Write your name here

| Surname | Other names |
|---|---|
| | |

**Pearson Edexcel GCSE**

Centre Number | | | | | |

Candidate Number | | | | |

# Mathematics A

## Paper 1 (Non-Calculator)

**Higher Tier**

Wednesday 2 November 2016 – Morning
**Time: 1 hour 45 minutes**

Paper Reference
**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### 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 must not be used.**

### Information

- The total mark for this paper is 100
- 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.

### 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.

*Turn over* ▶

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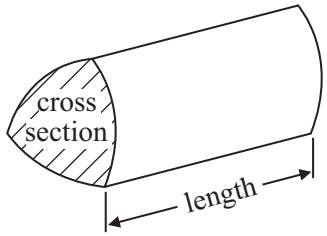
PEARSON

**GCSE Mathematics 1MA0**

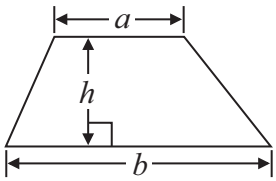
Formulae: Higher Tier

**You must not write on this formulae page.**
**Anything you write on this formulae page will gain NO credit.**

**Volume of prism** = area of cross section × length

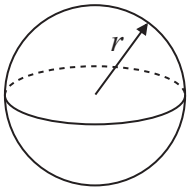



**Area of trapezium** = $\frac{1}{2}(a + b)h$



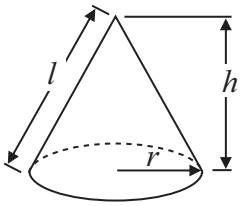

**Volume of sphere** = $\frac{4}{3}\pi r^3$

**Surface area of sphere** = $4\pi r^2$

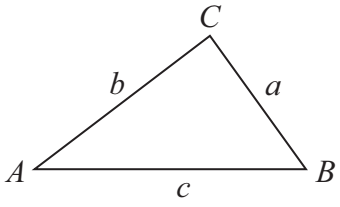



**Volume of cone** = $\frac{1}{3}\pi r^2 h$

**Curved surface area of cone** = $\pi rl$




**In any triangle *ABC***




**The Quadratic Equation**
The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{(b^2 - 4ac)}}{2a}$$

**Sine Rule** $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine Rule** $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of triangle** = $\frac{1}{2}ab \sin C$

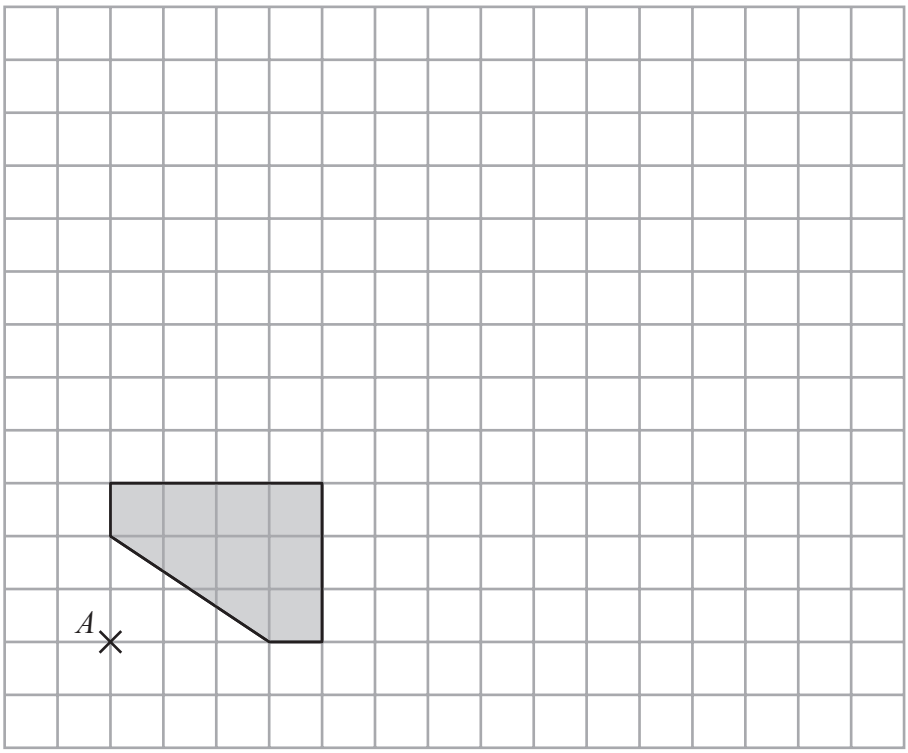
**Answer ALL questions.**

**Write your answers in the spaces provided.**

**You must write down all stages in your working.**

**You must NOT use a calculator.**

**1**




On the grid, enlarge the shape by scale factor 3, centre $A$.

**(Total for Question 1 is 3 marks)**

**2**

| **Train tickets** |
| --- |
| day return £6.45 |
| monthly saver £98.50 |

Sue goes to work by train.

Sue worked for 18 days last month.
She bought a day return ticket each day she worked.

A monthly saver ticket is cheaper than 18 day return tickets.
How much cheaper?

£ .....

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

**3** There are some red counters and some yellow counters in a bag in the ratio 1 : 5
There are 20 yellow counters in the bag.

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

.....

**(2)**

Janet puts some more red counters into the bag.
The ratio of the number of red counters to the number of yellow counters is now 1 : 2

(b) How many red counters does Janet put into the bag?

.....

**(2)**

**(Total for Question 3 is 4 marks)**

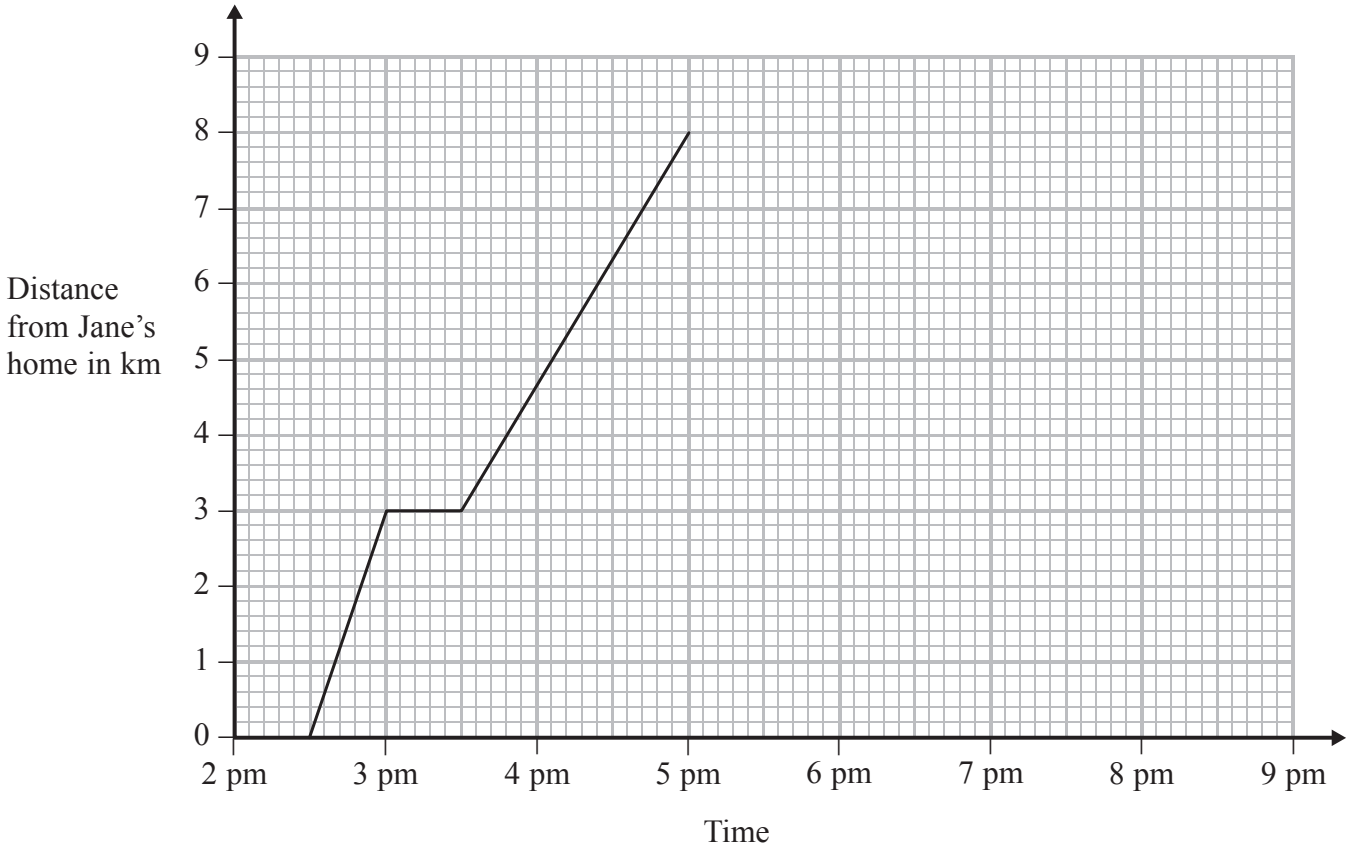
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**4** Jane walked from her home to the ice rink.

The travel graph for Jane's journey to the ice rink is shown below.




On the way to the ice rink Jane stopped at her friend's house.

(a) How far is it from her friend's house to the ice rink?

..... km

**(1)**

Jane was at the ice rink for 1 hour 30 minutes.
She then walked home at a steady speed.
Jane took 2 hours to walk home.

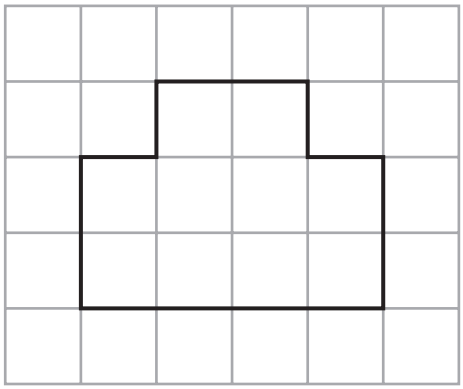
(b) Complete the travel graph for this information.

**(2)**

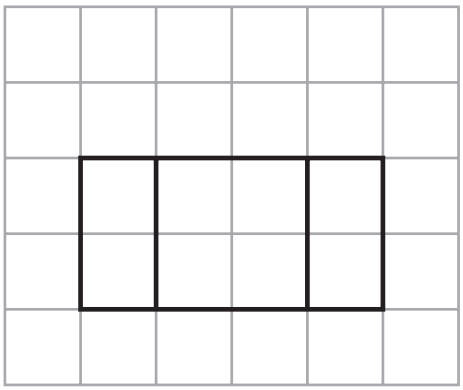
**(Total for Question 4 is 3 marks)**

**5** Here are the front elevation and the plan of a prism.

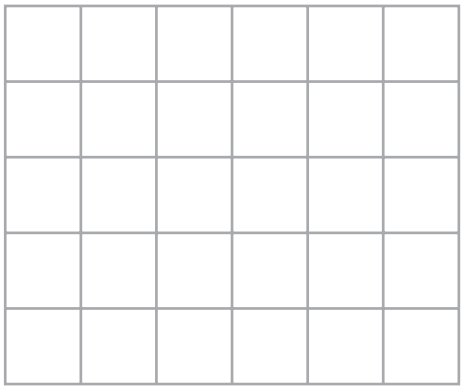
Front elevation



Plan



On the grid below, draw the side elevation of the prism.



**(Total for Question 5 is 2 marks)**

DO NOT WRITE IN THIS AREA

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DO NOT WRITE IN THIS AREA

**6** The table shows some information about the ages of 60 teachers.

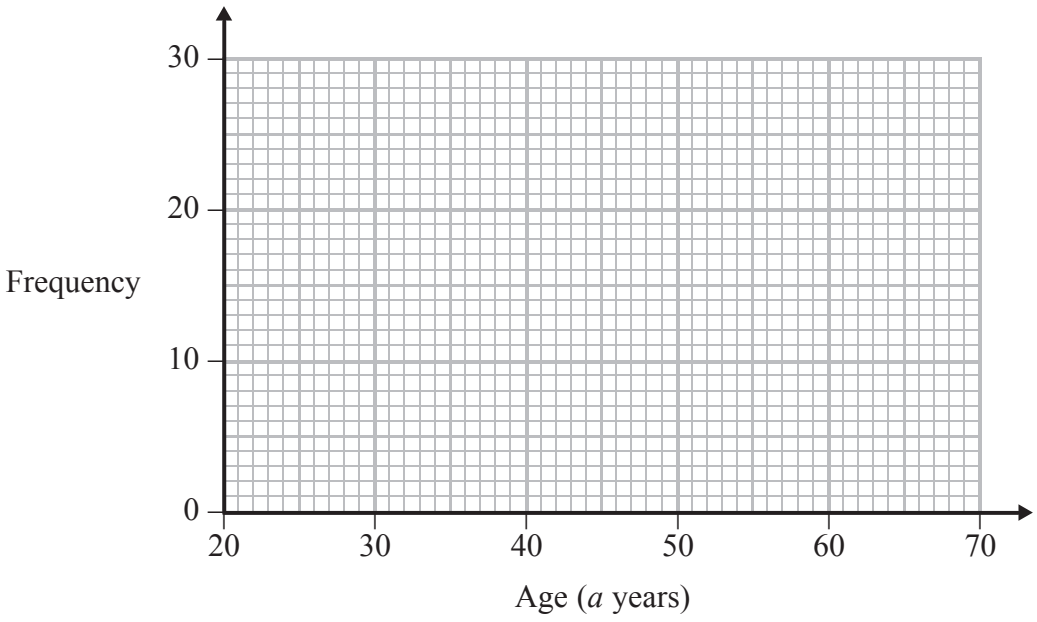
| Age ($a$ years) | Frequency |
|---|---|
| $20 < a \leqslant 30$ | 6 |
| $30 < a \leqslant 40$ | 16 |
| $40 < a \leqslant 50$ | 14 |
| $50 < a \leqslant 60$ | 22 |
| $60 < a \leqslant 70$ | 2 |

(a) Write down the modal class interval.

.....

**(1)**

(b) Draw a frequency polygon for the information in the table.




**(2)**

**(Total for Question 6 is 3 marks)**

**7** The diagram shows a path around a pond.

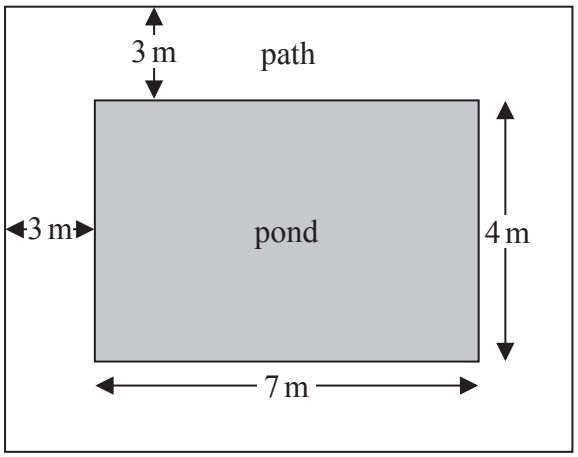



Diagram **NOT** accurately drawn

The pond is in the shape of a rectangle with length 7 m and width 4 m.
The path is 3 m wide.

Ali is going to cover the path with gravel.
One bag of gravel will cover 10 $m^2$ of the path.

How many bags of gravel does Ali need to buy?
You must show your working.

..... bags

**(Total for Question 7 is 4 marks)**

***8** Two shops, Mega Bathrooms and Bathroom Mart, each have a sale.

| **Mega Bathrooms** | **Bathroom Mart** |
|---|---|
| Sale<br><br>60% off normal price<br>**then**<br>15% off | Sale<br><br>$\frac{2}{3}$ off normal price |

Sally wants to buy some bathroom units.
The units have a normal price of £1500

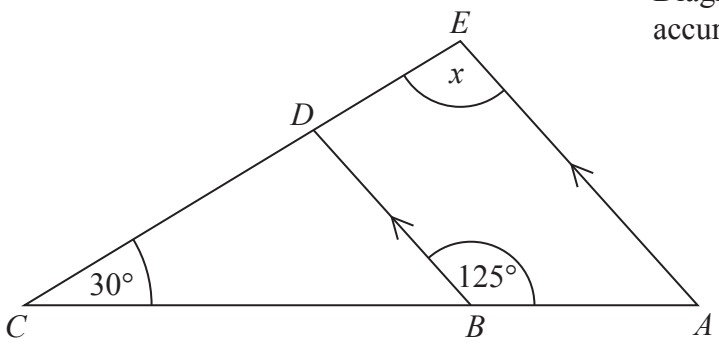
Sally wants to buy the units as cheaply as possible.

Which shop should she buy the units from?
You must show all your working.

**(Total for Question 8 is 4 marks)**

***9**

Diagram **NOT** accurately drawn

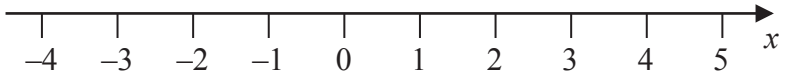



*ABC* and *EDC* are straight lines.
*AE* and *BD* are parallel.
Angle *ABD* = 125°
Angle *BCD* = 30°

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

**(Total for Question 9 is 4 marks)**

**10** (a) Show the inequality $x < 3$ on the number line below.




**(2)**

(b) Solve the inequality $4x - 7 \geqslant 13$

.....

**(2)**

**(Total for Question 10 is 4 marks)**

**11** Alan is on holiday in Germany.
He is driving to Berlin.

Alan drives past this road sign.

| Berlin 240 kilometres |
|---|

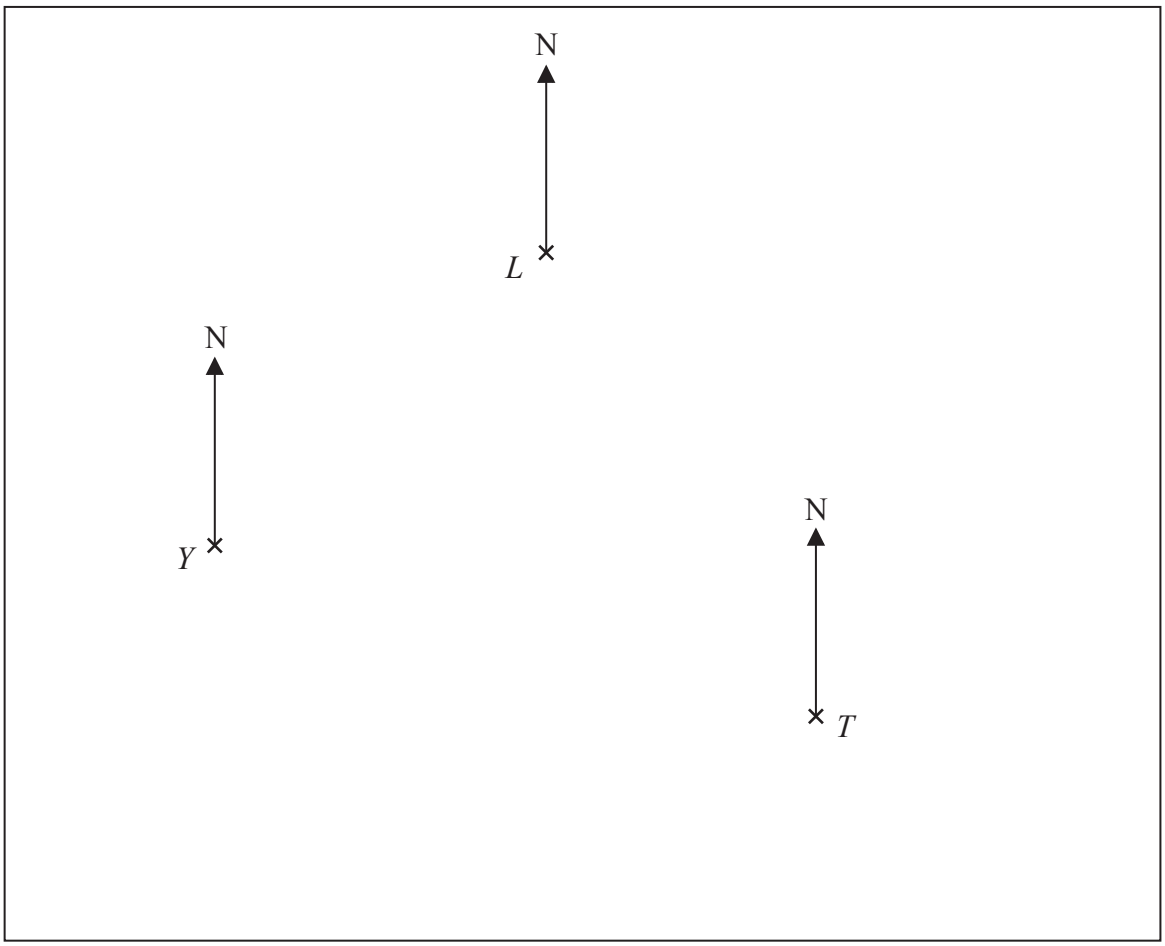
Alan stops at a service station 25 miles after the road sign.

Work out how far Alan has to drive from the service station to get to Berlin.

.....

**(Total for Question 11 is 3 marks)**

**12** The diagram shows the positions of a lighthouse $L$, a yacht $Y$ and a tanker $T$ on a map.




Scale 1 cm represents 10 km

(a) Measure the bearing of $L$ from $Y$.

..... °

**(1)**

The tanker, $T$, sails 80 km on a bearing of 320°.

(b) Find the distance, in km, between the tanker and the lighthouse when the tanker is closest to the lighthouse.

..... km

**(2)**

**(Total for Question 12 is 3 marks)**

**13** $h = 3t^2$

(a) Work out the value of $h$ when $t = 5$

.....

**(2)**

$h = 3t^2$

(b) Work out the value of $t$ when $h = 108$

.....

**(2)**

(c) Make $a$ the subject of the formula

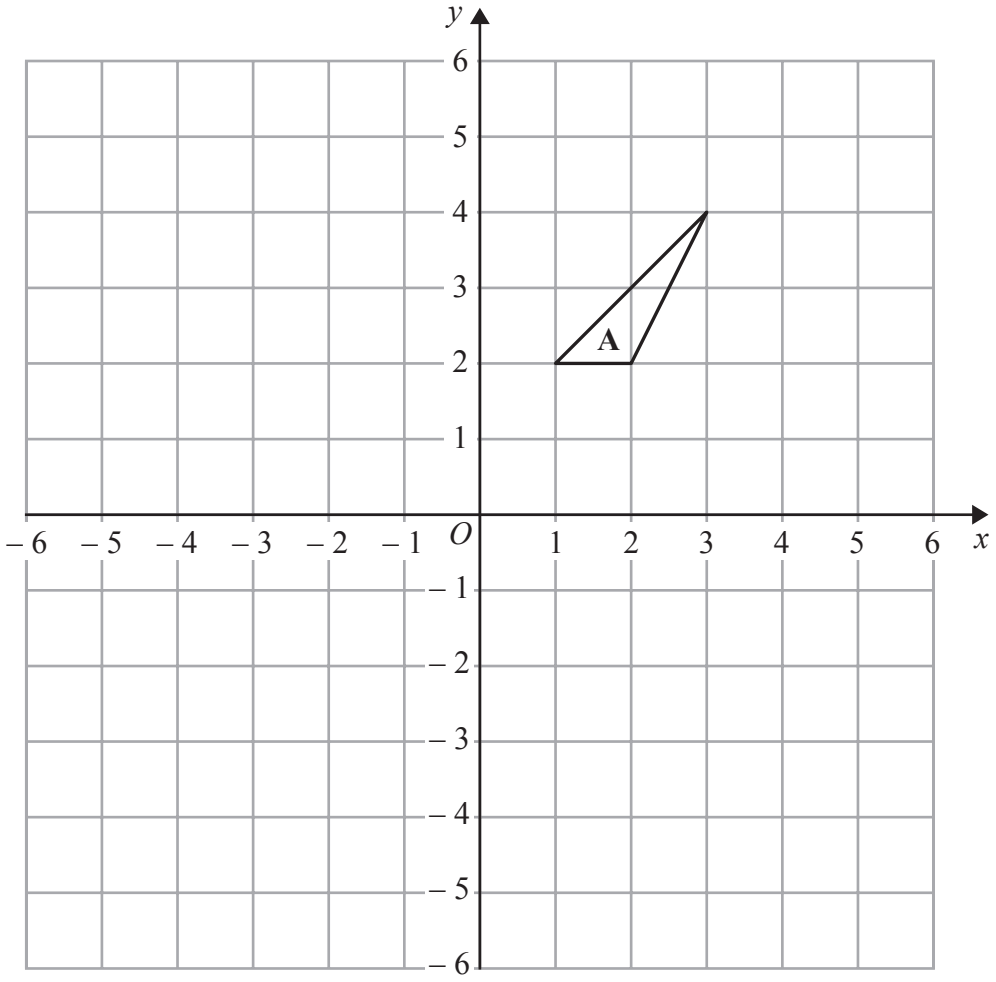
$$v = u + at$$

.....

**(2)**

**(Total for Question 13 is 6 marks)**

**14**




Triangle **A** is rotated 90° clockwise about the point (0, 1) to give triangle **B**.

Triangle **B** is translated by the vector $\begin{pmatrix} -3 \\ -1 \end{pmatrix}$ to give triangle **C**.

Describe fully the single transformation that maps triangle **A** onto triangle **C**.

.....

.....

**(Total for Question 14 is 3 marks)**

**15** $AB$ is a line segment.

The midpoint of the line segment $AB$ has coordinates (3, 5)
Point $A$ has coordinates (9, 2)

(a) Work out the coordinates of point $B$.

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

**(2)**

(b) Work out an equation of the straight line that passes through (9, 2) and (3, 5)

.....

**(3)**

**(Total for Question 15 is 5 marks)**

**16** There are 15 children at a birthday party.
The mean age of the 15 children is 7 years.

9 of the 15 children are boys.
The mean age of the boys is 5 years.

Work out the mean age of the girls.

..... years

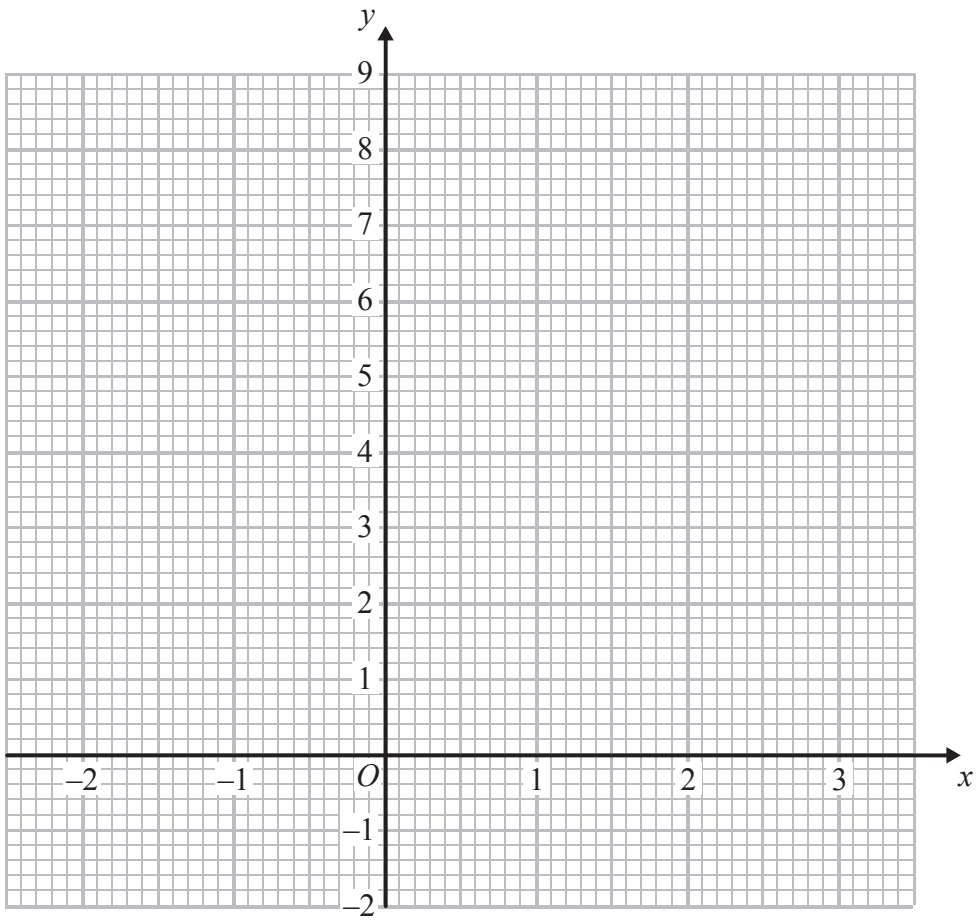
**(Total for Question 16 is 3 marks)**

**17** (a) Complete the table of values for $y = 2^x$

| $x$ | –2 | –1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|
| $y$ | 0.25 | | | 2 | | |

**(2)**

(b) On the grid, draw the graph of $y = 2^x$ for values of $x$ from –2 to 3

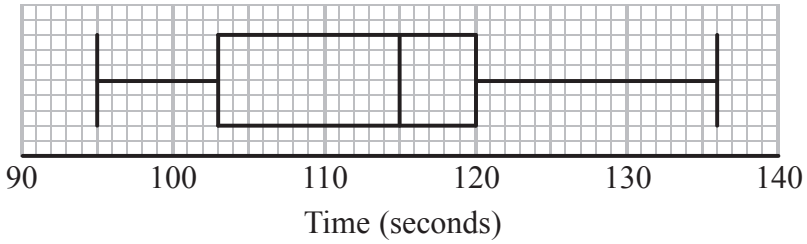



**(2)**

**(Total for Question 17 is 4 marks)**

***18** Tom recorded the times, in seconds, some boys took to complete an obstacle course.

He drew this box plot for his results.




Tom also recorded the times some girls took to complete the obstacle course.

Here are the times, in seconds, for the girls.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 99 | 101 | 103 | 106 | 108 | 109 | 110 | 110 | 111 | 112 |
| 113 | 114 | 115 | 115 | 117 | 120 | 124 | 125 | 132 | |

Compare the distribution of the times for the boys with the distribution of the times for the girls.

**(Total for Question 18 is 4 marks)**

**19** Solve the simultaneous equations

$2x - y = 13$

$x - 2y = 11$

$x =$ .....

$y =$ .....

**(Total for Question 19 is 3 marks)**

**20** William is building a planetary path for people to walk along.
The planetary path will have a model of the Sun and models of the planets.

William uses two different scales.
He uses

1 cm to 1000 km for the diameter of each planet

1 m to 1 000 000 km for the distance from the Sun to each planet

William makes a model of the planet Venus.
The model has a diameter of 12.1 cm.

(a) Work out the real diameter of the planet Venus.
Give your answer in standard form.

..... km
**(2)**

William works out the distance from the model of the Sun to the model of the planet Neptune.

The real distance from the Sun to the planet Neptune is $4.503 \times 10^9$ km.

(b) Work out the distance from the model of the Sun to the model of the planet Neptune.
Give your answer in km, correct to 1 decimal place.

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

**(Total for Question 20 is 5 marks)**

**21**

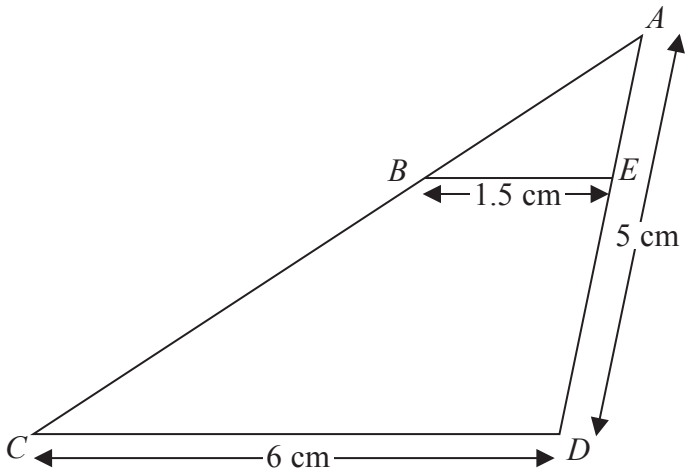



Diagram **NOT** accurately drawn

*ABC* and *AED* are straight lines.
*BE* and *CD* are parallel.
*BE* = 1.5 cm.
*CD* = 6 cm.
*AD* = 5 cm.

Calculate the length of *ED*.

..... cm

**(Total for Question 21 is 3 marks)**

**22** The diagram shows a prism.

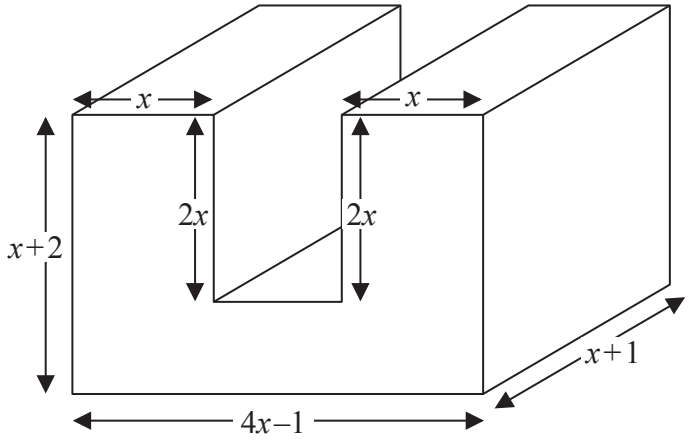


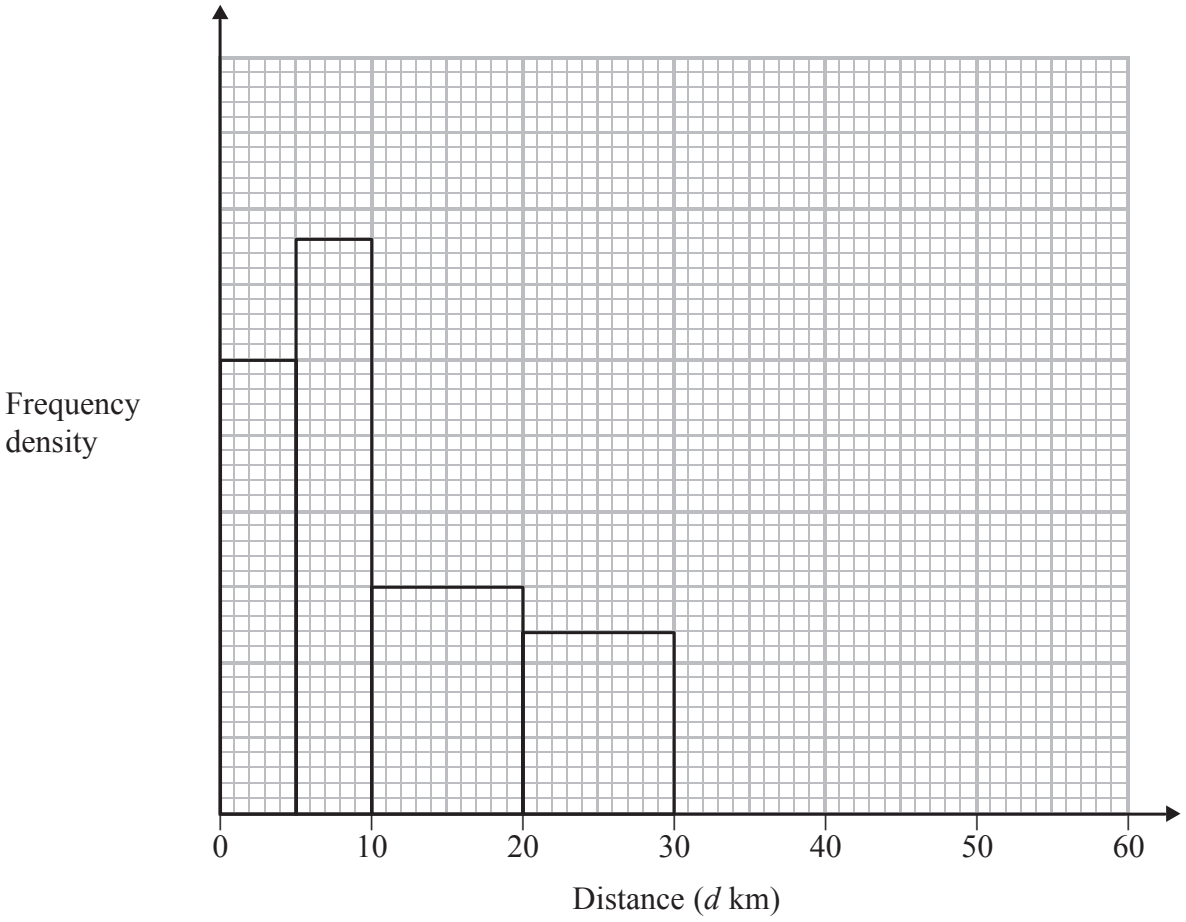

Diagram **NOT** accurately drawn

All measurements are in centimetres.
All corners are right angles.

Find an expression, in terms of $x$, for the volume, in $cm^3$, of the prism.
You must show your working.
Give your answer in its simplest form.

**(Total for Question 22 is 4 marks)**

**23** The incomplete histogram and table give some information about the distances some people travel to work.




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

| Distance ($d$ km) | Frequency |
|---|---|
| $0 < d \leqslant 5$ | 30 |
| $5 < d \leqslant 10$ | |
| $10 < d \leqslant 20$ | |
| $20 < d \leqslant 30$ | 24 |
| $30 < d \leqslant 50$ | 16 |

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

**(Total for Question 23 is 3 marks)**

**24** The intensity of the sound, $I$ watts/m$^2$, received from a loudspeaker is inversely proportional to the square of the distance, $d$ metres, from the loudspeaker.

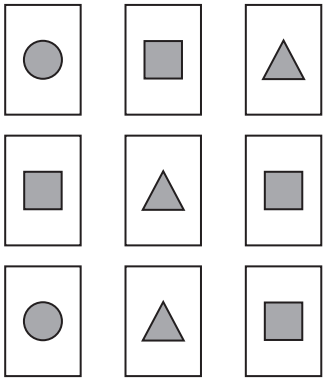
When $d = 2$, $I = 30$

Work out the value of $I$ when $d = 10$

.....

**(Total for Question 24 is 3 marks)**

**25** Here are 9 cards.
Each card has a shape on it.



In a game the cards are turned over so that the shapes are hidden.
The cards are then mixed up.

Katie turns over at random two of the cards.

Work out the probability that these two cards have different shapes on them.
You must show all your working.

.....

**(Total for Question 25 is 4 marks)**

***26** The diagram shows a triangle *DEF* inside a rectangle *ABCD*.

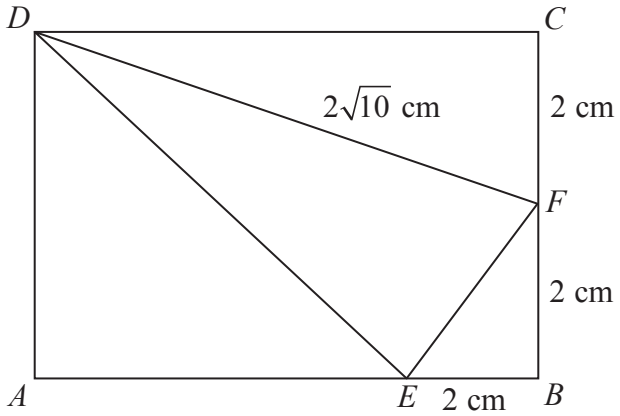



Diagram **NOT** accurately drawn

Show that the area of triangle *DEF* is 8 cm$^2$.
You must show all your working.

**(Total for Question 26 is 4 marks)**

**27** The diagram shows a sphere and a solid cylinder.

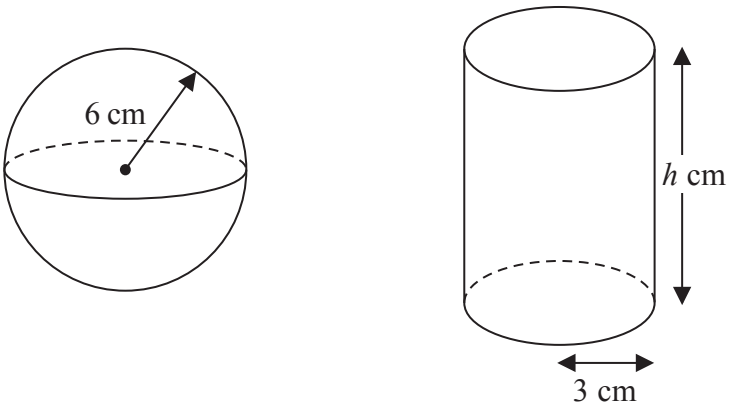



Diagram **NOT** accurately drawn

The sphere has radius 6 cm.
The solid cylinder has a base radius of 3 cm and a height of $h$ cm.

The total surface area of the cylinder is twice the total surface area of the sphere.

Work out the ratio of the volume of the sphere to the volume of the cylinder.
Give your answer in its simplest form.
You must show all your working.

**(Total for Question 27 is 5 marks)**

**TOTAL FOR PAPER IS 100 MARKS**