# 101 Edexcel GCSE
## Mathematics (Linear) – 1MA0

# SIMULTANEOUS EQUATIONS WITH A QUADRATIC

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

## Information

The marks for each question are shown in brackets – use this as a guide as to how much time to
spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication
will be assessed – you should take particular care on these questions with your spelling, punctuation
and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

**1.** Solve the simultaneous equations

$$x^2 + y^2 = 29$$

$$y - x = 3$$

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

**(Total 7 marks)**

**2.** Bill said that the line $y = 6$ cuts the curve $x^2 + y^2 = 25$ at two points.

(a) By eliminating $y$ show that Bill is incorrect.

**(2)**

(b) By eliminating $y$, find the solutions to the simultaneous equations

$$x^2 + y^2 = 25$$
$$y = 2x - 2$$

$x = $ ........................ $y = $ ..................

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

**(6)**
**(Total 8 marks)**

**3.** By eliminating $y$, find the solutions to the simultaneous equations

$$x^2 + y^2 = 25$$
$$y = x - 7$$

$x =$ .............................  $y =$ .............................

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

**(Total 6 marks)**

**4.** By eliminating $y$, find the solutions to the simultaneous equations

$$y - 2x = 3$$

$$x^2 + y^2 = 18$$

$x =$............................ $y =$............................

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

**(Total 7 marks)**

**5.** Solve the simultaneous equations

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

$$y = 3x + 1$$

$x =$ .................... $y =$ ....................

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

**(Total 6 marks)**

**6.** Solve the simultaneous equations

$x + y = 4$

$x^2 + y^2 = 40$

$x =$..................., $y =$ ..................

or

$x =$..................., $y =$ ..................

**(Total 7 marks)**

**7.** By eliminating $x$, find the solutions to the simultaneous equations

$$x - 2y = 1$$
$$x^2 + y^2 = 13$$

$x =$ ……….., $y =$ ……….

or $\quad x =$ ……….., $y =$ ……….

**(Total 7 marks)**

# 102  Edexcel GCSE
## Mathematics (Linear) – 1MA0

# TRANSFORMATION OF GRAPHS

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

## Information

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.
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## Advice

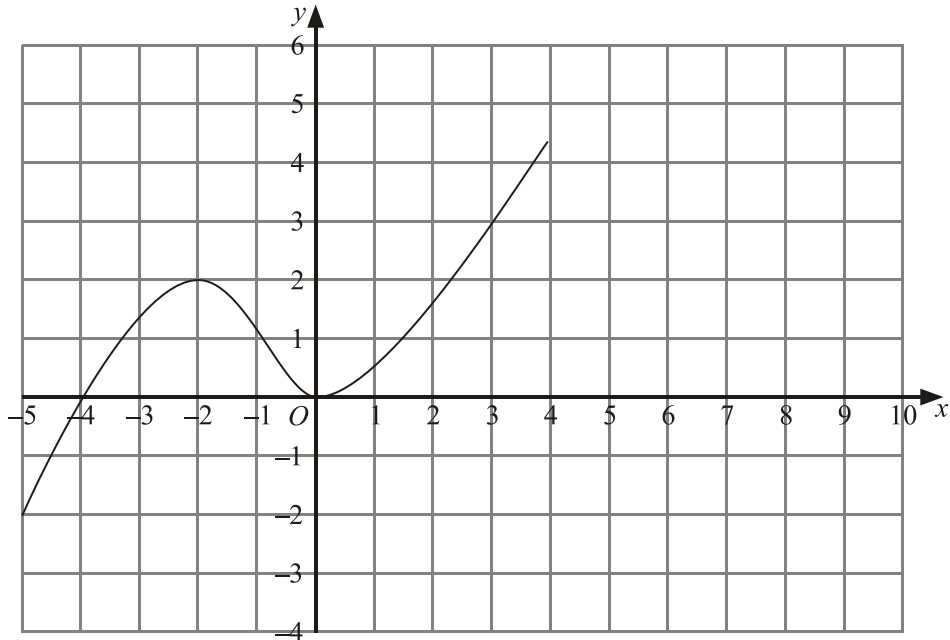Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
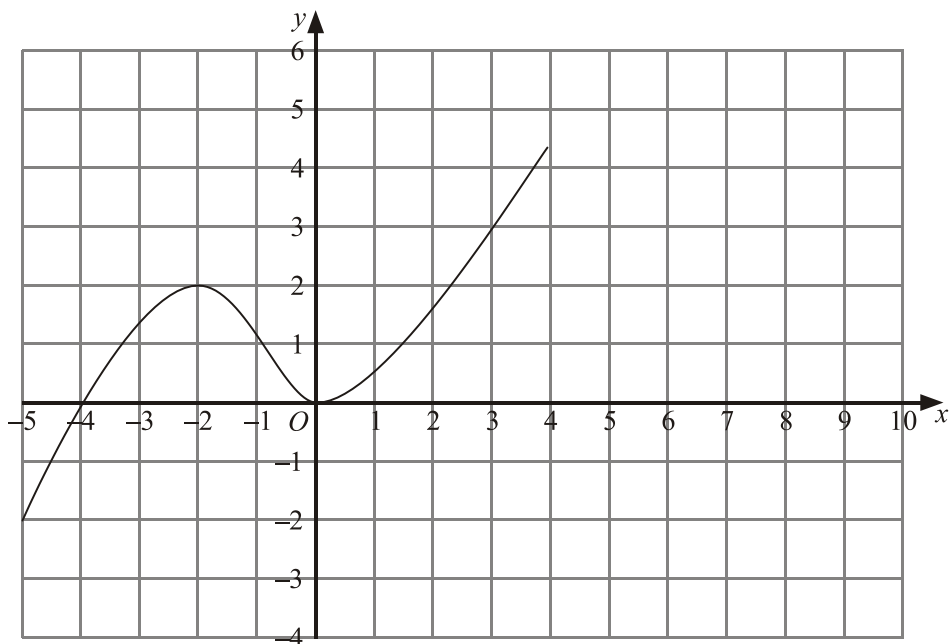Check your answers if you have time at the end.

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

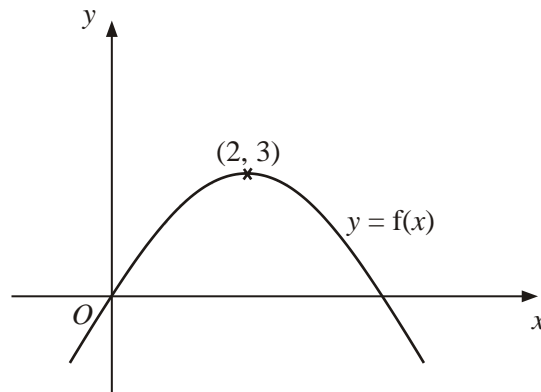(a) On this grid, sketch the graph of $y = f(x) + 2$



**(2)**

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



**(2)**

**(4 marks)**

**2.**



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the maximum point of this curve are (2, 3).

Write down the coordinates of the maximum point of the curve with equation
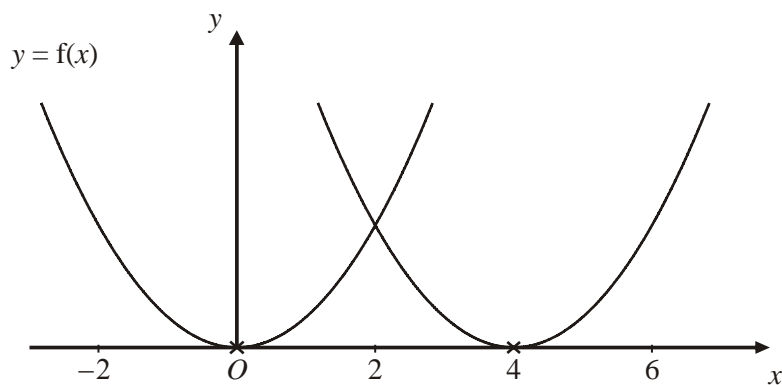
(a)  $y = f(x - 2)$

(......... , ..........)

**(1)**

(b)  $y = 2f(x)$

(......... , ..........)

**(1)**

**(2 marks)**

**3.**



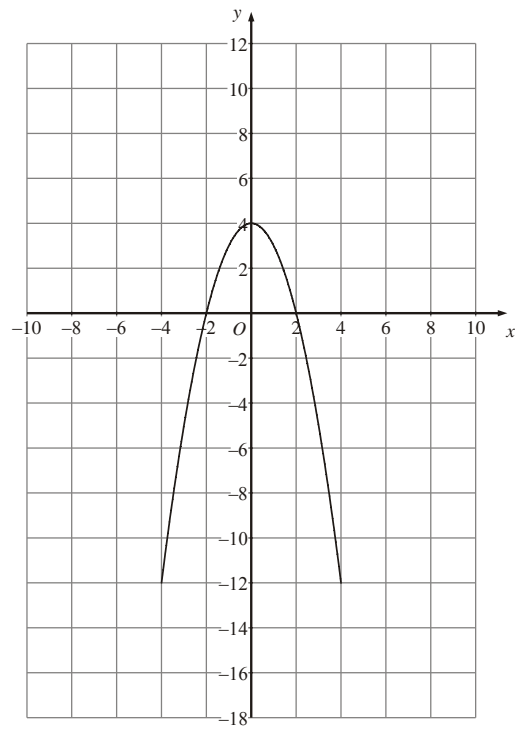The curve with equation $y = f(x)$ is translated so that the point at (0, 0) is mapped onto the point (4, 0).

Find an equation of the translated curve.

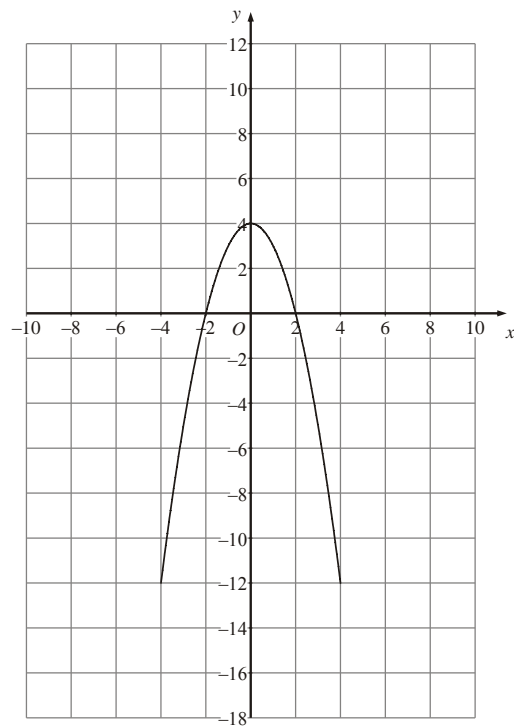....................................

**(2 marks)**

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

(a) On this grid, sketch the graph of $y = f(x) - 4$



**(2)**

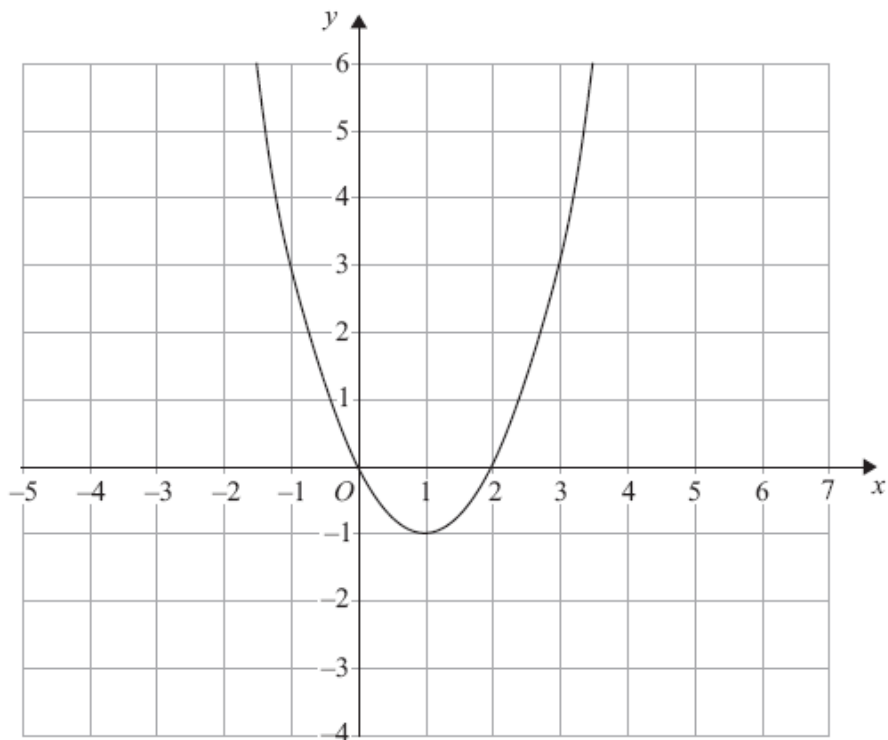(b) On this grid, sketch the graph of $y = f(\frac{1}{2}x)$.
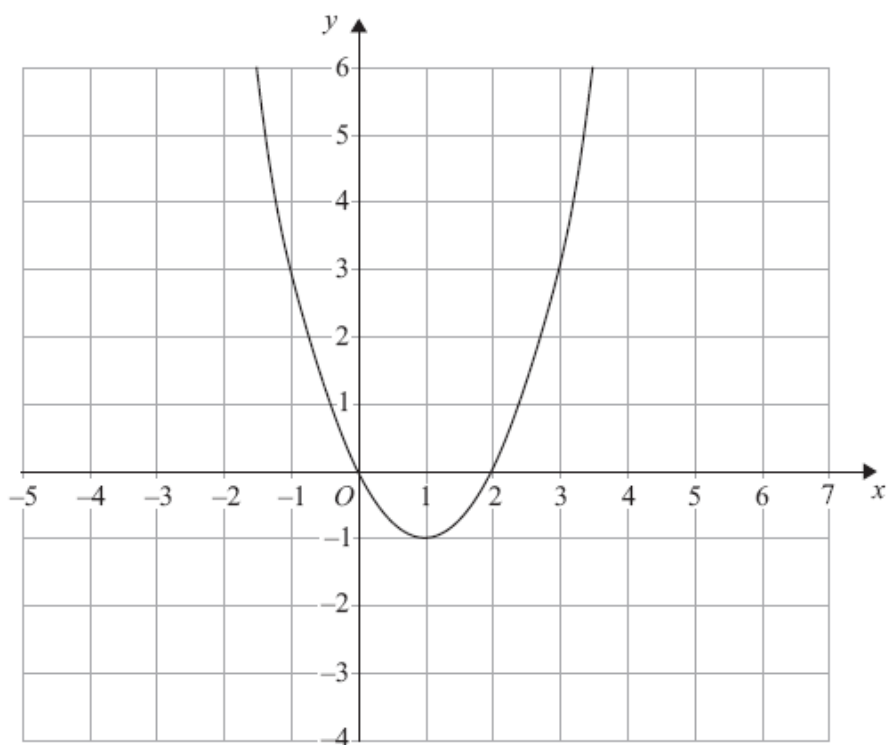


**(2)**

**(4 marks)**

843

**5.** 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)

**(4 marks)**

844
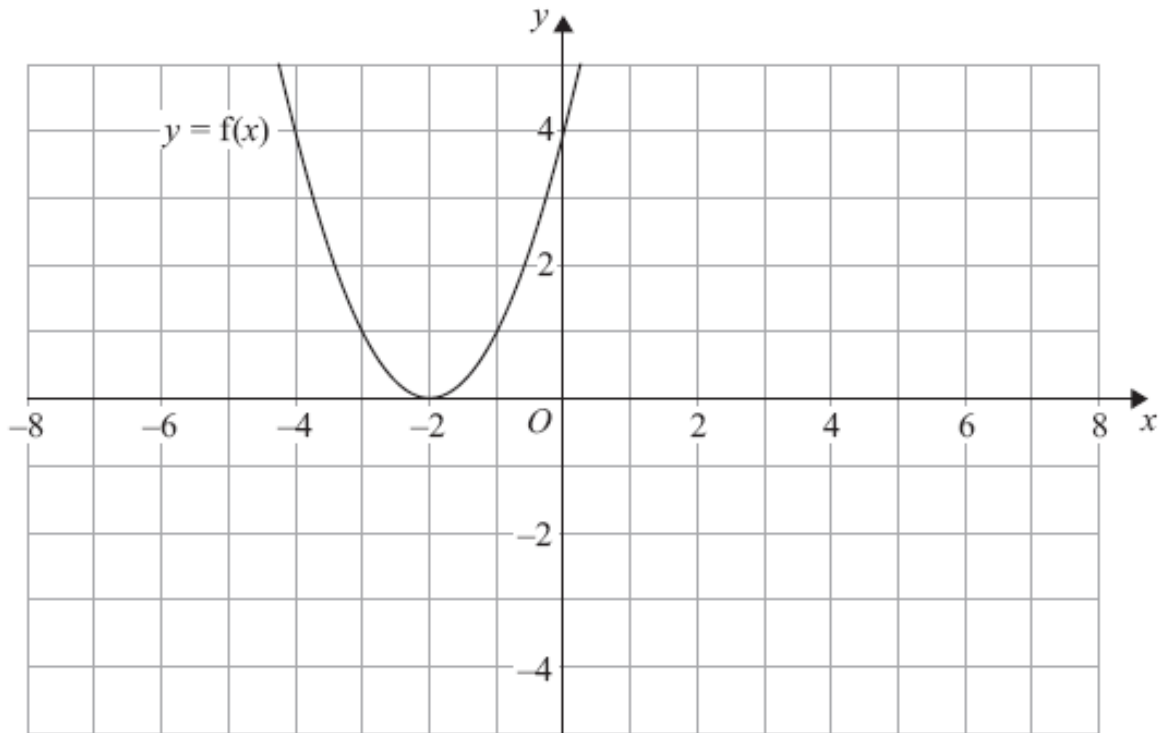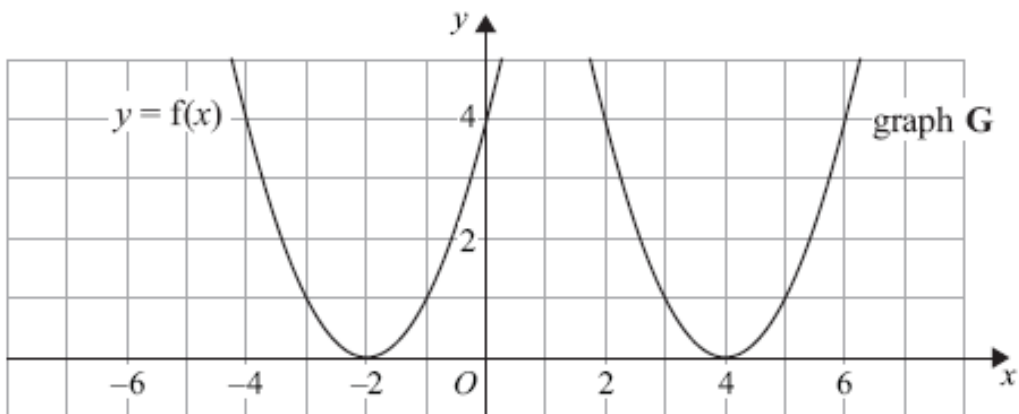
**6.**    $y = f(x)$

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



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

**(2)**
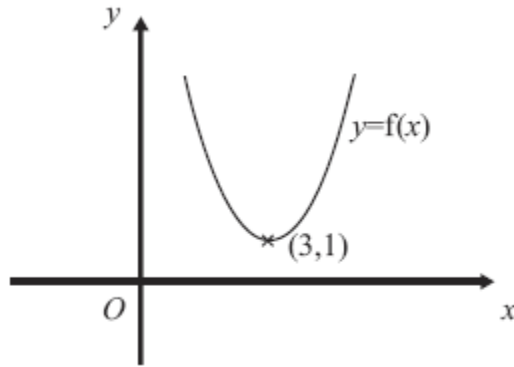
The graph of $y = f(x)$ is shown on the grid.



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

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

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

**(2)**

**(4 marks)**

**7.**



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the minimum point of this curve are (3, 1).

Write down the coordinates of the minimum point of the curve with equation

(a) $y = f(x) + 3$

(1)

(…………, …………)

(b) $y = f(x - 2)$

(1)

(…………, …………)

(c) $y = f\left(\tfrac{1}{2}x\right)$

(1)

(…………, …………)

**(3 marks)**

**8.**
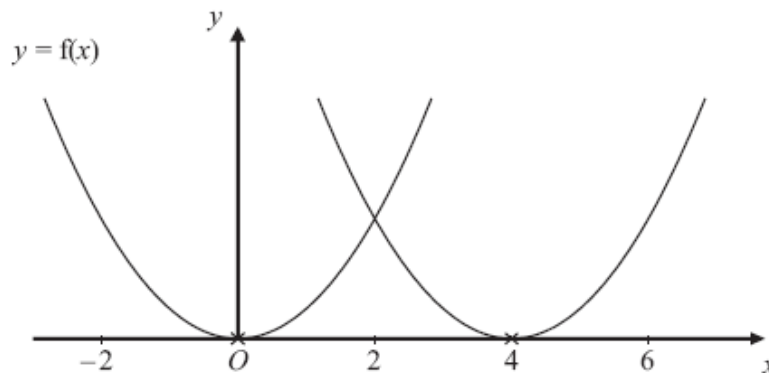


The curve with equation $y = f(x)$ is translated so that the point at (0, 0) is mapped onto the point (4, 0).

Find an equation of the translated curve.

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

**(2 marks)**

**9.** This is a sketch of the curve with the equation $y = f(x)$.
The only minimum point of the curve is at $P(3, -4)$.
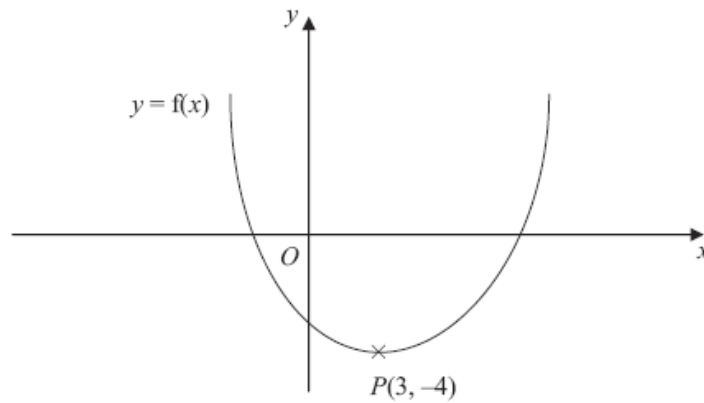


(a) Write down the coordinates of the minimum point of the curve with the equation
$y = f(x - 2)$.

(............. , .............)

**(2)**

(b) Write down the coordinates of the minimum point of the curve with the equation
$y = f(x + 5) + 6$

(............. , .............)

**(2)**

**(4 marks)**

# 103  Edexcel GCSE
## Mathematics (Linear) – 1MA0

# ENLARGEMENT: NEGATIVE SCALE FACTOR

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
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Calculators may be used.

## Information

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spend on **each** question.
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will be assessed – you should take particular care on these questions with your spelling, punctuation
and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

**1.**



Enlarge the shaded triangle by a scale factor $1\frac{1}{2}$, centre $P$.

**(Total 3 marks)**

**2.**
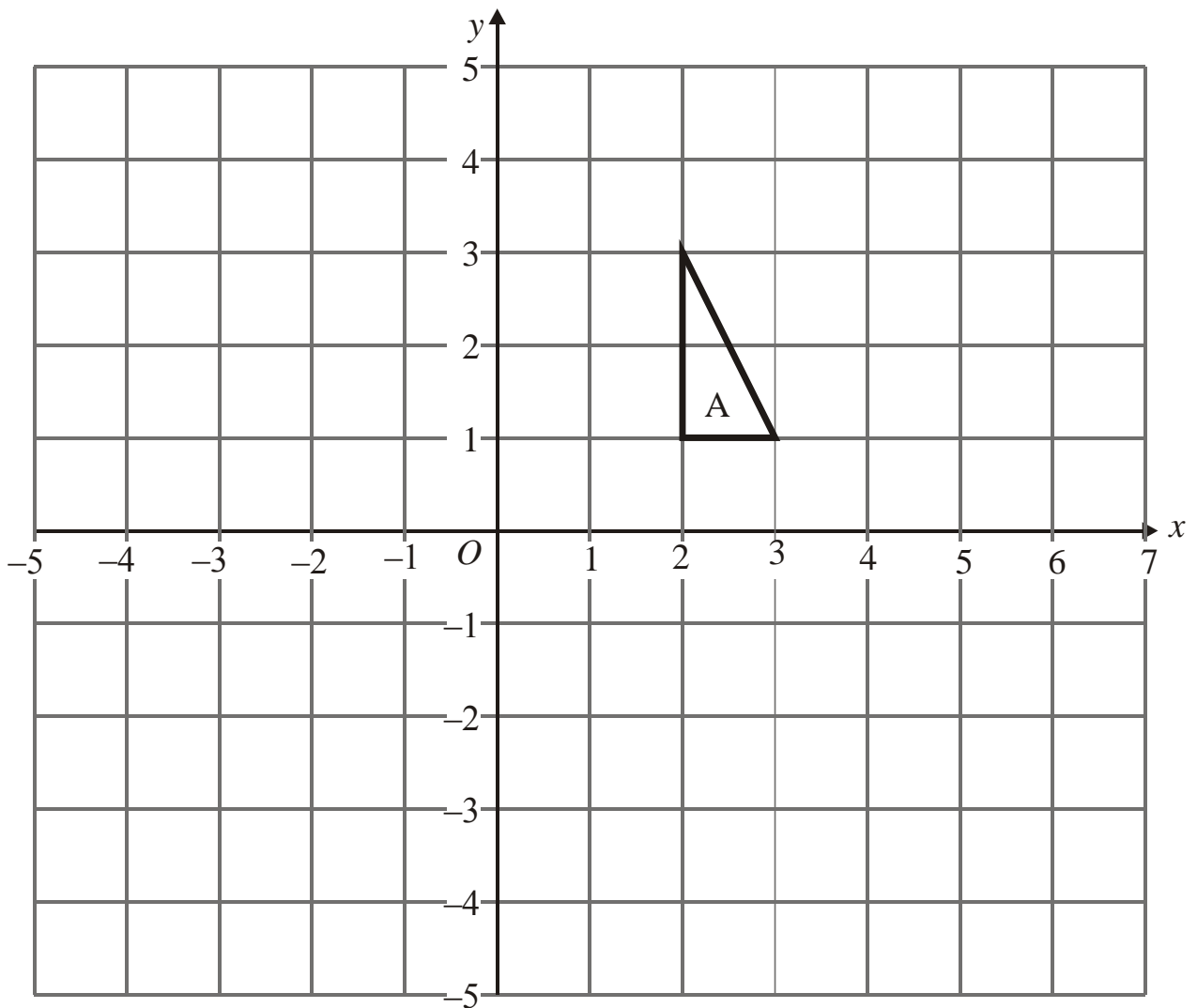


Enlarge triangle **A** by scale factor $-1\frac{1}{2}$, centre $O$.

**(Total 3 marks)**

**3.**
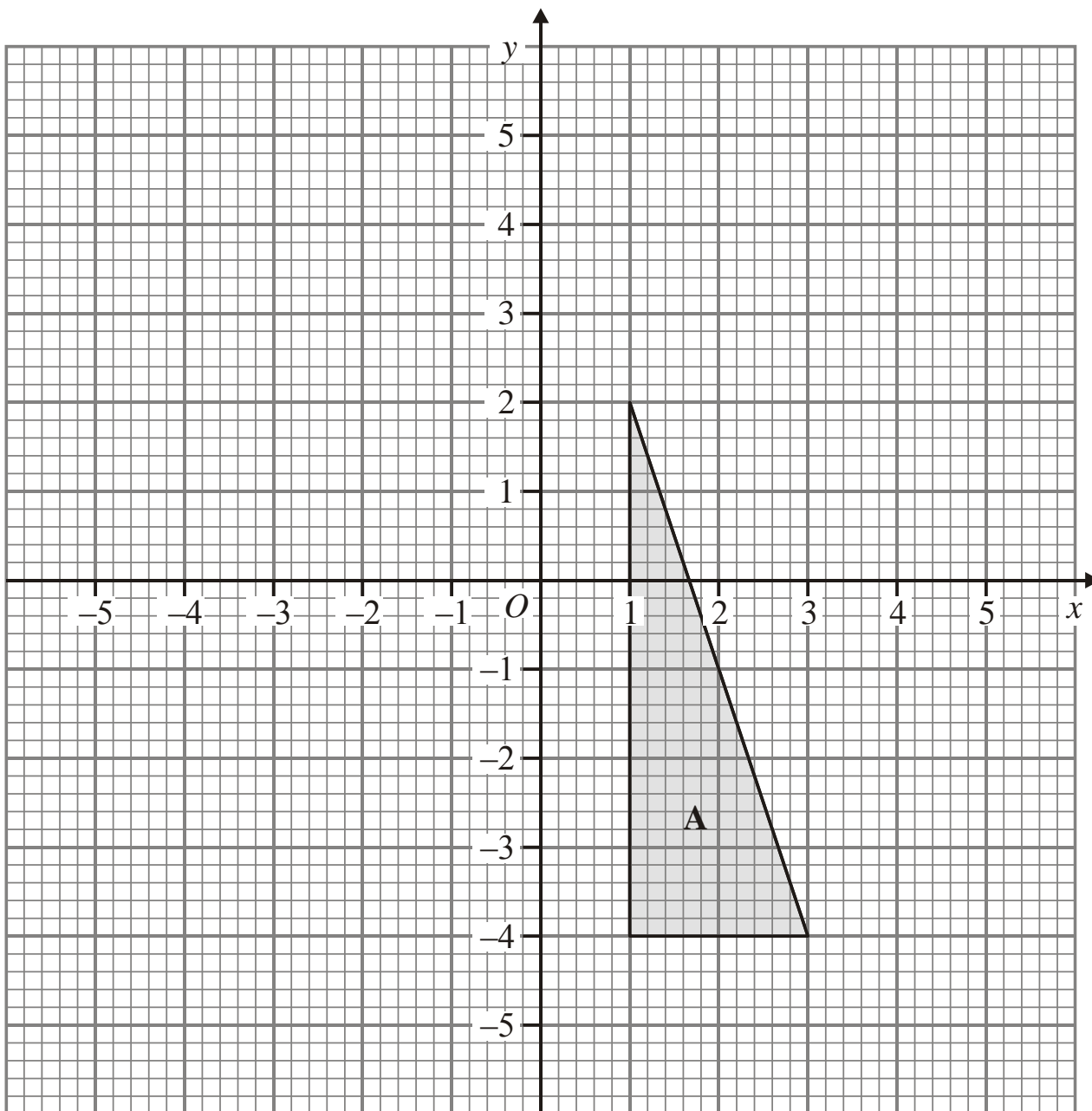


Enlarge triangle **A** by scale factor $-\frac{1}{2}$, centre (−1, −2).

Label your triangle **B**.

**(Total 3 marks)**

**4.**
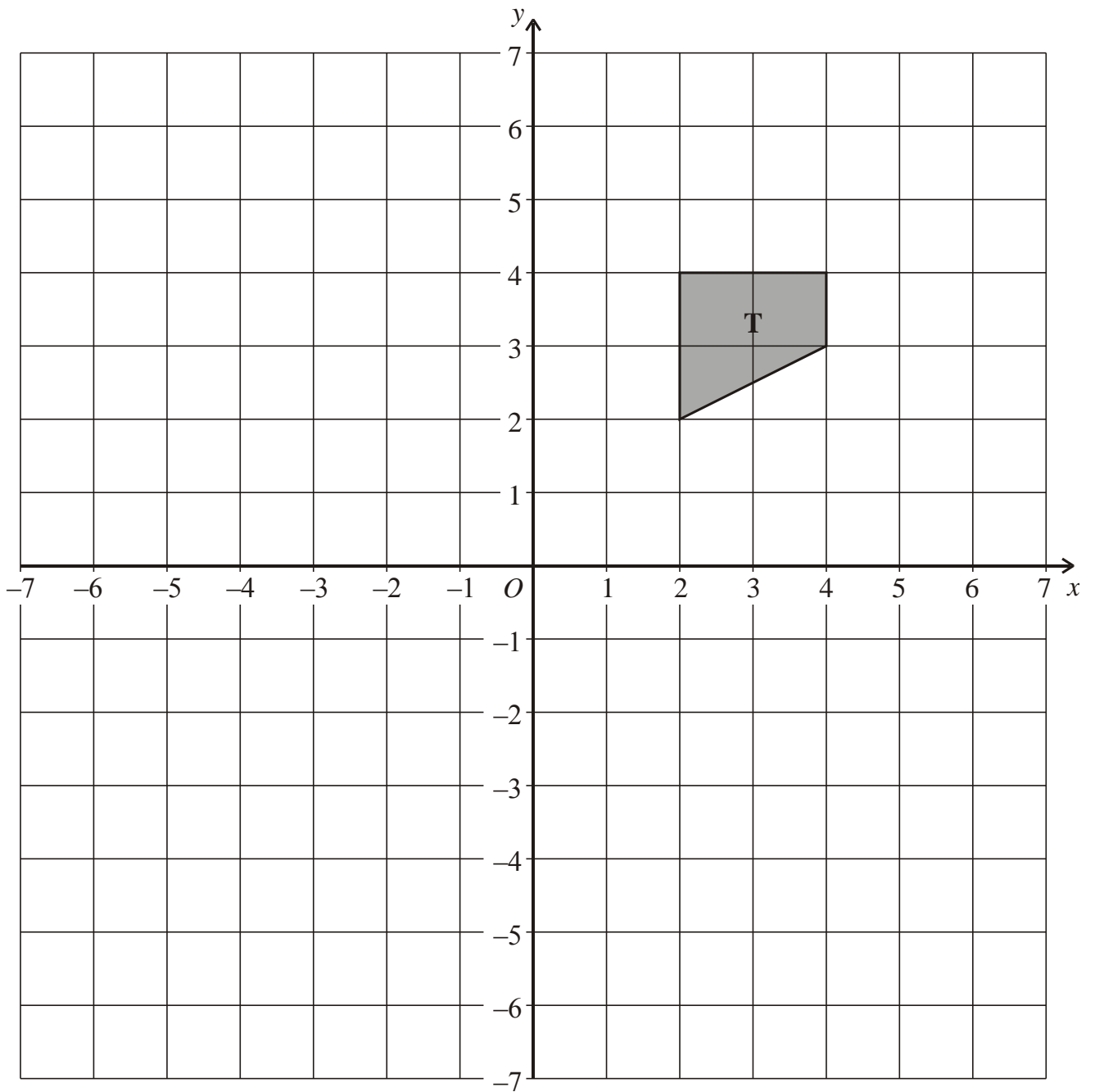


Enlarge shape **T** with scale factor −1.5, centre (0, 2).

**(Total 3 marks)**

**5.**
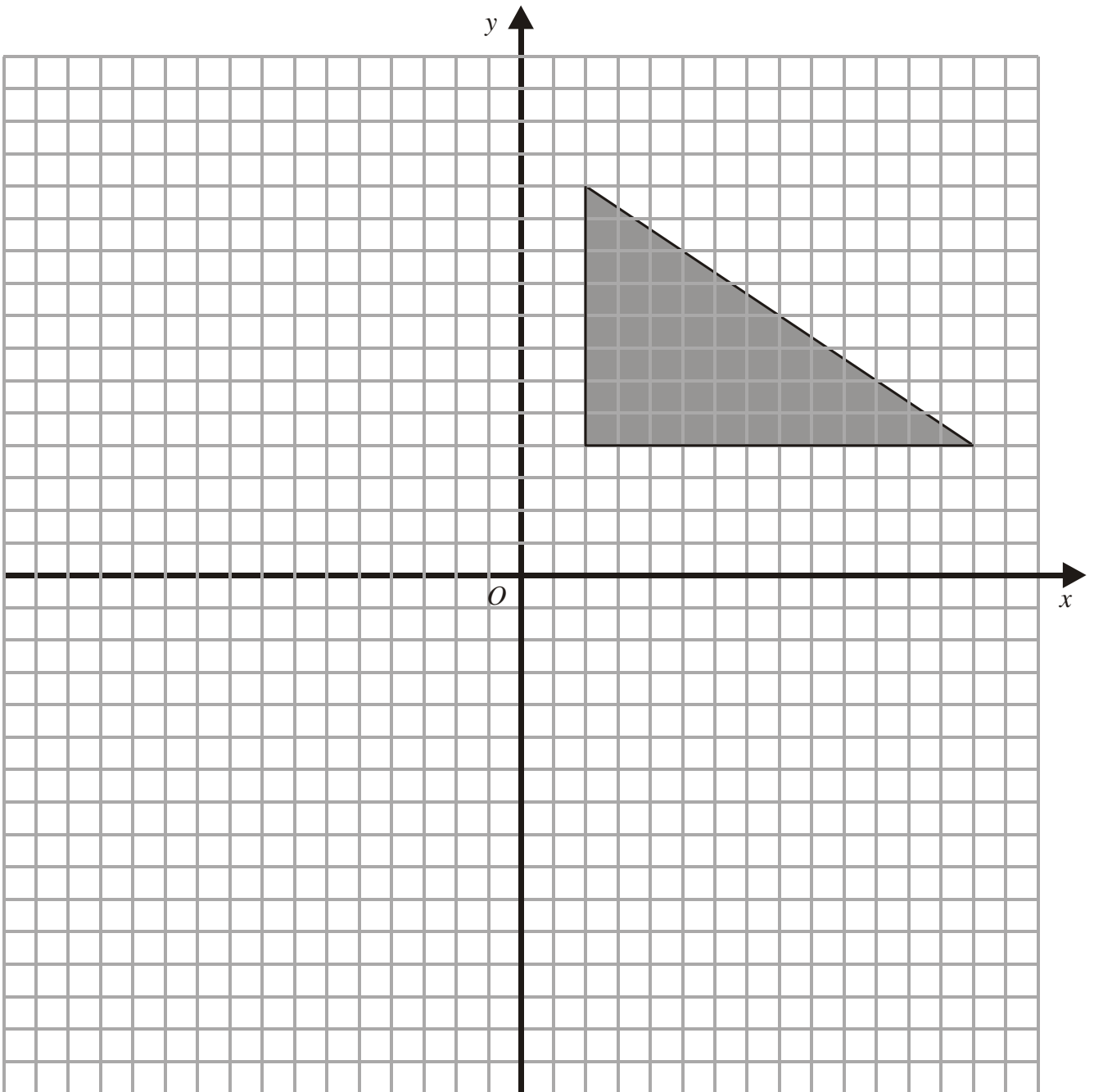


Enlarge the triangle by a scale factor of $-\frac{1}{2}$, centre $O$

**(Total 2 marks)**

**6.** The triangle *ABC* is to be enlarged, using *E* as the centre, to give the triangle *PQR*. The line *PQ* is the image of the line *BA*.
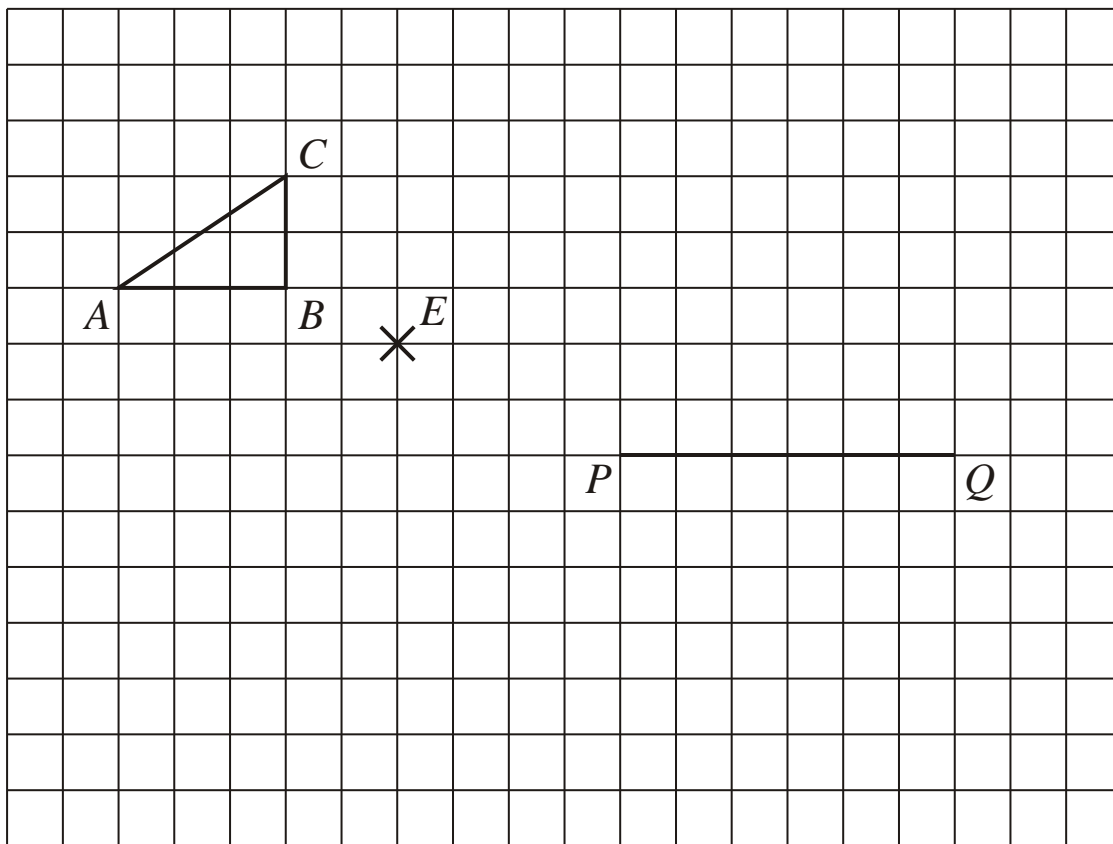


(a) Write down the scale factor of the enlargement.

.………………………

**(1)**

(b) Complete the triangle *PQR*.

**(1)**
**(Total 2 marks)**

**7.**
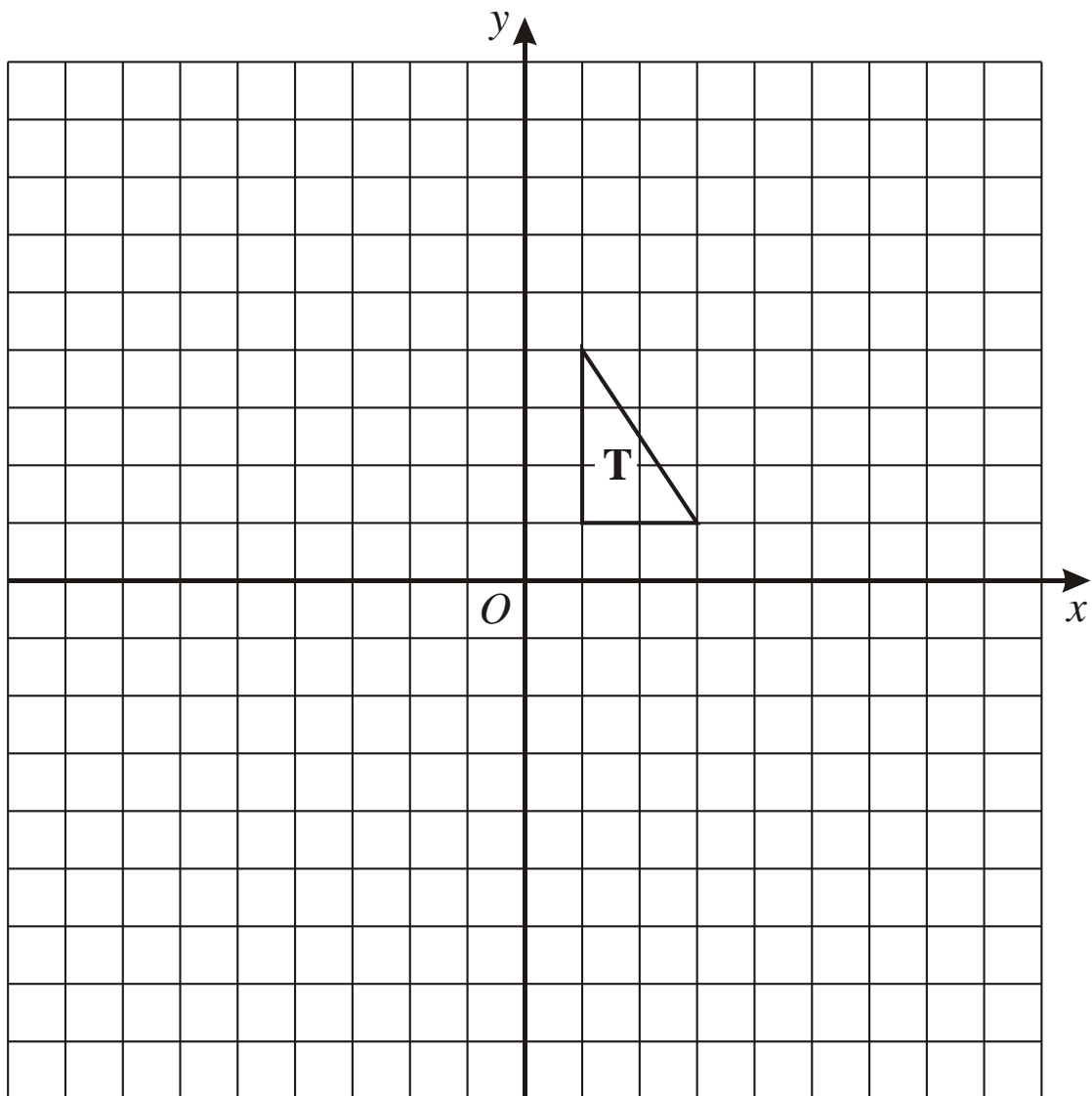


Enlarge triangle **T**, scale factor –2, centre *O*.

**(Total 2 marks)**

# 104  Edexcel GCSE
## Mathematics (Linear) – 1MA0

# SINE AND COSINE RULES & AREA OF TRIANGLES

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

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## Advice

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**1.**



Diagram **NOT** accurately drawn

*AB* = 11.7 m.
*BC* = 28.3 m.
Angle *ABC* = 67$^0$.

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

.............................. m$^2$

**(2)**

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

.............................. m

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

**2.**



C

73°

7 cm

10 cm

A

B
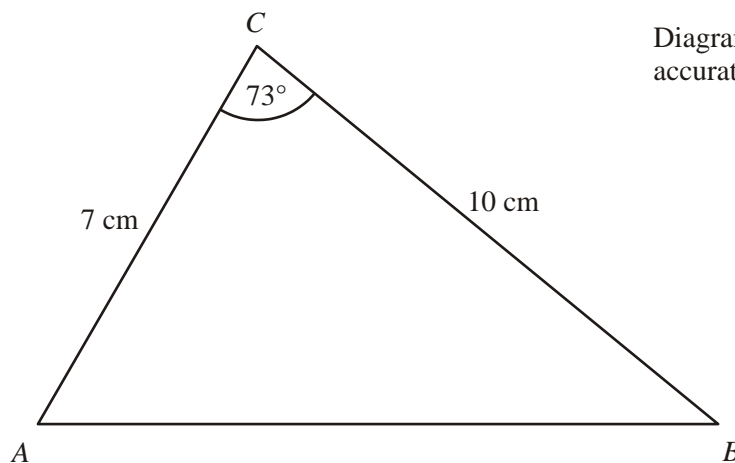
Diagram **NOT** accurately drawn

In triangle *ABC*,
*AC* = 7 cm,
*BC* = 10 cm,
angle *ACB* = 73°.

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

……………………. cm

**(Total 4 marks)**

**3.**
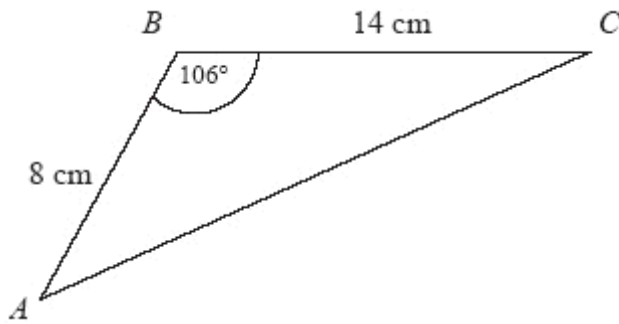


Diagram **NOT** accurately drawn

*ABC* is a triangle.

*AB* = 8 cm

*BC* = 14 cm

Angle *ABC* = 106 °

Calculate the area of the triangle.

Give your answer correct to 3 significant figures.

………………..cm$^2$

**(Total 3 marks)**

**4.**
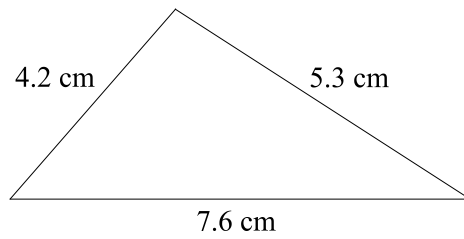


4.2 cm    5.3 cm

7.6 cm

Diagram **NOT** accurately drawn

The lengths of the sides of a triangle are 4.2 cm, 5.3 cm and 7.6 cm.

(a)    Calculate the size of the largest angle of the triangle.
       Give your answer correct to 1 decimal place.

.....................................°

**(3)**

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

.............................. cm$^2$

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

**5.**
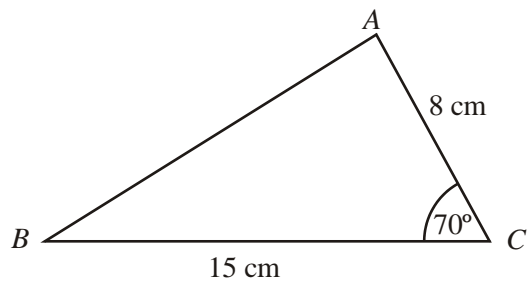


Diagram **NOT** accurately drawn

In triangle *ABC*,
*AC* = 8 cm,
*BC* = 15 cm,
Angle *ACB* = 70°.

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

................................ cm

**(3)**

(b) Calculate the size of angle *BAC*.
   Give your answer correct to 1 decimal place.

................................°

**(2)**

**(Total 5 marks)**

**6.**
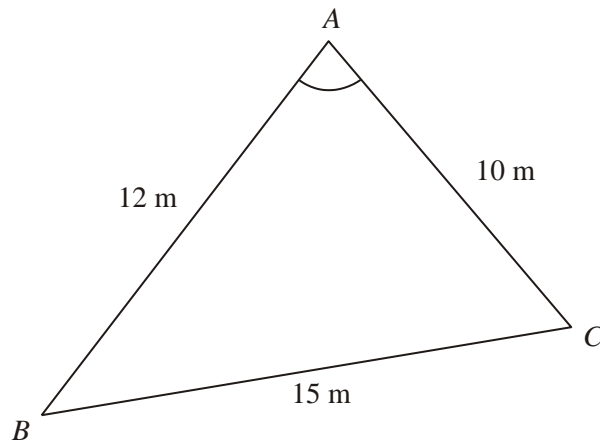


Diagram **NOT** accurately drawn

*ABC* is a triangle.
*AB* = 12 m.
*AC* = 10 m.
*BC* = 15 m.

Calculate the size of angle *BAC*.
Give your answer correct to one decimal place.

.................................°

**(Total 3 marks)**

**7.**
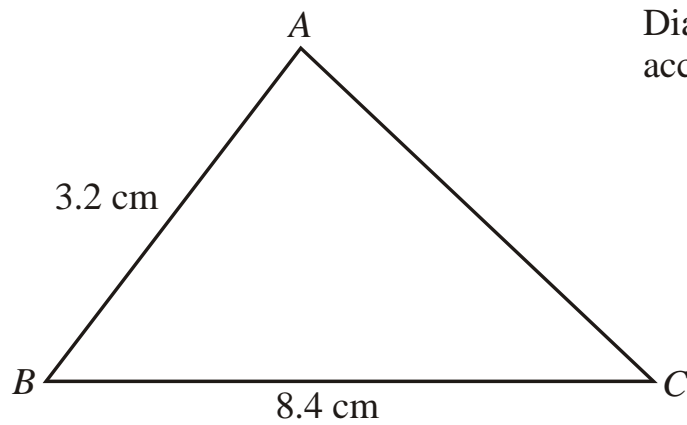


Diagram **NOT** accurately drawn

$AB$ = 3.2 cm
$BC$ = 8.4 cm

The area of triangle $ABC$ is 10 cm$^2$.

Calculate the perimeter of triangle $ABC$.
Give your answer correct to three significant figures.

..................... cm
**(Total 6 marks)**

# 105  Edexcel GCSE
## Mathematics (Linear) – 1MA0
# 3D PYTHAGORAS

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
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Calculators may be used.

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and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

**1.**



The diagram represents a cuboid *ABCDEFGH*.

*AB* = 5 cm.
*BC* = 7 cm.
*AE* = 3 cm.

Calculate the length of *AG*.

Give your answer correct to 3 significant figures.

..................................... cm

**(3)**

**2.** A cuboid has length 3 cm, width 4 cm and height 12 cm.

P

12 cm

4 cm

3 cm  Q
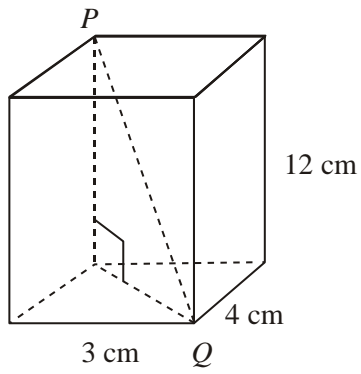
Diagram **NOT**
accurately drawn

Work out the length of *PQ*.

..................................... cm

**(Total 3 marks)**

**3.** The diagram shows a pyramid. The apex of the pyramid is *V*.

Each of the sloping edges is of length 6 cm.
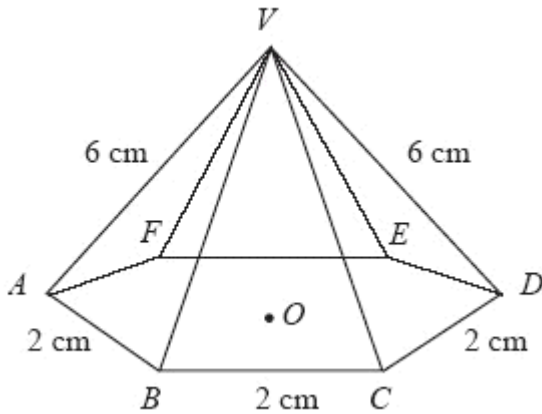


Diagram **NOT** accurately drawn

The base of the pyramid is a regular hexagon with sides of length 2 cm.

*O* is the centre of the base.
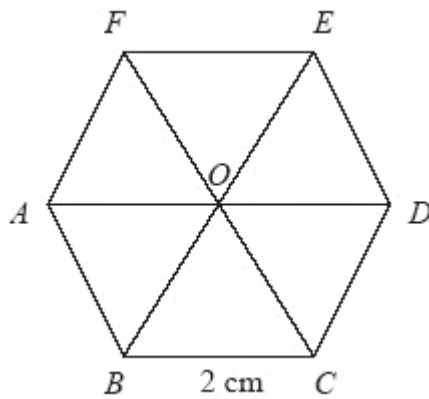


Diagram **NOT** accurately drawn

Calculate the height of *V* above the base of the pyramid.
Give your answer correct to 3 significant figures.

………………..cm

**(3)**

# 106  Edexcel GCSE
## Mathematics (Linear) – 1MA0
# SPHERES AND CONES

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
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## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
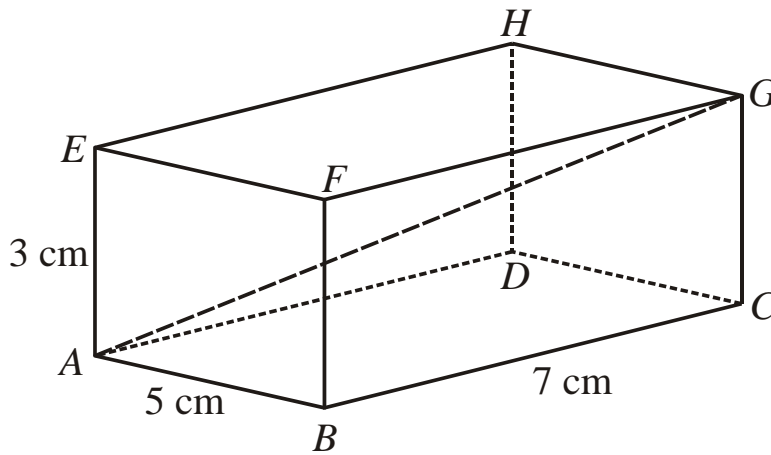Check your answers if you have time at the end.

**1.**



12 cm

10 cm

Diagram **NOT** accurately drawn

The diagram represents a cone.
The height of the cone is 12 cm.
The diameter of the base of the cone is 10 cm.

Calculate the curved surface area of the cone.
Give your answer as a multiple of □.

..…………….. cm²

**(Total 3 marks)**

**2.**
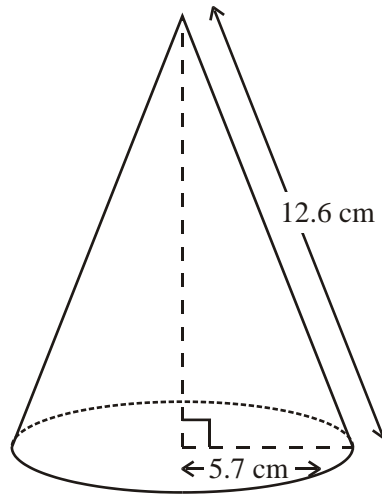


12.6 cm

←5.7 cm→

Diagram **NOT** accurately drawn

The radius of the base of a cone is 5.7 cm.
Its slant height is 12.6 cm.

Calculate the volume of the cone.
Give your answer correct to 3 significant figures.

……………………….. cm$^3$

**(Total 4 marks)**

**3.**
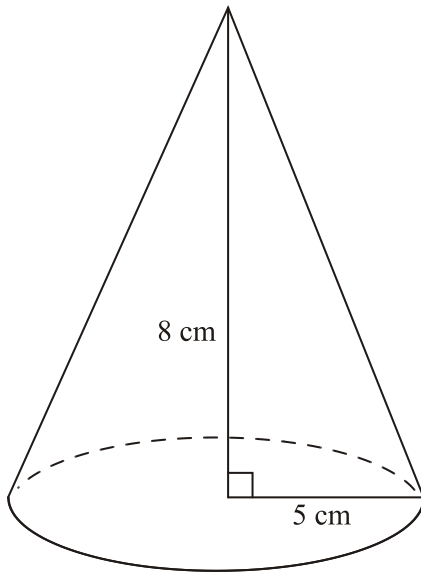


Diagram **NOT** accurately drawn

A cone has a base radius of 5 cm and a vertical height of 8 cm.

Calculate the volume of the cone.

Give your answer correct to 3 significant figures.

.................................. cm$^3$

**(2)**

**4.** The diagram shows a child's toy.

22cm

7cm

The toy is made fro
The cone and hemis
The total height of t
Work out the volum
Give your answer c
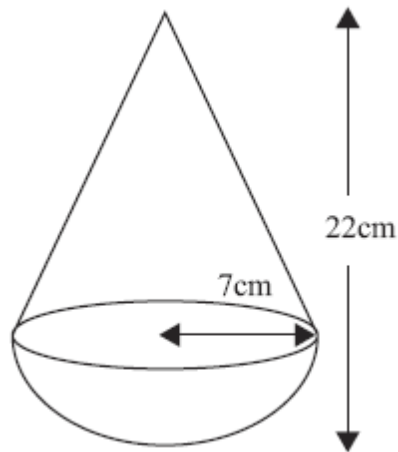
.......................................................... cm³
**(Total 3 marks)**

**5.** The diagram shows a solid hemisphere of radius 8 cm.

8 cm
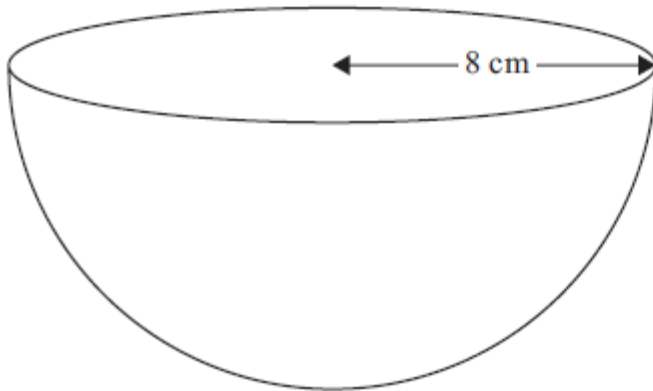
Work out the total surface area of the hemisphere.
Give your answer correct to 3 significant figures.

.............................. cm$^2$

**(Total 3 marks)**

**6.**
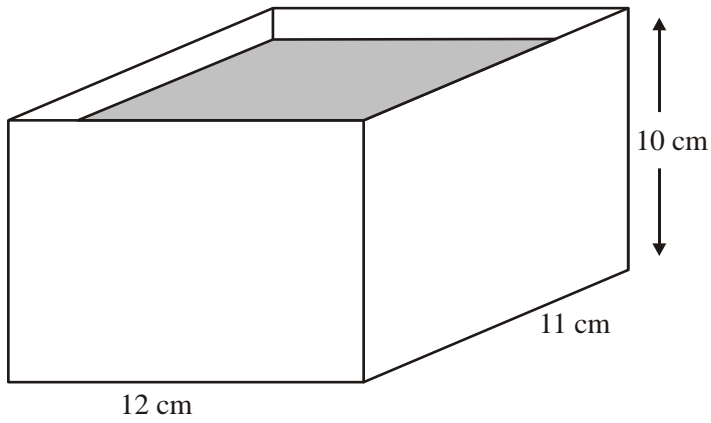


Diagram **NOT**
accurately drawn
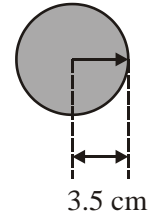
10 cm

11 cm

12 cm

3.5 cm

A rectangular container is 12 cm long, 11 cm wide and 10 cm high.
The container is filled with water to a depth of 8 cm.

A metal sphere of radius 3.5 cm is placed in the water.
It sinks to the bottom.

Calculate the rise in the water level.
Give your answer correct to 3 significant figures.

.............................cm

**(Total 4 marks)**

**7.**
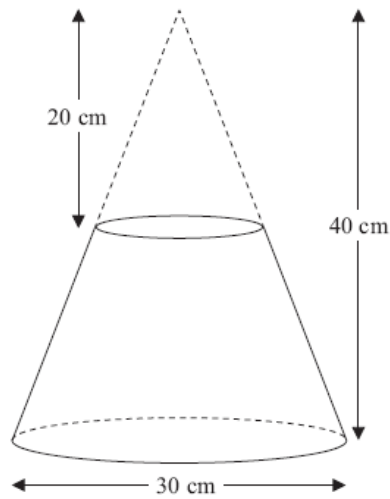


20 cm

40 cm

30 cm

Diagram **NOT**
accurately drawn

A frustum is made by removing a small cone from a similar large cone.
The height of the small cone is 20 cm.
The height of the large cone is 40 cm.
The diameter of the base of the large cone is 30 cm.
Work out the volume of the frustum.
Give your answer correct to 3 significant figures.

......................................... cm$^3$

**(Total 4 marks)**

# 107 Edexcel GCSE
## Mathematics (Linear) – 1MA0
# AREA OF SECTOR AND LENGTH OF ARCS

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

## Information

The marks for each question are shown in brackets – use this as a guide as to how much time to
spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication
will be assessed – you should take particular care on these questions with your spelling, punctuation
and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
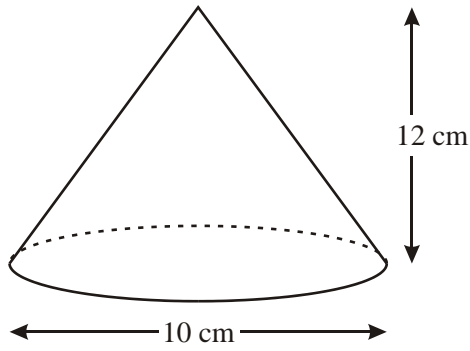Check your answers if you have time at the end.

**1.**



Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre *O*.
The radius of the circle is 13 cm.
The angle of the sector is 150°.

Calculate the area of the sector.
Give your answer correct to 3 significant figures.

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

**2.**
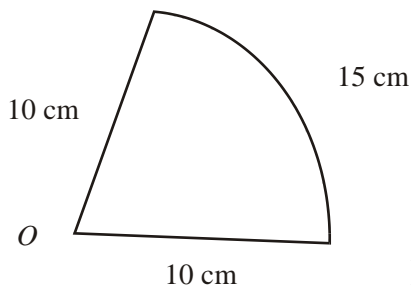


Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre *O*, radius 10 cm.
The arc length of the sector is 15 cm.

Calculate the area of the sector.

.......................... cm$^2$
**(Total 4 marks)**

**3.**
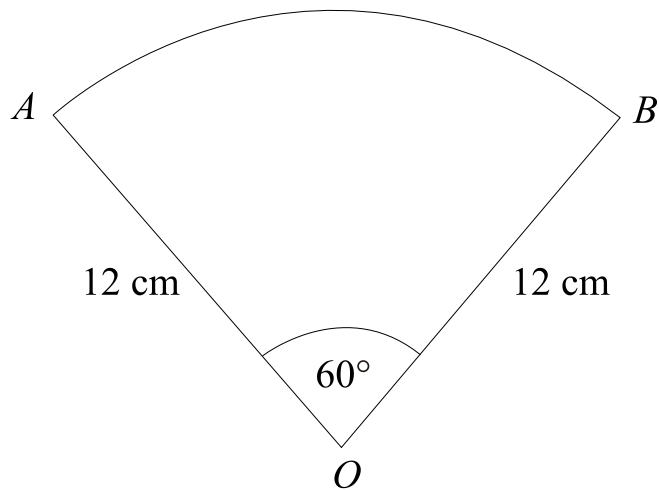


Diagram **NOT** accurately drawn

*OAB* is a sector of a circle, centre *O*.
Angle *AOB* = 60º.
*OA* = *OB* = 12 cm.

Work out the length of the arc *AB*.
Give your answer in terms of $\pi$.

..................................... cm

**(Total 3 marks)**

**4.**
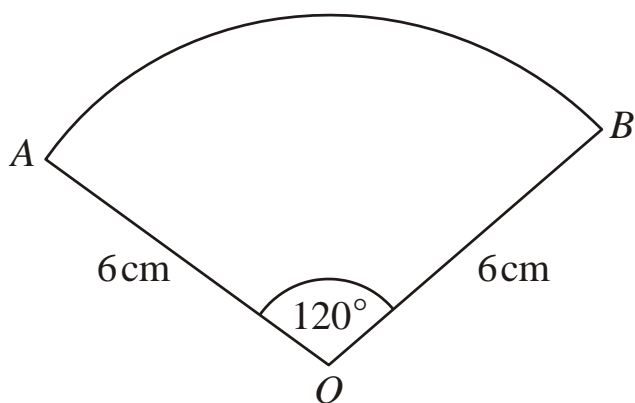


Diagram **NOT** accurately drawn

The diagram shows a sector of a circle, centre *O*.
The radius of the circle is 6 cm.
Angle *AOB* = 120°.

Work out the **perimeter** of the sector.
Give your answer in terms of π in its simplest form.

........................... cm

**(Total 3 marks)**

**5.**
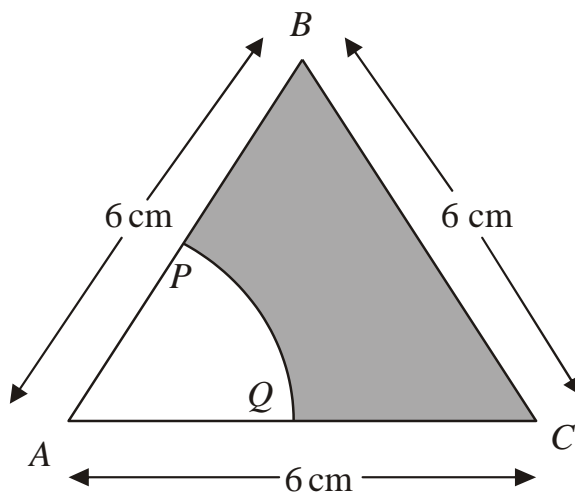


Diagram **NOT** accurately drawn

The diagram shows an equilateral triangle *ABC* with sides of length 6 cm.

*P* is the midpoint of *AB*.
*Q* is the midpoint of *AC*.
*APQ* is a sector of a circle, centre *A*.

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

........................................ cm$^2$

**(Total 4 marks)**

**6.**

Diagram **NOT** accurately drawn
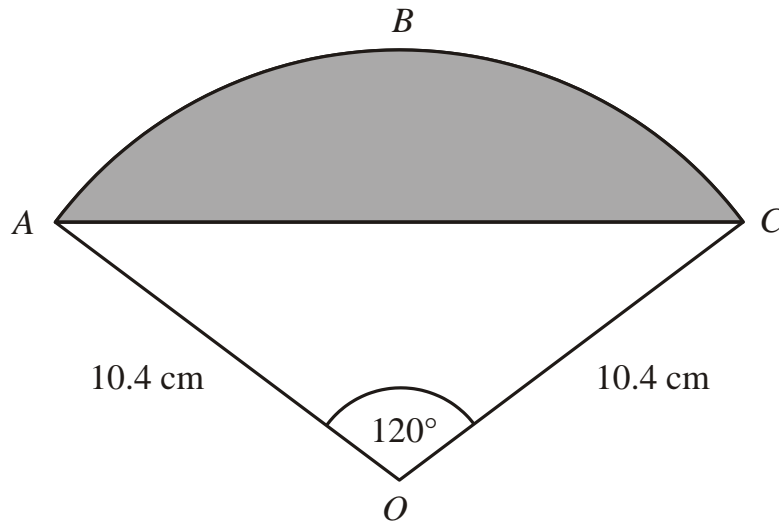


The diagram shows a sector *OABC* of a circle with centre *O*.
*OA* = *OC* = 10.4 cm.
Angle *AOC* = 120°.

(a) Calculate the length of the arc *ABC* of the sector.
Give your answer correct to 3 significant figures.

.....................................cm

**(3)**

(b) Calculate the area of the shaded segment *ABC*.
Give your answer correct to 3 significant figures.

.....................................cm$^2$

**(4)**
**(Total 7 marks)**

**7.** The diagram shows a sector of a circle with centre $O$.
The radius of the circle is 8 cm.

*PRS* is an arc of the circle.
*PS* is a chord of the circle.
Angle *POS* = 40°
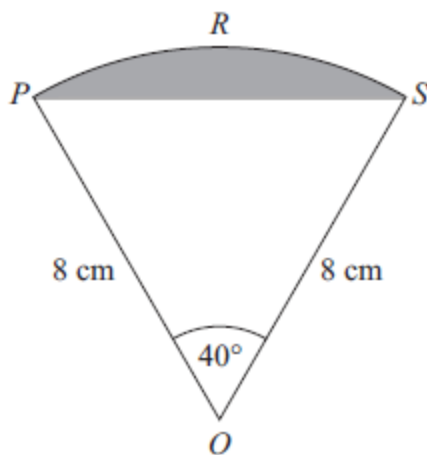


Diagram **NOT**
accurately drawn

Calculate the area of the shaded segment.
Give your answer correct to 3 significant figures.

........................... cm$^2$

**(Total 5 marks)**

**8.**



Diagram **NOT**
accurately drawn

80 m

O 35°

80 m

A

B

C
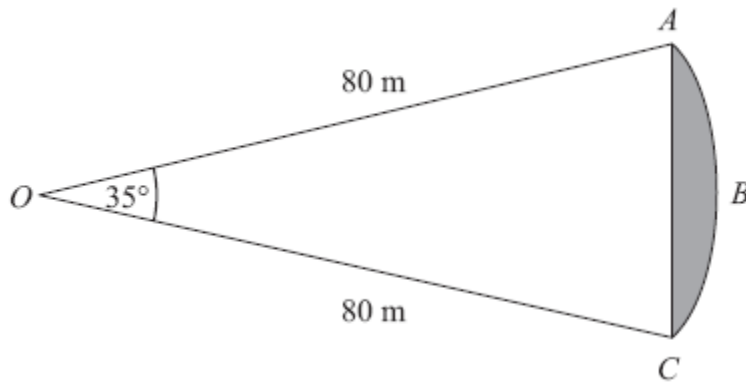
*ABC* is an arc of a circle centre *O* with radius 80 m.
*AC* is a chord of the circle.
Angle *AOC* = 35°.

Calculate the area of the shaded region.
Give your answer correct to 3 significant figures.

.............................. m$^2$

**(Total 5 marks)**

# 108  Edexcel GCSE
## Mathematics (Linear) – 1MA0

# VECTORS

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

## Information

The marks for each question are shown in brackets – use this as a guide as to how much time to
spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication
will be assessed – you should take particular care on these questions with your spelling, punctuation
and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
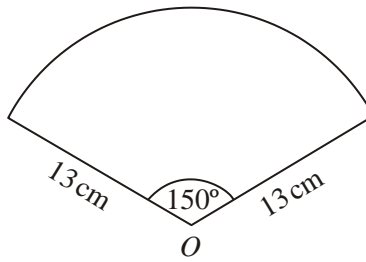Check your answers if you have time at the end.

**1.**



Diagram **NOT** accurately drawn

*ABCDEF* is a regular hexagon, with centre *O*.

$\overrightarrow{OA} = \mathbf{a}$ , $\overrightarrow{OB} = \mathbf{b}$.

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

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

**(1)**

The line *AB* is extended to the point *K* so that *AB* : *BK* = 1 : 2

(b) Write the vector $\overrightarrow{CK}$ in terms of **a** and **b**.
    Give your answer in its simplest form.
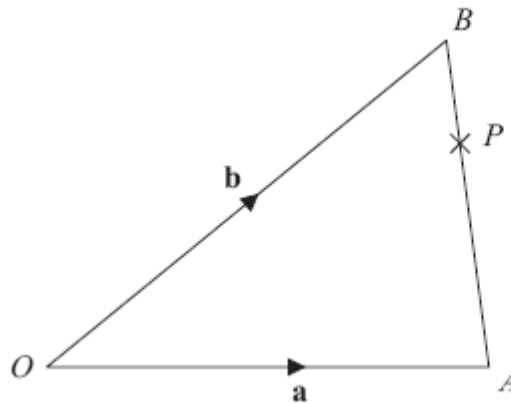
.......................................

**(3)**

**(4 marks)**

885

**2.**



Diagram **NOT** accurately drawn

*OAB* is a triangle.

$\overrightarrow{OA} = \mathbf{a}$
$\overrightarrow{OB} = \mathbf{b}$

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

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

*P* is the point on *AB* such that *AP* : *PB* = 3 : 1

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

.................................................
**(3)**

**(4 marks)**

**3.**



Diagram **NOT** accurately drawn
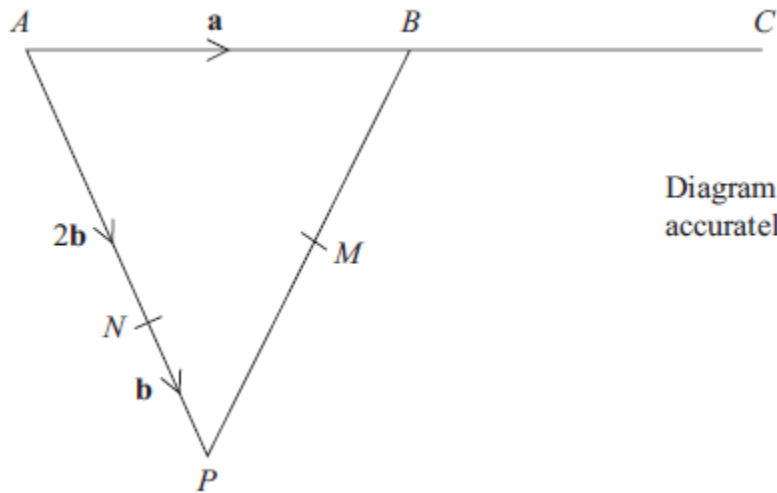
*APB* is a triangle.
*N* is a point on *AP*.

$$\overrightarrow{AB} = \mathbf{a} \qquad \overrightarrow{AN} = 2\mathbf{b} \qquad \overrightarrow{NP} = \mathbf{b}$$

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

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

**(1)**

*B* is the midpoint of *AC*.
*M* is the midpoint of *PB*.

*(b) Show that *NMC* is a straight line.

**(4)**

**(5 marks)**

887

**4.**
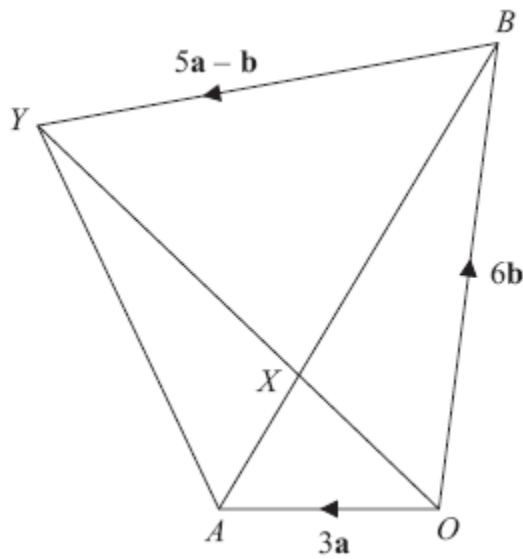


Diagram **NOT** accurately drawn

*OAYB* is a quadrilateral.

$\overrightarrow{OA} = 3\mathbf{a}$

$\overrightarrow{OB} = 6\mathbf{b}$

(a) Express $\overrightarrow{AB}$ in terms of **a** and **b**.

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

**(1)**

*X* is the point on *AB* such that *AX* : *XB* = 1 : 2

and $\overrightarrow{BY} = 5\mathbf{a} - \mathbf{b}$

\* (b) Prove that $\overrightarrow{OX} = \dfrac{2}{5}\,\overrightarrow{OY}$

**(4)**

**(5 marks)**

**5.**
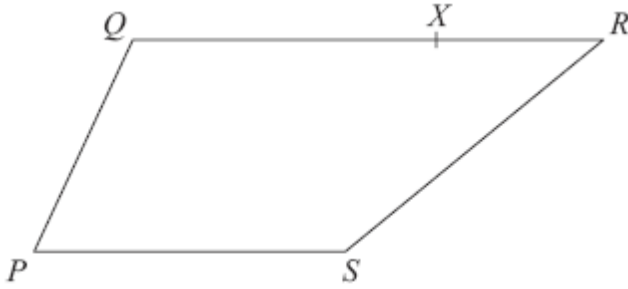


Diagram **NOT** accurately drawn

*PQRS* is a trapezium.
*PS* is parallel to *QR*.
*QR* = 2*PS*

$\overrightarrow{PQ}$ = **a**    $\overrightarrow{PS}$ = **b**

*X* is the point on *QR* such that *QX* : *XR* = 3 : 1

Express in terms of **a** and **b**.

(i)  $\overrightarrow{PR}$

(2)

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

(ii)  $\overrightarrow{SX}$

(3)

.......................................................
**(5 marks)**

**6.**
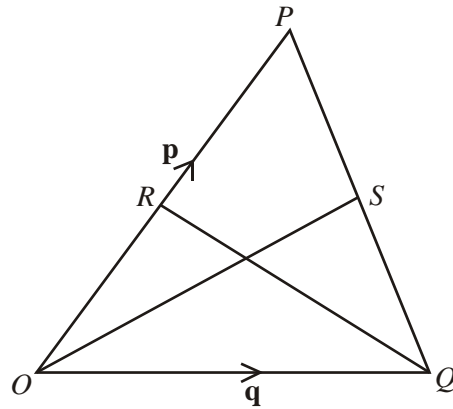


Diagram **NOT** accurately drawn

*OPQ* is a triangle.

*R* is the midpoint of *OP*.

S is the midpoint of *PQ*.

$\overrightarrow{OP} = p$ and $\overrightarrow{OQ} = q$

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

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

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

**(5 marks)**

**6.**



Diagram **NOT**
accurately drawn
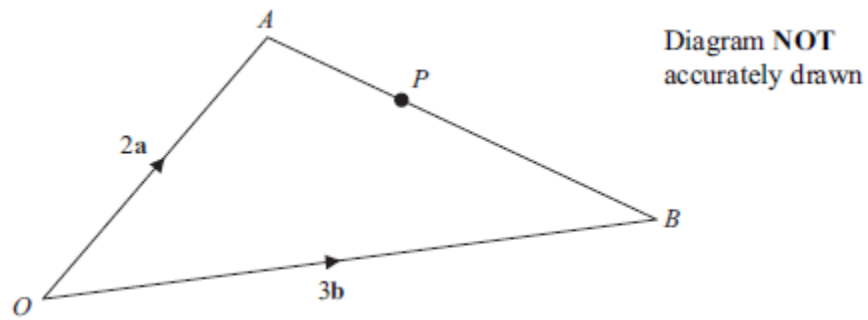
*OAB* is a triangle.

$\overrightarrow{OA} = 2\mathbf{a}$

$\overrightarrow{OB} = 3\mathbf{b}$

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = ...........................

**(1)**

*P* is the point on *AB* such that *AP* : *PB* = 2 : 3

(*b*) Show that $\overrightarrow{OP}$ is parallel to the vector **a** + **b**.

**(3)**

**(4 marks)**

# 109  Edexcel GCSE
## Mathematics (Linear) – 1MA0

# HISTOGRAMS

| **Materials required for examination** | **Items included with question papers** |
|---|---|
| Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used. | Nil |

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

## Information

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
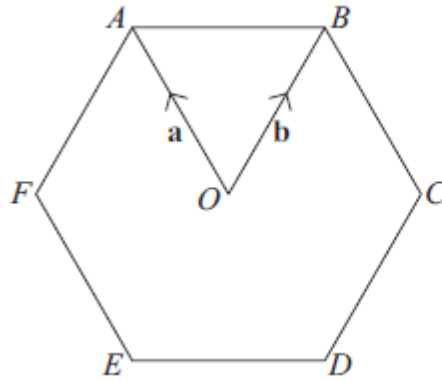Check your answers if you have time at the end.

**1.** The table gives some information about the speeds, in km/h, of 100 cars.

| Speed($s$ km/h) | Frequency |
|---|---|
| $60 < s \leq 65$ | 15 |
| $65 < s \leq 70$ | 25 |
| $70 < s \leq 80$ | 36 |
| $80 < s \leq 100$ | 24 |

(a) On the grid, draw a histogram for the information in the table.



Speed ($s$ km/h)
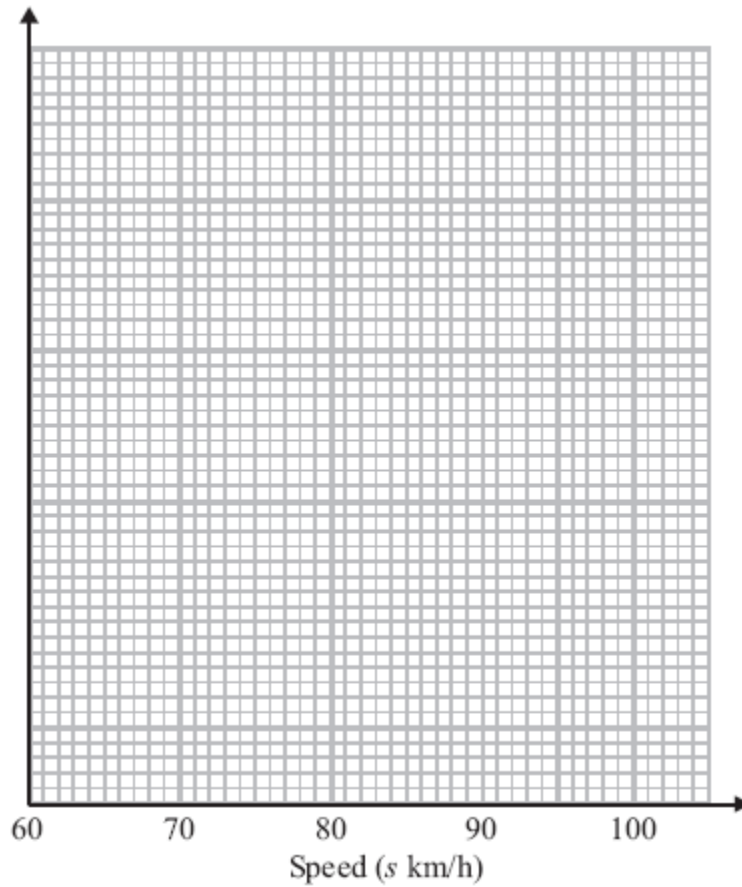
(3)

(b) Work out an estimate for the number of cars with a speed of more than 85 km/h.

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

(2)

**(5 marks)**

**2.** The table gives information about the heights, *h* metres, of trees in a wood.

| Height (*h* metres) | Frequency |
|---|---|
| $0 < h \leq 2$ | 7 |
| $2 < h \leq 4$ | 14 |
| $4 < h \leq 8$ | 18 |
| $8 < h \leq 16$ | 24 |
| $16 < h \leq 20$ | 10 |

Draw a histogram to show this information.
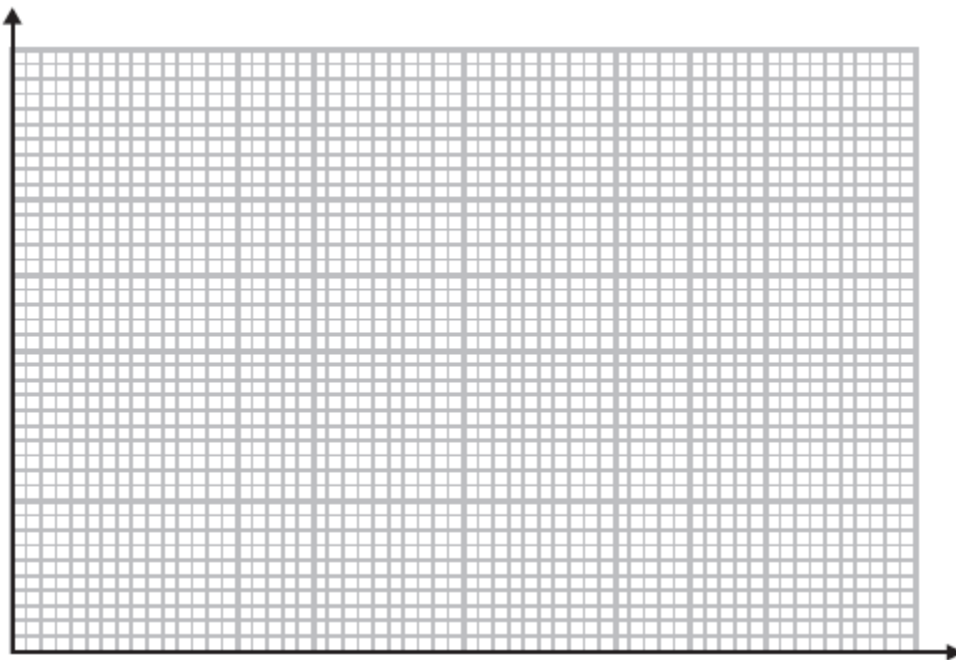
**(3 marks)**

**3.** The histogram shows some information about the weights of a sample of apples.
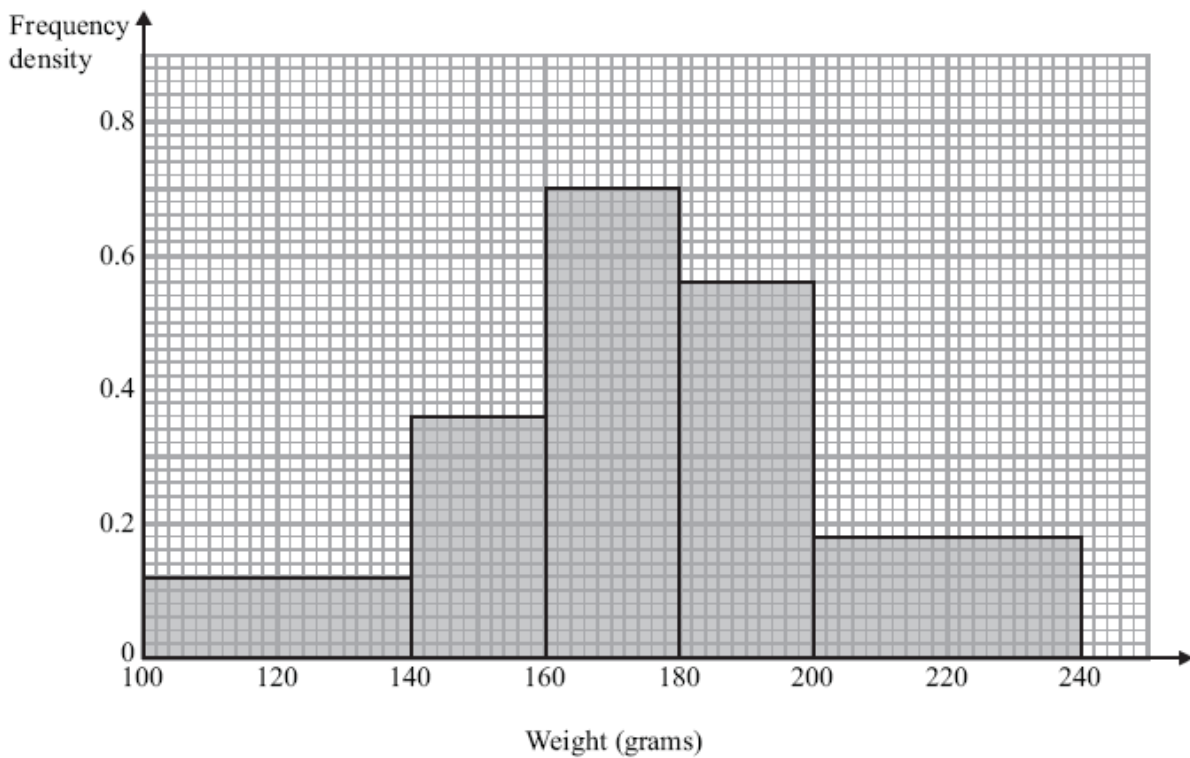


Weight (grams)

Work out the proportion of apples in the sample with a weight between 140 grams and 200 grams.

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

**(4 marks)**

**4.** The table shows information about the lengths of time, $t$ minutes, it took some students to do their maths homework last week.

| Time ($t$ minutes) | Frequency |
|:---:|:---:|
| $0 < t \leq 10$ | 4 |
| $10 < t \leq 15$ | 8 |
| $15 < t \leq 20$ | 24 |
| $20 < t \leq 30$ | 16 |
| $30 < t \leq 50$ | 5 |

Draw a histogram for this information.
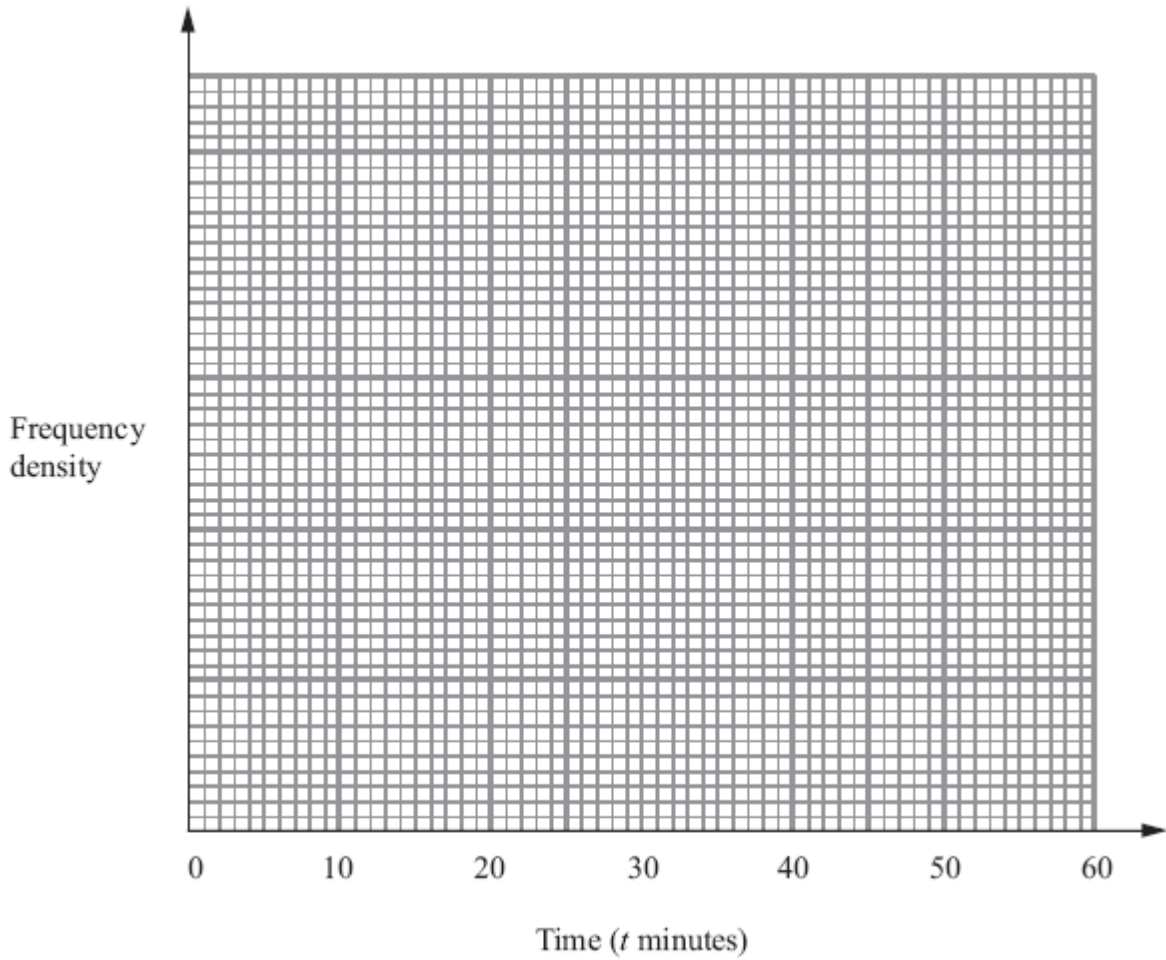


**(Total 3 marks)**

**5.** The table shows information about the total times that 35 students spent using their mobile phones one week.

| Time ($h$ hours) | Frequency |
|---|---|
| $0 \leqslant h < \dfrac{1}{2}$ | 8 |
| $\dfrac{1}{2} \leqslant h < 1$ | 7 |
| $1 \leqslant h < 2$ | 11 |
| $2 \leqslant h < 4$ | 9 |

On the grid below, draw a histogram for this information.



Frequency density

Time
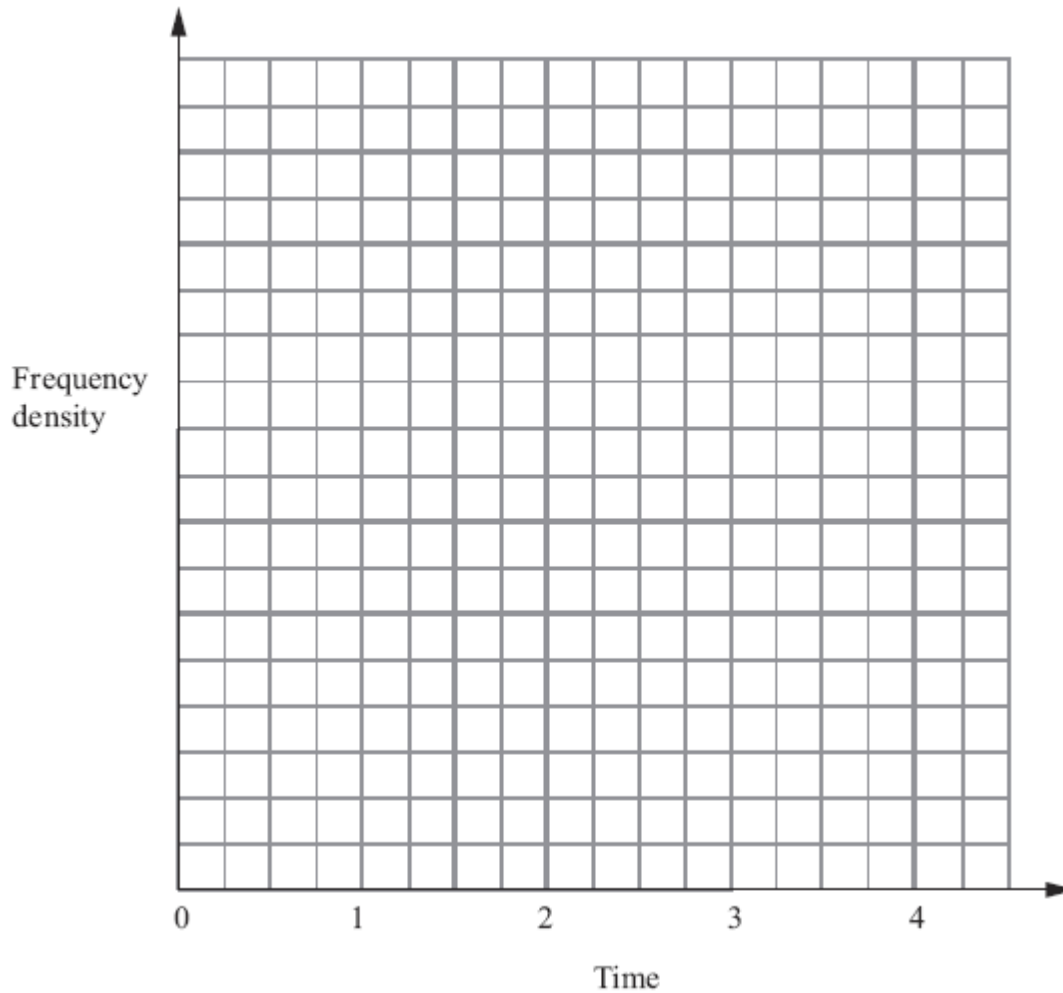
**(Total for Question 23 = 3 marks)**

**6.** The incomplete table and histogram give some information about the ages of the people who live in a village.
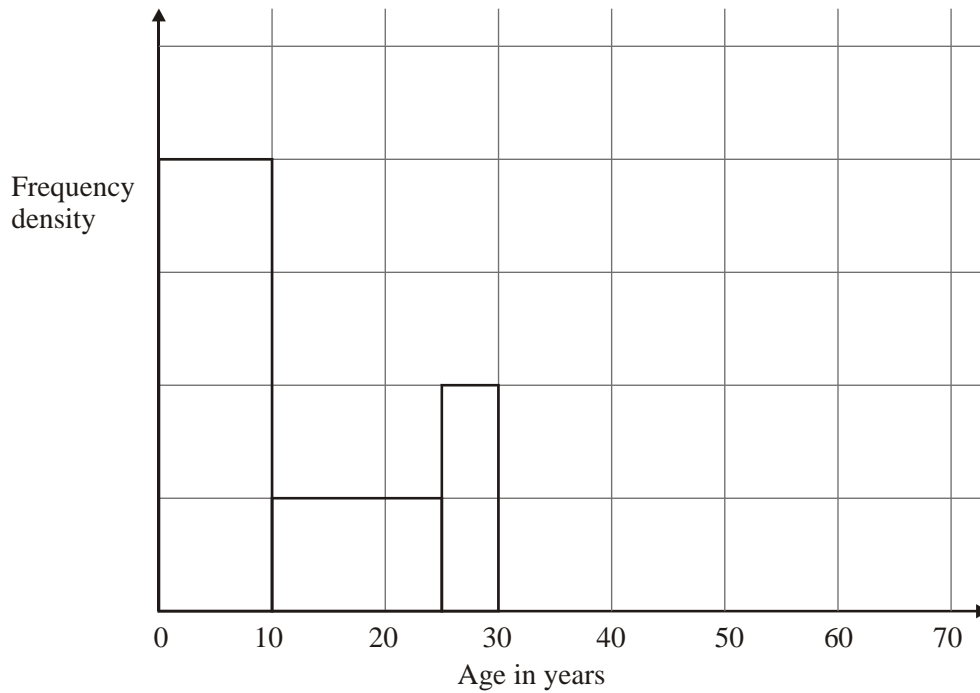


(a) Use the information in the histogram to complete the frequency table below.

| Age (x) in years | Frequency |
|---|---|
| $0 < x \leq 10$ | 160 |
| $10 < x \leq 25$ | |
| $25 < x \leq 30$ | |
| $30 < x \leq 40$ | 100 |
| $40 < x \leq 70$ | 120 |

**(2)**

(b) Complete the histogram.

**(2)**

**(Total 4 marks)**

**7.** The table shows the distribution of the ages of passengers travelling on a plane from London to Belfast.

| Age ($x$ years) | Frequency |
|---|---|
| $0 < x \le 20$ | 28 |
| $20 < x \le 35$ | 36 |
| $35 < x \le 45$ | 20 |
| $45 < x \le 65$ | 30 |

On the grid below, draw a histogram to show this distribution.

Age ($x$ years)
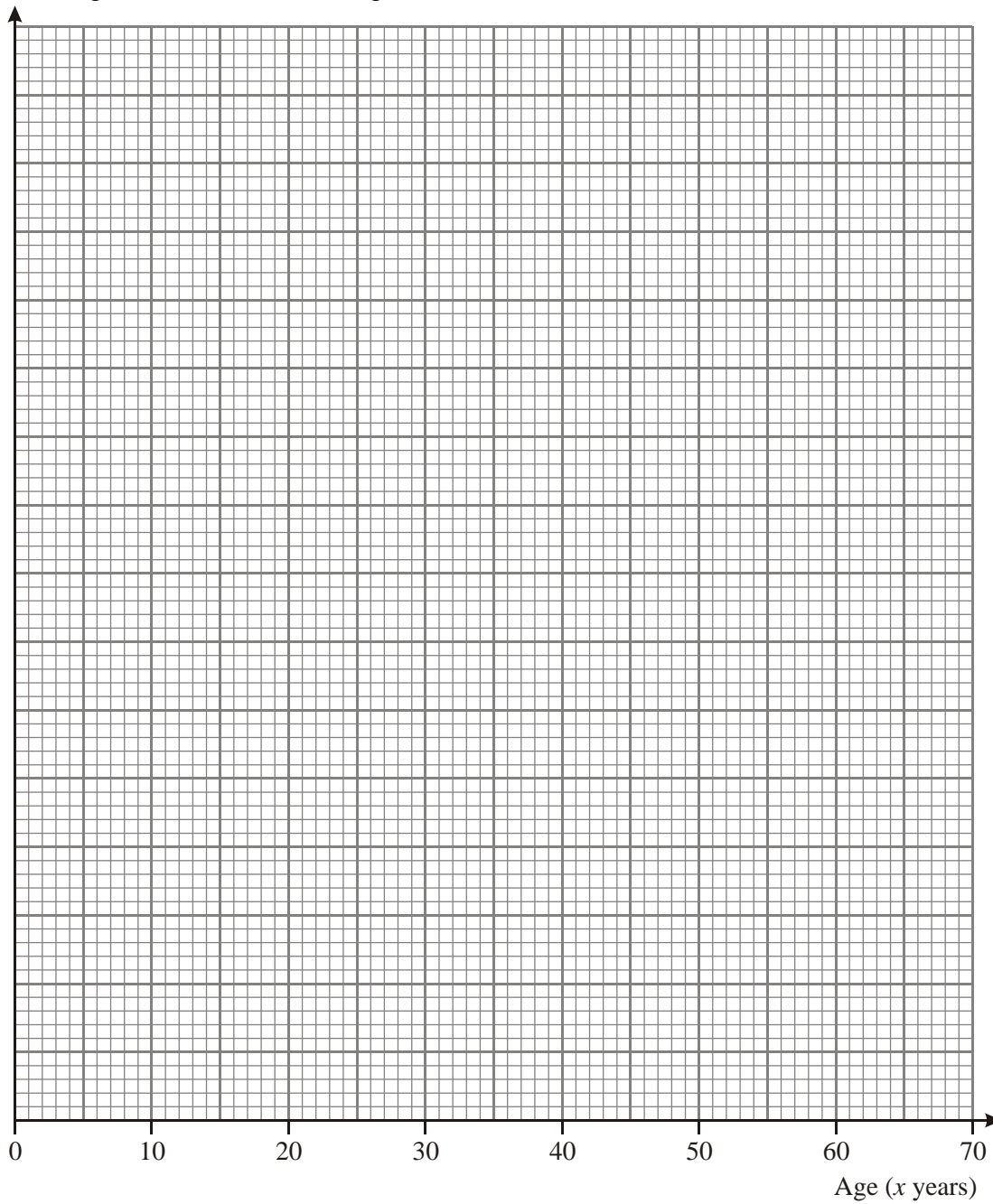
**(Total 3 marks)**

# 110  Edexcel GCSE
## Mathematics (Linear) – 1MA0

# STRATIFIED SAMPLING

| **Materials required for examination** | **Items included with question papers** |
| --- | --- |
| Ruler graduated in centimetres and millimetres, protractor, compasses, pen, HB pencil, eraser. Tracing paper may be used. | Nil |

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

## Information

The marks for each question are shown in brackets – use this as a guide as to how much time to spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication will be assessed – you should take particular care on these questions with your spelling, punctuation and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

**1.** The grouped frequency table shows information about the weights, in kilograms, of 20 students, chosen at random from Year 11.

| Weight ($w$ kg) | Frequency |
| --- | --- |
| $50 \le w < 60$ | 7 |
| $60 \le w < 70$ | 8 |
| $70 \le w < 80$ | 3 |
| $80 \le w < 90$ | 2 |

There are 300 students in Year 11.

Work out an estimate for the number of students in Year 11 whose weight is between 50 kg and 60 kg.

…………………………………

**(Total 3 marks)**

**2.** The table shows the number of students in each year group at a school.

| Year group | 7 | 8 | 9 | 10 | 11 |
| --- | --- | --- | --- | --- | --- |
| Number of students | 190 | 145 | 145 | 140 | 130 |

Jenny is carrying out a survey for her GCSE Mathematics project.
She uses a stratified sample of 60 students according to year group.

Calculate the number of Year 11 students that should be in her sample.

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

**(Total 3 marks)**

**3.** A school has 450 students.
Each student studies one of Greek or Spanish or German or French.
The table shows the number of students who study each of these languages.

| Language | Number of students |
|---|---|
| Greek | 145 |
| Spanish | 121 |
| German | 198 |
| French | 186 |

An inspector wants to look at the work of a stratified sample of 70 of these students.

Find the number of students studying each of these languages that should be in the sample.

Greek ...........................

Spanish ........................

German ........................

French .........................

**(Total 3 marks)**

**4.** There are three age groups in a competition.
The table shows the number of competitors in each age group.

| 16-18 years | 19-24 years | 25+ years |
|---|---|---|
| 120 | 250 | 200 |

John wants to do a survey of the competitors.
He uses a stratified sample of exactly 50 competitors according to each age group.

Work out the number of competitors in each age group that should be in his stratified
sample of 50.

16-18 years: ..................

19-24 years: ..................

25+ years: ..................

**(Total 3 marks)**

**5.** The table shows the number of boys and the number of girls in each year group at
Springfield Secondary School.

There are 500 boys and 500 girls in the school.

| Year group | Number of boys | Number of girls |
|---|---|---|
| 7 | 100 | 100 |
| 8 | 150 | 50 |
| 9 | 100 | 100 |
| 10 | 50 | 150 |
| 11 | 100 | 100 |
| Total | 500 | 500 |

Azez took a stratified sample of 50 girls, by year group.

Work out the number of Year 8 girls in his sample.

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

**6.** The table gives information about the numbers of students in the two years of a college course.

| | Male | Female |
|---|---|---|
| **First year** | 399 | 602 |
| **Second year** | 252 | 198 |

Anna wants to interview some of these students.
She takes a random sample of 70 students stratified by year and by gender.

Work out the number of students in the sample who are male and in the first year.

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

**7.** 258 students each study one of three languages.
The table shows information about these students.

| | Language studied | | |
|---|---|---|---|
| | **German** | **French** | **Spanish** |
| **Male** | 45 | 52 | 26 |
| **Female** | 25 | 48 | 62 |

A sample, stratified by the language studied and by gender, of 50 of the 258 students is taken.

(a) Work out the number of male students studying Spanish in the sample.

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

**(2)**

(b) Work out the number of female students in the sample.

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

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

**8.** (a) Explain what is meant by

(i) a random sample,

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

(ii) a stratified sample.

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

.

**(2)**

The table shows some information about the members of a golf club.

| Age range | Male | Female | Total |
|-----------|------|--------|-------|
| Under 18 | 29 | 10 | 39 |
| 18 to 30 | 82 | 21 | 103 |
| 31 to 50 | 147 | 45 | 192 |
| Over 50 | 91 | 29 | 120 |
| Total number of members | | | 454 |

The club secretary carries out a survey of the members.

He chooses a sample, stratified both by age range and by gender, of 90 of the 454 members.

(b) Work out an estimate of the number of male members, in the age range 31 to 50, he would have to sample.

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

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

**9.** Hamid wants to find out what people in Melworth think about the sports facilities in the town.
Hamid plans to stand outside the Melworth sports centre one Monday morning.
He plans to ask people going into the sports centre to complete a questionnaire.

Carol tells Hamid that his survey will be biased.

(i) Give **one** reason why the survey will be biased.

……………………………………………………………………………

…...……....…………………………………………….………………

…………………..……………………………………………………

(ii) Describe **one** change Hamid could make to the way in which he is going to carry out his survey so that it will be less biased.

……………………………………………………………………………

……………………………………………………………………………

……………………………………………………………………………

**(Total 2 marks)**

**10.** There are 970 students in Bayton High School.
Brian takes a random sample of 100 students.
He asks these 100 students which subject they like best.
They can choose English or Maths or Science.
Brian is going to use his results to work out an estimate of how many of the 970 students like English best.

Explain how.

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

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

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

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

**(Total 2 marks)**

**11.** 340 475 people live in Brinton.
A company carried out a survey.
It used a random sample of 1500 of the 340 475 people.
870 of this sample of 1500 people were male.

Work out an estimate for the number of **females** living in Brinton.

…………………….

**(Total 3 marks)**

**12.** The table shows some information about the pupils at Statson School.

| Year group | Boys | Girls | Total |
|------------|------|-------|-------|
| Year 7 | 104 | 71 | 175 |
| Year 8 | 94 | 98 | 192 |
| Year 9 | 80 | 120 | 200 |
| Total | 278 | 289 | 567 |

Kelly carries out a survey of the pupils at Statson School.
She takes a sample of 80 pupils, stratified by both Year group and gender.

(a) Work out the number of Year 8 boys in her sample.

………………….

**(2)**

(b) Describe a method that Kelly could use to take a random sample of
Year 8 boys.

………………………………………………………………………………

………………………………………………………………………………

………………………………………………………………………………

**(2)**

**(Total 4 marks)**

**13.** The table gives information about the number of girls in each of four schools.

| School | A | B | C | D | Total |
|---|---|---|---|---|---|
| Number of girls | 126 | 82 | 201 | 52 | 461 |

Jenny did a survey of these girls.
She used a stratified sample of exactly 80 girls according to school.

Work out the number of girls from each school that were in her sample of 80.
Complete the table.

| School | A | B | C | D | Total |
|---|---|---|---|---|---|
| Number of girls | | | | | 80 |

**(Total 3 marks)**

**14.** The table shows the number of boys in each of four groups.

| Group | A | B | C | D | Total |
|---|---|---|---|---|---|
| Number of boys | 32 | 43 | 38 | 19 | 132 |

Jamie takes a sample of 40 boys stratified by group.

Calculate the number of boys from group B that should be in his sample.

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

**15.** Melanie wants to find out how often people go to the cinema.

She gives a questionnaire to all the women leaving a cinema.

Her sample is biased.
Give **two** possible reasons why.

1 ..............................................................................................................

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

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

2 ..............................................................................................................

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

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

**(Total 2 marks)**

**16.** The two-way table shows information about the number of students in a school.

| | Year Group | | | | | Total |
|---|---|---|---|---|---|---|
| | **7** | **8** | **9** | **10** | **11** | |
| **Boys** | 126 | 142 | 140 | 135 | 125 | 670 |
| **Girls** | 134 | 140 | 167 | 125 | 149 | 715 |
| **Total** | 260 | 282 | 307 | 260 | 276 | 1385 |

Robert carries out a survey of these students.
He uses a sample of 50 students stratified by gender and by year group.

Calculate the number of girls from year 9 that are in his sample.

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

# 111  Edexcel GCSE
## Mathematics (Linear) – 1MA0

# PROOF

**Materials required for examination**
Ruler graduated in centimetres and
millimetres, protractor, compasses,
pen, HB pencil, eraser.
Tracing paper may be used.

**Items included with question papers**
Nil

## Instructions

Use black ink or ball-point pen.
Fill in the boxes at the top of this page with your name, centre number and candidate number.
Answer all questions.
Answer the questions in the spaces provided – there may be more space than you need.
Calculators may be used.

## Information

The marks for each question are shown in brackets – use this as a guide as to how much time to
spend on **each** question.
Questions labelled with an **asterisk** (*) are ones where the quality of your written communication
will be assessed – you should take particular care on these questions with your spelling, punctuation
and grammar, as well as the clarity of expression.

## Advice

Read each question carefully before you start to answer it.
Keep an eye on the time.
Try to answer every question.
Check your answers if you have time at the end.

**1.** The $n$th even number is $2n$.

The next even number after $2n$ is $2n + 2$

(a) Explain why.

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

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

**(1)**

(b) Write down an expression, in terms of $n$, for the next even number after $2n + 2$

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

**(1)**

(c) Show algebraically that the sum of any 3 consecutive even numbers is always a multiple of 6

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

**2.** Prove that $(3n + 1)^2 - (3n - 1)^2$ is a multiple of 4, for all positive integer values of $n$.

**3.** Prove, using algebra, that the sum of two consecutive whole numbers is always an odd number.

**4.** Prove that

$$(2n + 3)^2 - (2n - 3)^2 \text{ is a multiple of 8}$$

for all positive integer values of $n$.

**(3 marks)**

**\*5.** Prove algebraically that the difference between the squares of any two consecutive integers is equal to the sum of these two integers.

**(4 marks)**

**6.** Prove that $(5n + 1)^2 - (5n - 1)^2$ is a multiple of 5, for all positive integer values of $n$.

**7.** If $2n$ is always even for all positive integer values of $n$, prove algebraically that the sum of the squares of any two consecutive even numbers is always a multiple of 4.

**(3 marks)**

**8.** Prove that

$(n + 1)^2 - (n - 1)^2 + 1$ is always odd for all positive integer values of $n$.

**(3 marks)**

**9.** Prove algebraically that the sum of the squares of any two consecutive numbers always leaves a remainder of 1 when divided by 4.

**(4 marks)**