triangle **C**.

**(2)**
**(Total 5 marks)**

**4.**




(a) Reflect shape **A** in the *y* axis.

**(2)**

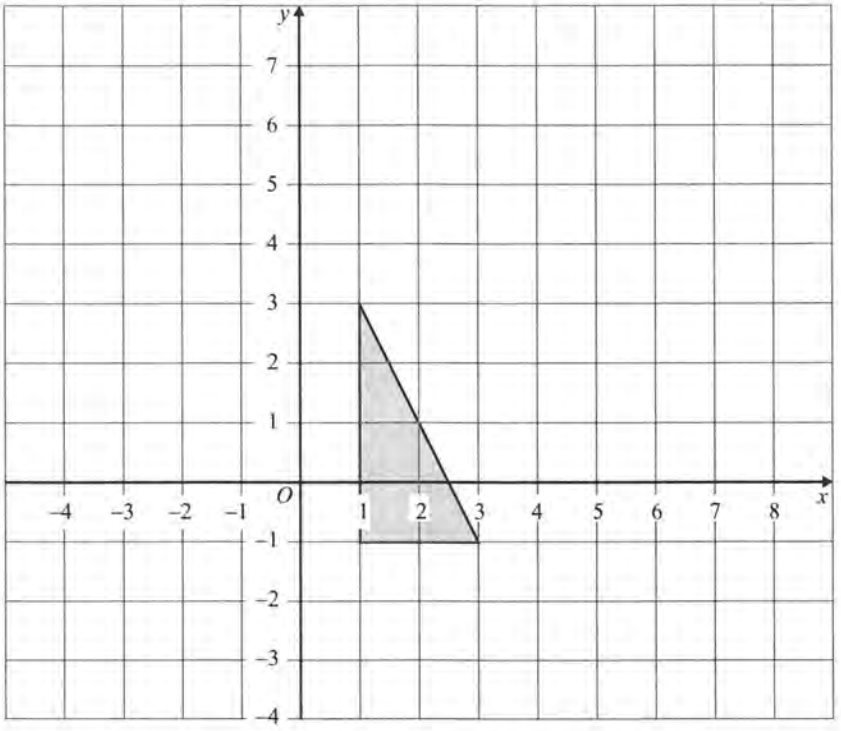
(b) Describe fully the **single** transformation which takes shape **A** to shape **B**.

.....

**(3)**

**(Total 5 marks)**

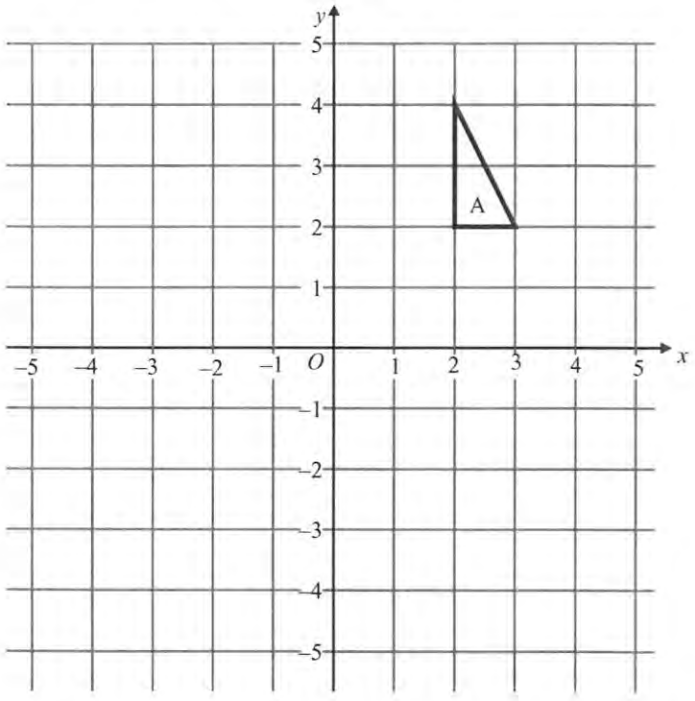
**5.**




Enlarge the shaded triangle by a scale factor 2, centre 0.

**(Total 3 marks)**

**6.**



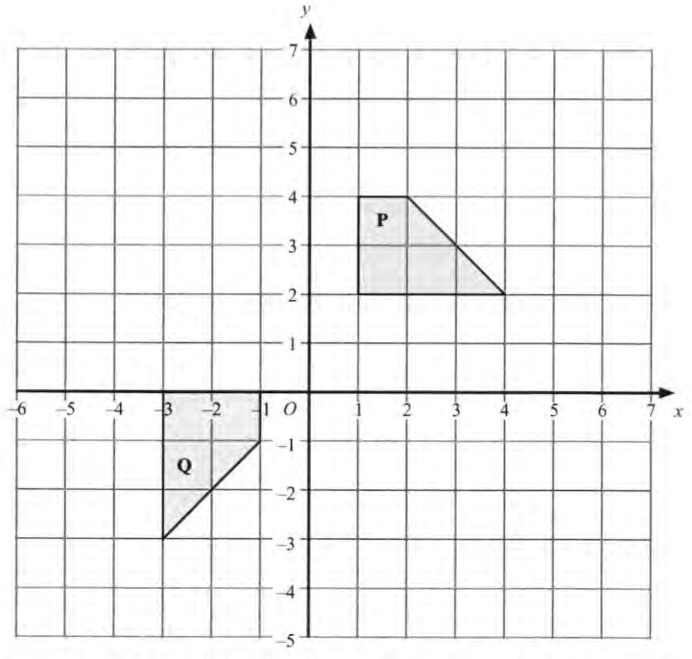

(a) On the grid, rotate triangle **A** 180° about *O*.
Label your new triangle **B**.

**(2)**

(b) On the grid, enlarge triangle **A** by scale factor ½, centre *O*.
Label your new triangle **C**.

**(3)**
**(Total 5 marks)**

**7.**




Describe fully the single transformation that will map shape **P** onto shape **Q**.

.....

.....

**(Total 3 marks)**

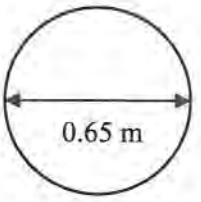
## Circles

**Things to remember:**

- $\pi r^2$ sounds like area to me, when I need the circumference I'll just use $\pi D$.
- Read the question carefully and check if you are being asked to find circumference or area and whether they have given you the radius or the diameter.
- Remember the diameter is twice the radius.

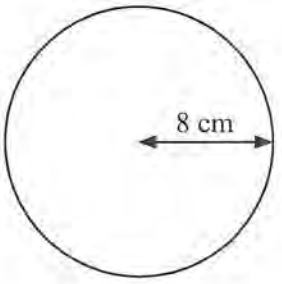
**Questions:**

**1.** The diameter of a wheel on Harry's bicycle is 0.65 m.
Calculate the circumference of the wheel.
Give your answer correct to 2 decimal places.
Diagram NOT accurately drawn



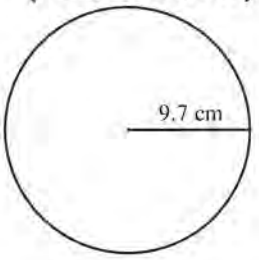

..... m
**(Total 2 marks)**

**2.** Diagram NOT accurately drawn
The radius of this circle is 8 cm.
Work out the circumference of the circle.
Give your answer correct to 2 decimal places.



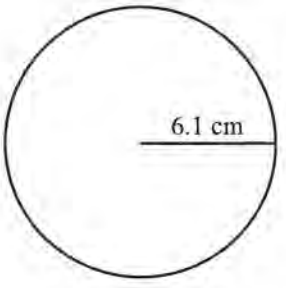

..... cm
**(Total 2 marks)**

**3.** Diagram NOT accurately drawn
The radius of the circle is 9.7 cm.
Work out the area of the circle.
Give your answer to 3 significant figures.




..... $cm^2$
**(Total 2 marks)**

**4.** A circle has a radius of 6.1 cm.
Work out the area of the circle.




.....
**(Total 3 marks)**

**5.** The top of a table is a circle.
The radius of the top of the table is 50 cm.

(a) Work out the area of the top of the table.

.....cm²

**(2)**

The base of the table is a circle.
The diameter of the base of the table is 40 cm.

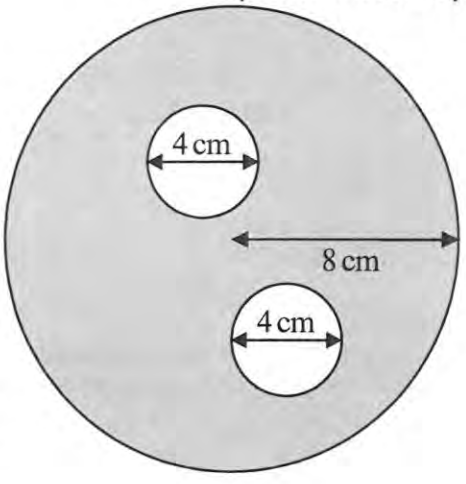
(b) Work out the circumference of the base of the table.

.....cm

**(2)**

**(Total 4 marks)**

**6.** The diagram shows two small circles inside a large circle.
The large circle has a radius of 8 cm.
Each of the two small circles has a diameter of 4 cm.




(a) Write down the radius of each of the small circles.

..... cm

**(1)**

(b) Work out the area of the region shown shaded in the diagram.
Give your answer correct to one decimal place.

..... cm²

**(4)**

**(Total 5 marks)**

## Area Problems

**Things to remember:**

- Area of a rectangle = base x height
- Area of a triangle = ½ x base x height
- Area of a parallelogram = base x height
- Area of a trapezium = ½ (a + b) h, where a and b are the parallel sides and h is the height
- The perimeter is the distance around the edge of the shape

**Questions:**

***1.** The diagram shows the floor plan of Mary's conservatory.

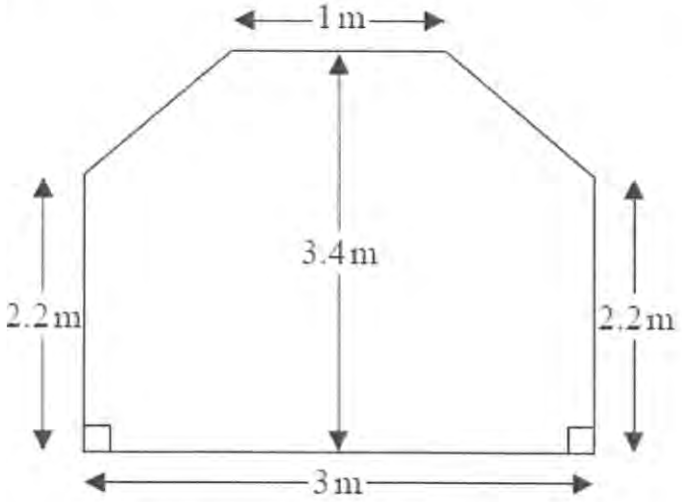



Diagram **NOT** accurately drawn

Mary is going to cover the floor with tiles.
The tiles are sold in packs.
One pack of tiles will cover $2m^2$
A pack of tiles normally costs £24.80
Mary gets a discount of 25% off the cost of the tiles.
Mary has £100
Does Mary have enough money to buy all the tiles she needs?
You must show all your working.

**(Total for question = 5 marks)**

***2.** Mr Weaver's garden is in the shape of a rectangle.
In the garden there is a patio in the shape of a rectangle and two ponds in the shape of circles with diameter 3.8 m.
The rest of the garden is grass.

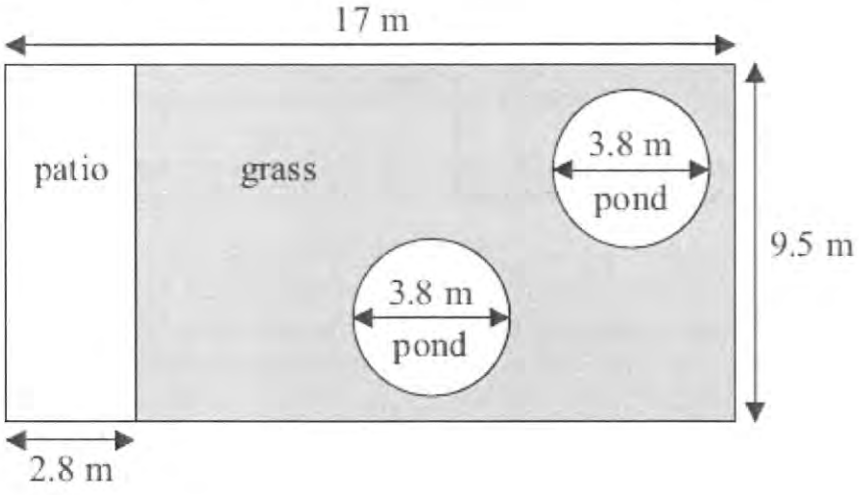



Diagram **NOT** accurately drawn

Mr Weaver is going to spread fertiliser over all the grass.
One box of fertiliser will cover 25 $m^2$ of grass.
How many boxes of fertiliser does Mr Weaver need?
You must show your working.

**(Total for Question is 5 marks)**

*3. The diagram shows the plan of Mrs Phillips' living room.

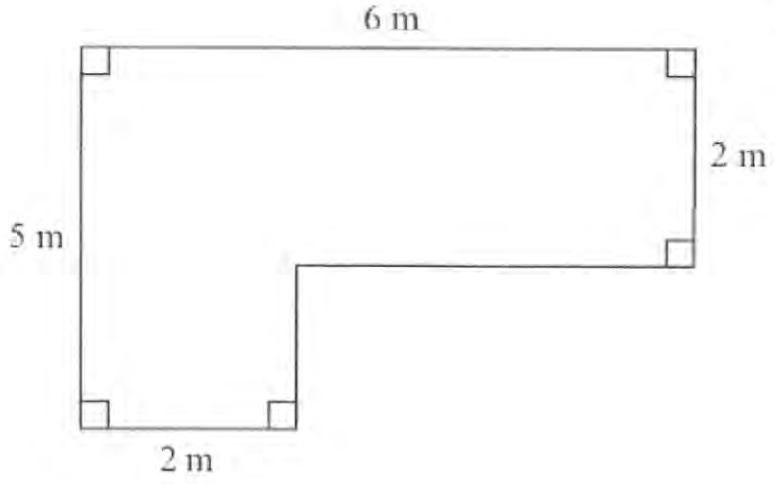



Diagram **NOT** accurately drawn

Mrs Phillips is going to cover the floor with floor boards.
One pack of floor boards will cover 2.5 $m^2$.
How many packs of floor boards does she need?
You must show your working.

**(Total for Question is 4 marks)**

**4.** A piece of card is in the shape of a trapezium.

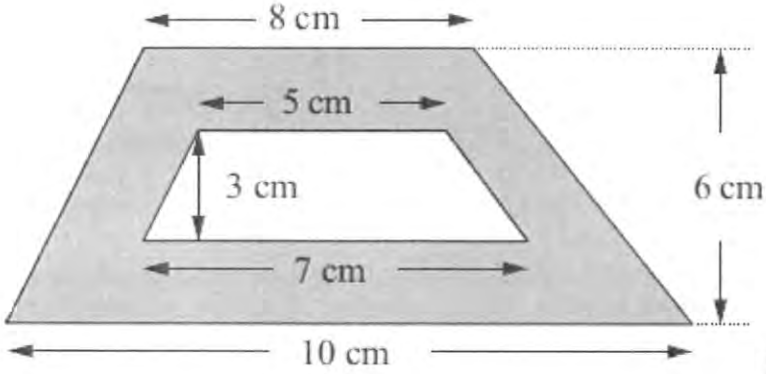



Diagram **NOT** accurately drawn

A hole is cut in the card.
The hole is in the shape of a trapezium.
Work out the area of the shaded region.

. . . . . cm$^2$

**(Total for Question is 3 marks)**

**5.** Mrs Kunal's garden is in the shape of a rectangle.
Part of the garden is a patio in the shape of a triangle.
The rest of the garden is grass.

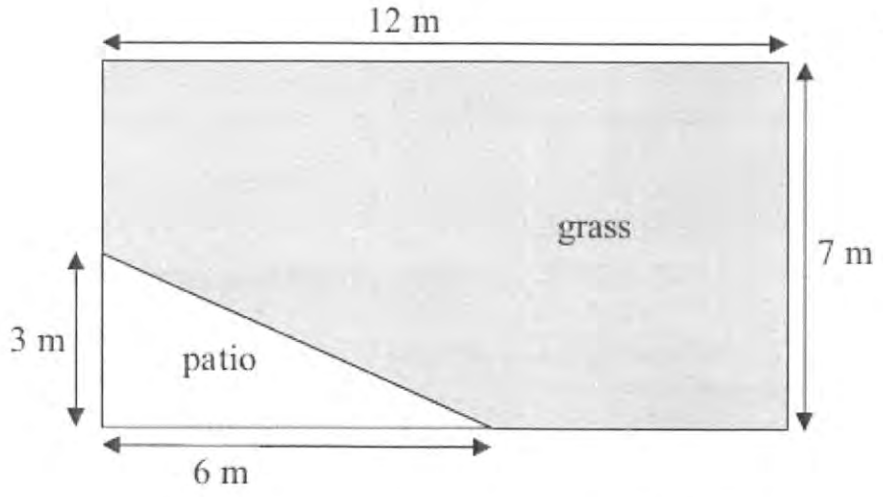



Diagram **NOT** accurately drawn

Mrs Kunal wants to spread fertiliser over all her grass.
One box of fertiliser is enough for 32 $m^2$ of grass.
How many boxes of fertiliser will she need?
You must show your working.

.....

**(Total for Question is 4 marks)**

***6.** The diagram shows a flower bed in the shape of a circle.

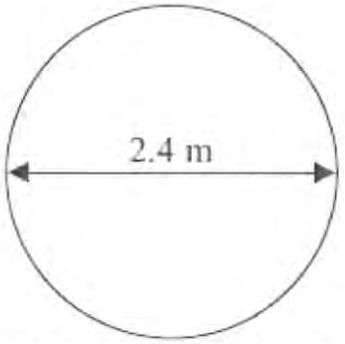



Diagram **NOT** accurately drawn

The flower bed has a diameter of 2.4 m.
Sue is going to put a plastic strip around the edge of the flower bed.
The plastic strip is sold in 2 metre rolls.
How many rolls of plastic strip does Sue need to buy?
You must show all your working.

**(Total for Question is 4 marks)**

## Volume and Surface Area of Prisms

**Things to remember:**

- Volume of a prism = area of cross section x length
- The surface area is the area of the surface (calculate the area of each face then add together)

**Questions:**

**1.** The diagram shows a prism.

All the corners are right angles.
Work out the volume of the prism.

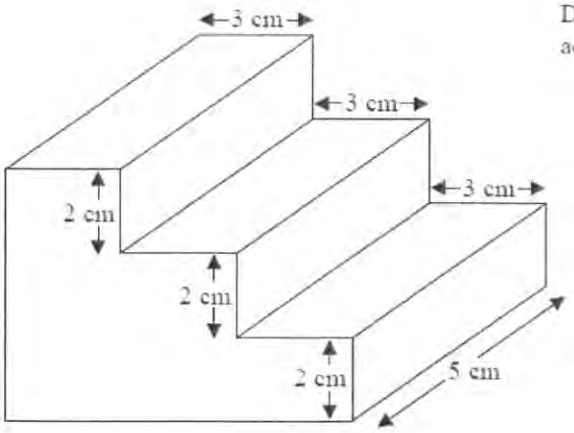
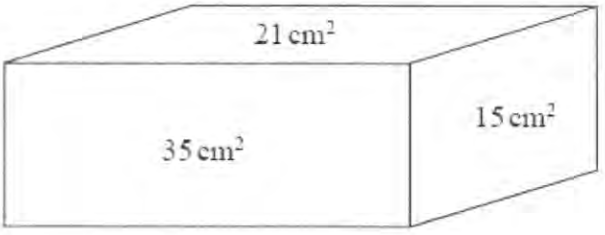



Diagram NOT accurately drawn

.....cm$^3$

**(Total for question = 3 marks)**

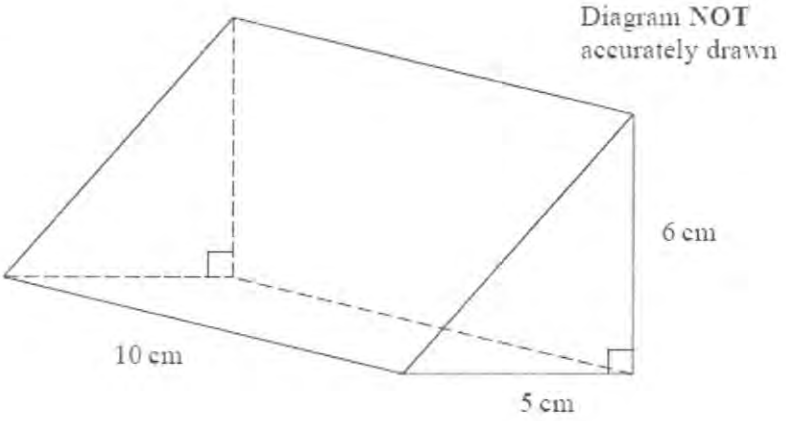
**2.** The diagram shows the area of each of three faces of a cuboid.
Diagram **NOT** accurately drawn
The length of each edge of the cuboid is a whole number of centimetres.
Work out the volume of the cuboid.




.....cm$^3$

**(Total for question = 4 marks)**

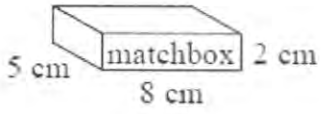
**3.** The diagram shows a triangular prism.
Work out the volume of the prism.

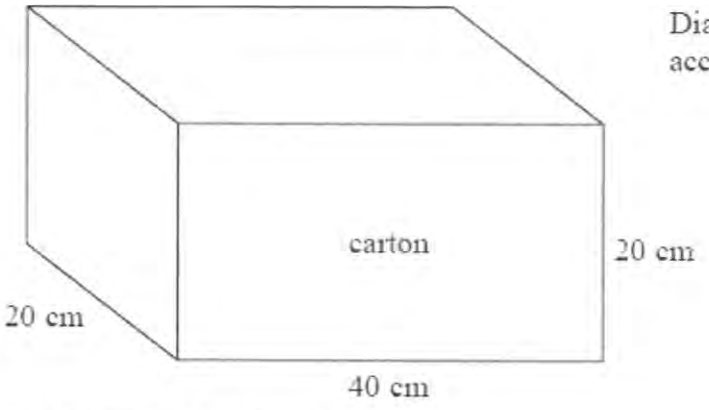



.....

**(Total for question = 3 marks)**

**4.** A matchbox is 5 cm by 8 cm by 2 cm.
A carton is 20 cm by 40 cm by 20 cm.
The carton is completely filled with matchboxes.



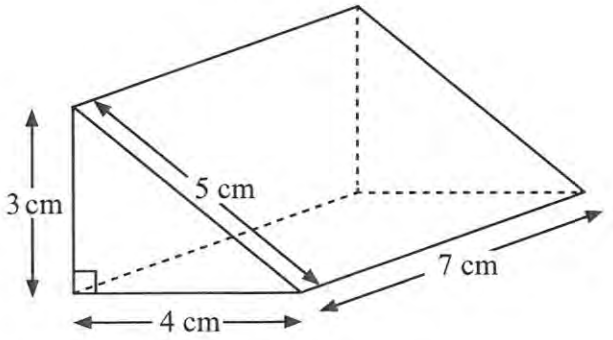




Work out the number of matchboxes in the carton.

.....

**(Total for Question is 3 marks)**

**5.** Diagram **NOT** accurately drawn
Work out the total surface area of the triangular prism.




..... cm²
**(Total 3 marks)**

**6.** The diagram shows a prism.

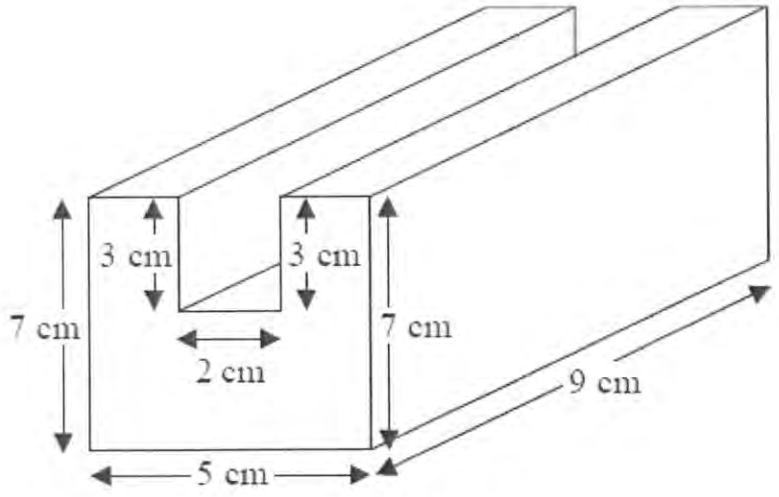
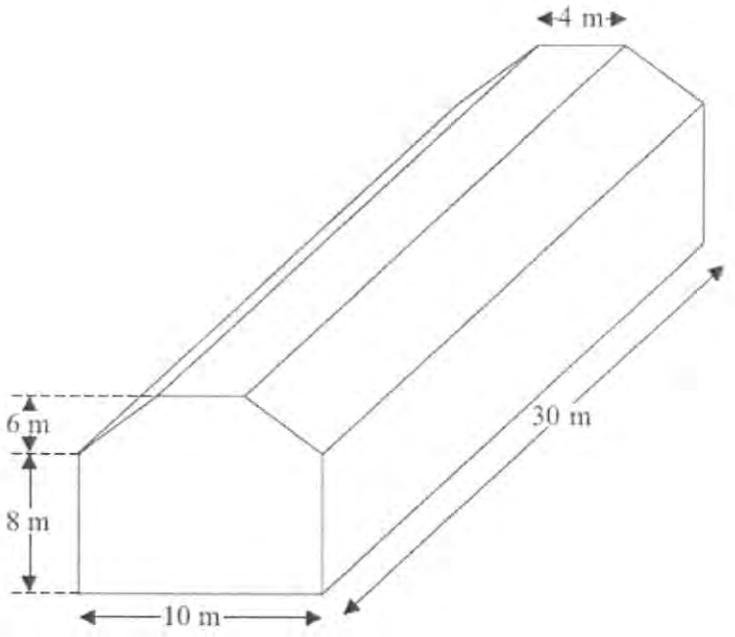



Diagram **NOT** accurately drawn

All the corners are right angles.
Work out the volume of the prism.

.....cm³
**(Total for question = 4 marks)**

**7.** Diagram **NOT** accurately drawn
The diagram represents a shed.
The shed is in the shape of a prism.
The cross section of the prism is a hexagon.
The hexagon has one line of symmetry.
The walls of the shed are vertical.
Calculate the volume of the shed.

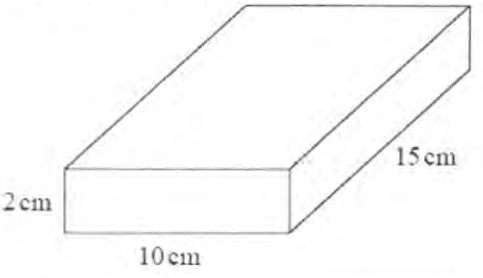



.....$m^3$

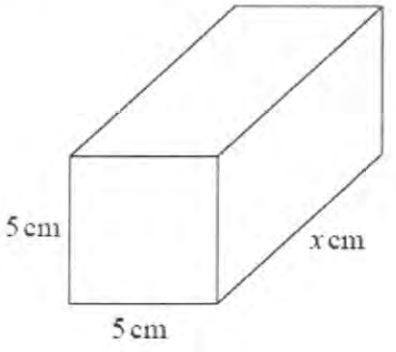
**(Total for Question is 4 marks)**

**8.** Jane makes cheese.
The cheese is in the shape of a cuboid.

Jane is going to make a new cheese.
The new cheese will also be in the shape of a cuboid.
The cross section of the cuboid will be a 5cm by 5cm square.




Jane wants the new cuboid to have the same volume as the 2cm by 10cm by 15cm cuboid.
Work out the value of $x$.




..... cm

**(Total for question = 3 marks)**

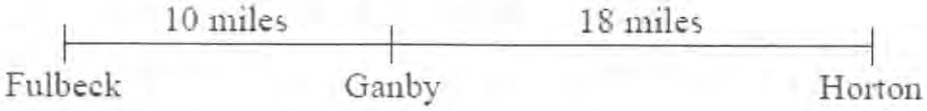
## Speed, Distance and Time

**Things to remember:**

- There are 60 seconds in a minute and 60 minutes in an hour.
- 5 miles = 8 km

**Questions:**

**1.** The distance from Fulbeck to Ganby is 10 miles.
The distance from Ganby to Horton is 18 miles.




Raksha is going to drive from Fulbeck to Ganby.
Then she will drive from Ganby to Horton.
Raksha leaves Fulbeck at 10 00
She drives from Fulbeck to Ganby at an average speed of 40mph.
Raksha wants to get to Horton at 10 35
Work out the average speed Raksha must drive at from Ganby to Horton.

..... mph

**(Total for question = 3 marks)**

**2.** A London airport is 200 miles from Manchester airport.
A plane leaves Manchester airport at 10 am to fly to the London airport.
The plane flies at an average speed of 120 mph.
What time does the plane arrive at the London airport?

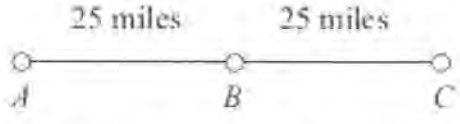
.....

**(Total for question = 4 marks)**

*3. The world speed record for a train is 360 mph.
It takes Malcolm 6 seconds to drive a train 1 kilometre.
Has the train broken the world speed record?
Use 5 miles = 8 km.

**(Total for question = 5 marks)**

4. *A*, *B* and *C* are 3 service stations on a motorway.
*AB* = 25 miles and *BC* = 25 miles




Aysha drives along the motorway from *A* to *C*.
ysha drives at an average speed of 50 mph from *A* to *B*.
She drives at an average speed of 60 mph from *B* to *C*.
Work out the difference in the time Aysha takes to drive from *A* to *B* and the time Aysha takes to drive from *B* to *C*.
Give your answer in minutes.

..... minutes
**(Total for Question is 3 marks)**

**5.** Peter goes for a walk.
He walks 15 miles in 6 hours.

(a) Work out Peter's average speed.
Give your answer in miles per hour.

..... mph
**(2)**

5 miles = 8 km.
Sunita says that Peter walked more than 20 km.

*(b) Is Sunita right?
You must show all your working.

**(2)**
**(Total for Question is 4 marks)**

## Averages

**Things to remember:**

- Mode is most – the number that occurs the most frequently.
- Median is middle – put the numbers in order then identify the middle number.
- Mean is mean to work out – add all the numbers together and divide by the quantity in the list.
- Range is the difference from the biggest to the smallest.

**Questions:**

**1.** Mrs Smith asked each student in her class to record the numbers of times they used their mobile phone last Saturday.
Here are the results for the boys.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Boys | 8 | 10 | 8 | 9 | 7 | 9 | 8 | 13 | 14 |

(a) Work out the median.

.....

**(2)**

Here are the results for the girls.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Girls | 6 | 8 | 9 | 9 | 10 | 14 | 14 |

*(b) Compare the numbers of times the boys used their mobile phones with the numbers of times the girls used their mobile phones.

**(4)**
**(Total for question = 6 marks)**

**2.** There are 18 packets of sweets and 12 boxes of sweets in a carton.
The mean number of sweets in all the 30 packets and boxes is 14
The mean number of sweets in the 18 packets is 10
Work out the mean number of sweets in the boxes.

.....

**(Total for question = 3 marks)**

**3.** 25 students in class A did a science exam.
30 students in class B did the same science exam.
The mean mark for the 25 students in class A is 67.8
The mean mark for all the 55 students is 72.0
Work out the mean mark for the students in class B.

.....

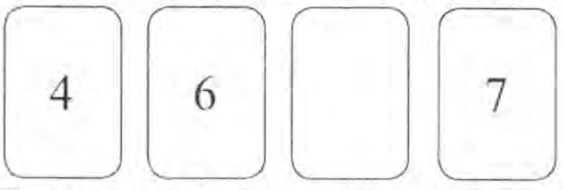
**(Total for Question is 3 marks)**

**4.** There are 10 boys and 20 girls in Mrs Brook's class.
Mrs Brook gave all the class a test.
The mean mark for all the class is 60
The mean mark for the girls is 56
Work out the mean mark for the boys.

.....

**(Total for Question is 3 marks)**

**5.** Here are four number cards.
One of the cards is turned over so you cannot see the number on it.




The mean of the four numbers is 6
Work out the number you **cannot** see.

.....

**(Total for Question 10 is 3 marks)**

***6.** There are two trays of plants in a greenhouse.
The first tray of plants was given fertiliser.
The second tray of plants was not given fertiliser.
On Monday the heights of the plants were measured in centimetres.
The boxes show some information about the heights of the plants.

**Heights of the plants given fertiliser**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 22 | 29 | 30 | 35 | 37 | 40 | 44 | 47 |
| 48 | 48 | 54 | 56 | 59 | 66 | 72 | |

**Information about the heights of plants not given fertiliser**

| | | | |
|---|---|---|---|
| Smallest | 18 | Lower quartile | 26 |
| Largest | 64 | Upper quartile | 47 |
| Median | 44 | | |

Compare the distribution of the heights of the plants given fertiliser to the distribution of the heights of the plants not given fertiliser.

**(Total for Question is 4 marks)**

**7.** 23 girls have a mean height of 153 cm.
17 boys have a mean height of 165 cm.
Work out the mean height of all 40 children.

..... cm

**(Total for Question is 3 marks)**

**8.** Hertford Juniors is a basketball team.
At the end of 10 games, their mean score is 35 points per game.
At the end of 11 games, their mean score has gone down to 33 points per game.
How many points did the team score in the 11th game?

.....

**(Total for Question is 3 marks)**

**9.** Mr Brown gives his class a test.
The 10 girls in the class get a mean mark of 70%
The 15 boys in the class get a mean mark of 80%

Nick says that because the mean of 70 and 80 is 75 then the mean mark for the whole class in the test is 75%
Nick is not correct.

Is the correct mean mark less than or greater than 75%?
You must justify your answer.

.....

.....

.....

**(Total for question = 2 marks)**

**10.** Walkden Reds is a basketball team.
At the end of 11 games, their mean score was 33 points per game.
At the end of 10 games, their mean score was 2 points higher.

Jordan says,
"Walkden Reds must have scored 13 points in their 11th game."

Is Jordan right?
You must show how you get your answer.

.....

**(Total for question is 3 marks)**

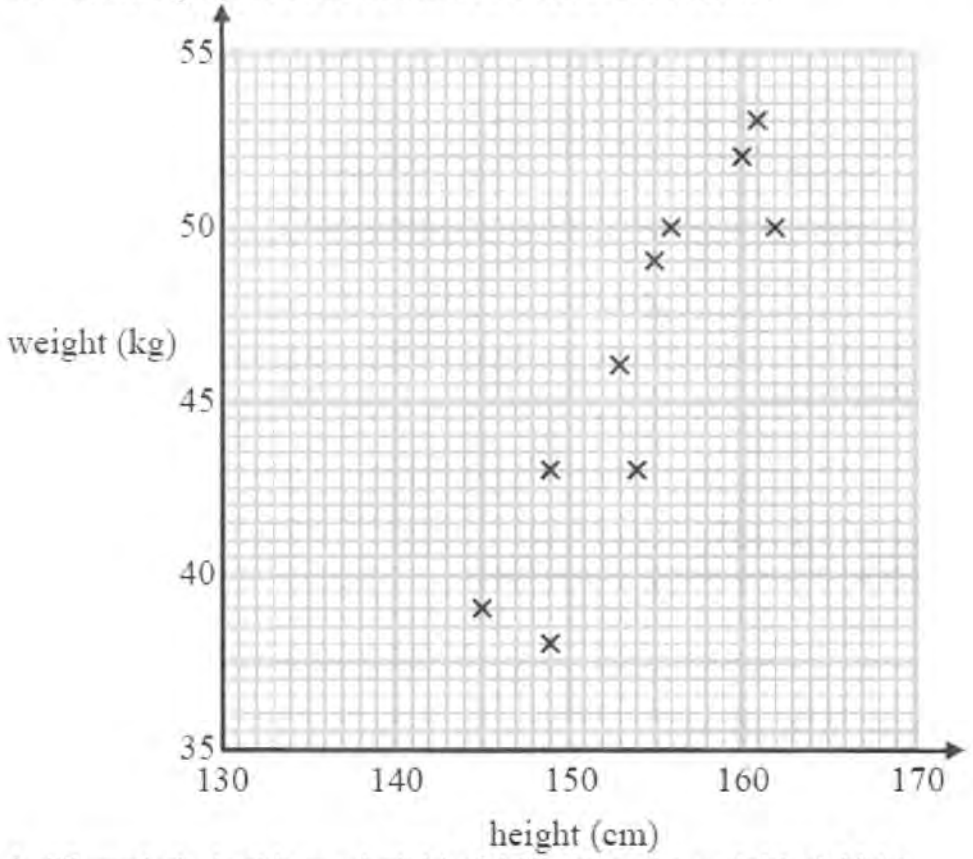
## Scatter Graphs

**Things to remember:**

- Check the scale carefully when plotting points. If it helps, write in more numbers on the scale.
- Always draw a line of best fit
- When estimating a value show lines on your graph.
- You can describe a relationship by using the words "positive correlation" or "negative correlation." Make sure you include the word correlation.

**Questions:**

**1.** Leon recorded the height, in cm, and the weight, in kg, of each of ten students.
The scatter graph shows information about his results.




A different student has a height of 146 cm and a weight of 41 kg.

(a) Plot this information on the scatter graph.

**(1)**

(b) Describe the relationship between the height and the weight of these students.

.....

**(1)**

A student has a weight of 47.5 kg.

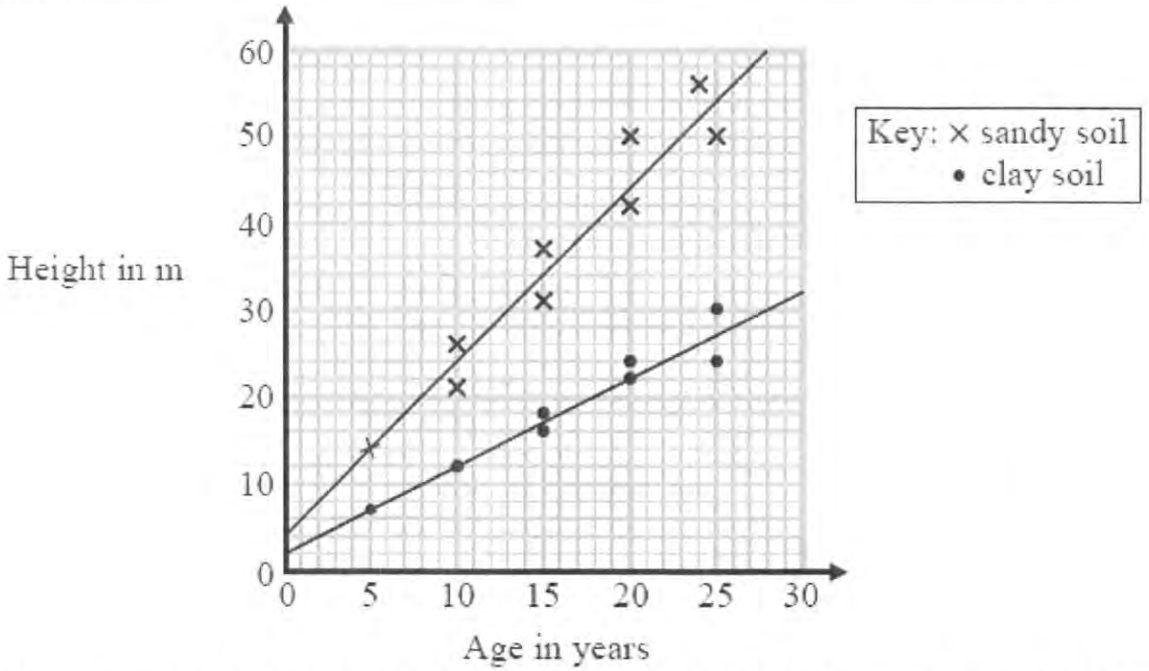
(c) Use the scatter graph to estimate the height of this student.

..... cm

**(2)**

**(Total for question = 4 marks)**

**2.** Bill wants to compare the heights of pine trees growing in sandy soil with the heights of pine trees growing in clay soil.
The scatter diagram gives some information about the heights and the ages of some pine trees.




(a) Describe the relationship between the height of pine trees and the age of pine trees growing in sandy soil.

.....

**(1)**

A pine tree growing in clay soil is 18 years old.

(b) Find an estimate for the height of this tree.

.....m

**(1)**

A pine tree is growing in sandy soil.

(c) Work out an estimate for how much the height of this tree increases in a year.

.....m

**(2)**

(d) Compare the rate of increase of the height of trees growing in clay soil with the rate of increase of the height of trees growing in sandy soil.

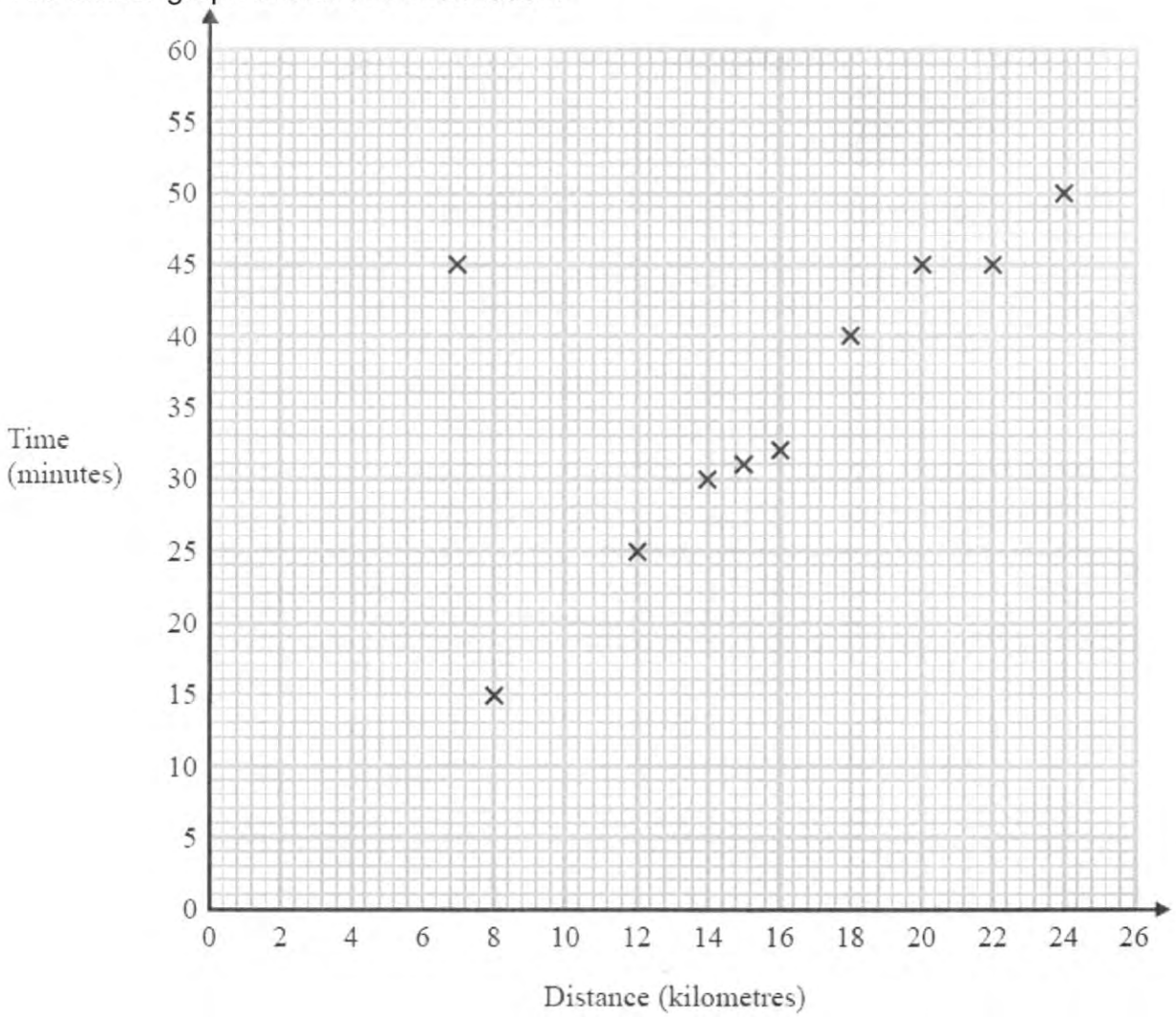
.....

.....

**(2)**

**(Total for question = 6 marks)**

**3.** A delivery driver records for each delivery the distance he drives and the time taken. The scatter graph shows this information.




For another delivery he drives 22 kilometres and takes 50 minutes.

(a) Show this information on the scatter graph.

**(1)**

(b) What type of correlation does the scatter graph show?

.....

**(1)**

The driver has to drive a distance of 10km for his next delivery.

(c) Estimate the time taken for this delivery.

..... minutes

**(2)**

During one of the deliveries, the driver was delayed by road works.

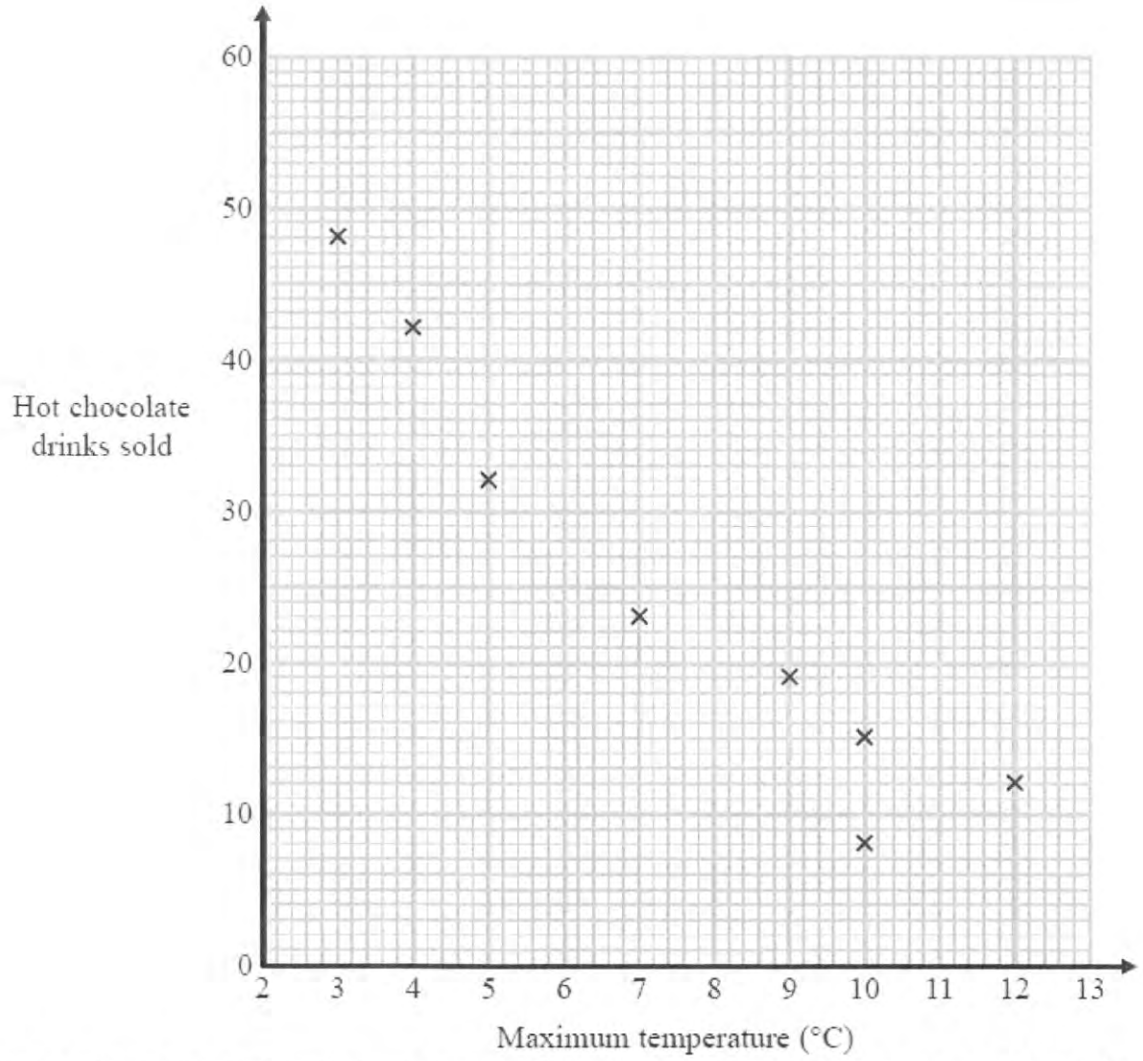
(d) Using the graph write down the time taken for this delivery.

..... minutes

**(1)**

**(Total for question = 5 marks)**

**4.** Carlos has a cafe in Clacton.
Each day, he records the maximum temperature in degrees Celsius (°C) in Clacton and the number of hot chocolate drinks sold.
The scatter graph shows this information.




On another day the maximum temperature was 6 °C and 35 hot chocolate drinks were sold.

(a) Show this information on the scatter graph.

**(1)**

(b) Describe the relationship between the maximum temperature and the number of hot chocolate drinks sold.

.....

.....

**(1)**

(c) Draw a line of best fit on the scatter diagram.

**(1)**

One day the maximum temperature was 8 °C.

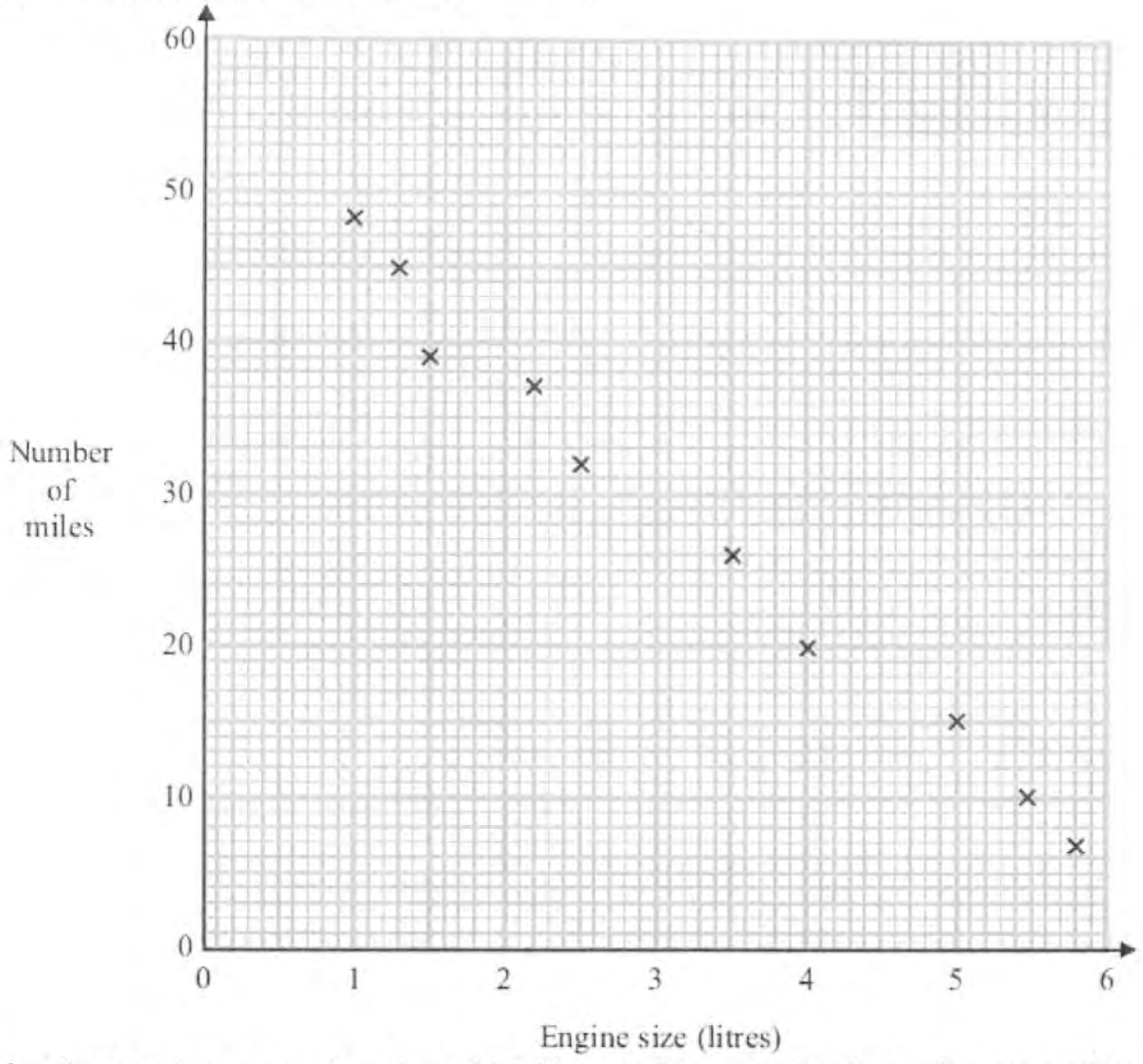
(d) Use your line of best fit to estimate how many hot chocolate drinks were sold.

.....

**(1)**

**(Total for Question is 4 marks)**

**5.** A car company records the number of miles cars of different engine sizes, in litres, travel using one gallon of fuel.
The scatter graph shows this information.




Another car has an engine size of 1.8 litres and travels 42 miles using one gallon of fuel.

(a) Plot this information on the scatter graph.

**(1)**

(b) What type of correlation does this scatter graph show?

.....

**(1)**

(c) Draw a line of best fit.

**(1)**

A car has an engine size of 2.8 litres.

(d) Find an estimate for the number of miles this car travels using one gallon of fuel.

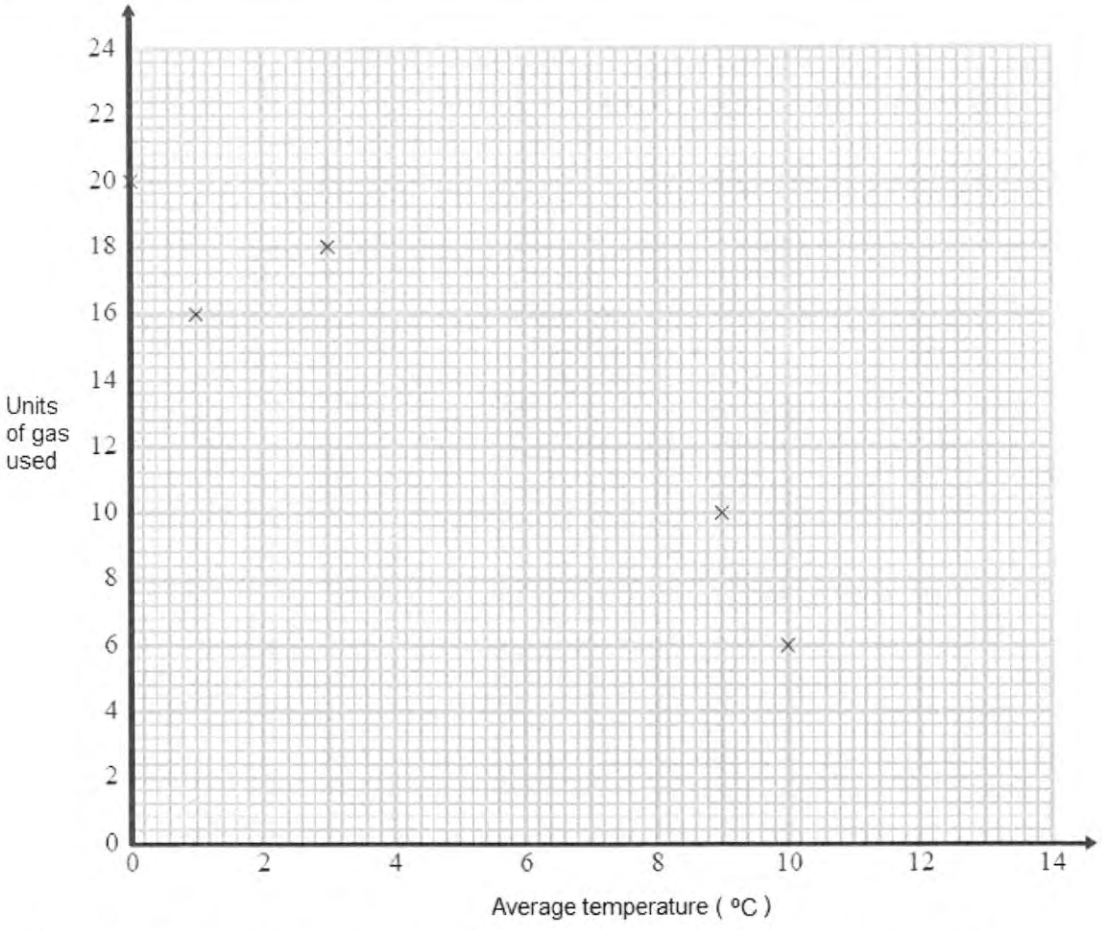
..... miles

**(1)**

**(Total for Question is 4 marks)**

**6.** The table shows the average temperature on each of seven days and the number of units of gas used to heat a house on these days.

| Average temperature (°C) | 0 | 1 | 3 | 9 | 10 | 12 | 13 |
|---|---|---|---|---|---|---|---|
| Units of gas used | 20 | 16 | 18 | 10 | 6 | 6 | 2 |




(a) Complete the scatter graph to show the information in the table.
The first 5 points have been plotted for you.

**(1)**

(b) Describe the relationship between the average temperature and the number of units of gas used.

.....

.....

**(1)**

(c) Estimate the average temperature on a day when 12 units of gas are used.

.....°C

**(2)**

**(Total for Question is 4 marks)**

## Relative Frequency

**Things to remember:**

- Probabilities of exhaustive events sum to 1
- To calculate relative frequency, multiply the number of trials by the given probability

**Questions:**

**1.** An electronic game can show red or blue or green or yellow.
The table shows the probabilities that the colour shown will be red or will be green or will be yellow.

| Colour | red | blue | green | yellow |
|---|---|---|---|---|
| Probability | 0.15 | | 0.41 | 0.24 |

Arthur plays the game.

(a) Work out the probability that the colour shown will be blue.

.....

**(2)**

Janice is going to play the game 50 times.

(b) Work out an estimate for the number of times the colour shown will be yellow.

.....

**(2)**

**(Total for question = 4 marks)**

**2.** Karl wants to raise money for charity.
He designs a game for people to play.
Karl uses a fair 10-sided dice for the game.
The dice is numbered from 1 to 10
Each person will roll the dice once. A person wins the game if the dice lands on a multiple of 4
Ali plays the game once.

(a) Work out the probability that Ali will win the game.

.....

**(2)**

Each person pays 30p to play the game once.
The prize for a win is £1
Karl thinks that the game will be played 100 times.

(b) Work out an estimate for how much money Karl will raise for charity.

.....

**(3)**

**(Total for question = 5 marks)**

**3.** Ali throws a biased dice 200 times.
The table shows information about his results.

| Score | Frequency |
|---|---|
| 1 | 47 |
| 2 | 4 |
| 3 | 25 |
| 4 | 56 |
| 5 | 38 |
| 6 | 30 |

Charlie throws the dice 550 times.
Work out an estimate for the total number of times that Charlie will get a score of 4

.....

**(Total for Question is 3 marks)**

**4.** The probability that a pea plant will grow from a seed is 93%.
Sarah plants 800 seeds.
Work out an estimate for the number of seeds that will grow into pea plants.

.....

**(Total for Question is 2 marks)**

**5.** Rhiana plays a game.
The probability that she will lose the game is 0.32
The probability that she will draw the game is 0.05
Rhiana is going to play the game 200 times.
Work out an estimate for the number of times Rhiana will win the game.

.....

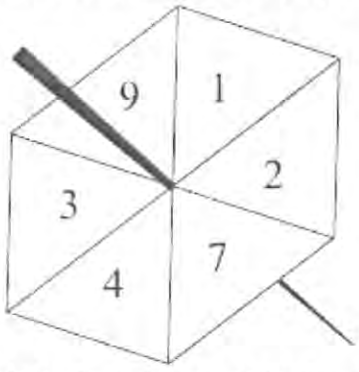
**(Total for Question is 3 marks)**

**6.** The probability that a biased dice will land on a five is 0.3
Megan is going to roll the dice 400 times.
Work out an estimate for the number of times the dice will land on a five.

.....

**(Total for Question is 2 marks)**

**7.** Here is a fair 6-sided spinner.




Jake is going to spin the spinner once.

(a) Write down the probability that the spinner will land

(i) on 4

.....

(ii) on a number greater than 10

.....

**(2)**

Liz is going to spin the spinner 120 times.

(b) Work out an estimate for the number of times the spinner will land on 7

.....

**(2)**

**(Total for Question is 4 mark)**

**8.** There are only red counters, blue counters, white counters and black counters in a bag.
The table shows the probability that a counter taken at random from the bag will be red or blue.

| **Colour** | red | blue | white | black |
|---|---|---|---|---|
| **Probability** | 0.2 | 0.5 | | |

The number of white counters in the bag is the same as the number of black counters in the bag.

Tania takes at random a counter from the bag.

(a) Work out the probability that Tania takes a white counter.

.....

**(2)**

There are 240 counters in the bag.

(c) Work out the number of red counters in the bag.

.....

**(2)**

**(Total for Question is 4 marks)**

## Dividing into a Ratio

**Things to remember:**

- Start by dividing the quantity by the total number of parts, then multiply by each share.
- Don't forget to include units throughout your working.

**Questions:**

**1.** Keith and Graham share £105 in the ratio 4:3
Work out how much Keith gets.

.....

**(Total for Question is 2 marks)**

***2.** Talil is going to make some concrete mix.
He needs to mix cement, sand and gravel in the ratio 1 : 3 : 5 by weight.
Talil wants to make 180 kg of concrete mix.
Talil has

15 kg of cement
85 kg of sand
100 kg of gravel

Does Talil have enough cement, sand and gravel to make the concrete mix?

**(Total for Question is 4 marks)**

**3.** Liam, Sarah and Emily shared some money in the ratio 2 : 3 : 7
Emily got £80 more than Liam.
How much money did Sarah get?

.....

**(Total for question = 3 marks)**

**4.** A pile of sand has a weight of 60 kg.
The sand is put into a small bag, a medium bag and a large bag in the ratio 2 : 3 : 7
Work out the weight of sand in each bag.

small bag ..... kg

medium bag ..... kg

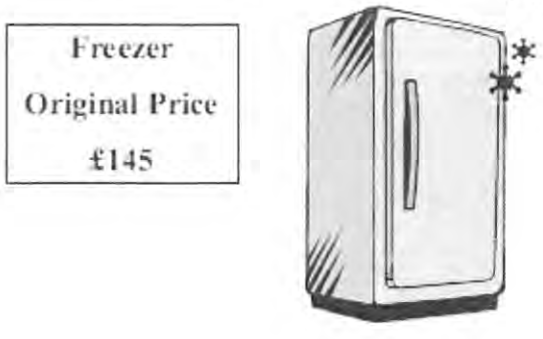
large bag ..... kg

**(Total for Question is 3 marks)**

**5.** A shop sells freezers and cookers.
The ratio of the number of freezers sold to the number of cookers sold is 5 : 2
The shop sells a total of 140 freezers and cookers in one week.
*(a) Work out the number of freezers and the number of cookers sold that week.

**(3)**

Jake buys this freezer in a sale.
The price of the freezer is reduced by 20%.
(b) Work out how much Jake saves.




£ .....

**(2)**

**(Total for Question is 5 marks)**

**6.** Graham and Michael share £35 in the ratio 5 : 2
Work out the amount of money that Graham gets.

£.....

**(Total for Question is 2 marks)**

**7.** 5 schools sent some students to a conference.
One of the schools sent both boys and girls.
This school sent 16 boys.
The ratio of the number of boys it sent to the number of girls it sent was 1 : 2
The other 4 schools sent only girls.
Each of the 5 schools sent the same number of students.
Work out the total number of students sent to the conference by these 5 schools.

.....

**(Total for Question is 4 marks)**

## Recipes

**Things to remember:**

- Calculate the scale factor.
- Multiply each ingredient by the scale factor.
- Check your answer using estimating and common sense to check that it seems sensible.

**Questions:**

**1.** This is a list of ingredients for making a pear & almond crumble for 4 people.

| Ingredients for **4** people. |
|---|
| 80 g plain flour |
| 60 g ground almonds |
| 90 g soft brown sugar |
| 60 g butter |
| 4 ripe pears |

Work out the amount of each ingredient needed to make a pear & almond crumble for **10** people.

..... g plain flour

..... g ground almonds

..... g soft brown sugar

..... g butter

..... ripe pears

**(Total 3 marks)**

**2.** Here are the ingredients needed to make 500 ml of custard.

| **Custard makes 500 ml** |
|---|
| 400 ml of milk |
| 3 large egg yolks |
| 50 g sugar |
| 2 teaspoons of cornflour |

(a) Work out the amount of sugar needed to make 2000 ml of custard.

.....g

**(2)**

(b) Work out the amount of milk needed to make 750 ml of custard.

.....ml

**(2)**

**(Total 4 marks)**

**3.** Here is a recipe for making 10 chocolate chip cookies.

| **Chocolate Chip Cookies** |
|---|
| Makes 10 cookies. |
| 100 g of flour |
| 60 g of sugar |
| 50 g of margarine |
| 40 g of chocolate chips |
| 2 eggs |

Work out the amounts needed to make 15 chocolate chip cookies.

..... g of flour

..... g of sugar

..... g of margarine

..... g of chocolate chips

..... eggs

**(Total 3 marks)**

**4.** Here is a list of ingredients for making a peach dessert for **6** people.

Peach dessert for 6 people.

| | |
|---|---|
| 150 g | jelly |
| 10 | sponge fingers |
| 500 ml | custard |
| 200 g | peaches |

Bob is going to make a peach dessert for **15** people.
Work out the amount of each ingredient he needs.

.....g jelly

.....sponge fingers

.....m/ custard

.....g peaches

**(Total for Question is 3 marks)**

**5.** Here are the ingredients needed to make leek and potato soup for 4 people.

**Leek and potato soup**

**Serves 4**

4 leeks

350 g potatoes

600 ml vegetable stock

300 ml milk

Jenny wants to make soup for 6 people.
Work out the amount of each ingredient she needs.

..... leeks

..... g potatoes

..... ml vegetable stock

..... ml milk

**(Total for question = 3 marks)**

**6.** Jane made some almond biscuits which she sold at a fête.
She had:
5 kg of flour
3 kg of butter
2.5 kg of icing sugar
320 g of almonds
Here is the list of ingredients for making 24 almond biscuits.

Ingredients for 24 almond biscuits

150 g flour
100 g butter
75 g icing sugar
10 g almonds

Jane made as many almond biscuits as she could, using the ingredients she had.
Work out how many almond biscuits she made.

**(Total for question = 3 marks)**

## Percentages of Amounts, Increasing and Decreasing

**Things to remember:**

- "Per cent" means "out of 100".
- Increase means the value will go up, decrease means the value will go down.

**Questions:**

**1.** David is going to buy a cooker.
The cooker has a price of £320
David pays a deposit of 15% of the price of the cooker.
How much money does David pay as a deposit?

£ .....

**(Total for Question is 2 marks)**

**2.** Work out 65% of 300

.....

**(Total for question = 2 marks)**

***3.** Barak is going to buy 550 nails from one of these companies.

| Nail Company | Hammer Company |
|---|---|
| 50 nails | 25 nails |
| £4.15 plus VAT at 20% | £2.95 |
| | Special offer<br>Buy 100 get 25 free |

He wants to buy the nails at the cheaper cost.
Where should he buy the nails, from the Nail Company or the Hammer Company?

**(Total for question = 5 marks)**

**4.** Greg sells car insurance and home insurance.
The table shows the cost of these insurances.

| **Insurance** | car insurance | home insurance |
|---|---|---|
| **Cost** | £200 | £350 |

Each month Greg earns
£530 basic pay
5% of the cost of all the car insurance he sells
and 10% of the cost of all the home insurance he sells
In May Greg sold
6 car insurances
and 4 home insurances
Work out the total amount of money Greg earned in May.

£ .....

**(Total for Question is 5 marks)**

**5.** Mr Watkins needs to buy some oil for his central heating.
Mr Watkins can put up to 1500 litres of oil in his oil tank.
There are already 850 litres of oil in the tank.
Mr Watkins is going to fill the tank with oil.
The price of oil is 67.2p per litre.
Mr Watkins gets 5% off the price of the oil.
How much does Mr Watkins pay for the oil he needs to buy?

£ .....

**(Total for Question is 5 marks)**

*6. Jim's pay is £180 each week.
Jim asks his boss for an increase of £20 a week.
Jim's boss offers him a 10% increase.
Is the offer from Jim's boss more than Jim asked for?
You must show your working.

**(Total for Question is 3 marks)**

*7. Gordon owns a shop.
Here are the prices of three items in Gordon's shop and in a Supermarket.

| Gordon's Shop | |
|---|---|
| 400 g loaf of bread | £1.22 |
| 1 litre of milk | £0.96 |
| 40 tea bags | £2.42 |

| Supermarket | |
|---|---|
| 400 g loaf of bread | £1.15 |
| 1 litre of milk | £0.86 |
| 40 tea bags | £2.28 |

Gordon reduces his prices by 5%.
Will the total cost of these three items be cheaper in Gordon's shop than in the Supermarket?

**(Total for Question is 3 marks)**

**8.** Mr Brown and his 2 children are going to London by train.
An adult ticket costs £24
A child ticket costs £12
Mr Brown has a Family Railcard.

| Family Railcard gives |
| --- |
| $\frac{1}{3}$ off adult tickets |
| 60% off child tickets |

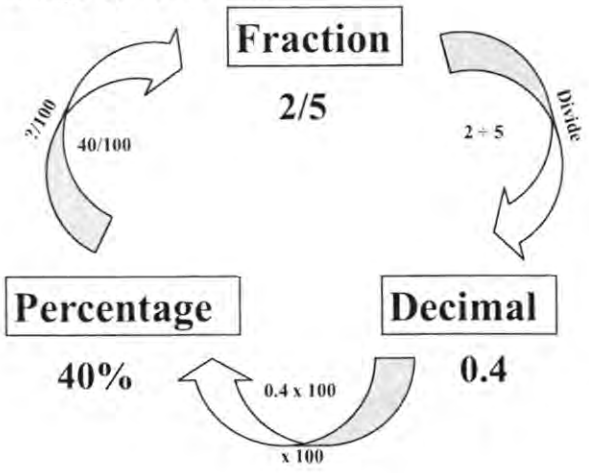
Work out the total cost of the tickets when Mr Brown uses his Family Railcard.

£.....

**(Total for Question is 4 marks)**

## Fractions, Decimals and Percentages

**Things to remember:**




**Questions:**

**1.** (a) Write 0.1 as a fraction.

.....

**(1)**

(b) Write ¼ a decimal.

.....

**(1)**

**(Total for Question is 2 marks)**

**2.** (a) Write $\frac{3}{4}$ as a decimal.

.....

**(1)**

(b) Write 0.3 as a fraction.

.....

**(1)**

**(Total for Question is 2 marks)**

**3.** (a) Write $\frac{1}{4}$ as a decimal.

.....

**(1)**

(b) Write 0.15 as a fraction.

.....

**(1)**

(c) Write 17 out of 40 as a fraction.

.....

**(1)**

**(Total for question = 3 marks)**

**4.** (a) Write $\frac{7}{10}$ as a decimal.

.....

**(1)**

(b) Write 0.45 as a percentage.

.....

**(1)**

(c) Write 30% as a fraction.
Give your fraction in its simplest form.

.....

**(2)**

**(Total for Question is 4 marks)**

**5.** (a) Write 0.7 as a fraction.

.....

**(1)**

(b) Write 0.3 as a percentage.

.....

**(1)**

(c) Write $\frac{8}{12}$ in its simplest form.

.....

**(1)**

**(Total for Question is 3 marks)**

**6.** Write these numbers in order of size. Start with the smallest number.

75% $\frac{7}{8}$ 0.25 $\frac{1}{2}$ $\frac{2}{3}$

.....

**(Total for question = 2 marks)**

**7.** Write these numbers in order of size. Start with the smallest number.

0.6 $\frac{2}{3}$ 65% 0.606

.....

**(Total for question = 2 marks)**

**8.** Celina and Zoe both sing in a band.
One evening the band plays for 80 minutes.
Celina sings for 65% of the 80 minutes.

Zoe sings for $\frac{5}{8}$ of the 80 minutes.
Celina sings for more minutes than Zoe sings.
Work out for how many more minutes.
You must show all your working.

..... minutes
**(Total for question = 4 marks)**

Name: _____

# Contents

## Types of Numbers

**Things to remember:**

- A factor is a whole number that divides exactly into another number.
- A multiple is a number that may be divided by another a certain number of times without a remainder.
- A prime number only has 2 factors – 1 and itself.
- A power tells us how many times the base number has been multiplied by itself
- A root is the opposite of a power.
- A square number is the result of multiplying an integer (whole number) by itself.

**Questions:**

**1.** (a) Write down the square of 8

.....

**(1)**

(b) Write down the value of $10^3$

.....

**(1)**

(c) Estimate the value of $\sqrt{20}$

.....

**(1)**

**(Total for Question is 3 marks)**

**2.** Here is a list of eight numbers: 4 5 4 25 29 30 33 39 40

From the list, write down

**(2)** a factor of 20

.....

(ii) a multiple of 10

.....

(iii) the prime number that is greater than 15

.....

**(Total for Question is 3 marks)**

**3.** Express 180 as a product of its prime factors.

.....

**(Total for Question is 3 marks)**

**4.** (a) Write down the value of $7^2$

.....
**(1)**

(b) Write down the value of $\sqrt{25}$

.....
**(1)**

(c) Write down the value of $2^3$

.....
**(1)**
**(Total for Question is 3 marks)**

**5.** (a) Write down the value of $\sqrt{81}$

.....
**(1)**

(b) Work out the value of $5^2 + 2^3$

.....
**(2)**
**(Total for Question is 3 marks)**

**6.** Here is a list of numbers:
2 3 10 12 15 16 24
From the list write down
**(2)** an odd number

.....
**(1)**

(b) a multiple of 6

.....
**(1)**

(c) a factor of 18

.....
**(1)**
**(Total for Question is 3 marks)**

**7.** Here is a list of numbers.
2 3 5 8 10 16 21 24
From the numbers in the list,

**(2)** write down an odd number

.....
**(1)**

(b) write down the square number

.....
**(1)**

(c) write down the number which is a multiple of 6

.....
**(1)**
**(Total for Question is 3 marks)**

**8.** Here is a list of numbers.

1 2 4 5 7 11 13 14 15 17

From the list, write down three different prime numbers that add together to make 20

.....

**(Total for Question is 3 marks)**

## Place Value

**Things to remember:**
Label columns as below

| Thousands | Hundreds | Tens | Units | $\frac{1}{10}$ | $\frac{1}{100}$ | $\frac{1}{1000}$ |
|---|---|---|---|---|---|---|

**Questions:**

**1.** (a) Write the number **seven thousand and twenty five** in figures.

.....

**(1)**

(b) Write the number 9450 in words.

.....

**(1)**

(c) Write the number 28.75 to the nearest whole number.

.....

**(1)**

(d) Write the number 7380 to the nearest thousand.

.....

**(1)**

**(Total for Question is 4 marks)**

**2.** Write down the value of the 3 in the number 4376

.....

**(Total for question = 1 mark)**

**3.** Write down the value of the 3 in 16.35

.....

**(Total for question is 1 mark)**

**4.** (a) Work out 90 ÷ 10

.....

**(1)**

(b) Write these numbers in order of size. Start with the smallest number.
2.8 4.71 0.6 13.4

.....

**(1)**

(c) Write $^{7}/_{10}$ as a decimal.

.....

**(1)**

**(Total for Question is 3 marks)**

**5.** (a) Write these numbers in order of size. Start with the smallest number.

3517 7135 5713 1357

.....

**(1)**

(b) Write these numbers in order of size. Start with the smallest number.

0.354 0.4 0.35 0.345

.....

**(1)**

**(Total for Question is 2 marks)**

**6.** Here are four cards. There is a number on each card.

| 4 | 5 | 2 | 1 |
|---|---|---|---|

(a) Write down the largest 4-digit even number that can be made using each card only once.

.....

**(2)**

(b) Write down all the 2-digit numbers that can be made using these cards.

.....

**(2)**

**(Total for question is 4 marks)**

**7.** (a) Write these numbers in order of size. Start with the smallest number.

3007 4435 399 4011 3333

.....

**(1)**

(b) Write these numbers in order of size. Start with the smallest number.

3.7 5.62 0.7 14.3

.....

**(1)**

(c) Write $\frac{9}{10}$ as a decimal.

.....

**(1)**

**(Total for question = 3 marks)**

**8.** Write the following numbers in order of size. Start with the smallest number.

0.61 0.1 0.16 0.106

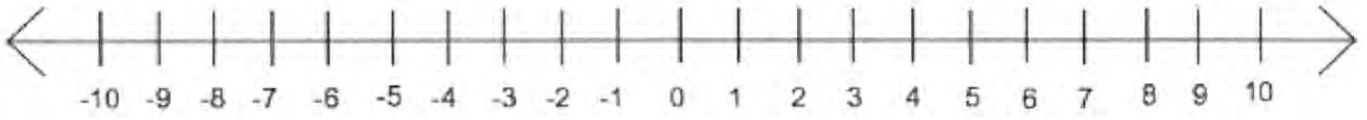
.....

**(Total for question = 1 mark)**

## Directed Numbers

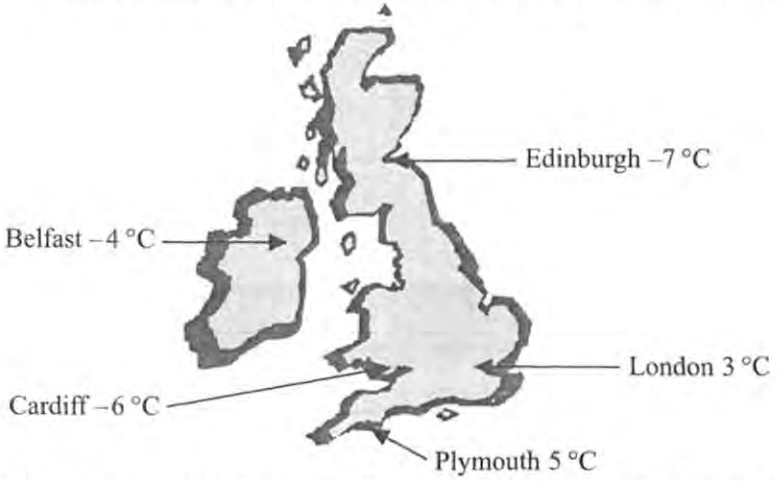
**Things to remember:**

- Mixed means minus!
- Use a number line – if you're adding you need to move in a positive direction (right), if you're subtracting you need to move in a negative direction (left).




**Questions:**

**2.** Here is a map of the British Isles.
The temperatures in some places, one night last winter are shown on the map.




(a) (i) Write down the names of the two places that had the biggest difference in temperature.

.....

.....

(ii) Work out the difference in temperature between these two places.

.....°C

**(3)**

(b) Two pairs of places have a difference in temperature of 2 °C.
Write down the names of these places.

(i) ..... and .....

(ii) ..... and .....

**(2)**

**(Total 5 marks)**

**2.** Sally wrote down the temperature at different times on 1st January 2003.

| Time | Temperature |
|---|---|
| midnight | – 6 °C |
| 4 am | –10 °C |
| 8 am | – 4 °C |
| noon | 7 °C |
| 3 pm | 6 °C |
| 7 pm | –2 °C |

(a) Write down

(i) the **highest** temperature,

..... °C

(ii) the **lowest** temperature.

..... °C

**(2)**

(b) Work out the difference in the temperature between

(i) 4 am and 8 am,

..... °C

(ii) 3 pm and 7 pm.

..... °C

**(2)**

At 11 pm that day the temperature had fallen by 5 °C from its value at 7 pm.

(c) Work out the temperature at 11 pm.

..... °C

**(1)**

**(Total 5 marks)**

**3.** The table shows the temperature on the surface of each of five planets.

| Planet | Temperature |
|---|---|
| Venus | 480 °C |
| Mars | – 60 °C |
| Jupiter | – 150 °C |
| Saturn | – 180 °C |
| Uranus | – 210 °C |

**(2)** Work out the difference in temperature between Mars and Jupiter.

..... °C

**(1)**

(b) Work out the difference in temperature between Venus and Mars.

..... °C

**(1)**

(c) Which planet has a temperature 30 °C higher than the temperature on Saturn?

.....

**(1)**

The temperature on Pluto is 20 °C lower than the temperature on Uranus.

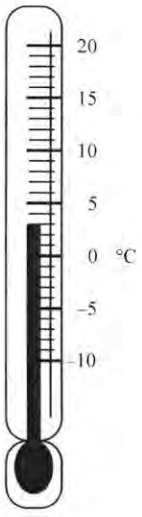
(d) Work out the temperature on Pluto.

..... °C

**(1)**

**(Total 4 marks)**

**4.** (a) Write down the temperature shown on the thermometer.




.....°C
**(1)**

The temperature falls by 8°C.

(b) Work out the new temperature.

.....°C
**(1)**
**(Total 2 marks)**

**5.** The table shows the highest and lowest temperatures one day in London and Moscow.

| | **Highest** | **Lowest** |
|---|---|---|
| London | 8°C | –6°C |
| Moscow | –3°C | –8°C |

**(2)** Work out the difference between the **lowest** temperature in London and the **lowest** temperature in Moscow.

.....°C
**(1)**

(b) Work out the difference between the **highest** and **lowest** temperature in London.

.....°C
**(1)**
**(Total 2 marks)**

**6.** The table shows the midday temperatures in 4 different cities on Monday.

| **City** | **Midday temperature (°C)** |
|---|---|
| Belfast | 5 |
| Cardiff | –1 |
| Glasgow | –6 |
| London | –4 |

**(2)** Which city had the lowest temperature?

.....
**(1)**

(b) Work out the difference between the temperature in Cardiff and the temperature in Belfast.

.....°C
**(1)**

By Tuesday, the midday temperature in London had risen by 7 °C.

(c) Work out the midday temperature in London on Tuesday.

.....°C
**(1)**
**(Total 3 marks)**

**7.** Mr Snow stayed some time at the South Pole.
The highest temperature there was –30 °C.
The lowest temperature there was –57 °C.

**(2)** Work out the difference between the highest temperature and the lowest temperature at the South Pole.

.....°C
**(1)**

Mr Snow returned to his house in London.
The temperature outside his house was –2 °C.
The temperature inside his house was 12 °C higher.

(b) Work out the temperature inside his house.

.....°C
**(1)**
**(Total 2 marks)**

**8.** Write these temperatures in order. Start with the lowest temperature.

7°C  –2°C  10°C  –5°C  3°C

.....

**(Total for question = 1 mark)**

## Coordinates

**Things to remember:**
Along the corridor, up the stairs → (x,y)

**Questions:**

**1.** (a) Write down the coordinates of the point *P*.

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

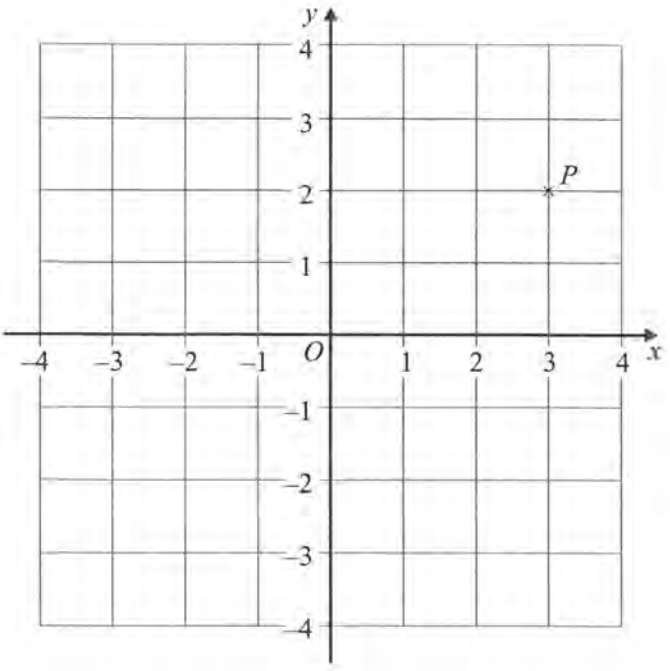
**(1)**

(b) (i) On the grid, plot the point (0, 3). Label the point *Q*.

(ii) On the grid, plot the point (–2, –3). Label the point *R*.

**(2)**

**(Total 3 marks)**




**2.** (a) Write down the coordinates of the point

(i) *A*,

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

(ii) *B*.

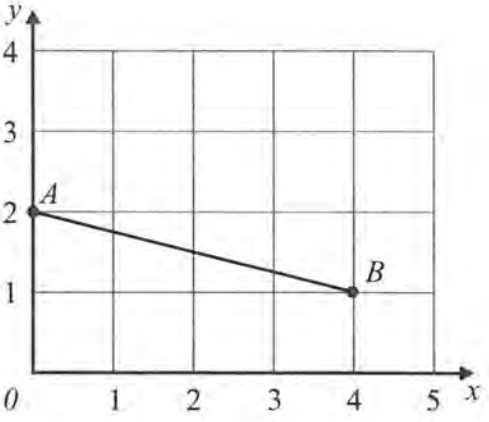
( ..... , ..... )

**(2)**

(b) On the grid, mark with a cross (×) the midpoint of the line *AB*.

**(1)**

**(Total 3 marks)**




**3.** (a) (i) Write down the coordinates of the point A.

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

(ii) Write down the coordinates of the point *B*.

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

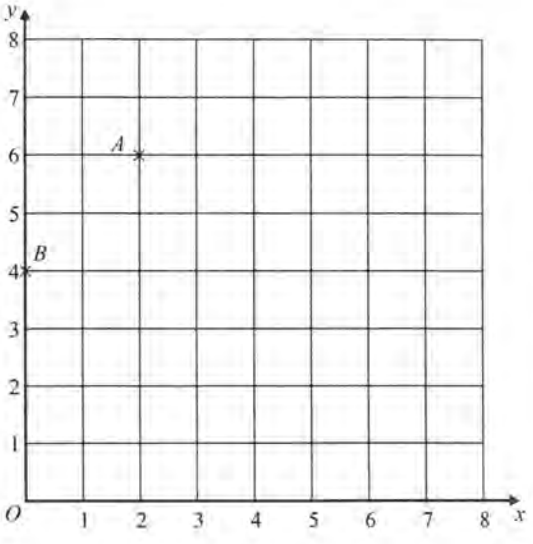
**(2)**

(b) (i) On the grid, mark the point (6, 4) with the letter *P*.

(ii) On the grid, mark the point (3, 0) with the letter *Q*.

**(2)**

**(Total 4 marks)**



**4.** (a) Write down the coordinates of the point

(i) $A$,

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

(ii) $C$.

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

**(2)**

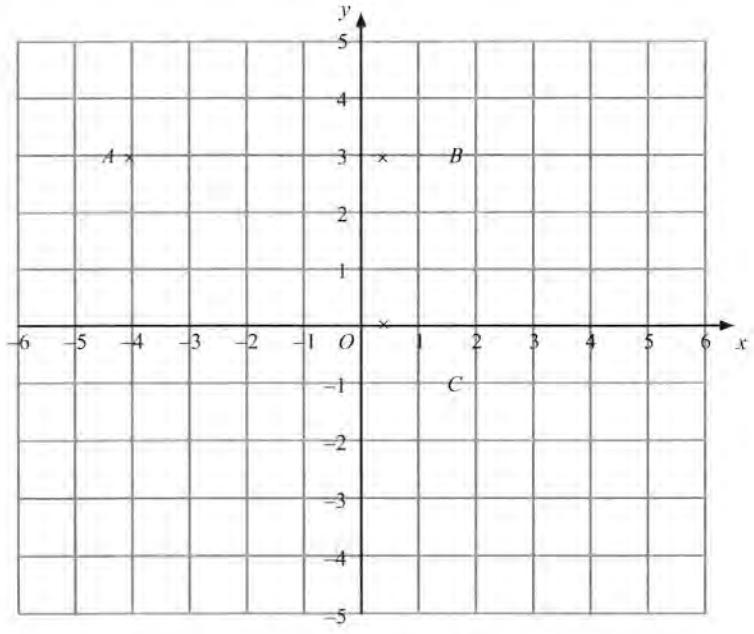
(b) (i) On the grid, mark the point $D$ so that $ABCD$ is a rectangle.

(ii) Write down the coordinates of $D$.

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

**(2)**

**(Total 4 marks)**




**5.** (a) Write down the coordinates of the point $A$.

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

**(1)**

(b) Write down the coordinates of the point $B$.

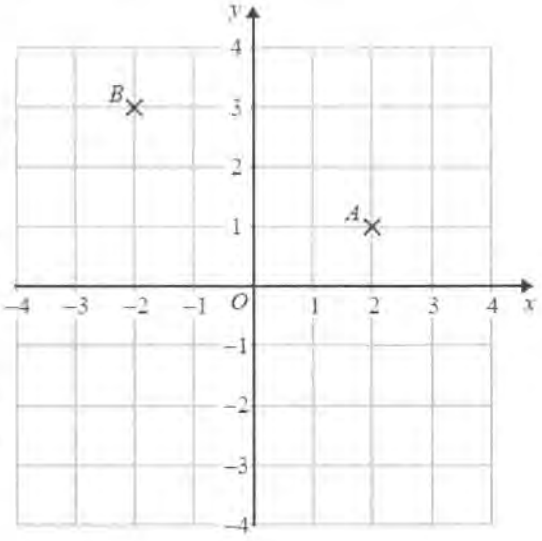
(..... , .....)

**(1)**

(c) On the grid, mark with a cross (×) the point (−3, −1). Label this point $C$.

**(1)**

**(Total for question = 3 marks)**




**6.** (a) (i) Write down the coordinates of the point $A$.

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

(ii) Write down the coordinates of the point $B$.

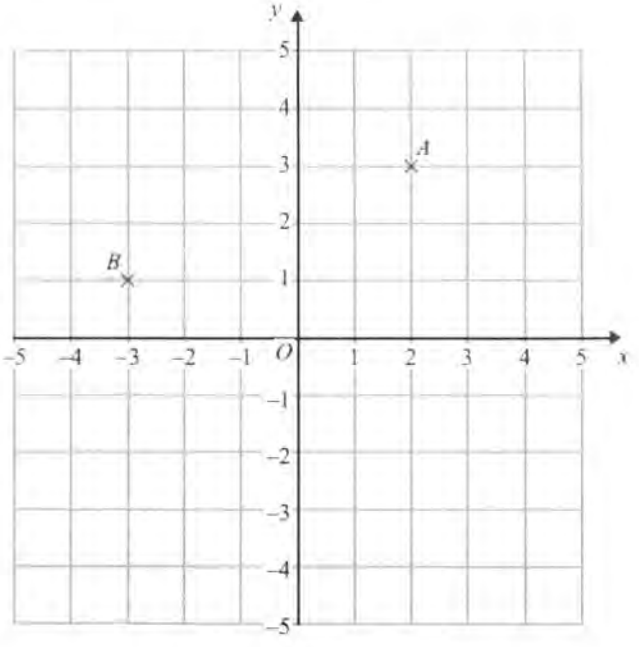
(..... , .....)

**(2)**

(b) On the grid, mark with a cross the point (3, –4). Label this point $C$.

**(1)**

**(Total for Question is 3 marks)**



**7.** (a) Write down the coordinates of the point $P$.

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

**(1)**

(b) Write down the coordinates of the point $R$.

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

**(1)**

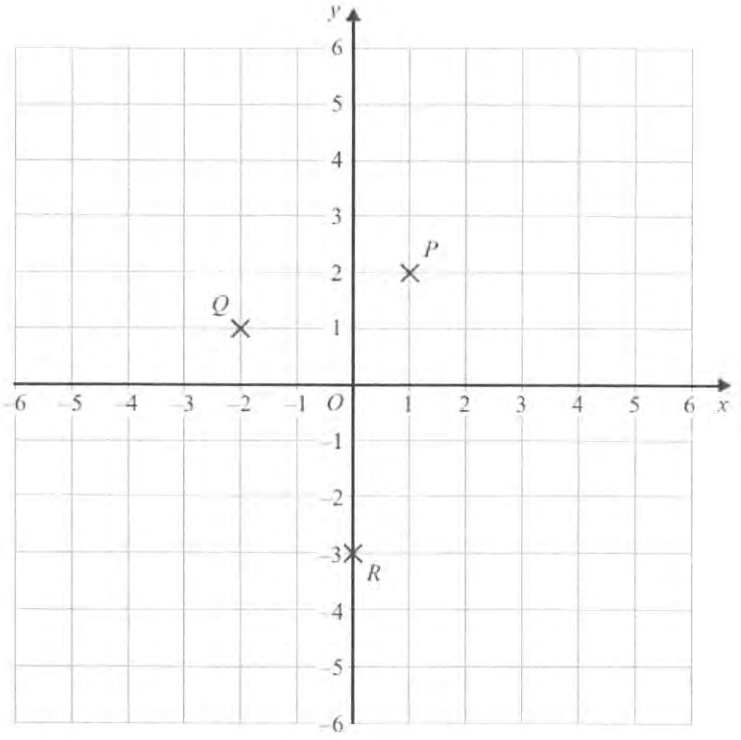
$P$, $Q$ and $R$ are three vertices of a parallelogram.

(c) Write down the coordinates of the fourth vertex of this parallelogram.

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

**(1)**

**(Total for Question is 3 marks)**




**8.** (a) Write down the coordinates of point $B$.

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

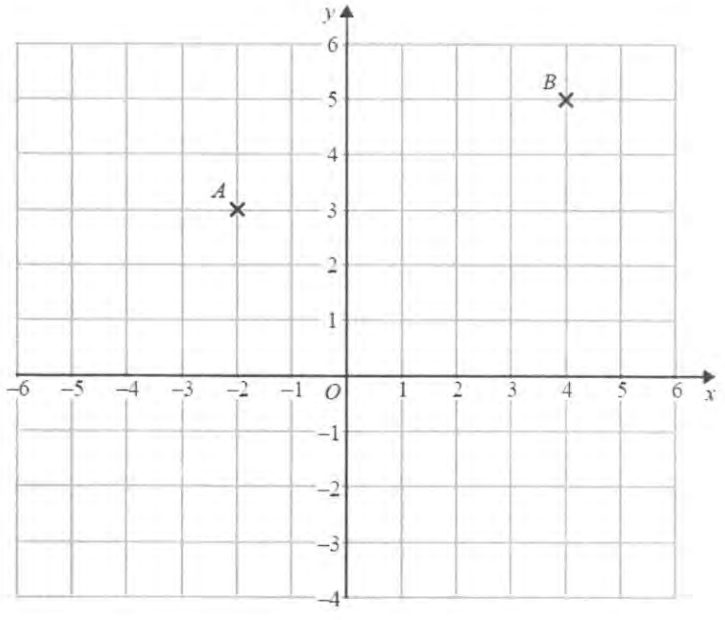
**(1)**

(b) Find the coordinates of the midpoint of $AB$.

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

**(1)**

**(Total for question = 2 marks)**



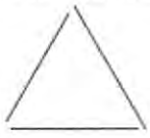
## Patterns and Sequences

**Things to remember:**

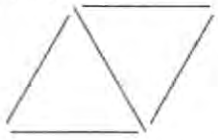
- If there is a pattern, look carefully at how many sticks/blocks are being added on each time.
- Work out the rule (for example: add 4 or multiply by 2) to help you work out the next term.

**Questions:**

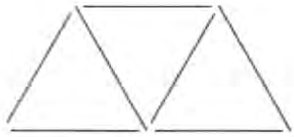
**1.** Here are some patterns made from sticks.



Pattern number 1



Pattern number 2



Pattern number 3

In the space below, draw Pattern number 4

**(1)**

(b) Complete the table.

| Pattern number | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| Number of sticks | 3 | 5 | 7 | | |

**(1)**

(c) How many sticks make Pattern number 15?

.....

**(1)**

**(Total for Question is 3 marks)**

**2.** Here are the first four terms of a number sequence.

6 10 14 18

**(2)** Write down the next term in this sequence.

.....

**(1)**

(b) Find the $10^{th}$ term in this sequence.

.....

**(1)**

(c) The number 102 is **not** a term in this sequence. Explain why.

.....

.....

**(1)**

**(Total for Question is 3 marks)**

**3.** Here are the first four terms of a number sequence.

3 7 11 15

(a) Write down the next term of this sequence.

.....

**(1)**

The 50th term of this number sequence is 199

(b) Write down the 51st term of this sequence.

.....

**(1)**

The number 372 is **not** a term of this sequence.

(c) Explain why.

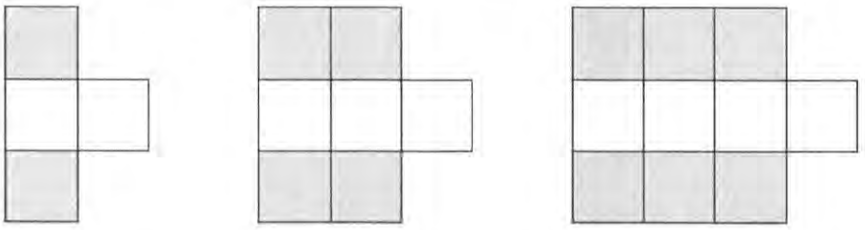
.....

.....

**(1)**

**(Total for Question is 3 marks)**

**4.** Here are some patterns made from white centimetre squares and grey centimetre squares.



Pattern 1 Pattern 2 Pattern 3

(a) In the space below, draw Pattern 4

**(1)**

(b) Find the number of grey squares in Pattern 6

.....

**(1)**

A Pattern has 20 grey squares.

(c) Work out how many white squares there are in this Pattern.

.....

**(2)**

**(Total for Question is 4 marks)**

**5.** Here are some patterns made from sticks.

Pattern number 1 Pattern number 2 Pattern number 3

(a) Draw Pattern number 4 in the space below.

**(1)**

(b) How many sticks are needed for Pattern number 12?

.....

**(2)**

Sunil says that he will need 70 sticks for Pattern number 20

(c) Is Sunil correct? You must give a reason for your answer.

.....

.....

.....

**(2)**

**(Total for Question is 5 marks)**

**6.** Here are the first 6 terms of a number sequence.

5 9 13 17 21 25

(a) Write down the next term of the sequence.

.....

**(1)**

(b) (i) Work out the eleventh term of the sequence.

.....

(ii) Explain how you found your answer.

.....

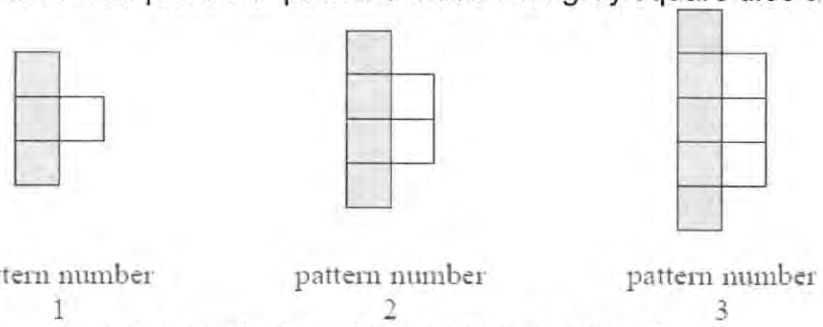
.....

.....

**(2)**

**(Total for Question is 3 marks)**

**7.** Here is a sequence of patterns made with grey square tiles and white square tiles.



pattern number 1 | pattern number 2 | pattern number 3

**(2)** In the space below, draw pattern number 4

**(1)**

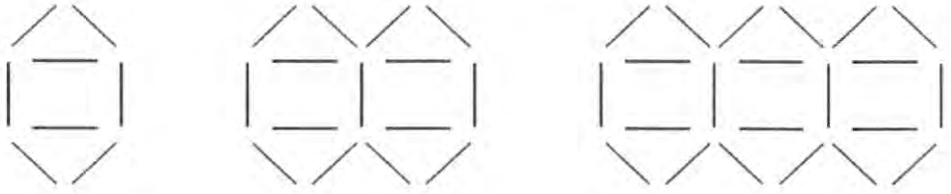
(b) Find the total number of tiles in pattern number 20

.....

**(2)**

**(Total for question is 3 marks)**

**8.** Here is a sequence of patterns made from sticks.



pattern number 1 | pattern number 2 | pattern number 3

(a) In the space below, draw pattern number 4

**(1)**

(b) How many sticks are needed for pattern number 10?

.....

**(2)**

**(Total for question = 3 marks)**

## Collecting Like Terms (Simplifying)

**Things to remember:**

- 2a means a + a or 2 lots of a
- $a^2$ means a x a
- The sign (+ or -) belongs to the term following it. You may find it easier to identify like terms using two different highlighters.

**Questions:**

**1.** (a) Simplify $a + a + a + a$

.....

**(1)**

(b) Simplify $3 \times c \times d$

.....

**(1)**

(c) Simplify $3ef + 5ef - ef$

.....

**(1)**

**(Total for Question is 3 marks)**

**2.** (a) Simplify $b + b + b + b$

.....

**(1)**

(b) Simplify $8n - 3n$

.....

**(1)**

(c) Simplify $3 \times c \times d$

.....

**(1)**

(d) Simplify $3x + 7y + 2x - y$

.....

**(2)**

**(Total for Question is 5 marks)**

**3.** Simplify $3x + 5y + x + 4y$

.....

**(Total for Question is 2 marks)**

**4.** (a) Simplify $a \times c \times 3$

.....

**(1)**

(b) Simplify $p \times p \times p$

.....

**(1)**

(c) Simplify $5x - 4y + 3x - 3y$

.....

**(2)**

**(Total for Question is 4 marks)**

**5.** (a) Simplify $5a - 2a$

.....

**(1)**

(b) Simplify $3 \times 4y$

.....

**(1)**

(c) Simplify $3e + 4f + 2e - f$

.....

**(2)**

**(Total for Question is 4 marks)**

**6.** (a) Simplify $m + m + m$

.....

**(1)**

(b) Simplify $9e - 2e$

.....

**(1)**

(c) Simplify $5 \times 3g$

.....

**(1)**

**(Total for Question is 3 marks)**

**7.** (a) Simplify $d + d + d + d$

.....

**(1)**

(b) Simplify $3 \times e \times f$

.....

**(1)**

(c) Simplify $2x + 3y + 3x - y$

.....

**(2)**

**(Total for question = 4 marks)**

**8.** (a) Simplify $f + f + f + f - f$

.....

**(1)**

(b) Simplify $2m \times 3$

.....

**(1)**

(c) Simplify $3a + 2h + a + 3h$

.....

**(2)**

**(Total for Question is 4 marks)**

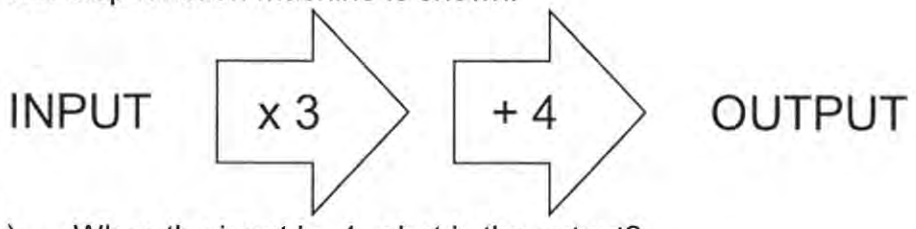
## Solving Linear Equations

**Things to remember:**

- "Solve" means to find the value of the variable (what number the letter represents).
- The inverse of + is – and the inverse of x is ÷
- Work one step at a time, keeping you = signs in line on each new row of working.

**Questions:**

**1.** A two step function machine is shown.




(a) When the input is -4, what is the output?

.....

**(1)**

(b) If the output is 25, what was the input?

.....

**(1)**

(c) If the input is n, what is the output?

.....

**(2)**

**(Total for Question is 4 marks)**

**2.** You can use this rule to work out the total cost of hiring a car.

| **Total cost = £4 per hour plus £12** |
|---|

Arun hires a car for 5 hours.

(a) Work out the total cost.

£.....

**(2)**

Raj hires a car.

The total cost is £40

(b) Work out how many hours Raj hires the car for.

..... hours

**(3)**

**(Total for Question is 5 marks)**

**3.** (a) Solve $6g = 18$

$g =$ . . . . . .

**(1)**

(b) Solve $5h + 7 = 17$

$h =$ . . . . . .

**(2)**

**(Total for Question is 3 marks)**

**4.** (a) Solve $x + 9 = 19$

$x =$ . . . . . .

**(1)**

(b) Solve $2y = 17$

$y =$ . . . . . .

**(1)**

(c) Solve $\frac{w}{4} = 8$

$w =$ . . . . . .

**(1)**

**(Total for Question is 3 marks)**

**5.** (a) Solve $\frac{n}{7} = 2$

$n =$ . . . . . .

**(1)**

(b) Solve $3g + 4 = 19$

$g =$ . . . . . .

**(2)**

**(Total for Question is 3 marks)**

**6.** (a) Solve $4x = 20$

$x =$ .....

**(1)**

(b) Solve $y - 9 = 17$

$y =$ .....

**(1)**

**(Total for question = 2 marks)**

**7.** Solve $3x + 7 = 1$

$x =$ .....

**(Total for question = 2 marks)**

**8.** Solve $4x + 5 = x + 26$

$x =$ .....

**(Total for question = 2 marks)**

## Inequalities

**Things to remember:**

- < means less than
- > means greater than
- ≤ means less than or equal to
- ≥ means greater than or equal to
- An integer is a whole number
- On a number line, use a full circle to show a value can be equal, and an empty circle to show it cannot.

**Questions:**

**1.** $-2 < n \leq 3$
$n$ is an integer.
Write down all the possible values of $n$.

.....

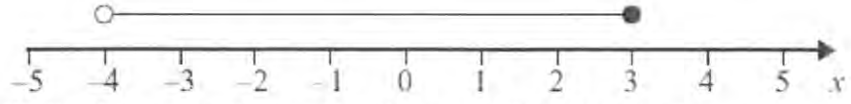
**(Total for Question is 2 marks)**

**2.** (a) $n$ is an integer.
$-1 \leq n < 4$
List the possible values of $n$.

.....

**(2)**

(b)

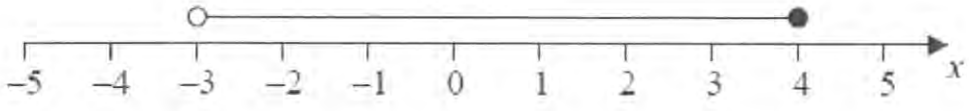



Write down the inequality shown in the diagram.

.....

**(2)**
**(Total for Question is 4 marks)**

**3.** Here is an inequality, in $x$, shown on a number line.

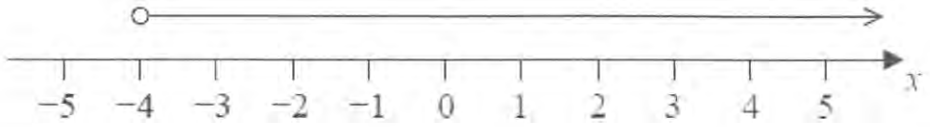



Write down the inequality.

.....

**(Total for Question is 2 marks)**

**4.**




(a) Write down the inequality represented on the number line.

.....

**(1)**

(b) $-3 \leq n < 2$
$-2 < m < 4$
$n$ and $m$ are integers.
Given that $n = m$, write down all the possible values of $n$.

.....

**(2)**
**(Total for question = 5 marks)**

**5.** $-5 < y \leq 0$
$y$ is an integer.
Write down all the possible values of $y$.

.....

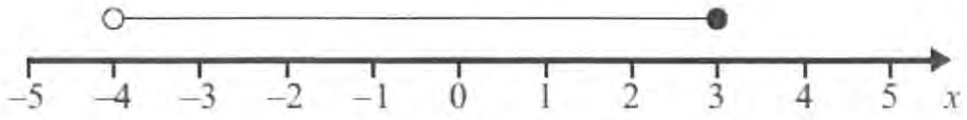
**(Total for Question is 2 marks)**

**6.** (a) $n$ is an integer.
$-1 \leq n < 4$
List the possible values of $n$.

.....

**(2)**

(b)




Write down the inequality shown in the diagram.

.....

**(2)**
**(Total for Question is 4 marks)**

**7.** $-4 < n \leq 1$

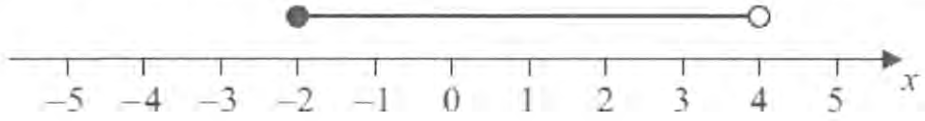
$n$ is an integer.

(a) Write down all the possible values of $n$.

.....

**(2)**

(b) Write down the inequalities represented on the number line.



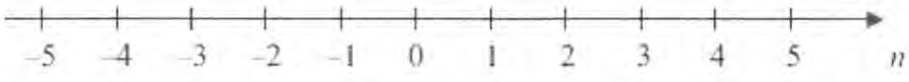

.....

**(2)**

**(Total for Question is 4 marks)**

**8.** $-2 < n \leq 3$

(a) Represent this inequality on the number line.




**(Total for Question is 2 marks)**

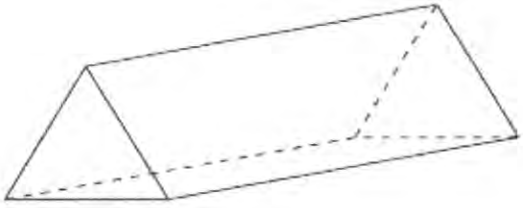
## Types of Shapes and their Properties

**Things to remember:**

- Sides and vertices belong on 2D shapes.
- Edges, faces and vertices belong on 3D shapes.

**Questions:**

**1.** Here is a triangular prism.



(a) For this prism, write down

(i) the number of edges

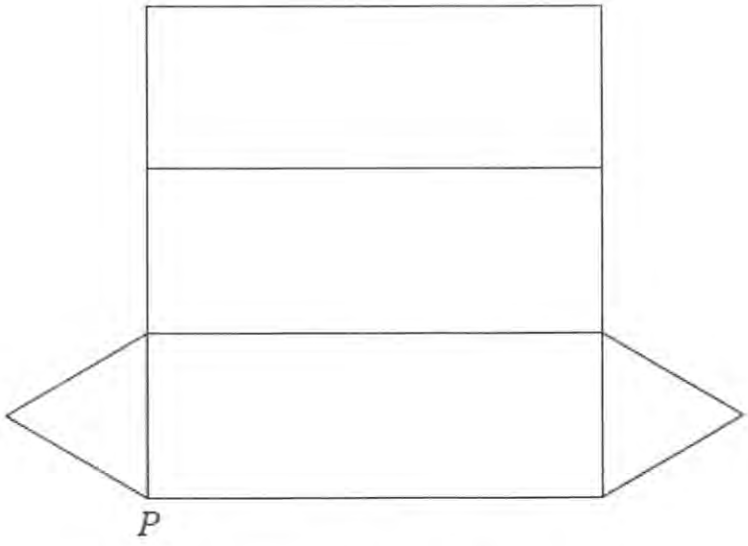
.....

(ii) the number of faces

.....

**(2)**

Here is a net of the triangular prism.



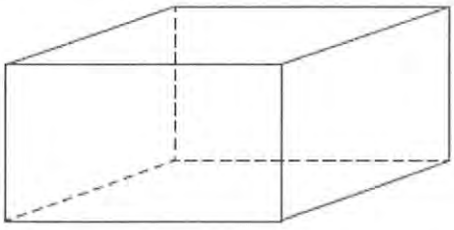

The net is folded to make the prism.
One other point meets at *P*.

(b) Mark this point on the net with the letter *P*.

**(1)**

**(Total for Question is 3 marks)**

**2.** Here is a cuboid.



The following sentences are about cuboids.

Complete each sentence by writing the correct number in the gap.

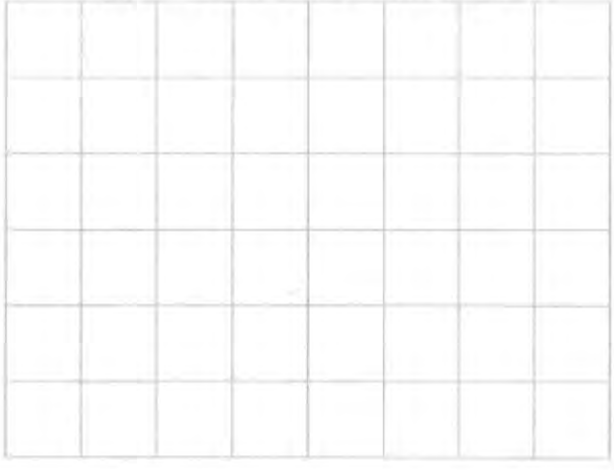
(i) A cuboid has ..... faces.

(ii) A cuboid has ..... edges.

(iii) A cuboid has ..... vertices.

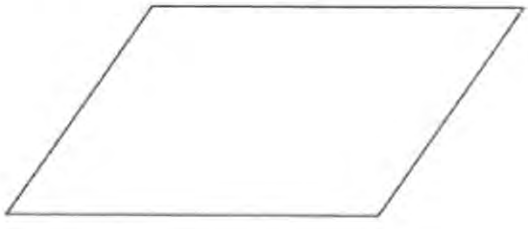
**(Total for Question is 3 marks)**

**3.** (a) On the grid, draw a kite.



**(1)**

(b) Here is a quadrilateral.



Write down the special name of this quadrilateral.

.....

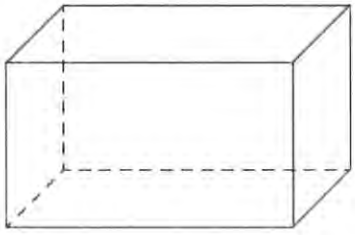
**(1)**

**(Total for Question is 2 marks)**

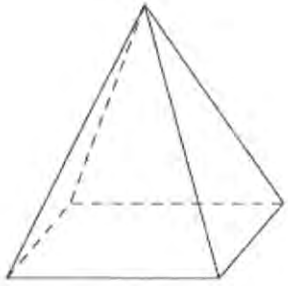
**4.** Draw a sketch of a pentagon.

**(Total for Question is 1 marks)**

**5.** Write down the name of each of these 3-D shapes.



(i) .....



(ii) .....

**(Total for Question is 2 marks)**

**6.** Here are some solid 3-D shapes.

A B C D E

(a) Write down the letter of the shape that is a sphere.

.....

**(1)**

(b) Write down the mathematical name of shape **A**.

.....

**(1)**

(c) How many faces does shape **B** have?

.....

**(1)**

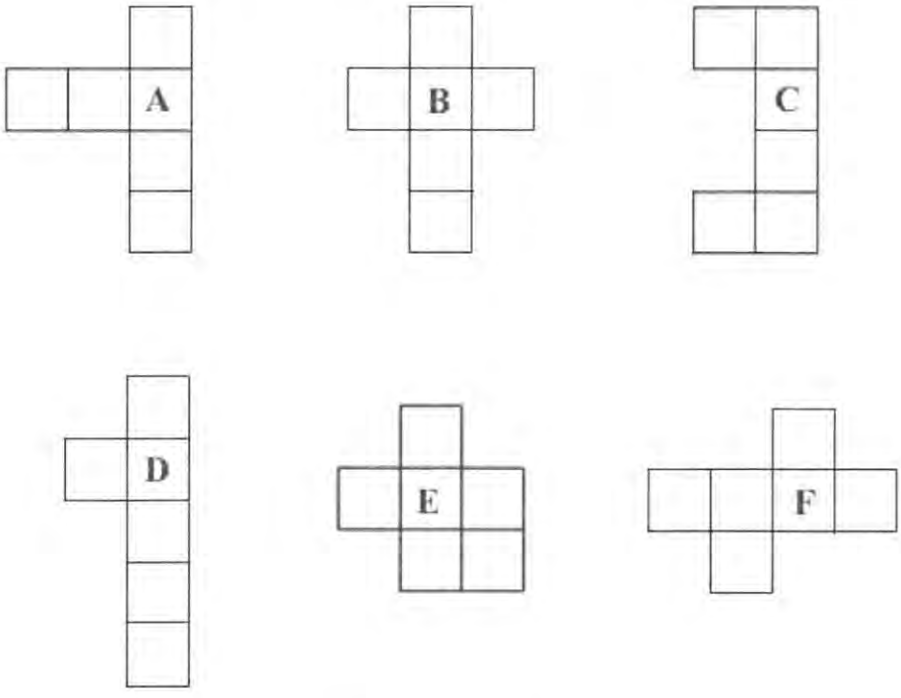
(d) How many edges does shape **D** have?

.....

**(1)**

**(Total for Question is 4 marks)**

**7.** Here are some shapes made from squares.




Two of these shapes are nets of a cube.
Which two shapes?

.....

**(Total for Question is 2 marks)**

**8.** Here is a list of the names of five types of quadrilateral.

Trapezium Parallelogram Square Rhombus Rectangle

(a) From the list, write down the names of two quadrilaterals which must have all four sides the same length.

..... and .....

**(1)**

(b) From the list, write down the name of the quadrilateral that has only one pair of parallel sides.

.....

**(1)**

For one of these quadrilaterals: the corners are not right angles,
the quadrilateral has rotational symmetry of order 2
and the diagonals cross at right angles.

(c) Write down the name of this quadrilateral.

.....

**(1)**

**(Total for Question is 3 marks)**

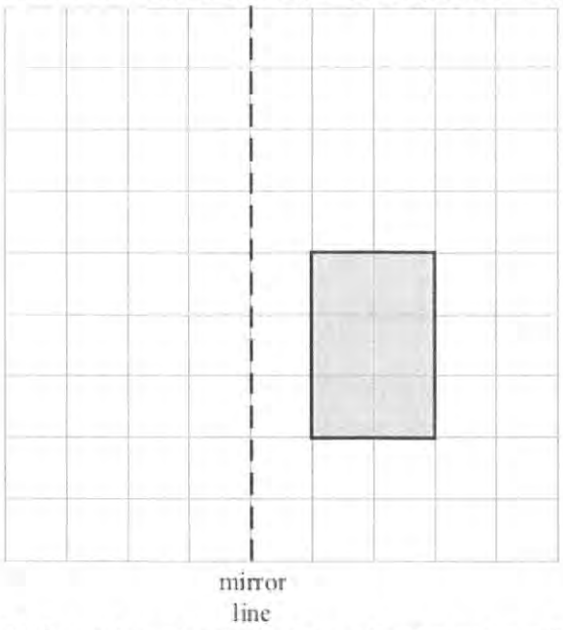
## Reflection, Rotation and Symmetry

**Things to remember:**

- A reflection is where the shape is flipped.
- A rotation is where the shape is turned.

**Questions:**

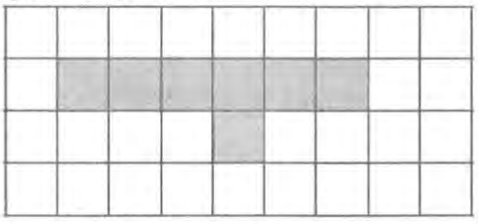
**1.** Here is a shaded shape on a grid of centimetre squares.




Reflect the shaded shape in the mirror line.

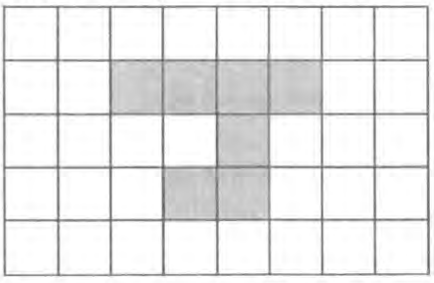
**(Total for Question is 2 marks)**

**2.** (a) On the grid, shade in one more square so that the completed shape has one line of symmetry.



**(1)**

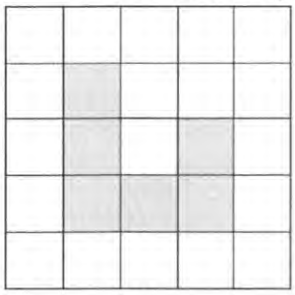
(b) On the grid below, shade in two more squares so that the completed shape has rotational symmetry of order 2



**(1)**

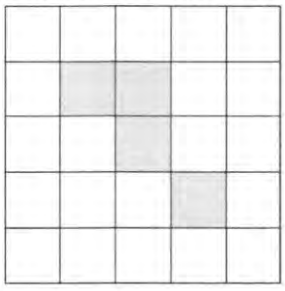
**(Total for Question is 2 marks)**

**3.** (a) Shade **one** more square to make a pattern with 1 line of symmetry.



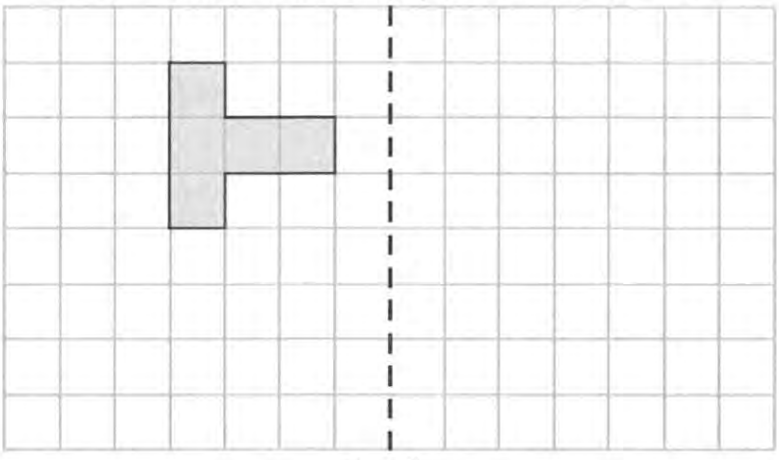
**(1)**

(b) Shade **one** more square to make a pattern with rotational symmetry of order 2



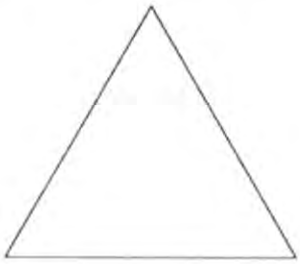
**(1)**
**(Total for Question is 2 marks)**

**4.** Reflect the shaded shape in the mirror line.




**(Total for Question is 2 marks)**

**5.** Here is an equilateral triangle.

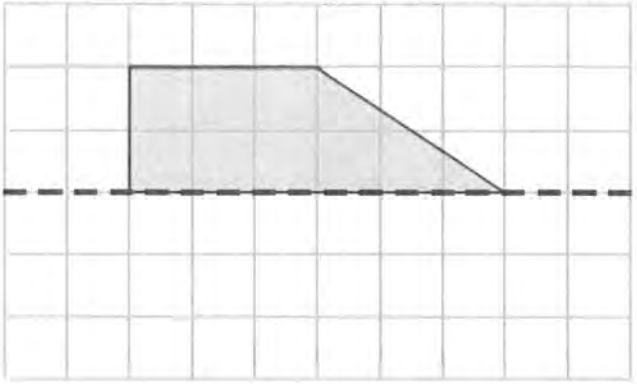


Write down the order of rotational symmetry of the triangle.

.....

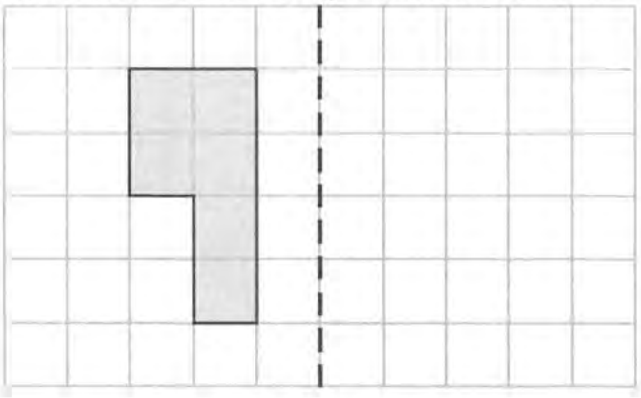
**(Total for Question is 1 mark)**

**6.** (a) Reflect the shaded shape in the mirror line.



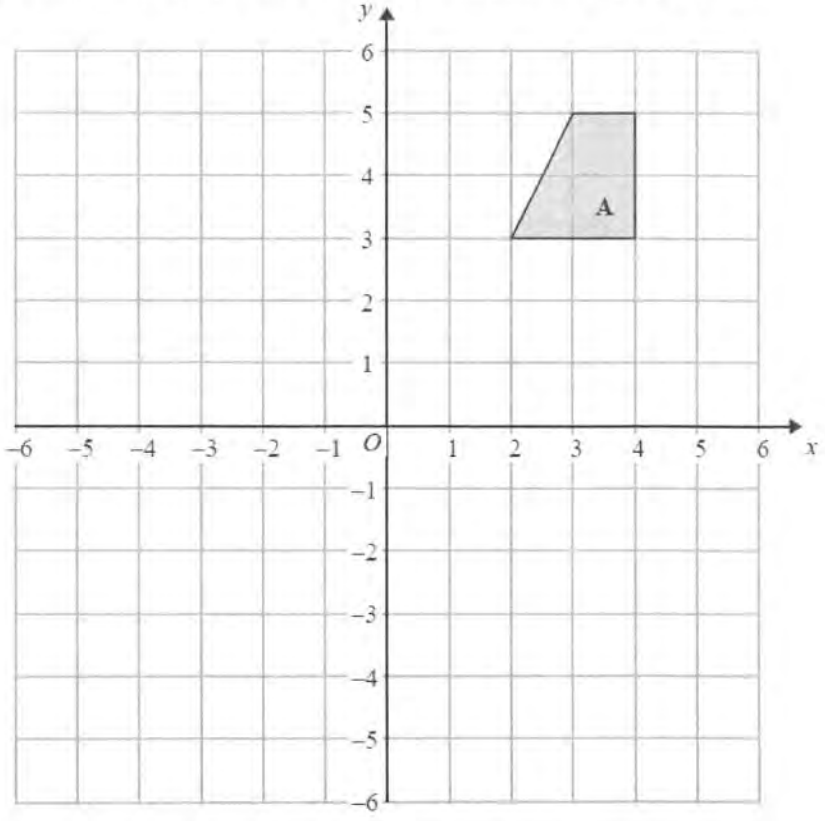
**(1)**

(b) Reflect the shaded shape in the mirror line.



**(1)**
**(Total for Question is 2 marks)**

**7.** On the grid, rotate shape **A** 180° about the point (1, 1).




**(Total for Question is 2 marks)**

**8.** (a) (i) Shade 4 sectors on diagram **A** so that it has rotational symmetry of order 4

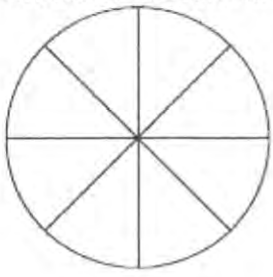


diagram **A**

(ii) Shade 4 sectors on diagram **B** so that it has rotational symmetry of order 2

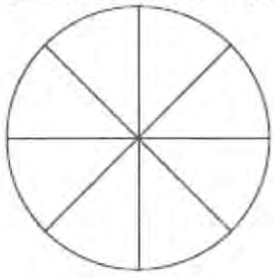


diagram **B**

**(Total for question = 2 marks)**

## Area and Perimeter of Rectangles and Triangles

**Things to remember:**

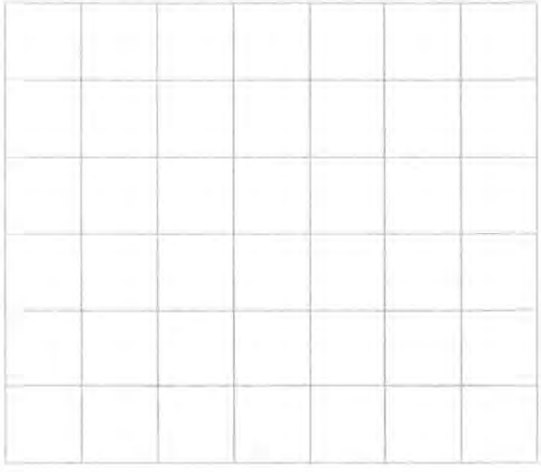
- Area of a rectangle = base x height
- Area of a triangle = ½ x base x height
- The perimeter is the distance around the outside of shape

**Questions:**

**1.** On the centimetre grid, draw a rectangle with an area of 12 $cm^2$.

**(Total for Question is 2 marks)**

**2.** On the grid of centimetre squares, draw a rectangle with a perimeter of 10 cm.



**(Total for Question is 2 marks)**

**3.** Here is a rectangle. Work out the area of this rectangle.

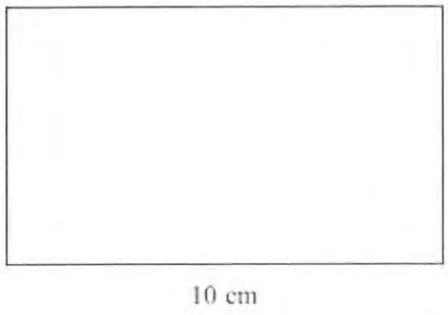
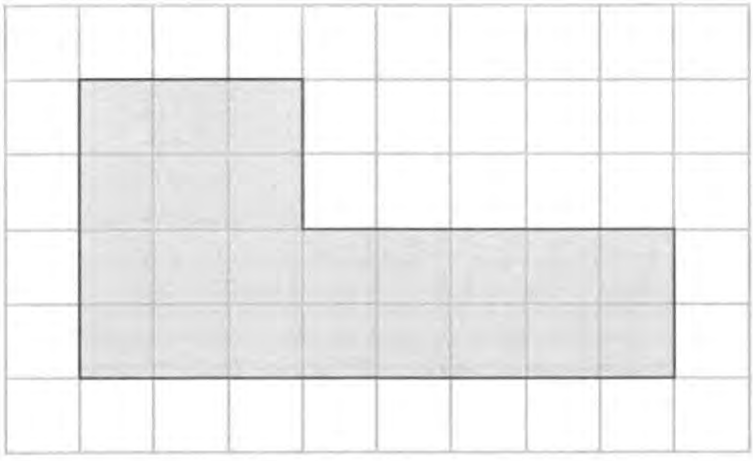



Diagram **NOT** accurately drawn

..... $cm^2$

**(Total for Question is 2 marks)**

**4.** The shaded shape is drawn on a grid of centimetre squares.



(a) Find the perimeter of the shaded shape.

..... cm

**(1)**

(b) Find the area of the shaded shape.

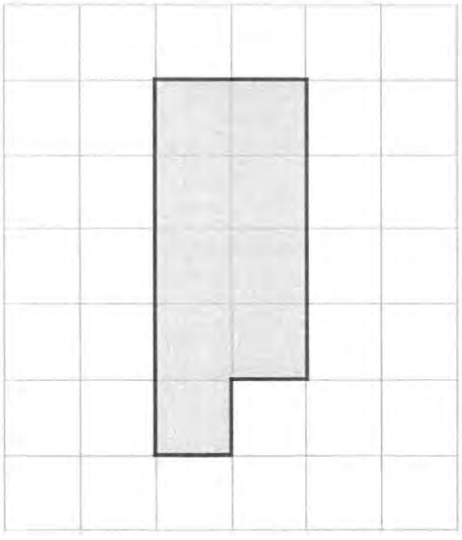
..... $cm^2$

**(1)**

**(Total for Question is 2 marks)**

**5.** The shaded shape is drawn on a grid of centimetre squares.

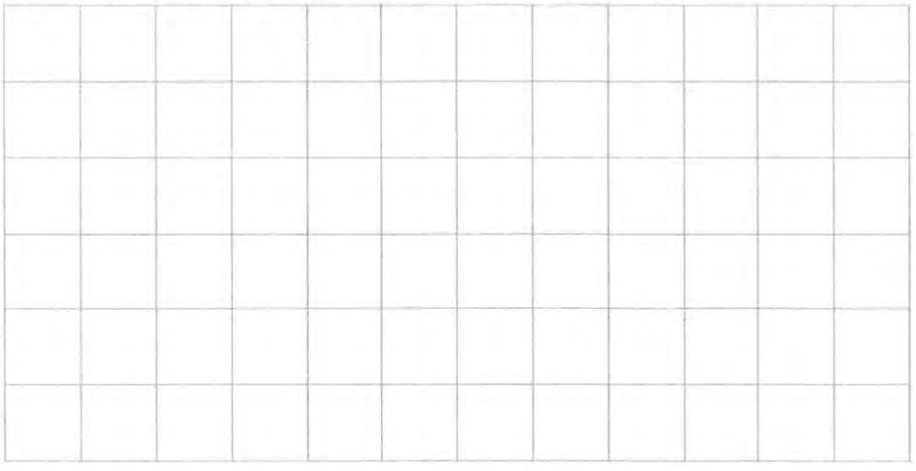
(a) Find the perimeter of the shaded shape.



..... cm

**(2)**

(b) On the grid below, draw a square with the same area as the shaded shape.



**(1)**

**(Total for Question is 3 marks)**

**6.** Dilys buys a new house.
She wants to have a lawn in the back garden.
The lawn is going to be in the shape of a rectangle.

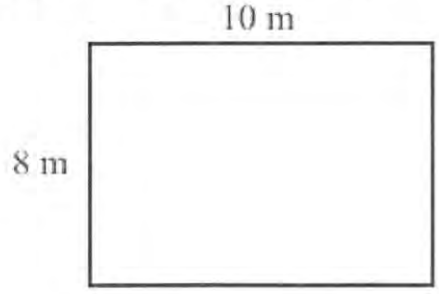



Diagram **NOT** accurately drawn

The lawn will have a length of 10 m. The lawn will have a width of 8 m.
Dilys wants to buy edging strip for her lawn.
The length of the edging strip needs to be equal to the perimeter of her lawn.
Edging strip costs £1.50 per metre. What is the total cost of the edging strip?

£.....

**(Total for Question is 4 marks)**

**7.** The diagram shows a garden with 4 flower beds.
The garden is a rectangle, 23 m by 17 m.

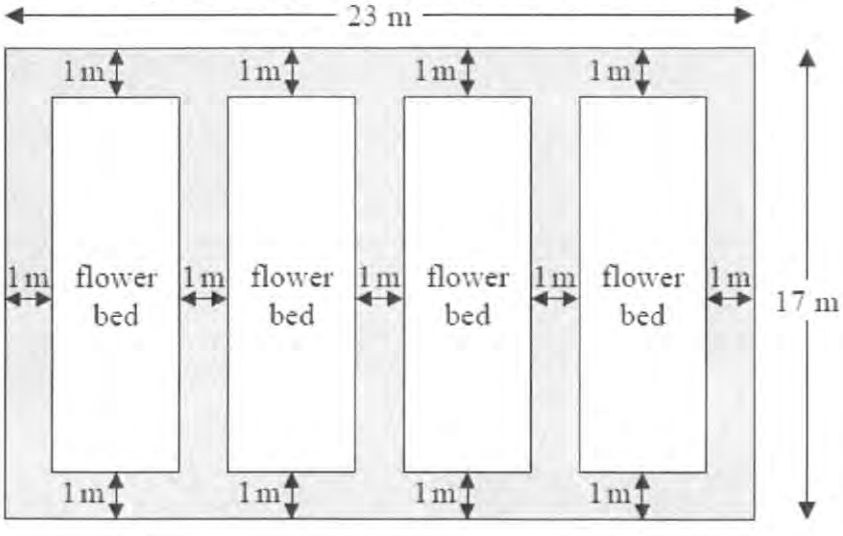



Diagram NOT accurately drawn
Each flower bed is a rectangle with the same length and the same width.
Work out the length and the width of a flower bed.

length =.....m

width =.....m

**(Total for Question is 3 marks)**

**8.** The diagram shows a rectangle and a square.

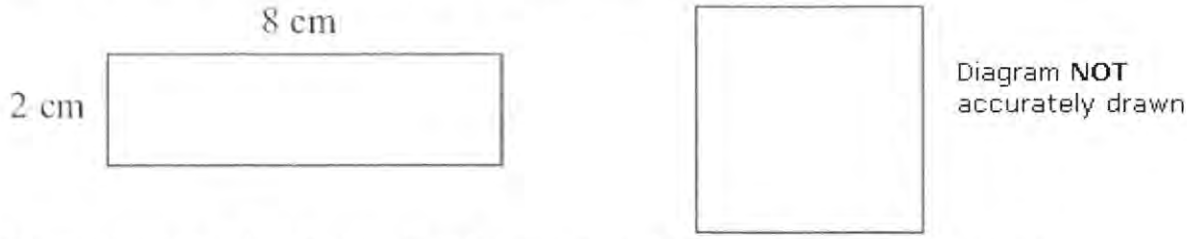



Diagram **NOT** accurately drawn

The perimeter of the rectangle is the same as the perimeter of the square.
Work out the length of one side of the square.

..... cm

**(Total for Question is 4 marks)**

## Measures

**Things to remember:**

- There are 60 seconds in a minute and 60 minutes in an hour.
- Be careful when reading scales – continue to count on until you reach the next written value to check.

**Questions:**

**1.** Here is a clock in a school.


(a) (i) School starts 15 minutes earlier than the time shown on the clock.
What time does school start?

.....

(ii) The first lesson ends 45 minutes after the time shown on the clock.
What time does the first lesson end?

.....

**(2)**

(b) School finishes at 3.20 pm. Write 3.20 pm using the 24-hour clock.

.....

**(1)**

**(Total for Question is 3 marks)**

**2.** (a) How many minutes are there between 8.50 pm and 10.05 pm?

..... minutes

**(1)**

(b) (i) Write 15 25 using the 12-hour clock.

.....

(ii) Write 9.15 pm using the 24-hour clock.

.....

**(2)**

Lucy and Saad went to a cafe on the same day.
Lucy was in the cafe from 10.15 am to 10.45 am.
Saad was in the cafe from 10.25 am to 11.05 am.

(c) Work out the number of minutes that Lucy and Saad were in the cafe at the same time.

..... minutes

**(2)**

**(Total for Question is 5 marks)**

**3.** Complete this table. Write a sensible unit for each measurement.

| | Metric | Imperial |
|---|---|---|
| The length of a pencil | centimetres | |
| The weight of a tomato | | ounces |
| The amount of milk in a bottle | | pints |

**(Total for Question is 3 marks)**

**4.** (a) Complete this table. Write a sensible unit for each measurement.

| | **Metric** | **Imperial** |
|---|---|---|
| **Diameter of a football** | ..... | inches |
| **Amount of fuel in a car fuel tank** | litres | ..... |

**(2)**

(b) (i) Change 4 kg to grams.

..... grams

(ii) Change 3500 ml to litres.

..... litres

**(2)**

**(Total for Question is 4 marks)**

**5.** (a) Write 3 metres in centimetres.

..... centimetres

**(1)**

(b) Write 4000 grams in kilograms.

..... kilograms

**(1)**

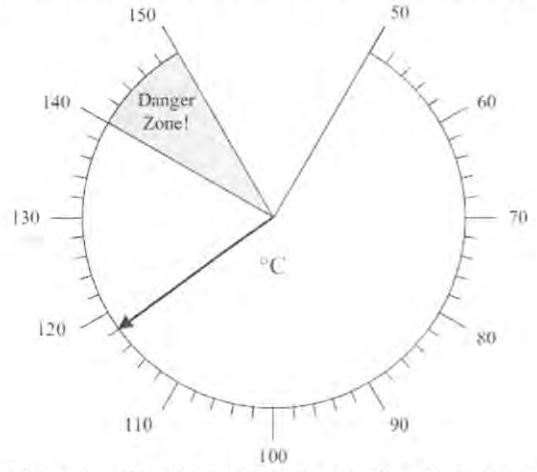
(c) Write 700 millilitres in litres.

..... litres

**(1)**

**(Total for question = 3 marks)**

**6.** The diagram shows a temperature gauge.

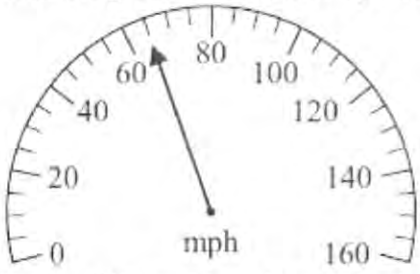



How many degrees does the temperature have to rise to get to the danger zone?

..... °C

**(Total for Question is 2 marks)**

**7.** The diagram shows the speed of a car.

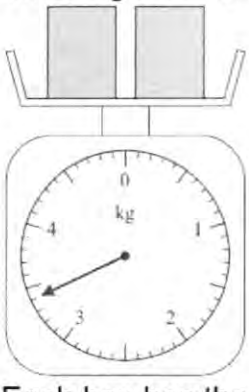



(a) Write down the speed.

..... mph

**(1)**

The diagram shows two boxes on some scales.




Each box has the same weight.

(b) Work out the weight of each box.

..... kg

**(2)**

**(Total for Question is 3 marks)**

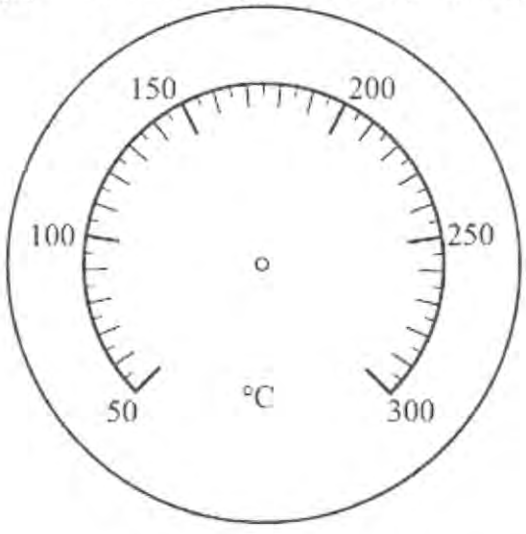
**8.** The diagram shows the temperature in an oven.


(a) Write down the temperature.

..... °C

**(1)**

(b) On the diagram below, draw an arrow to show a temperature of 125°C.




**(1)**

Lorna switches her oven on at 5.50 pm.
She sets the temperature at 180°C.
It takes 15 minutes for the oven to reach a temperature of 180°C.

(c) What time will the oven reach a temperature of 180°C?

.....

**(1)**

**(Total for Question is 3 marks)**

## Averages

**Things to remember:**

- Mode is most – the number that occurs the most frequently.
- Median is middle – put the numbers in order then identify the middle number.
- Mean is mean to work out – add all the numbers together and divide by the quantity in the list.
- Range is the difference from the biggest to the smallest.

**Questions:**

**1.** Chloe made a list of her homework marks.

4 5 5 5 4 3 2 1 4 5

(a) Write down the mode of her homework marks.

.....

**(1)**

(b) Work out her mean homework mark.

.....

**(2)**

**(Total 3 marks)**

**2.** Peter rolled a 6-sided dice ten times.

Here are his scores.

3 2 4 6 3 3 4 2 5 4

(a) Work out the median of his scores.

.....

**(2)**

(b) Work out the mean of his scores.

.....

**(2)**

(c) Work out the range of his scores.

.....

**(1)**

**(Total 5 marks)**

**3.** Mr Smith kept a record of the number of absences for each student in his class for one term.

Here are his results.

0 0 0 8 4 5 5 3 2 1

(a) Write down the mode.

.....

**(1)**

(b) Work out the mean.

.....

**(2)**

**(Total 3 marks)**

**4.** Here are ten numbers.

7 6 8 4 5 9 7 3 6 7

(a) Work out the range.

.....

**(2)**

(b) Work out the mean.

.....

**(2)**

**(Total 4 marks)**

**5.** Here are the test marks of 6 girls and 4 boys.

Girls: 5 3 10 2 7 3

Boys: 2 5 9 3

(a) Write down the mode of the 10 marks.

.....

**(1)**

(b) Work out the median mark of the **boys**.

.....

**(2)**

(c) Work out the range of the **girls'** marks.

.....

**(1)**

(d) Work out the mean mark of all 10 students.

.....

**(2)**

**(Total 6 marks)**

**6.** Here are 10 numbers.

3 2 5 4 2 4 6 2 1 2

Find the mode of these numbers.

.....

**(Total 1 mark)**

**7.** Jalin wrote down the ages, in years, of seven of his relatives.

45, 38, 43, 43, 39, 40, 39

(a) Find the median age.

.....

**(1)**

(b) Work out the range of the ages.

.....

**(1)**

(c) Work out the mean age.

.....

**(2)**

**(Total 4 marks)**

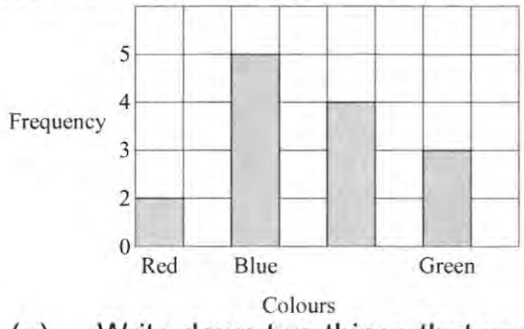
## Tally Charts and Bar Graphs

**Things to remember:**

- The fifth tally mark should make a gate – this makes it easier to count the tally as you can count up in 5s.
- Frequency means total.
- If you are drawing a bar chart, the axes must be labelled.

**Questions:**

**1.** Ray and Clare are pupils at different schools. They each did an investigation into their teachers' favourite colours. Here is Ray's bar chart of his teachers' favourite colours.



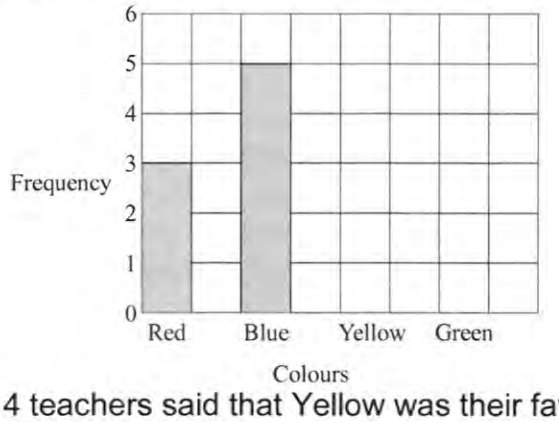

(a) Write down two things that are wrong with Ray's bar chart.

.....

.....

**(2)**

Clare drew a bar chart of her teachers' favourite colours. Part of her bar chart is shown below.




4 teachers said that Yellow was their favourite colour.
2 teachers said that Green was their favourite colour.

(b) Complete Clare's bar chart.

**(2)**

(c) Which colour was the mode for the teachers that Clare asked?

.....

**(1)**

(d) Work out the number of teachers Clare asked.

.....

**(1)**

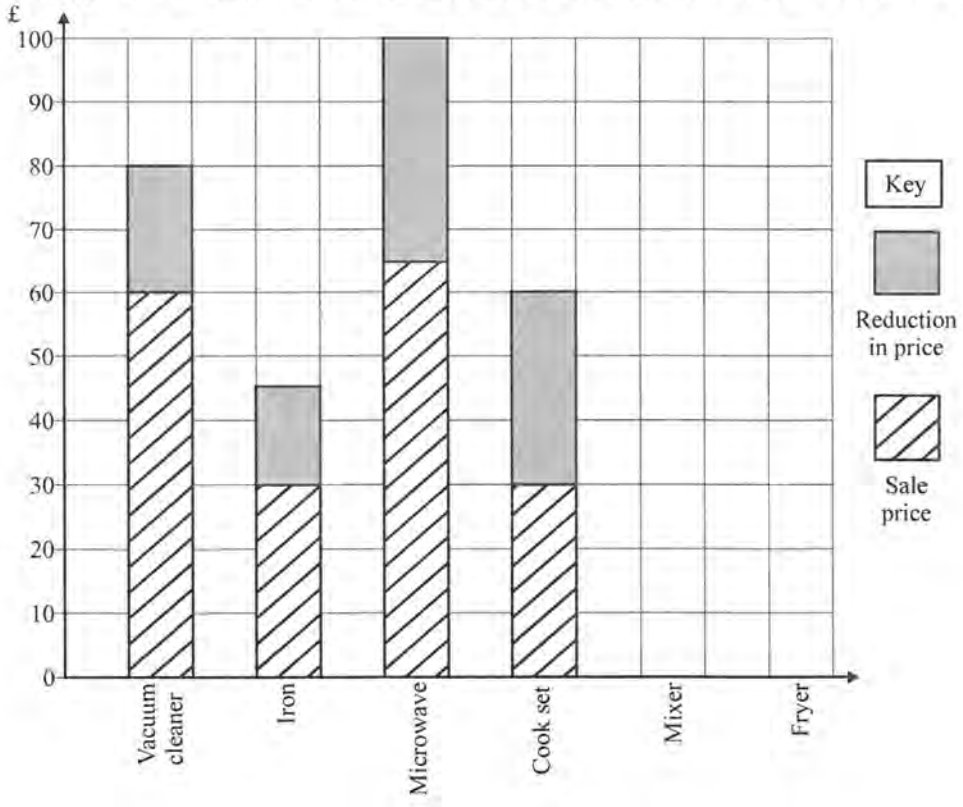
(e) Write down the fraction of the number of teachers that Clare asked who said Red was their favourite colour.

.....

**(1)**

**(Total 7 marks)**

**2.** A shop has a sale.The bar chart shows some information about the sale.




The normal price of a vacuum cleaner is £80
The sale price of a vacuum cleaner is £60
The price of a vacuum cleaner is reduced from £80 to £60

(a) Find the reduction in the price of the iron.

£ .....

**(1)**

(b) Which two items have the same sale price?

..... and .....

**(1)**

(c) Which item has the greatest reduction in price?

.....

**(1)**

| Mixer | |
|---|---|
| Normal price | £90 |
| Sale price | £70 |

| Fryer | |
|---|---|
| Normal price | £85 |
| Sale price | £70 |

(d) Complete the bar chart for the mixer and the fryer.

**(2)**
**(Total 7 marks)**

**3.** Daniel carried out a survey of his friends' favourite flavour of crisps.
Here are his results.

| | | | | |
|---|---|---|---|---|
| Plain | Chicken | Bovril | Salt & Vinegar | Plain |
| Salt & Vinegar | Plain | Chicken | Plain | Bovril |
| Plain | Chicken | Bovril | Salt & Vinegar | Bovril |
| Bovril | Plain | Plain | Salt & Vinegar | Plain |

(a) Complete the table to show Daniel's results.

| Flavour of crisps | Tally | Frequency |
|---|---|---|
| Plain | | |
| Chicken | | |
| Bovril | | |
| Salt & Vinegar | | |

**(3)**

(b) Write down the number of Daniel's friends whose favourite flavour was Salt & Vinegar.

.....

**(1)**

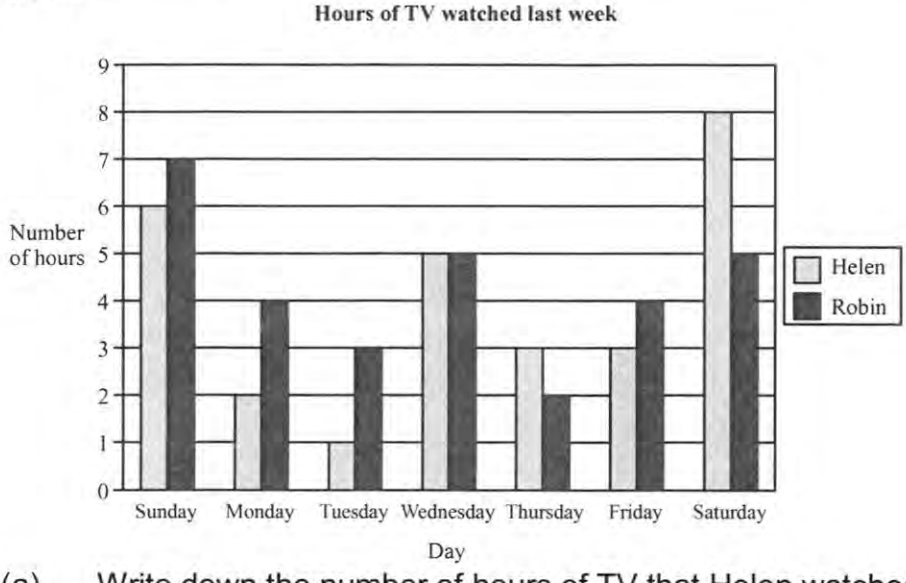
(c) Which was the favourite flavour of most of Daniel's friends?

.....

**(1)**

**(Total 5 marks)**

**4.** Here is a bar chart showing the number of hours of TV that Helen and Robin watched last week.




(a) Write down the number of hours of TV that Helen watched on Monday.

.....hours

**(1)**

(b) On which day did Helen and Robin watch the same number of hours of TV?

.....

**(1)**

(c) (i) Work out the total number of hours of TV that Robin watched on Friday and Saturday.

.....hours

(ii) Who watched the greater number of hours of TV on Friday and Saturday? Show your working.

**(3)**

**(Total 5 marks)**

**5.** Heather carried out a survey about her friends' pets. Here are her results.

| | | | | |
|---|---|---|---|---|
| Cat | Cat | Dog | Hamster | Cat |
| Dog | Hamster | Cat | Cat | Dog |
| Hamster | Dog | Hamster | Dog | Fish |
| Cat | Dog | Fish | Cat | Cat |

Complete the table to show Heather's results.

| Pet | Tally | Frequency |
|---|---|---|
| Cat | | |
| Dog | | |
| Fish | | |
| Hamster | | |

**(Total 3 marks)**

## Pictograms

**Things to remember:**

- Use the key!
- Once you have the number the whole pictures represents you can work out what the picture would be to represent 1 or 2 etc.

**Questions:**

**1.** The pictogram shows the numbers of loaves of bread made by Miss Smith, Mr Jones and Mrs Gray.

| | |
|---|---|
| Miss Smith |  |
| Mr Jones |  |
| Mrs Gray |  |
| Ms Shah | |
| Mr Khan | |

 represents 20 loaves of bread

Write down the number of loaves of bread made by Mr Jones.

.....

**(1)**

(b) Write down the number of loaves of bread made by Mrs Gray.

.....

**(1)**

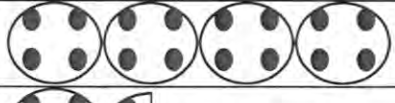
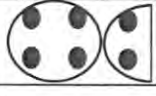
Ms Shah made 60 loaves of bread.
Mr Khan made 90 loaves of bread.

(c) Use this information to complete the pictogram.

**(2)**

**(Total 4 marks)**

**2.** The pictogram gives information about the number of goals scored in a local football league in each of 3 weeks.

| | |
|---|---|
| First week |  |
| Second week |  |
| Third week |  |
| Fourth week | |
| Fifth week | |

Key:  represents 4 goals

(a) Find the number of goals scored in the first week.

.....

**(1)**

(b) Find the number of goals scored in the third week.

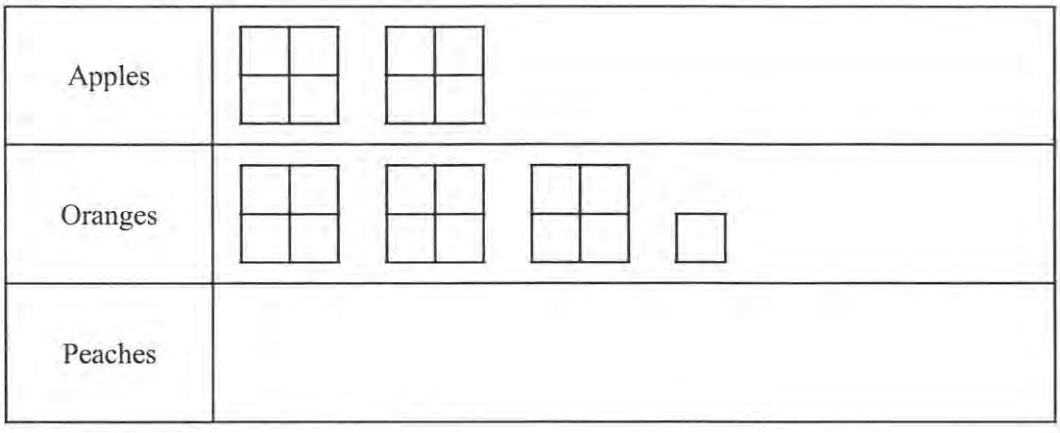
.....

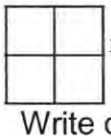
**(1)**

8 goals were scored in the fourth week.
5 goals were scored in the fifth week.
(c) Complete the pictogram.

**(2)**
**(Total 4 marks)**

**3.** Sharif buys some fruit. The pictogram shows information about the number of apples and the number of oranges he buys.




Key:  represents 8 fruit

(a) Write down the number of apples he buys.

.....

**(1)**

(b) Write down the number of oranges he buys.

.....

**(1)**

Sharif buys 12 peaches.
(c) Use this information to complete the pictogram.

**(1)**
**(Total 3 marks)**

# Probability

**Things to remember:**

- Probability can be expressed as a fraction, decimal or percentage. Do not write it as a ratio.
- All probabilities of an event will add up to 1.

**Questions:**

**1.** Draw a circle around the word, or words, which best describe the following possibilities.

(a) It will rain in Manchester next September.

| impossible | unlikely | even chance | likely | certain |
|---|---|---|---|---|

**(1)**

(b) The next baby to be born in London will be a girl.

| impossible | unlikely | even chance | likely | certain |
|---|---|---|---|---|

**(1)**

**(Total 2 marks)**

**2.** On the probability scale below, mark

(i) with the letter S, the probability that it will snow in London in June,

(ii) with the letter H, the probability that when a fair coin is thrown once it comes down heads,

(iii) with the letter M, the probability that it will rain in Manchester next year.

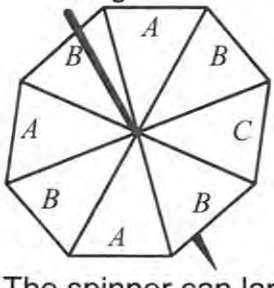

**(Total 3 marks)**

**3.** Kevin buys one raffle ticket.
A total of 350 raffle tickets are sold.
One of these tickets will win the raffle.
Each ticket has an equal chance of winning the raffle.
Write down the probability that Kevin's ticket will win the raffle.

.....

**(Total 1 mark)**

**4.** The diagram shows a fair spinner in the shape of a rectangular octagon.




The spinner can land on A or B or C. Marc spins the spinner.
Write down the probability that the spinner will land on A.

.....

**(Total 2 marks)**

**5.** A bag contains some beads which are red or green or blue or yellow.
The table shows the number of beads of each colour.

| Colour | Red | Green | Blue | Yellow |
|---|---|---|---|---|
| Number of beads | 3 | 2 | 5 | 2 |

Samire takes a bead at random from the bag.
Write down the probability that she takes a blue bead.

.....
**(Total 2 marks)**

**6.** Richard has a box of toy cars.
Each car is red or blue or white.
3 of the cars are red. 4 of the cars are blue. 2 of the cars are white.
Richard chooses one car at random from the box.
Write down the probability that Richard will choose a blue car.

.....
**(Total 2 marks)**

**7.** A company makes hearing aids.
A hearing aid is chosen at random. The probability that is has a fault is 0.09
Work out the probability that a hearing aid, chosen at random, will **not** have a fault.

.....
**(Total 1 mark)**

**8.** 60 British students each visited one foreign country last week.
The two-way table shows some information about these students.

| | **France** | **Germany** | **Spain** | **Total** |
|---|---|---|---|---|
| **Female** | | | 9 | 34 |
| **Male** | 15 | | | |
| **Total** | | 25 | 18 | 60 |

(a) Complete the two-way table.

**(3)**

One of these students is picked at random.
(b) Write down the probability that the student visited Germany last week.

.....
**(1)**
**(Total 4 marks)**

## Simplifying Ratios

**Things to remember:**

- Divide both parts of the ratio by the same factor until in its simplest form.

**Questions:**

**1.** Write the ratio 2 : 6 in its simplest form.

.....

**(1)**

**(Total for Question is 3 marks)**

**2.** Ewen has 48 white tiles and 16 blue tiles.

(a) Write down the ratio of the number of white tiles to the number of blue tiles.
Give your ratio in its simplest form.

.....

**(2)**

The cost of each white tile was £2
The cost of each blue tile was £4

(b) Work out the ratio of the total cost of the white tiles to the total cost of the blue tiles.

.....

**(2)**

**(Total for question = 4 marks)**

**3.** There are 140 students at Walbridge school.
80 of the students walk to school.
60 of the students cycle to school.
Write the ratio of the number of students who walk to school to the number of students who cycle to school.
Give your ratio in its simplest form.

.....

**(Total for Question is 2 marks)**

**4.** There are only red counters and blue counters in a bag.
The ratio of the number of red counters to the number of blue counters is 4 : 6
Write this ratio in its simplest form.

.....

**(Total for question = 1 mark)**

## Simplifying Fractions and Fractions of Amounts

- Divide both the numerator (top) and denominator (bottom) of the fraction by the same factor until in its simplest form.
- To find a fraction of an amount, divide the amount by the denominator, then multiply by the numerator.

**Questions:**

**1.** Sam has £480
He spends ¼ of the £480
Work out how much money Sam has left.

£ .....

**(Total for Question is 3 marks)**

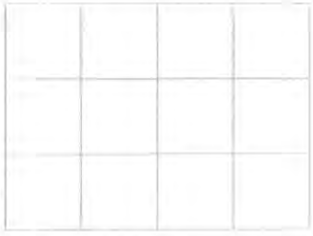
***2.** The normal price of a denim shirt at a shop is £9.60

On Special Offer Day, there is $\frac{1}{3}$ off the normal price.


Billy has £13
Has he enough money to buy two denim shirts on Special Offer Day?
You must show all your working.

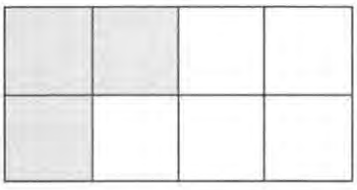
**(Total for Question is 4 marks)**

**3.** Here is a shape. Shade ¾ of this shape.



**(Total for Question is 1 mark)**

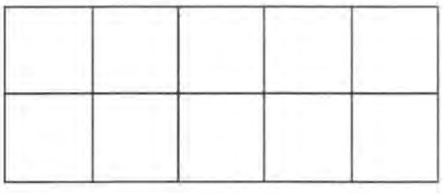
**4.** (a) Write down the fraction of this shape that is shaded.



.....

**(1)**

(b) Shade $\frac{1}{5}$ of this shape.



**(1)**

Here are some fractions.

$\frac{3}{10}$ $\frac{2}{8}$ $\frac{4}{12}$ $\frac{12}{40}$ $\frac{5}{20}$

Two of these fractions are equivalent to $\frac{1}{4}$

(d) Which two fractions?

..... and .....

**(2)**

**(Total for question = 5 marks)**

***5.** Here are two fractions.

$\frac{2}{3}$ $\frac{7}{8}$

Which of these fractions has a value closer to $\frac{3}{4}$?
You must show clearly how you get your answer.

**(Total for Question is 3 marks)**

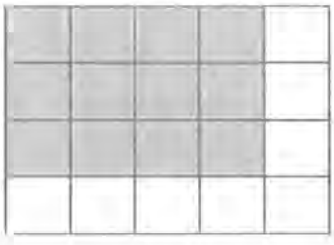
**6.** Why does $\frac{1}{4} = \frac{2}{8}$?

.....

.....

**(Total for Question is 2 marks)**

**7.** (a) What fraction of this shape is shaded?

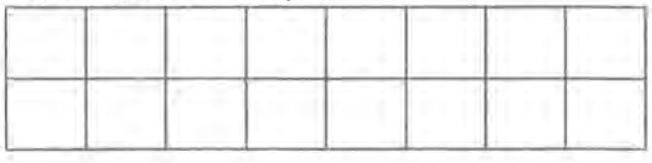


Write your fraction in its simplest form.

.....

**(2)**

(b) Shade $\frac{3}{8}$ of this shape.



**(1)**

**(Total for Question is 3 marks)**

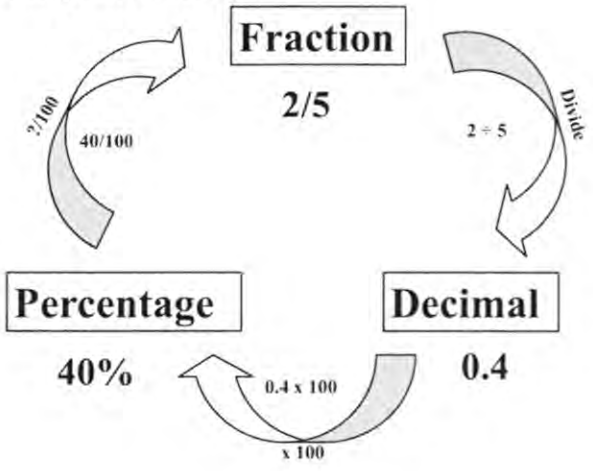
**8.** Write 35 out of 65 as a fraction.
Give your fraction in its simplest form.

.....

**(Total for question = 2 marks)**

## Fractions, Decimals and Percentages

**Things to remember:**




**Questions:**

**1.** (a) Write 0.1 as a fraction.

.....

**(1)**

(b) Write ¼ a decimal.

.....

**(1)**

**(Total for Question is 2 marks)**

**2.** (a) Write $\frac{3}{4}$ as a decimal.

.....

**(1)**

(b) Write 0.3 as a fraction.

.....

**(1)**

**(Total for Question is 2 marks)**

**3.** (a) Write $\frac{1}{4}$ as a decimal.

.....

**(1)**

(b) Write 0.15 as a fraction.

.....

**(1)**

(c) Write 17 out of 40 as a fraction.

.....

**(1)**

**(Total for question = 3 marks)**

**4.** (a) Write $\frac{7}{10}$ as a decimal.

.....

**(1)**

(b) Write 0.45 as a percentage.

.....

**(1)**

(c) Write 30% as a fraction.
Give your fraction in its simplest form.

.....

**(2)**
**(Total for Question is 4 marks)**

**5.** (a) Write 0.7 as a fraction.

.....

**(1)**

(b) Write 0.3 as a percentage.

.....

**(1)**

(c) Write $\frac{8}{12}$ in its simplest form.

.....

**(1)**
**(Total for Question is 3 marks)**

**6.** Write these numbers in order of size. Start with the smallest number.

75% $\frac{7}{8}$ 0.25 $\frac{1}{2}$ $\frac{2}{3}$

.....

**(Total for question = 2 marks)**

**7.** Write these numbers in order of size. Start with the smallest number.

0.6 $\frac{2}{3}$ 65% 0.606

.....

**(Total for question = 2 marks)**

**8.** Celina and Zoe both sing in a band.
One evening the band plays for 80 minutes.
Celina sings for 65% of the 80 minutes.

Zoe sings for $\frac{5}{8}$ of the 80 minutes.
Celina sings for more minutes than Zoe sings.
Work out for how many more minutes.
You must show all your working.

..... minutes
**(Total for question = 4 marks)**

# Useful websites:

**www.mathswatchvle.com**

*(Video explanations and questions)*

Centre ID: twgash

Username: firstname

Password: lastname

**www.methodmaths.com**

*(Past papers online that get instantly marked)*

Centre ID: wga

Username: firstname

Password: lastname

**www.hegartymaths.com**

*(Online tutorials and quizzes)*

Login: first name and last name are backwards and case sensitive

**www.bbc.co.uk/schools/gcsebitesize/maths**

Remember: Do your best; it is all you can do ☺