

Write your name here

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Other names

M. Semar-

Centre Number

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Candidate Number

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Edexcel GCSE

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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6/6/1/C2



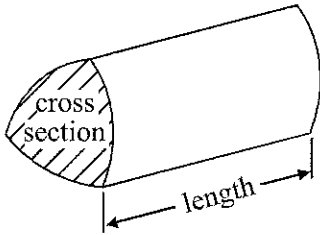
PEARSON

GCSE Mathematics 1MA0

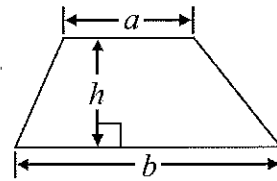
Formulae: Higher Tier

**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

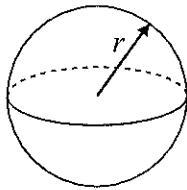


Area of trapezium = $\frac{1}{2}(a + b)h$



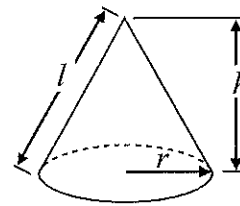
Volume of sphere = $\frac{4}{3}\pi r^3$

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

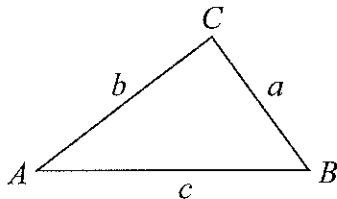


Volume of cone = $\frac{1}{3}\pi r^2 h$

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.

16 gingerbread

180 flour

40 ginger

110 butter

30 sugar

8 gingerbread

90 flour

20 ginger

55 butter

15 sugar

24 gingerbread

270

60

165

45

..... 270 g flour

..... 60 g ginger

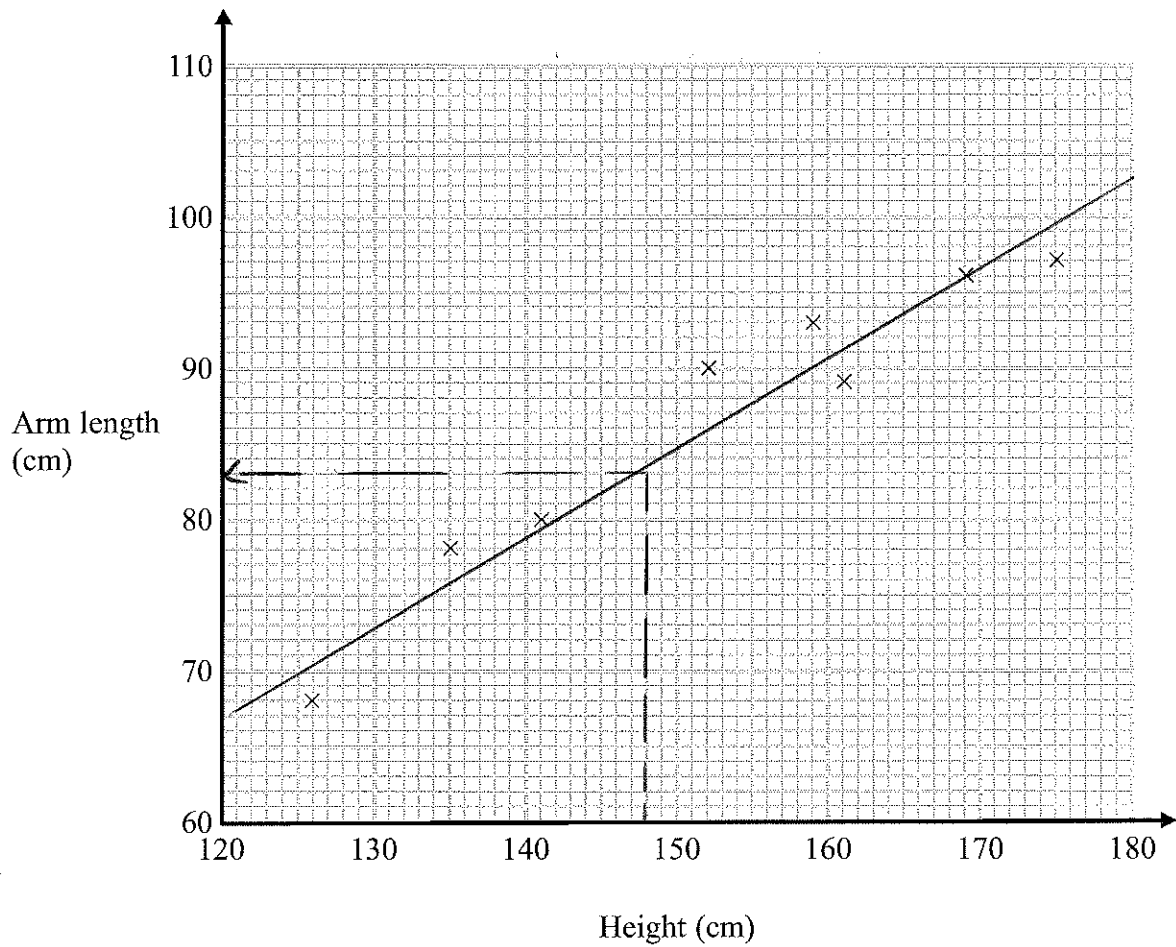
..... 165 g butter

..... 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 correlation
(1)

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

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

83 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.

$$\text{Number of units used} = 7155 - 7095 = 60 \text{ units}$$

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

$$\begin{aligned} \text{Cost of 60 units} &= 15 \times 60 \\ &= 15 \times 6 \times 10 \\ &= 900\text{p} \\ &= \text{£}9 \end{aligned}$$

Gary has to pay £9

(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?

0-1hr

1hr⁺-3hr

over 3h⁺

(Total for Question 4 is 2 marks)

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

$$31 = 30 \text{ (1sf)}$$

$$9.87 = 10 \text{ (1sf)}$$

$$0.509 = 0.5 \text{ (1sf)}$$

$$\frac{30 \times 10}{0.5} = \frac{300}{0.5}$$

$$= 600$$

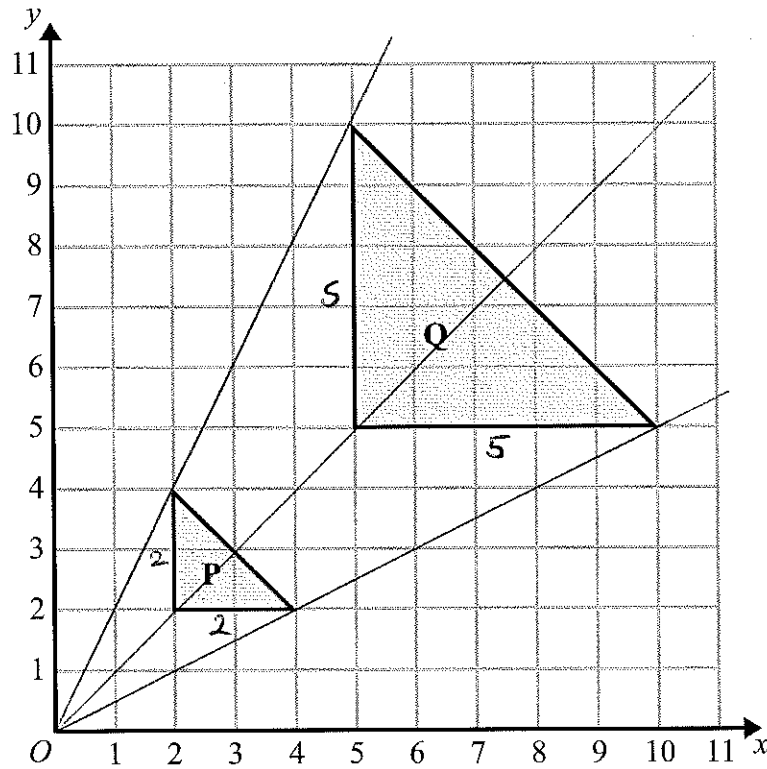
$$\left(\begin{array}{l} 300 \div 5 = 60 \\ 300 \div 0.5 = 600 \end{array} \right)$$

600

(Total for Question 5 is 3 marks)



6



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

Enlargement centre $(0,0)$ scale factor $2\frac{1}{2}$

$$2 \times Sf = 5$$

(Total for Question 6 is 3 marks)

$$\begin{aligned} Sf &= 5 \div 2 \\ &= 2.5 \\ &= 2\frac{1}{2} \end{aligned}$$



7 Here is a diagram of Jim's garden.

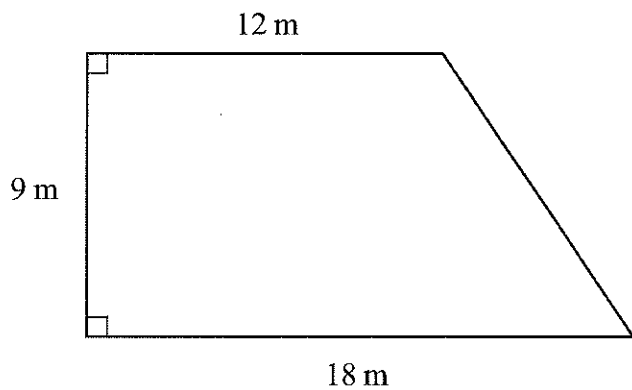


Diagram NOT
accurately drawn

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 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.

$$\begin{aligned} \text{Area of garden} &= \frac{(12+18)}{2} \times 9 \quad (\text{Trapezium}) \\ &= 135 \text{ m}^2 \end{aligned}$$

$$\begin{aligned} \text{Number of bags} &= 135 \div 20 \\ &= 6.75 \text{ bags} \end{aligned}$$

$$\begin{array}{r} 20 \overline{)135} \\ \underline{150} \\ \end{array} \quad = 7 \text{ bags}$$

$$\begin{aligned} \text{Cost} &= 4.99 \times 7 \\ &= \text{£}34.93 \end{aligned}$$

£ 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	0.15	0.15

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.

$$P(W) + P(B) + 0.2 + 0.5 = 1$$

$$P(W) + P(B) = 1 - 0.7$$

$$P(W) + P(B) = 0.3$$

$$P(W) = P(B) = 0.3 \div 2 = 0.15$$

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

There are 240 counters in the bag.

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

$$\begin{aligned} \text{Number of red counters} &= 0.2 \times 240 \\ &= 48 \end{aligned}$$

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

(Total for Question 8 is 4 marks)



9 The diagram shows a prism.

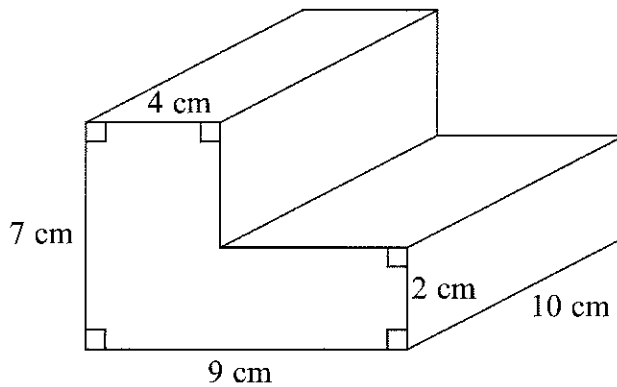
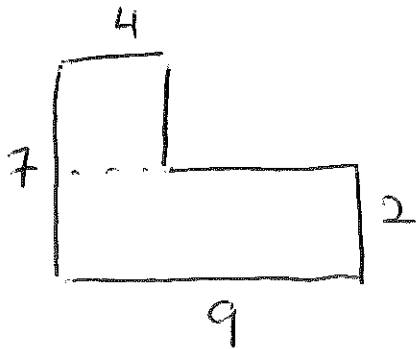


Diagram NOT
accurately drawn

Work out the volume of the prism.

Volume = Area of cross-section \times length of prism



$$\begin{aligned} \text{cross-section area} &= 2 \times 9 + 5 \times 4 \\ &= 18 + 20 = 38 \text{ cm}^2 \end{aligned}$$

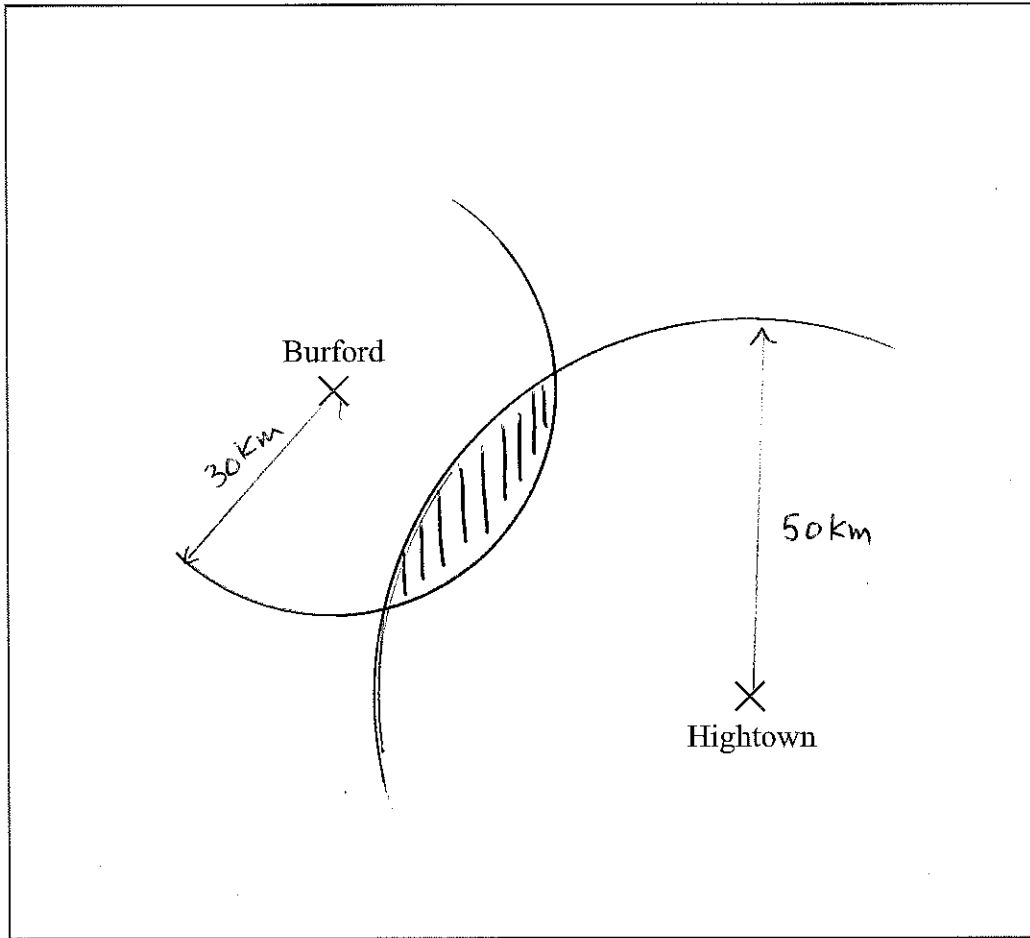
$$\begin{aligned} \text{Volume} &= 38 \times 10 \\ &= 380 \text{ cm}^3 \end{aligned}$$

..... 380 cm³

(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 $4(3x + 5)$

$$4 \times 3x + 4 \times 5$$

$$12x + 20$$

(1)

(b) Expand and simplify $2(x - 4) + 3(x + 5)$

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

$$5x + 7$$

$$5x + 7$$

(2)

(c) Expand and simplify

$$(x + 4)(x + 6)$$

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

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

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

(2)

(Total for Question 11 is 5 marks)



12 The diagram shows a circle drawn inside a square.

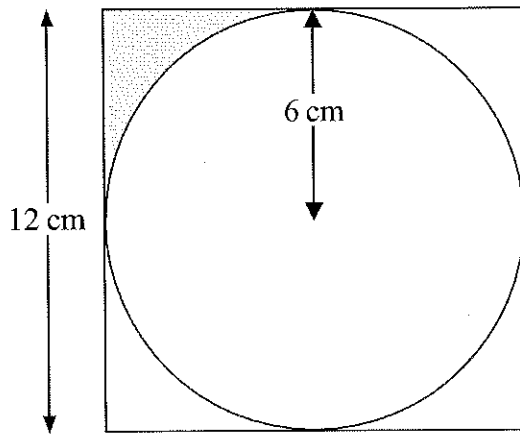


Diagram NOT accurately drawn

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 π .

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

$$\text{Area of circle} = \pi r^2 = 36\pi \quad (r=6)$$

$$\text{Difference in area} = 144 - 36\pi$$

$$\text{Shaded region} = \frac{144 - 36\pi}{4}$$

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

$$= 36 - 9\pi$$

$$= 9(4 - \pi)$$

$$36 - 9\pi$$

$$9(4 - \pi) \text{ cm}^2$$

(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?

180 kg in the ratio 1 : 3 : 5

Total parts = $1 + 3 + 5 = 9$ parts

Each part is worth $180 \div 9 = 20$ kg

Cement Sand Gravel

1 : 3 : 5

20 : 60 : 100

Talil has ^{not} enough cement
enough sand
enough gravel

Talil can not make the concrete mix because
he does not have enough cement

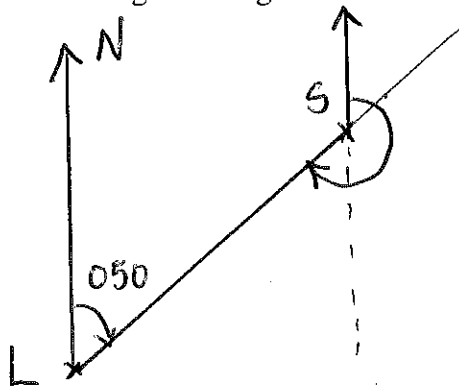
(Total for Question 13 is 4 marks)

(Short of 5 kg)



14 The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.



$$\begin{aligned} \text{Bearing of lighthouse from ship} &= 50 + 180 \\ &= 230^\circ \end{aligned}$$

..... 230°

(Total for Question 14 is 2 marks)

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

$$m^{5-3} = m^2$$

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

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

$$\begin{aligned} 5 \times x^4 \times x^2 \times y^3 \times y \\ 5x^6y^4 \end{aligned}$$

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

(Total for Question 15 is 3 marks)



16 The diagram shows a triangle.

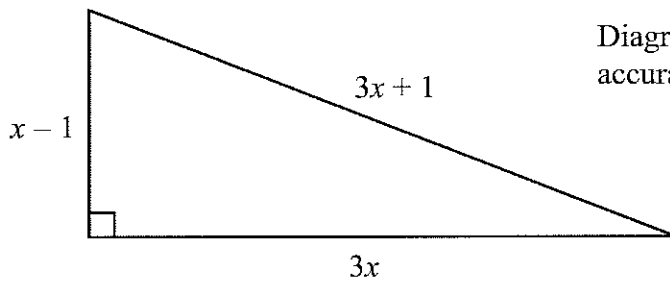


Diagram NOT
accurately drawn

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 .

$$\text{Perimeter} = 3x + x - 1 + 3x + 1$$

$$56 = 7x$$

$$7x = 56$$

$$x = 8$$

$$\text{Area} = \frac{b \times h}{2}$$

$$= \frac{3x \times (x-1)}{2}$$

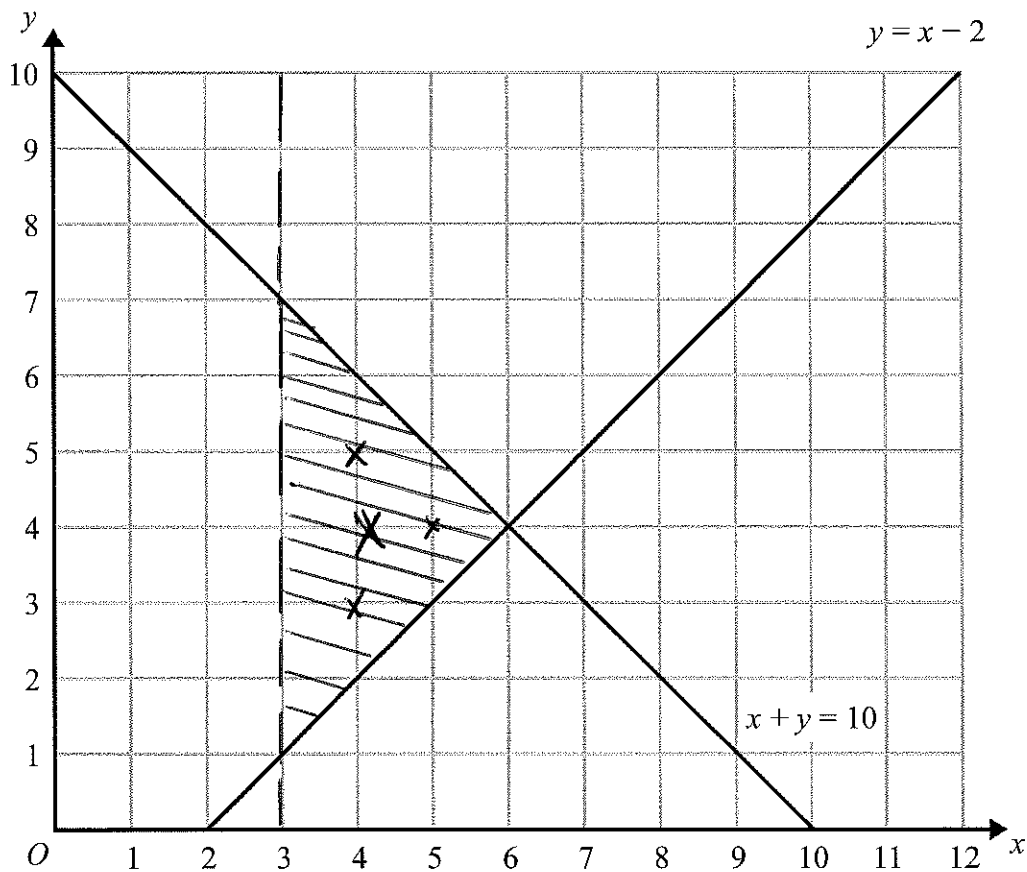
$$= \frac{3 \times 8 \times (8-1)}{2} = \frac{3 \times 8 \times 7}{2}$$

$$84 \text{ m}^2$$

(Total for Question 16 is 4 marks)



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



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

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

$(4, 3)$ $(4, 4)$ $(4, 5)$ $(5, 4)$

(Total for Question 17 is 3 marks)



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

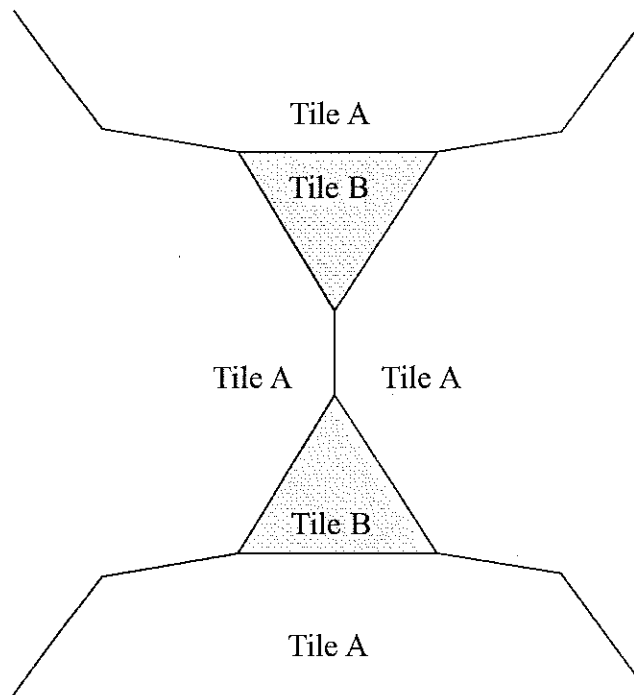


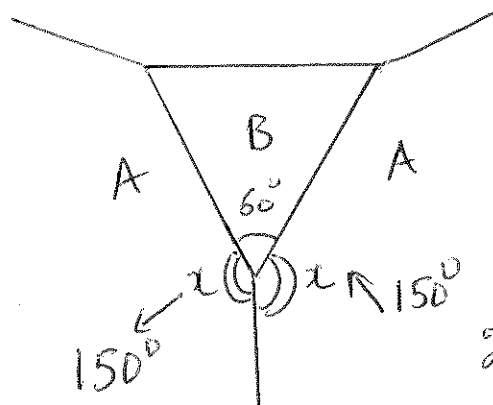
Diagram NOT accurately drawn

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.

Polygon B regular
= equilateral Δ
= each angle is 60°



$$x + x + 60 = 360$$

(angles at a point)

$$2x + 60 = 360$$

$$2x = 300$$

$$x = 150^\circ$$

In polygon A interior angle = 150°

This means EXterior angle = $180 - 150 = 30^\circ$

Number of sides = $360 \div 30 = 12$

..... 12 sides

(Total for Question 18 is 4 marks)

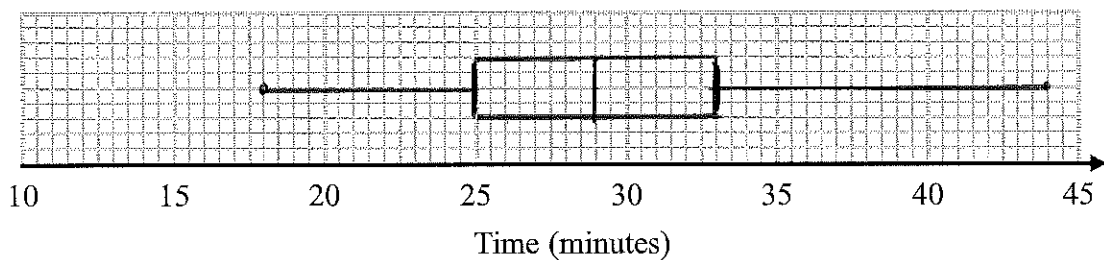


19 Sameena recorded the times, in minutes, some girls took to do a jigsaw puzzle.

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

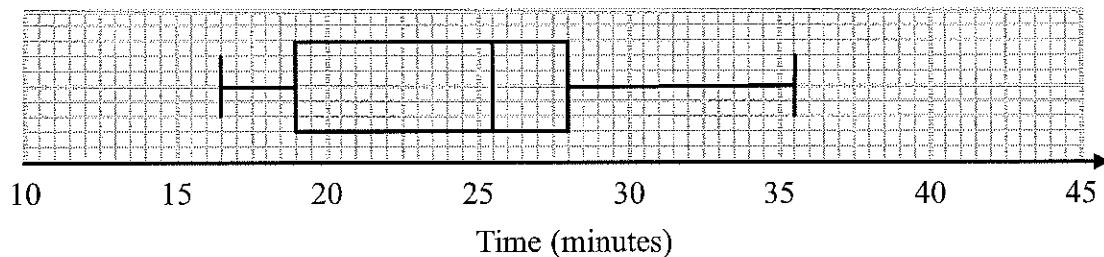
	Minutes
Shortest time	18
Lower quartile	25
Median	29
Upper quartile	33
Longest time	44

(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.

Median (girls) > Median boys -

IQR (girls) = 8 mn IQR (Boys) = 9 mn

The middle 50% of boys and girls have the same spread (nearly) \approx

(2)

(Total for Question 19 is 4 marks)



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

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

$$3.8 \quad 0.3800 \quad 380 \quad 0.038$$

Order =

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

(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.

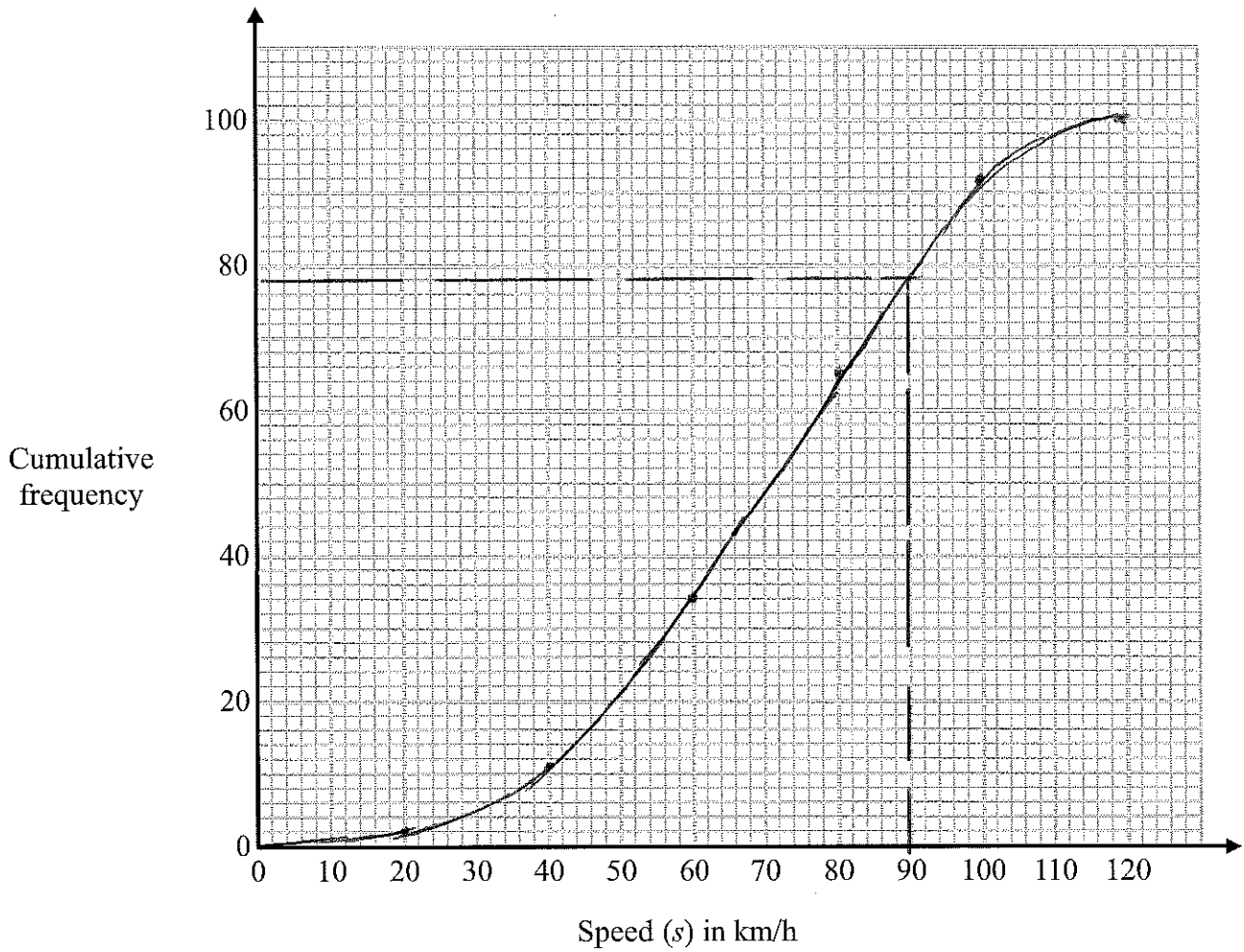
Speed (s) in km/h	Cumulative frequency	CF.
$0 < s \leq 20$	2	2
$0 < s \leq 40$	$2+9 = 11$	11
$0 < s \leq 60$	$11+23 = 34$	34
$0 < s \leq 80$	$34+31 = 65$	65
$0 < s \leq 100$	$65+27 = 92$	92
$0 < s \leq 120$	$92+8 = 100$	100

(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.

$$100 - 78 = 22$$

22 lorries
(2)

(Total for Question 21 is 5 marks)



22 Solve the simultaneous equations

$$\begin{cases} 4x + 3y = 4 \\ 3x + 5y = 17 \end{cases}$$

$$\begin{array}{r} - \left\{ \begin{array}{l} 12x + 8y = 16 \\ 12x + 15y = 51 \end{array} \right. - \\ \hline \end{array}$$

$$12x - 12x + 8y - 15y = 16 - 51$$

$$-7y = -35$$

$$y = \frac{-35}{-7} = +5$$

Substitute $y = +5$ into $3x + 2y = 4$

$$3x + 2(5) = 4$$

$$3x + 10 = 4$$

$$3x = 4 - 10$$

$$3x = -6$$

$$x = -2$$

$$x = \dots \dots \dots -2 \dots \dots \dots$$

$$y = \dots \dots \dots 5 \dots \dots \dots$$

(Total for Question 22 is 4 marks)



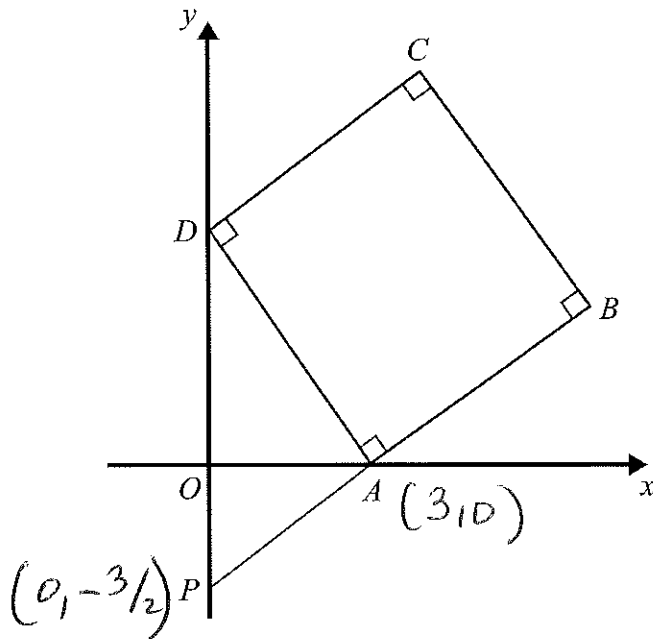


Diagram NOT
accurately drawn

$ABCD$ 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 .

At A $y = 0 \therefore -2x + 6 = 0$ gives $x = 3$

$A(3, 0)$

\therefore Line PB is perpendicular to AD :

$m_{PB} \times m_{AD} = -1$ thus $m_{PB} = \frac{-1}{-2} = \frac{1}{2}$

Line PB has $y = \frac{1}{2}x + c$ (equation)

$A(3, 0)$ belongs to PB therefore $0 = \frac{1}{2}x + c$

Line PB : $y = \frac{1}{2}x - \frac{3}{2}$ $c = -\frac{1}{2}x = -\frac{1}{2} \times 3 = -\frac{3}{2}$

At P : $x = 0$ $y = -\frac{3}{2}$ $P(0, -\frac{3}{2})$ length = $6 - (-\frac{3}{2})$
 At D : $x = 0$ $y = -2 \times 0 + 6 = 6$ $D(0, 6)$ $= 6 + \frac{3}{2}$
 $= 7.5$

(Total for Question 23 is 4 marks)



24 Make t the subject of the formula

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

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

$$4P + Pt = 3 - 2t$$

$$Pt + 2t = 3 - 4P$$

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

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

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

(Total for Question 24 is 4 marks)



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

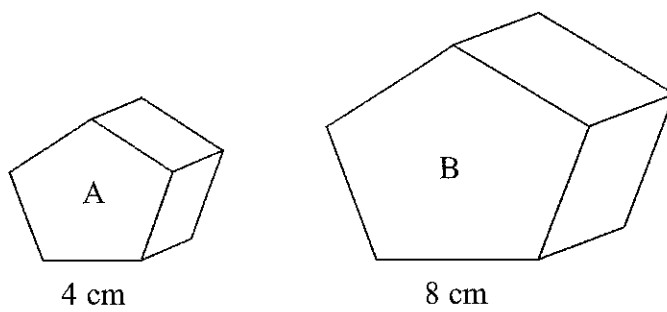


Diagram NOT accurately drawn

Solid A has a volume of 80 cm^3 .

$$sf = \frac{8}{4} = 2 \text{ (linear dimension)}$$

(a) Work out the volume of solid B.

$$V_B = V_A \times sf^3$$

$$V_B = 80 \times 2^3$$

$$= 640 \text{ cm}^3$$

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

Solid B has a total surface area of 160 cm^2 .

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

$$S_B = S_A \times sf^2$$

$$S_A = \frac{S_B}{sf^2}$$

$$S_A = \frac{160}{2^2} = \frac{160}{4}$$

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

(Total for Question 25 is 4 marks)



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

$$\frac{5}{\sqrt{2}} = \frac{5\sqrt{2}}{\sqrt{2}\sqrt{2}} = \frac{5\sqrt{2}}{\sqrt{4}} = \frac{5\sqrt{2}}{2}$$

$$\frac{5\sqrt{2}}{2} \quad (2)$$

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

$$[(2 + \sqrt{3}) + (2 - \sqrt{3})][(2 + \sqrt{3}) - (2 - \sqrt{3})]$$

$$a^2 - b^2 = (a+b)(a-b) \text{ difference of 2 squares -}$$

$$(4 + \sqrt{3} - \sqrt{3})(2 - 2 + \sqrt{3} - -\sqrt{3})$$

$$4(2\sqrt{3})$$

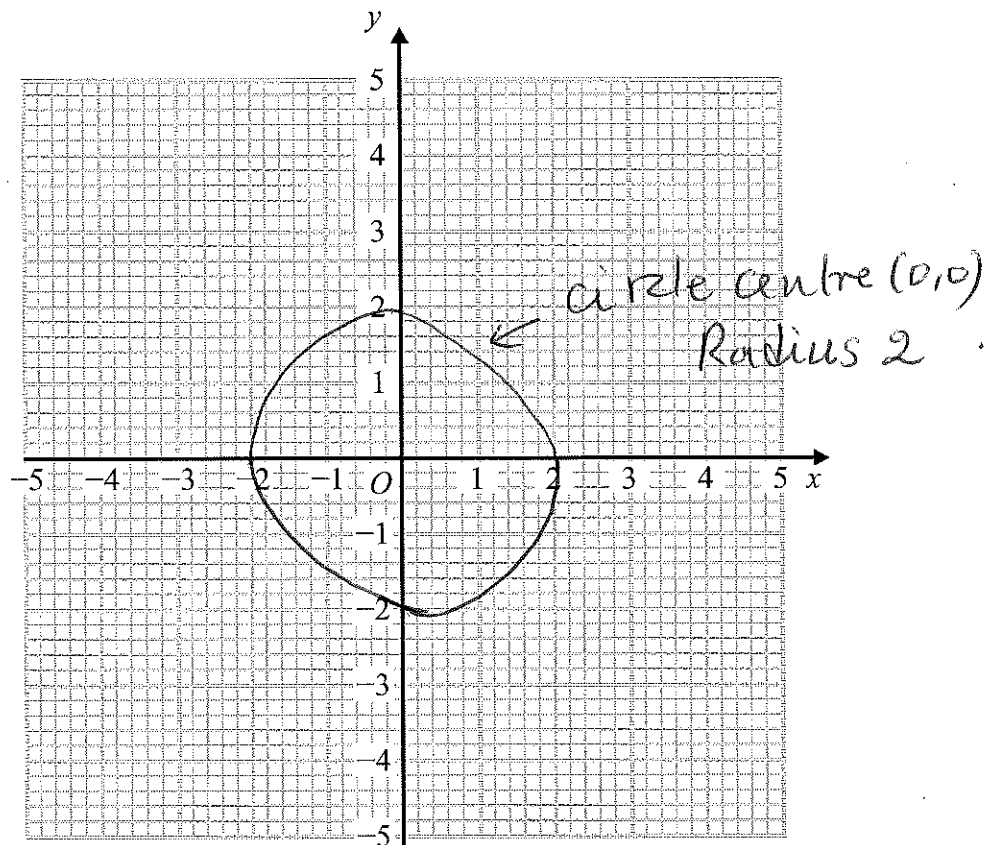
$$8\sqrt{3}$$

$$8\sqrt{3}$$

(2)

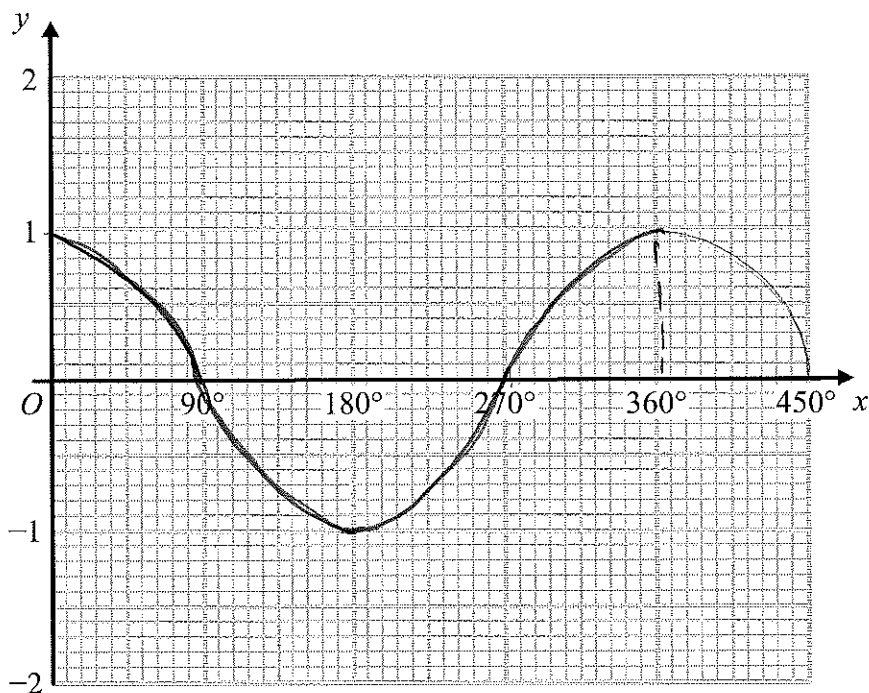
(Total for Question 26 is 4 marks)





(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)



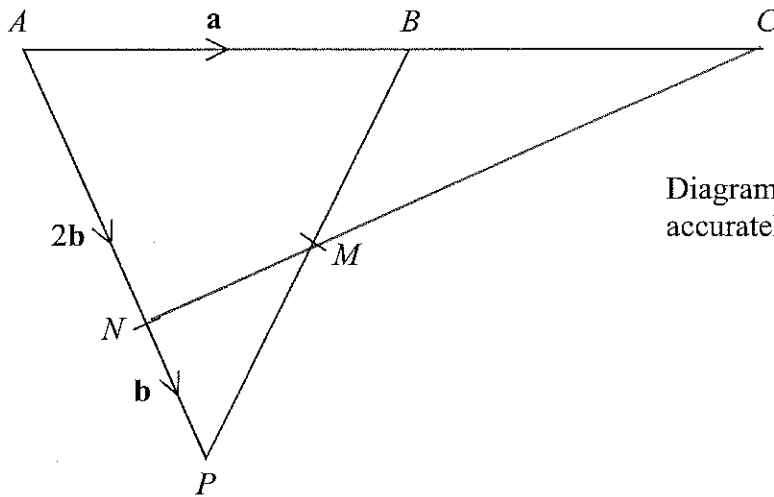


Diagram NOT
accurately drawn

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} .

$$\begin{aligned} \vec{PB} &= \vec{PA} + \vec{AB} = -\mathbf{b} - 2\mathbf{b} + \mathbf{a} \\ &= \mathbf{a} - 3\mathbf{b} \end{aligned}$$

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

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

* (b) Show that NMC is a straight line. This means $\vec{NC} = k\vec{NM}$
($k = \text{constant}$)

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

$$= \frac{1}{2}\mathbf{a} + \mathbf{b} - \frac{3}{2}\mathbf{b} = \frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{b} = \frac{1}{2}(\mathbf{a} - \mathbf{b})$$

$$\vec{NM} = \frac{1}{2}(\mathbf{a} - \mathbf{b}).$$

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

$$\left\{ \begin{aligned} \vec{NC} &= 2(\mathbf{a} - \mathbf{b}) \quad \therefore (k=4) \\ \vec{NM} &= \frac{1}{2}(\mathbf{a} - \mathbf{b}) \quad \therefore (\mathbf{a} - \mathbf{b}) = 2\vec{NM} \end{aligned} \right.$$

$$\vec{NC} = 2 \times 2\vec{NM}$$

$$\boxed{\vec{NC} = 4\vec{NM}}_{(4)}$$

$$\vec{NC} = 2 \times 2\vec{NM}$$

(Total for Question 28 is 5 marks)

N, C, M straight line -

TOTAL FOR PAPER IS 100 MARKS

