

Write your name here

Surname

Other names

**Edexcel GCSE**

Centre Number

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Candidate Number

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# Mathematics A

## Paper 1 (Non-Calculator)

**Higher Tier**

Tuesday 6 November 2012 – 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 ►

P40673A

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6/67/C2



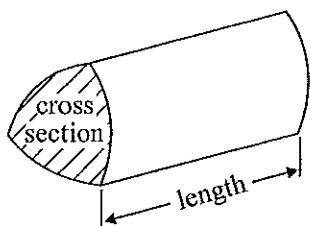
**PEARSON**

# GCSE Mathematics 1MA0

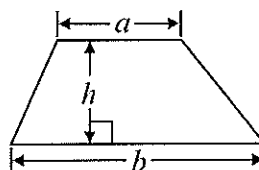
Formulae: Higher Tier

**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  $\times$  length

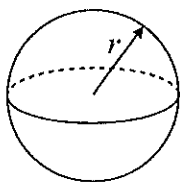


Area of trapezium =  $\frac{1}{2}(a + b)h$



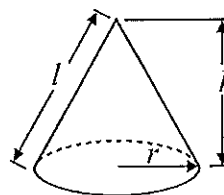
Volume of sphere =  $\frac{4}{3}\pi r^3$

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

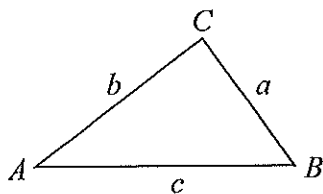


Volume of cone =  $\frac{1}{3}\pi r^2 h$

Curved surface area of cone =  $\pi r l$



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 Here are the ingredients needed to make 16 gingerbread men.

Ingredients  
to make 16 gingerbread men

180 g flour  
40 g ginger  
110 g butter  
30 g sugar

Hamish wants to make 24 gingerbread men.

Work out how much of each of the ingredients he needs.

*Halve the ingredients to work out 8 gingerbread men.*

*90g flour  
20g ginger  
55g butter  
15g sugar.*

*Now multiply the ingredients  
by 3 to work out 24 gingerbread men.*

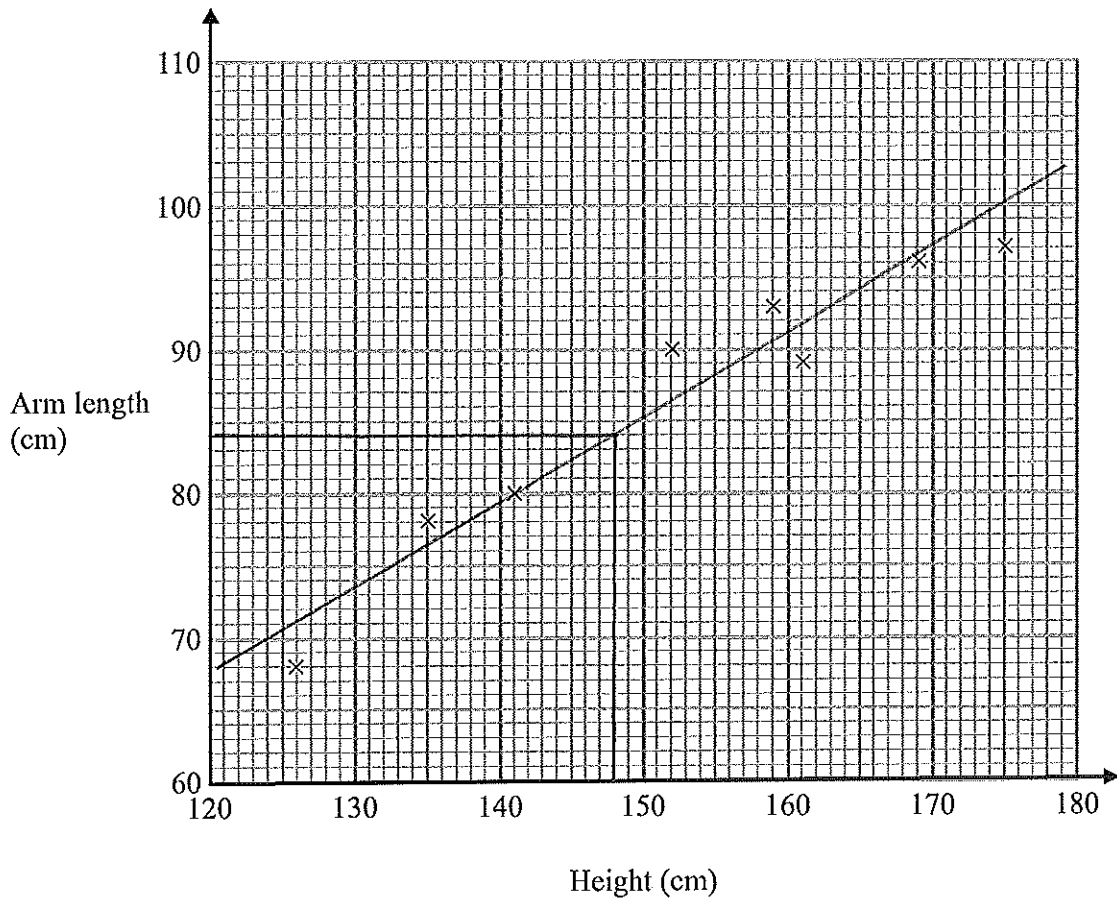
*90g x 3 = 270g  
20g x 3 = 60g  
55g x 3 = 165g  
15g x 3 = 45g*

..... 270 .....g flour  
..... 60 .....g ginger  
..... 165 .....g butter  
..... 45 .....g sugar

(Total for Question 1 is 3 marks)



- 2 The scatter graph shows information about the height and the arm length of each of 8 students in Year 11



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

.....positive.....  
(1)

A different student in Year 11 has a height of 148 cm.

- (b) Estimate the arm length of this student.

*Always draw on a line of best fit.*

.....84.....cm  
(2)

(Total for Question 2 is 3 marks)



\*3 Here is part of Gary's electricity bill.

Electricity bill	
New reading	7155 units
Old reading	7095 units
Price per unit 15p	

Work out how much Gary has to pay for the units of electricity he used.

$$\begin{array}{r} 7155 \\ - 7095 \\ \hline 0060 \end{array}$$

Gary has used 60 units of electricity.

Cost is  $60 \times 15p$

	10	5
60	600	300

$$\begin{array}{r} 600 \\ + 300 \\ \hline 900 \end{array}$$

So Gary must pay 900p or £9 for his electricity

(Total for Question 3 is 4 marks)



- 4 Alison wants to find out how much time people spend reading books. She is going to use a questionnaire.

Design a suitable question for Alison to use in her questionnaire.

How much time do you spend, reading books, per week?

Don't read books

less than 1 hr

1hr - 2hrs

3hrs - 4hrs

more than 4 hrs

(Total for Question 4 is 2 marks)

- 5 Work out an estimate for  $\frac{31 \times 9.87}{0.509}$

$$\frac{30 \times 10}{0.5}$$

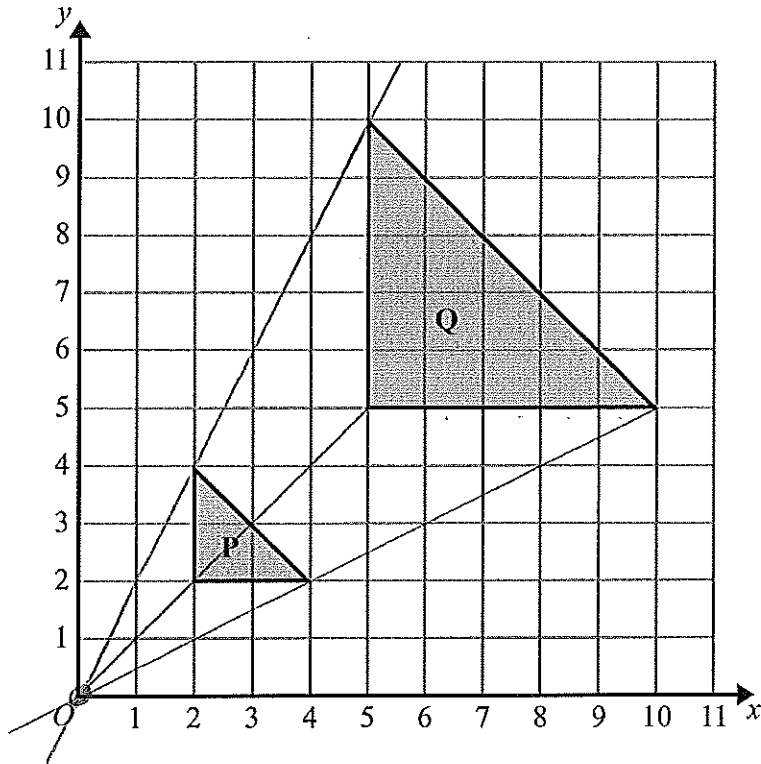
$$\frac{300}{0.5} = \underline{600}$$

.....600.....

(Total for Question 5 is 3 marks)



6



Describe fully the single transformation that maps shape P onto shape Q.

Enlargement, by a scale factor 2.5  
with a centre of enlargement (0, 0)

(Total for Question 6 is 3 marks)



P 4 0 6 7 3 A 0 7 2 8

7 Here is a diagram of Jim's garden.

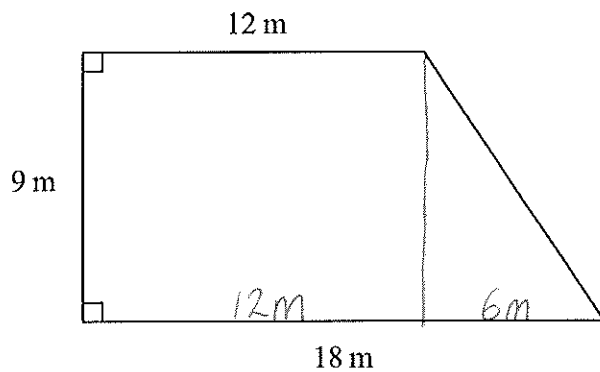


Diagram NOT  
accurately drawn

Jim wants to cover his garden with grass seed to make a lawn.

Grass seed is sold in bags.

There is enough grass seed in each bag to cover  $20 \text{ m}^2$  of garden.

Each bag of grass seed costs £4.99

Work out the least cost of putting grass seed on Jim's garden.

Find area of the garden.

$$\begin{aligned} \text{Rectangle} &= 9 \times 12 \\ &= 108 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Triangle} &= \frac{6 \times 9}{2} \\ &= \frac{54}{2} \\ &= 27 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Total area of garden} \\ \text{is } 108 + 27 &= 135 \text{ m}^2 \end{aligned}$$

Number of bags of grass seed needed

$$135 \div 20 = 6 \frac{15}{20} \text{ bags}$$

so would need 7 bags altogether.

$$\text{Cost} = 7 \times \pounds 4.99$$

$$7 \times \pounds 5 = \pounds 35$$

$$7 \times 1\text{p} = 7\text{p}$$

$$\pounds 35 - 7\text{p} = \underline{\pounds 34.93}$$

£ 34.93

(Total for Question 7 is 4 marks)





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.

$$0.2 + 0.5 = 0.7$$

$$1 - 0.7 = 0.3$$

$$0.3 \div 2 = 0.15$$

$$\frac{0.15}{(2)}$$

There are 240 counters in the bag.

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

$$0.2 = 20\%$$

$$20\% \text{ of } 240$$

$$10\% = 24$$

$$20\% = 48$$

$$\frac{48}{(2)}$$

(Total for Question 8 is 4 marks)



9 The diagram shows a prism.

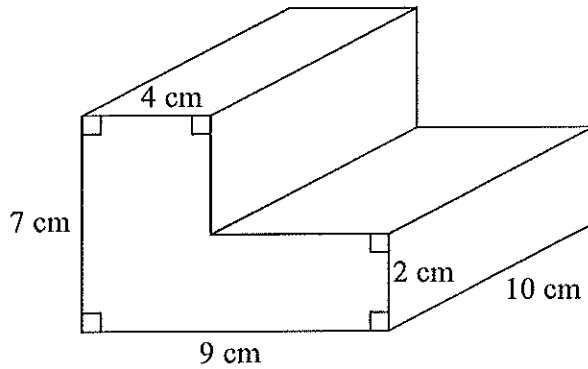
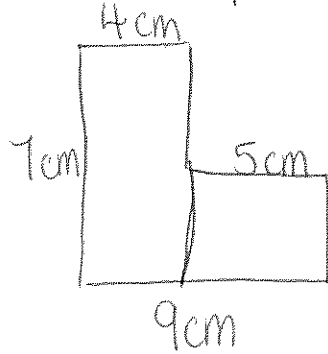


Diagram NOT accurately drawn

Work out the volume of the prism.

Volume = Area of cross-section  $\times$  Length.



$$7 \times 4 = 28 \text{ cm}^2$$

$$5 \times 2 = 10 \text{ cm}^2$$

$$2 \text{ cm Total area} = 28 + 10$$

$$= \underline{38 \text{ cm}^2}$$

$$\text{Volume} = 38 \text{ cm}^2 \times 10 \text{ cm}$$

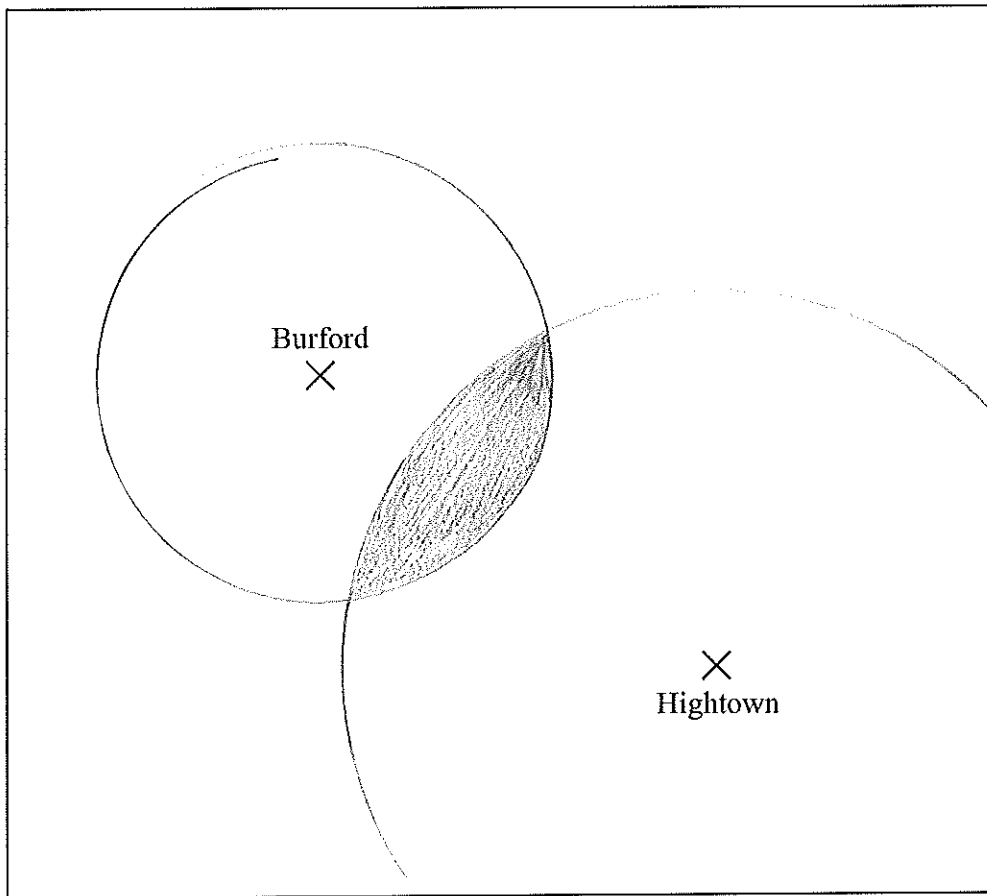
$$= \underline{380 \text{ cm}^3}$$

.....380..... $\text{cm}^3$

(Total for Question 9 is 3 marks)



- 10 Here is a map.  
The map shows two towns, Burford and Hightown.



Scale: 1 cm represents 10 km

A company is going to build a warehouse.

The warehouse will be less than 30 km from Burford **and** less than 50 km from Hightown.

Shade the region on the map where the company can build the warehouse.

(Total for Question 10 is 3 marks)



11 (a) Expand  $4(3x + 5)$  multiply out the brackets.  
 $12x + 20$

$$\frac{12x + 20}{(1)}$$

(b) Expand and simplify  $2(x - 4) + 3(x + 5)$  Be careful with the signs.

$$2x - 8 + 3x + 15$$

now gather together like terms

$$5x + 7$$

$$\frac{5x + 7}{(2)}$$

(c) Expand and simplify  $(x + 4)(x + 6)$

	$x$	$+4$
$x$	$x^2$	$+4x$
$+6$	$+6x$	$+24$

$$x^2 + 4x + 6x + 24$$

$$x^2 + 10x + 24$$

$$\frac{x^2 + 10x + 24}{(2)}$$

(Total for Question 11 is 5 marks)



12 The diagram shows a circle drawn inside a square.

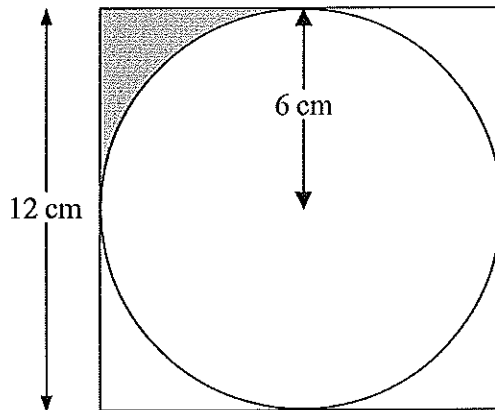


Diagram NOT accurately drawn

The circle has a radius of 6 cm.  
The square has a side of length 12 cm.

Work out the shaded area.

Give your answer in terms of  $\pi$ .

*so leave  $\pi$  in your answer.*

$$\text{Area of square is } 12 \times 12 = 144 \text{ cm}^2$$

$$\begin{aligned} \text{Area of circle} &= \pi r^2 \\ &= \pi \times 6^2 \\ &= 36\pi \end{aligned}$$

Area of shaded section

$$\frac{144 - 36\pi}{4}$$

$$36 - 9\pi$$

$$36 - 9\pi \text{ cm}^2$$

(Total for Question 12 is 3 marks)



\*13 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?

Ratio 1 : 3 : 5  $\rightarrow$  9 shares altogether

$$\text{One share} = \frac{180}{9} = 20\text{kg}.$$

To make 180kg of concrete mix you would need -

$$1 \times 20 = 20\text{kg cement}.$$

$$3 \times 20 = 60\text{kg sand}$$

$$5 \times 20 = 100\text{kg gravel}.$$

Talil only has 15kg of cement and needs 20kg. Therefore he does not have enough to make the concrete mix.

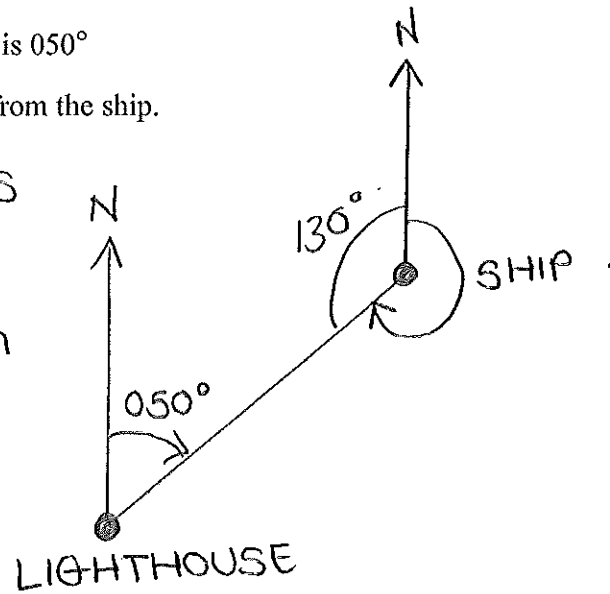
(Total for Question 13 is 4 marks)



14 The bearing of a ship from a lighthouse is  $050^\circ$

Work out the bearing of the lighthouse from the ship.

- Bearings are always measured from North and in a clockwise direction



$$360^\circ - 130^\circ = 230^\circ$$

230 .<sup>o</sup>

(Total for Question 14 is 2 marks)

15 (a) Simplify  $m^5 \div m^3$

$$\frac{m^2}{(1)}$$

(b) Simplify  $5x^4y^3 \times x^2y$

$$\frac{5x^6y^4}{(2)}$$

(Total for Question 15 is 3 marks)



16 The diagram shows a triangle.

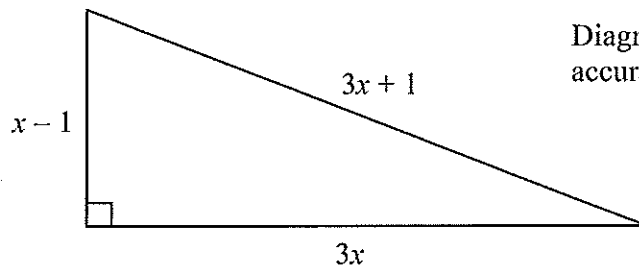


Diagram NOT  
accurately drawn

In the diagram, all the measurements are in metres.

The perimeter of the triangle is 56 m.

The area of the triangle is  $A \text{ m}^2$ .

Work out the value of  $A$ .

$$\begin{aligned}x-1 + 3x+1 + 3x &= 56\text{m} \\7x &= 56\text{m} \\x &= 8\text{m}\end{aligned}$$

use  $x=8$  to calculate the base and height of the triangle.

$$\text{base} \rightarrow 3 \times 8 = 24\text{m}$$

$$\text{height} \rightarrow 8 - 1 = 7\text{m}$$

$$\text{Area of triangle} = \frac{\text{base} \times \text{height}}{2}$$

$$\begin{aligned}&= \frac{24 \times 7}{2} \\&= 168 \div 2\end{aligned}$$

84

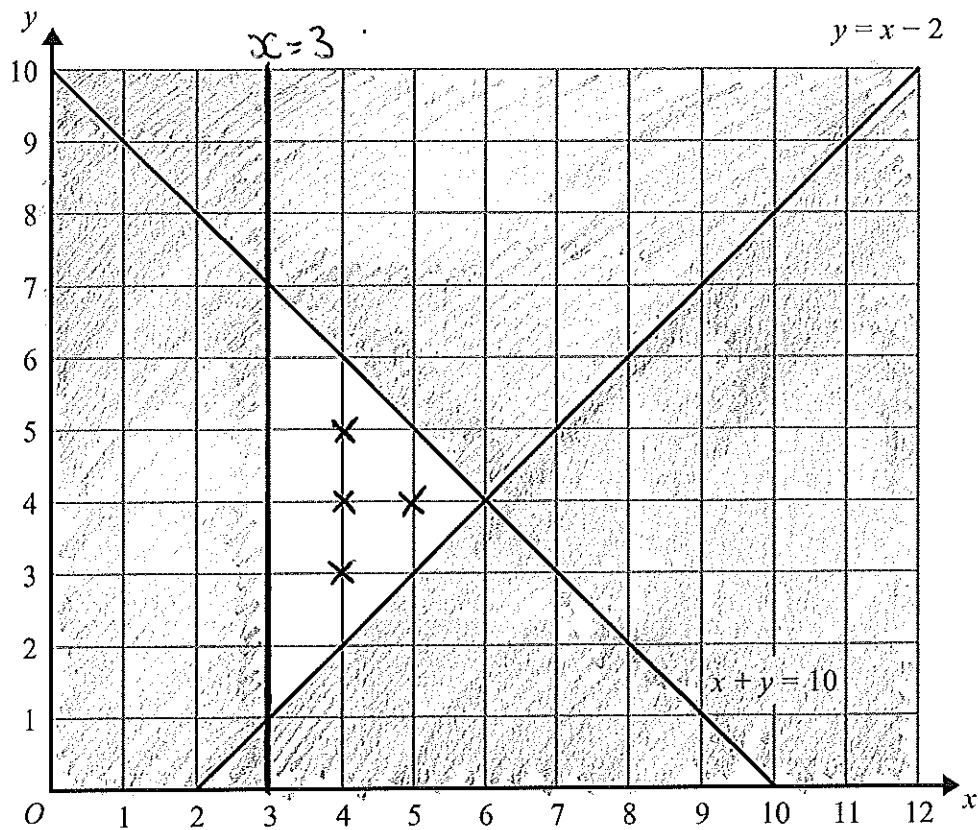
(Total for Question 16 is 4 marks)

$$\begin{array}{r}x \quad 24 \\ \times \quad 7 \\ \hline 168 \\ \hline 2\end{array}$$





17 The lines  $y = x - 2$  and  $x + y = 10$  are drawn on the grid.



On the grid, mark with a cross (x) each of the points with integer coordinates that are in the region defined by

$$\begin{aligned} y &> x - 2 \\ x + y &< 10 \\ x &> 3 \end{aligned}$$

(Total for Question 17 is 3 marks)

- Dotted line when inequalities are not equal to.



P 4 0 6 7 3 A 0 1 7 2 8

18 The diagram shows part of a pattern made from tiles.

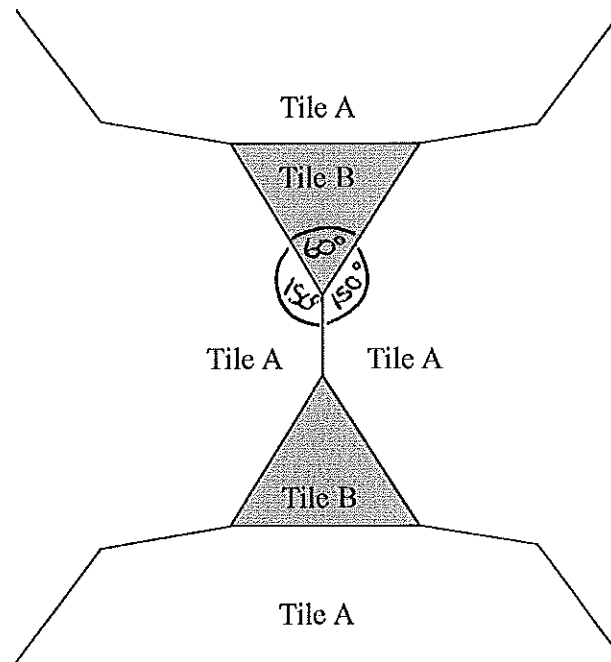


Diagram NOT accurately drawn

The pattern is made from two types of tiles, tile A and tile B.

Both tile A and tile B are regular polygons.

Work out the number of sides tile A has.

Interior angles of Tile B =  $60^\circ$  as it is an equilateral triangle

Interior angle therefore of Tile A =  $150^\circ$  (see diagram)

Interior angle = 150 Therefore the exterior angle =  $180 - 150 = 30^\circ$

No of sides =  $\frac{360}{30} = 12$  sides

.....12.....

(Total for Question 18 is 4 marks)

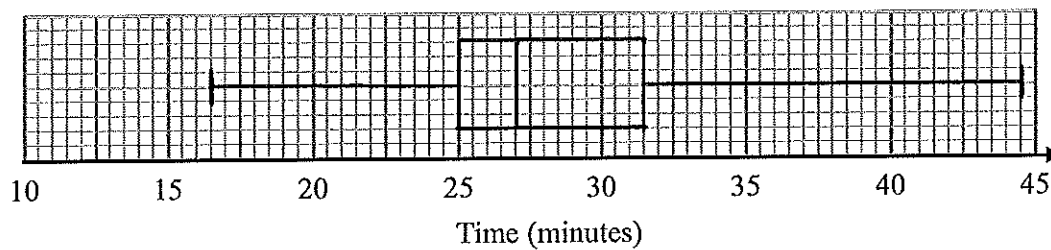


19 Sameena recorded the times, in minutes, some girls took to do a jigsaw puzzle.

Sameena used her results to work out the information in this table.

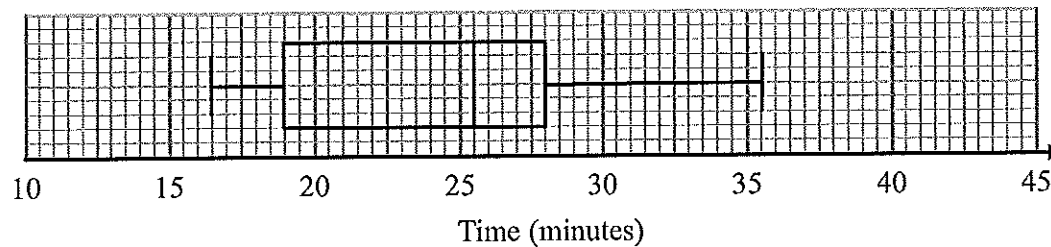
	Minutes
Shortest time	18
Lower quartile	25
Median	29
Upper quartile	33
Longest time	44

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



(2)

The box plot below shows information about the times, in minutes, some boys took to do the same jigsaw puzzle.



(b) Compare the distributions of the girls' times and the boys' times.

- The interquartile range for the girls data is less than for the boys.
- The median is less for boys than for girls

(2)

(Total for Question 19 is 4 marks)



- 20 Write the following numbers in order of size.  
Start with the smallest number.

$$\begin{array}{cccc}
 0.038 \times 10^2 & 3800 \times 10^{-4} & 380 & 0.38 \times 10^{-1} \\
 \downarrow & \downarrow & \downarrow & \downarrow \\
 3.8 & 0.38 & 380 & 0.038
 \end{array}$$

$$0.038 \times 10^{-1}, 3800 \times 10^{-4}, 0.38 \times 10^2, 380.$$

(Total for Question 20 is 2 marks)

- 21 The table shows information about the speeds of 100 lorries.

Speed ( $s$ ) in km/h	Frequency
$0 < s \leq 20$	2
$20 < s \leq 40$	9
$40 < s \leq 60$	23
$60 < s \leq 80$	31
$80 < s \leq 100$	27
$100 < s \leq 120$	8

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

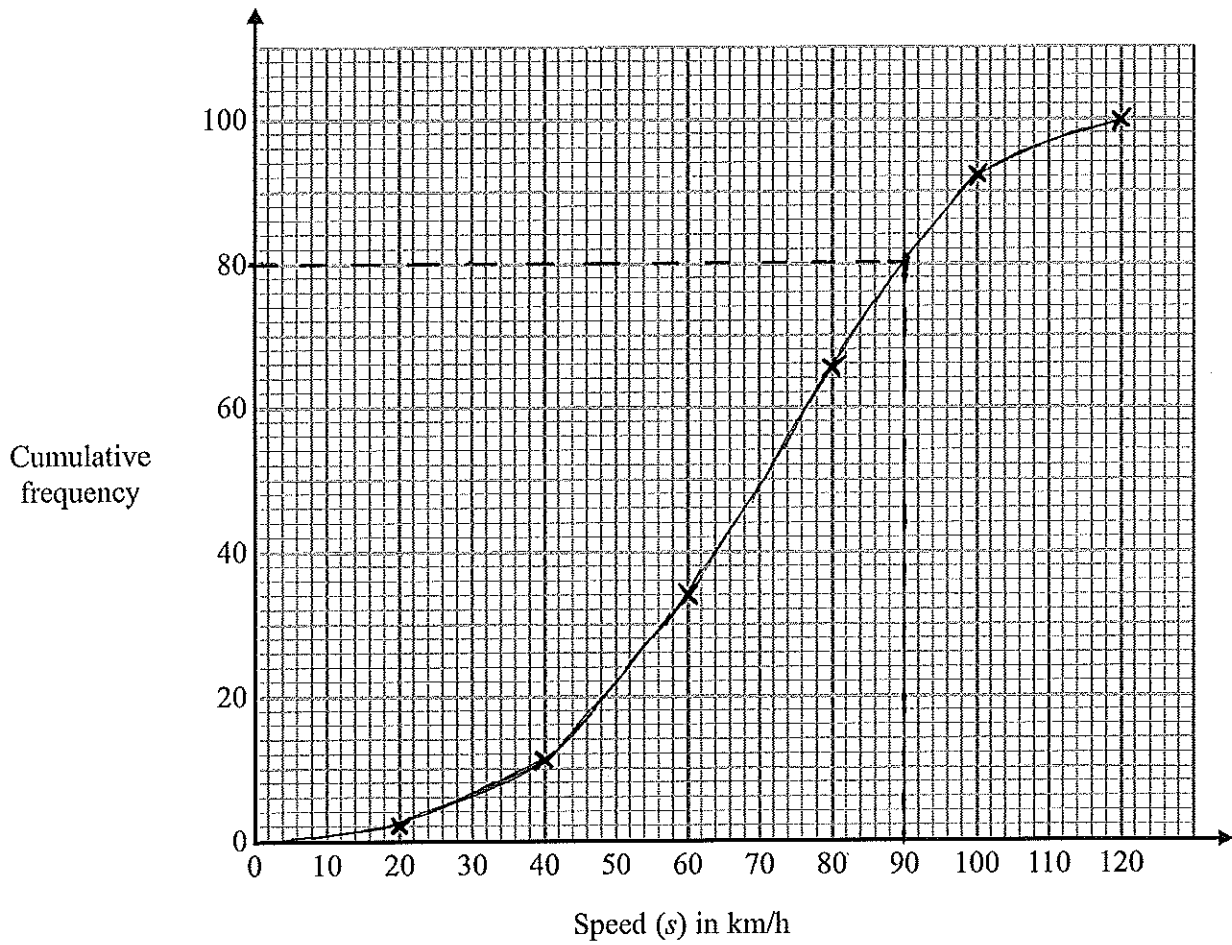
Speed ( $s$ ) in km/h	Cumulative frequency
$0 < s \leq 20$	2
$0 < s \leq 40$	11
$0 < s \leq 60$	34
$0 < s \leq 80$	65
$0 < s \leq 100$	92
$0 < s \leq 120$	100

(1)



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

(2)



(c) Find an estimate for the number of lorries with a speed of more than 90 km/h.

$$100 - 80 = 20$$

(2)

(Total for Question 21 is 5 marks)



P 4 0 6 7 3 A 0 2 1 2 8

22 Solve the simultaneous equations

$$\begin{aligned} 3x + 2y = 4 &\rightarrow 15x + 10y = 20 \quad \textcircled{1} \\ 4x + 5y = 17 &\rightarrow 8x + 10y = 34 \quad \textcircled{2} \end{aligned}$$

$$\textcircled{1} - \textcircled{2}$$

$$7x = -14$$

$$x = \frac{-14}{7} = -2$$

Sub into one of the original equations -

$$3(-2) + 2y = 4$$

$$-6 + 2y = 4$$

$$2y = 4 + 6$$

$$2y = 10$$

$$y = \frac{10}{2}$$

$$y = 5$$

$$x = \underline{\underline{-2}}$$

$$y = \underline{\underline{5}}$$

(Total for Question 22 is 4 marks)



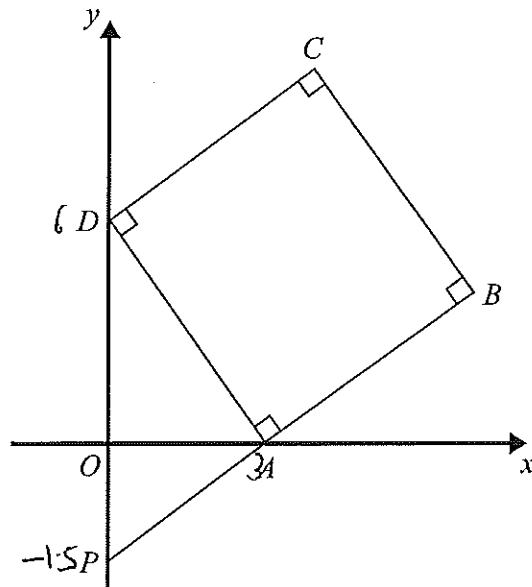


Diagram NOT  
accurately drawn

$ABCD$  is a square.

$P$  and  $D$  are points on the  $y$ -axis.

$A$  is a point on the  $x$ -axis.

$PAB$  is a straight line.

The equation of the line that passes through the points  $A$  and  $D$  is  $y = -2x + 6$

Find the length of  $PD$ .

Coordinates of  $A$ :  $y = 0$        $0 = -2x + 6$   
 $(3, 0)$                        $2x = 6$   
     $x = 3$

coordinates of  $D$ :  $x = 0$        $y = 6$   
 $(0, 6)$

equation of line  $PB$  has gradient of  $+\frac{1}{2}$  (as it is perpendicular to  $y = -2x + 6$ )

$$y = \frac{1}{2}x + c$$

goes through  $A = (3, 0)$

$$0 = \frac{3}{2} + c \Rightarrow c = -1.5$$

$$P = (0, -1.5)$$

7.5

(Total for Question 23 is 4 marks)

$$\text{length} = 6 - (-1.5) = 7.5$$



24 Make  $t$  the subject of the formula

$$p = \frac{3-2t}{4+t}$$

$$p(4+t) = 3-2t$$

$$4p + tp = 3-2t$$

$$tp = 3-2t-4p$$

$$tp + 2t = 3-4p$$

$$t(p+2) = 3-4p$$

$$t = \frac{3-4p}{p+2}$$

---

(Total for Question 24 is 4 marks)

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25 The diagram shows two similar solids, A and B.

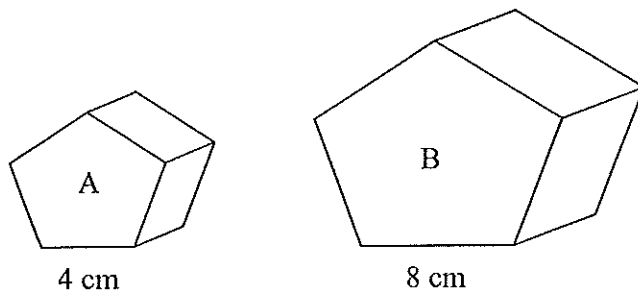


Diagram NOT  
accurately drawn

Solid A has a volume of  $80 \text{ cm}^3$ .

Shape A to Shape B  
Scale factor = 2

(a) Work out the volume of solid B.

$$80 \times 2^3 = 640 \text{ cm}^3.$$

$$\frac{640}{(2)} \text{ cm}^3$$

Solid B has a total surface area of  $160 \text{ cm}^2$ .

(b) Work out the total surface area of solid A.

Shape B to Shape A  
Scale factor =  $\frac{1}{2}$

$$160 \times \frac{1}{2}^2 = 40 \text{ cm}^2$$

$$\frac{40}{(2)} \text{ cm}^2$$

(Total for Question 25 is 4 marks)



P 4 0 6 7 3 A 0 2 5 2 8

26 (a) Rationalise the denominator of  $\frac{5}{\sqrt{2}}$

$$\frac{5}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{5\sqrt{2}}{2}$$

(2)

(b) Expand and simplify  $(2 + \sqrt{3})^2 - (2 - \sqrt{3})^2$

$$\begin{aligned}(2 + \sqrt{3})(2 + \sqrt{3}) &= 4 + 2\sqrt{3} + 2\sqrt{3} + 3 \\ &= 7 + 4\sqrt{3}.\end{aligned}$$

$$\begin{aligned}(2 - \sqrt{3})(2 - \sqrt{3}) &= 4 - 2\sqrt{3} - 2\sqrt{3} + 3 \\ &= 7 - 4\sqrt{3}.\end{aligned}$$

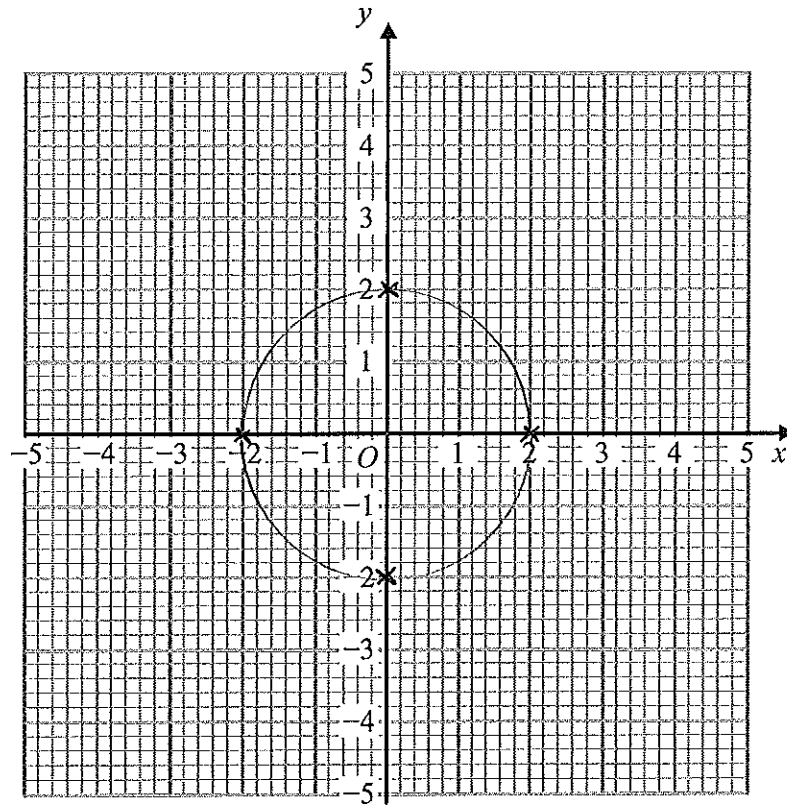
$$(7 + 4\sqrt{3}) - (7 - 4\sqrt{3})$$

$$7 + 4\sqrt{3} - 7 + 4\sqrt{3} = 8\sqrt{3}$$

(2)

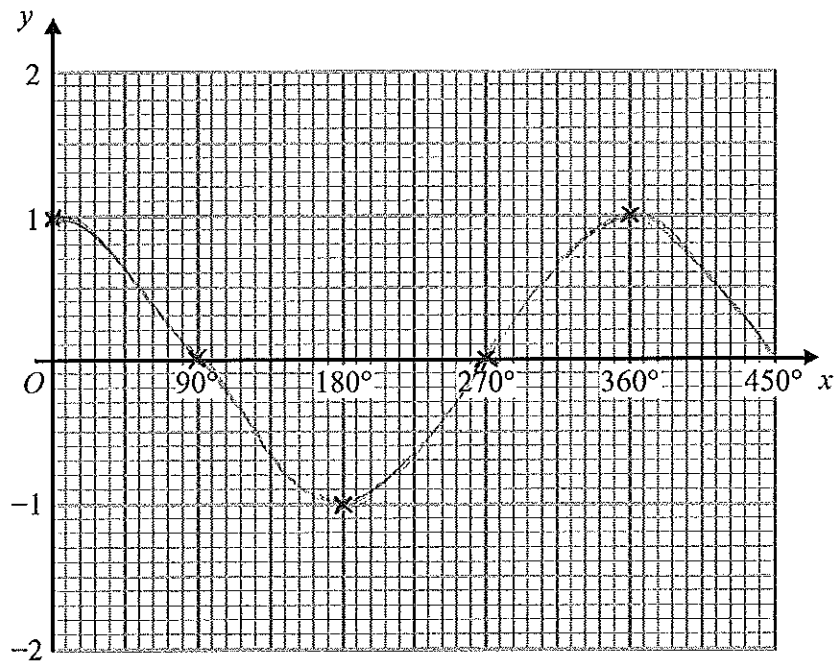
(Total for Question 26 is 4 marks)





(a) On the grid, draw the graph of  $x^2 + y^2 = 4$

(2)



(b) On the grid, sketch the graph of  $y = \cos x$  for  $0^\circ \leq x \leq 360^\circ$

(2)

(Total for Question 27 is 4 marks)



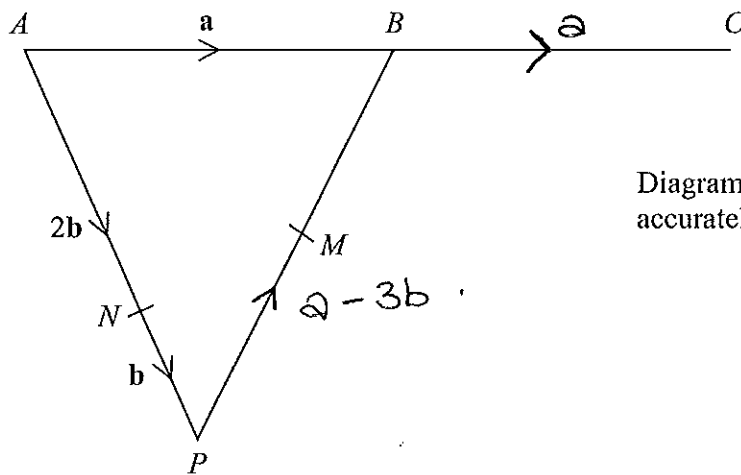


Diagram NOT  
accurately drawn

$APB$  is a triangle.  
 $N$  is a point on  $AP$ .

$$\vec{AB} = \mathbf{a} \quad \vec{AN} = 2\mathbf{b} \quad \vec{NP} = \mathbf{b}$$

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

$$\mathbf{a} - 3\mathbf{b} \quad (1)$$

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

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

$$\begin{aligned} \vec{NM} &= \mathbf{b} + \frac{1}{2}\mathbf{a} - \frac{3}{2}\mathbf{b} \\ &= \frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{b} \\ &= \frac{1}{2}(\mathbf{a} - \mathbf{b}) \end{aligned}$$

$\vec{NC}$  is a multiple  
of  $\vec{NM}$  with a  
common point.  
Therefore, it is a  
straight line.

$$\begin{aligned} \vec{NC} &= \mathbf{b} + \mathbf{a} - 3\mathbf{b} + \mathbf{a} \\ &= 2\mathbf{a} - 2\mathbf{b} \\ &= 2(\mathbf{a} - \mathbf{b}). \end{aligned}$$

(4)

(Total for Question 28 is 5 marks)

TOTAL FOR PAPER IS 100 MARKS

