

Write your name here

Surname

Correction

Other names

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Centre Number

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Candidate Number

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Edexcel GCSE

Mathematics A

Paper 1 (Non-Calculator)

Higher Tier

Tuesday 11 June 2013 – 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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5/5/



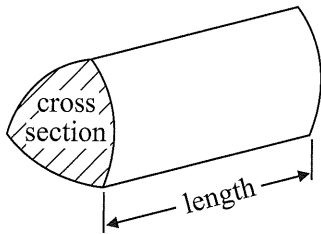
PEARSON

GCSE Mathematics 1MA0

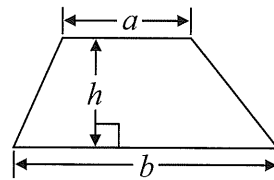
Formulae: Higher Tier

**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

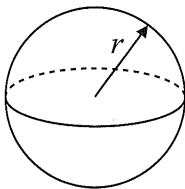


Area of trapezium = $\frac{1}{2} (a + b)h$



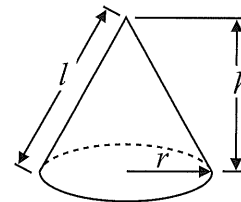
Volume of sphere = $\frac{4}{3} \pi r^3$

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

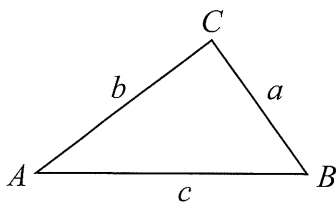


Volume of cone = $\frac{1}{3} \pi r^2 h$

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 Given that $1793 \times 185 = 331705$

write down the value of

(a) $1.\overline{793} \times 185$

33170.5

(b) $331705 \div 1.85 = 179300$

179300

(Total for Question 1 is 2 marks)

2 Mr Mason asks 240 Year 11 students what they want to do next year.

15% of the students want to go to college.

$\frac{3}{4}$ of the students want to stay at school.

The rest of the students do not know.

Work out the number of students who do not know.

$$\frac{15}{100} \times 240 = \frac{3}{20} \times 240 = \frac{3}{2} \times 24 = 36 \text{ students}$$

$$\frac{3}{4} \times 240 = 3 \times \frac{240}{4} = 3 \times 60 = 180 \text{ students.}$$

$$\begin{aligned} \text{Rest of students} &= 240 - 36 - 180 \\ &= 24 \text{ students} \end{aligned}$$

24

(Total for Question 2 is 4 marks)



3 Sixteen babies are born in a hospital.

Here are the weights of the babies in kilograms.

~~2.4~~ ~~2.7~~ ~~3.5~~ 4.4 4.5 ~~4.1~~ 4.4 ~~2.8~~
~~4.1~~ 3.8 ~~3.8~~ 4.2 ~~3.3~~ ~~3.0~~ 3.7 ~~3.3~~

Show this information in an ordered stem and leaf diagram.

2	4	7	8					
3	0	3	3	5	7	8	8	
4	1	1	2	4	4	5		

Key:
 2|7 means
 2.7 kg.

(Total for Question 3 is 3 marks)

4 (a) Expand $3(2 + t)$

$$\underline{6 + 3t}$$

(1)

(b) Expand $3x(2x + 5)$

$$6x^2 + 15x$$

$$\underline{6x^2 + 15x}$$

(2)

(c) Expand and simplify $(m + 3)(m + 10)$

$$m^2 + 10m + 3m + 30$$

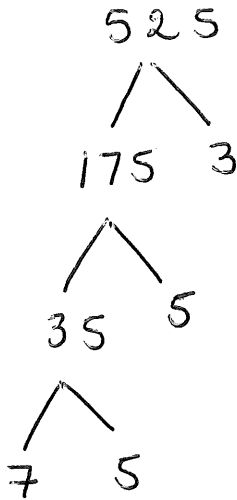
$$m^2 + 13m + 30$$

$$\underline{m^2 + 13m + 30}$$

(2)

(Total for Question 4 is 5 marks)

5 Write 525 as a product of its prime factors.



$$525 = 3 \times 5 \times 5 \times 7$$

$$3 \times 5^2 \times 7$$

(Total for Question 5 is 3 marks)

6 Ed has 4 cards.
There is a number on each card.

12

6

15

?

The mean of the 4 numbers on Ed's cards is 10

Work out the number on the 4th card.

$$\frac{12 + 6 + 15 + ?}{4} = 10$$

$$33 + ? = 10 \times 4$$

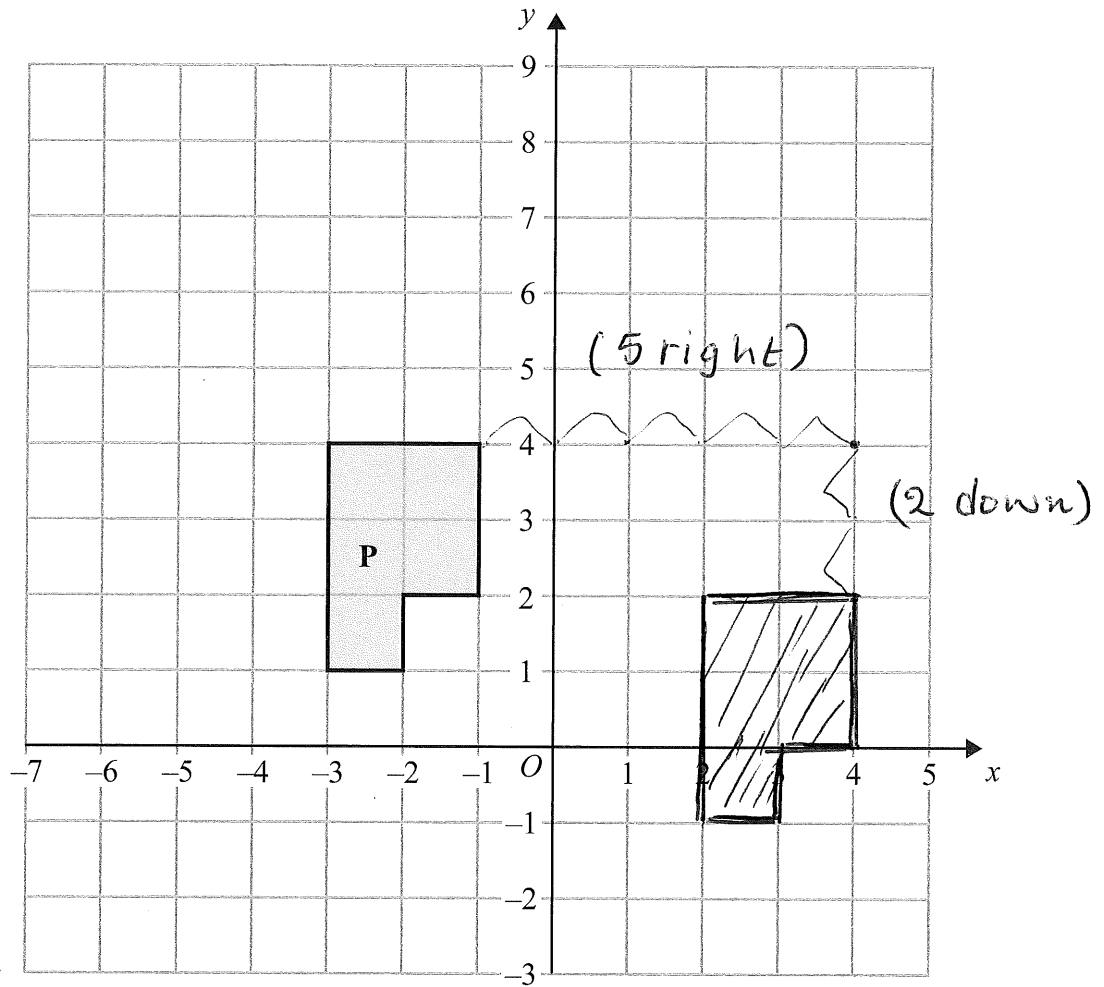
$$? = 40 - 33$$

$$? = 7$$

7

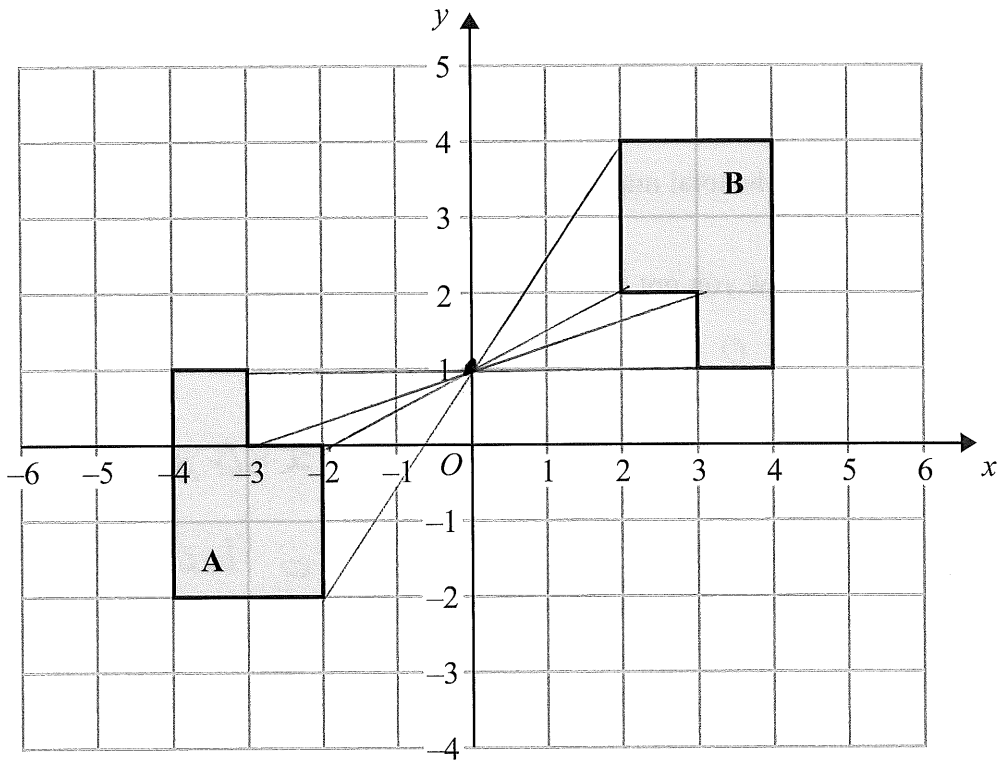
(Total for Question 6 is 3 marks)





(a) Translate shape **P** by the vector $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$

(2)



(b) Describe fully the single transformation that maps shape A onto shape B.

Rotation, centre (0,1), 180° clockwise or
anti-clockwise

(3)

(Total for Question 7 is 5 marks)

- 8 Margaret has some goats.
 The goats produce an average total of 21.7 litres of milk per day for 280 days.
 Margaret sells the milk in $\frac{1}{2}$ litre bottles.

Work out an estimate for the total number of bottles that Margaret will be able to fill with the milk.

You must show clearly how you got your estimate.

$$21.7 \text{ l} = 20 \text{ l (1sf)}$$

$$\begin{aligned} \text{Number of milk bottles} &= 20 \times 300 \times 2 \\ &= 12000 \text{ bottles} \end{aligned}$$

12000 bottles

(Total for Question 8 is 3 marks)

- 9 Matt and Dan cycle around a cycle track.

Each lap Matt cycles takes him 50 seconds.
 Each lap Dan cycles takes him 80 seconds.

Dan and Matt start cycling at the same time at the start line.

Work out how many laps they will each have cycled when they are next at the start line together.

common multiple of 50 and 80

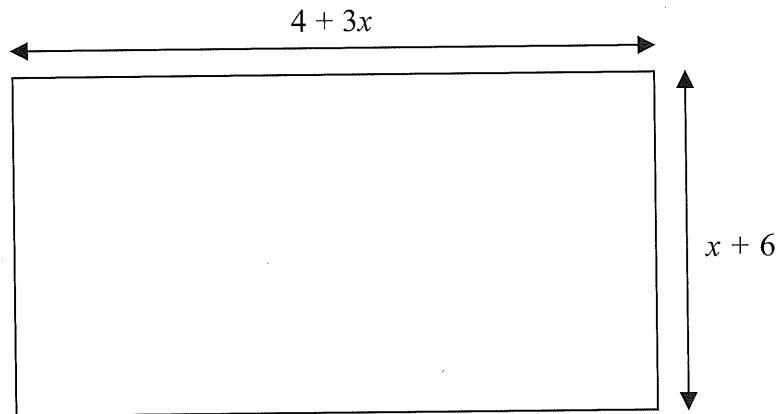
Matt:	50	100	150	200	250	300	350	400	450	500	550
Dan:	80	160	240	320	400	480	520	600			

Matt..... 8 laps

Dan..... 5 laps

(Total for Question 9 is 3 marks)

10 The diagram shows a garden in the shape of a rectangle.



All measurements are in metres.

The perimeter of the garden is 32 metres.

Work out the value of x

$$\begin{aligned} \text{Perimeter} &= (4 + 3x) + (4 + 3x) + (x + 6) + (x + 6) \\ &= 8x + 20 \end{aligned}$$

$$\begin{aligned} P = 32 \quad \therefore \quad 8x + 20 &= 32 \\ 8x &= 32 - 20 \end{aligned}$$

$$8x = 12$$

$$x = \frac{12}{8} = \frac{3}{2} = 1.5$$

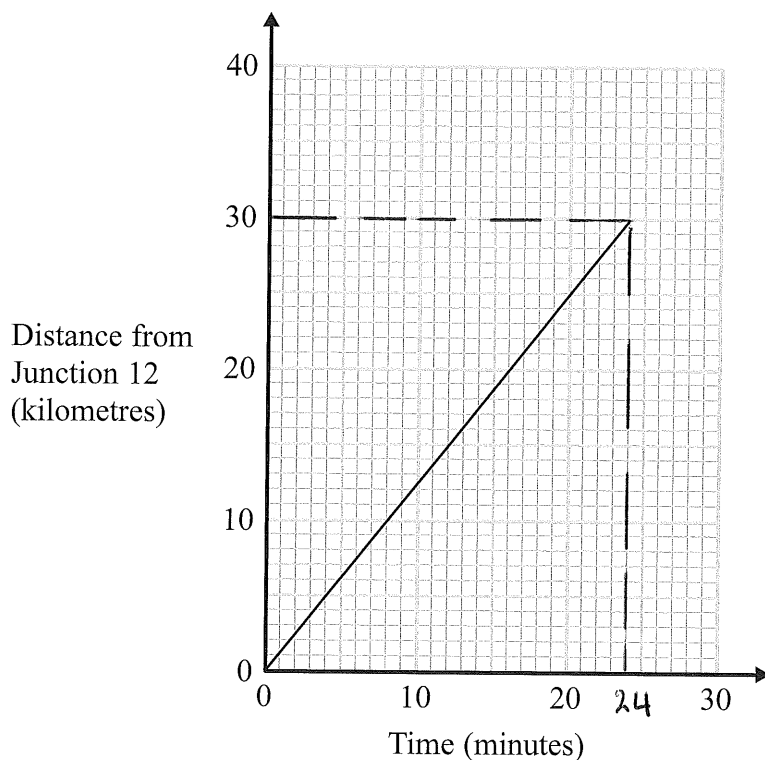
$$x = 1.5$$

$$x = 1.5$$

(Total for Question 10 is 4 marks)

*11 Debbie drove from Junction 12 to Junction 13 on a motorway.

The travel graph shows Debbie's journey.



Ian also drove from Junction 12 to Junction 13 on the same motorway. He drove at an average speed of 66 km/hour.

Who had the faster average speed, Debbie or Ian?
You must explain your answer.

Distance from 12 to 13 = 30 km

$$\text{Average speed} = \frac{\text{Distance}}{\text{Time}} \quad \therefore \quad S = \frac{D}{t}$$

• Average speed for Ian is 66 km/hour

• Average speed for Debbie: $S = \frac{D}{t} = \frac{30}{24}$ km/min

$$S = \frac{30}{24} \times 60 = \frac{5}{4} \times 60 = 5 \times 15 = 75 \text{ km/hr}$$

{	Debbie	75 km/hr
	Ian	66 km/hr

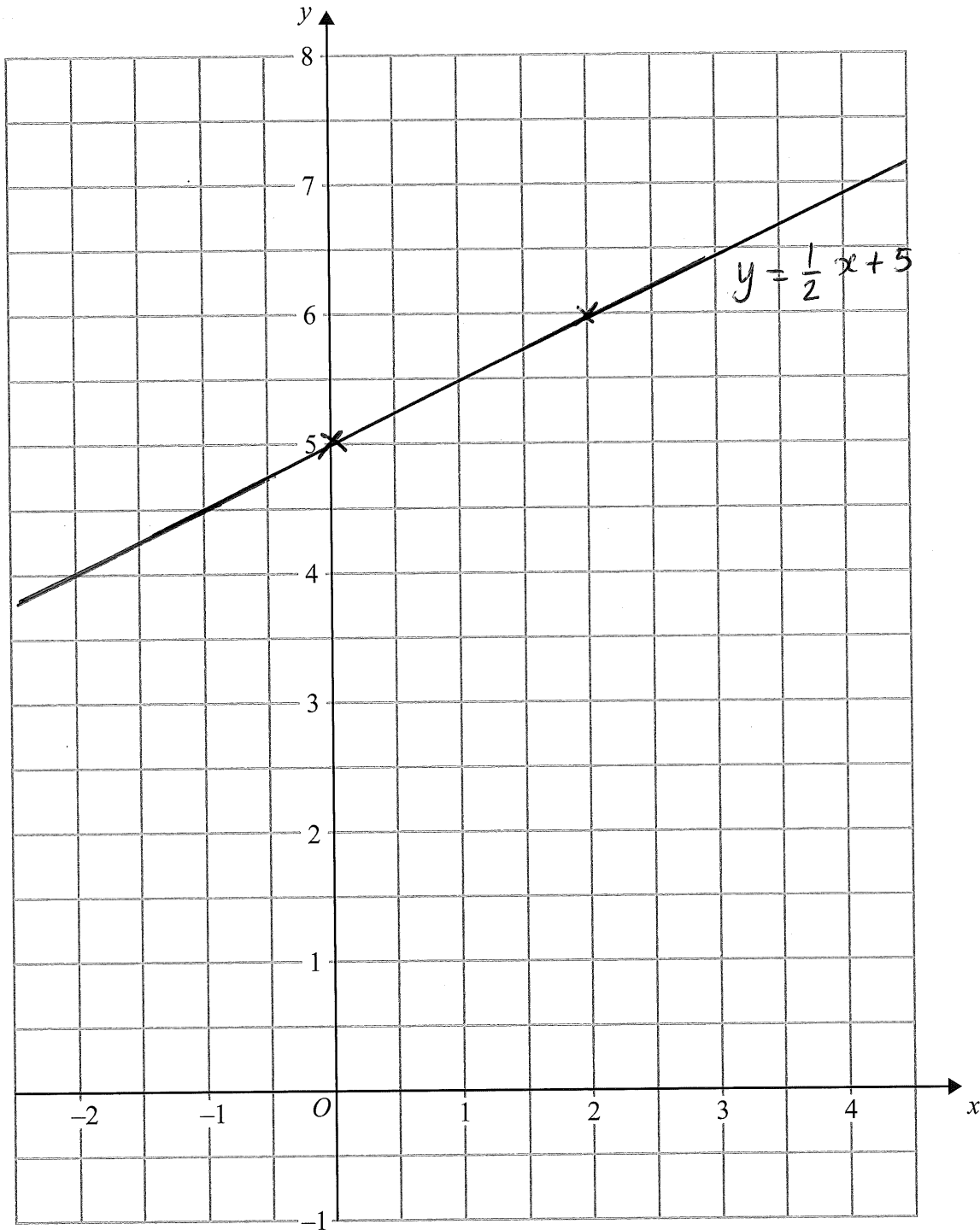
Debbie is faster

(Total for Question 11 is 4 marks)

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

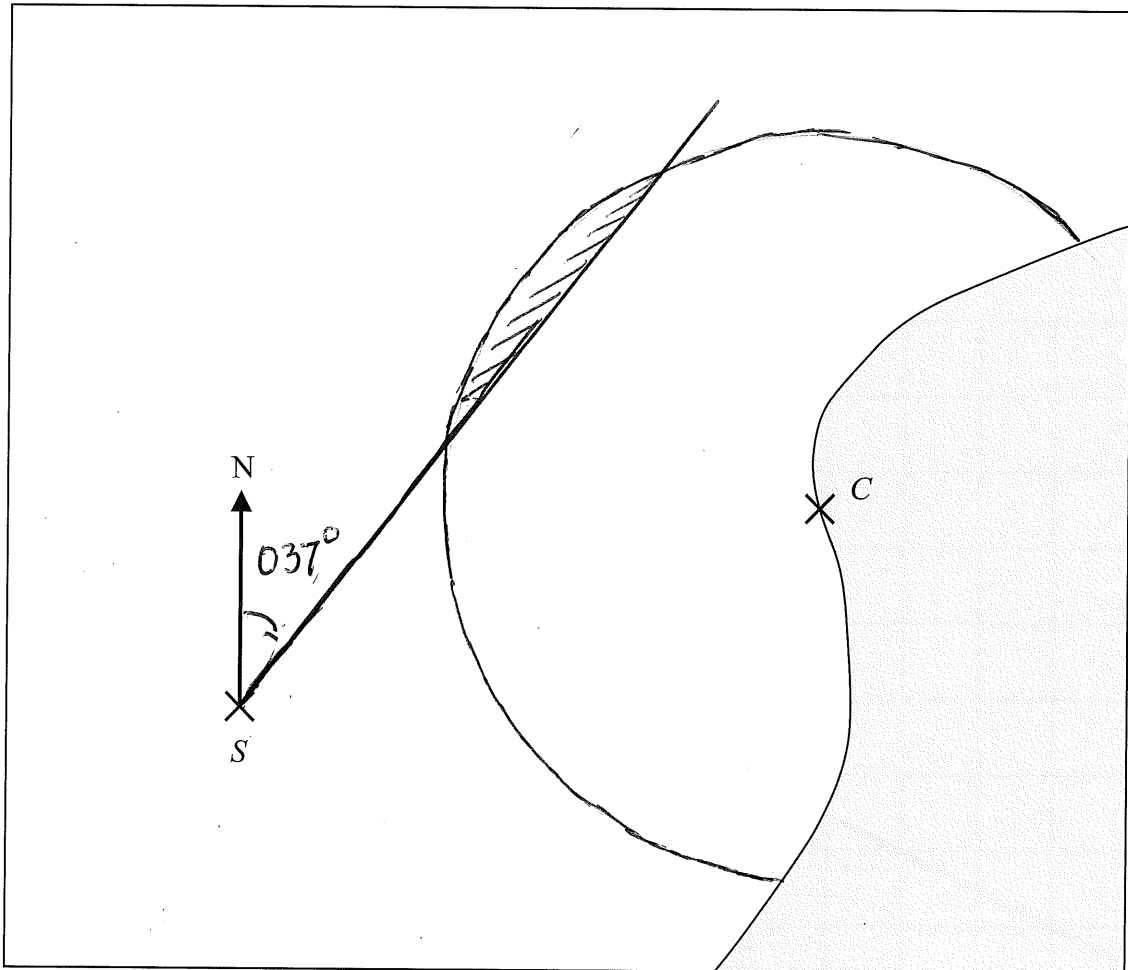
x	0	2
$y = \frac{1}{2}x + 5$	5	6

$$\begin{cases} x=0 & y = \frac{1}{2} \times 0 + 5 = 5 \\ x=2 & y = \frac{1}{2} \times 2 + 5 = 6 \end{cases}$$



(Total for Question 12 is 3 marks)

- *13 Here is a map.
The position of a ship, S , is marked on the map.



Scale 1 cm represents 100 m

Point C is on the coast.
Ships must not sail closer than 500 m to point C .

The ship sails on a bearing of 037°

Will the ship sail closer than 500 m to point C ?
You must explain your answer.

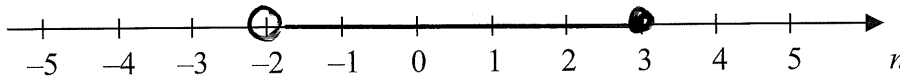
The locus of all points which are at 500m from point C is an arc circle radius 500m.

On a bearing of 037° , the ship will sail closer than 500m to C because the direction is in the locus of all points at 500m from C .

(Total for Question 13 is 3 marks)

14 $-2 < n \leq 3$

(a) Represent this inequality on the number line.



(2)

(b) Solve the inequality $8x - 3 \geq 6x + 4$

$$8x - 6x - 3 \geq 6x - 6x + 4$$

$$2x - 3 \geq 4$$

$$2x - 3 + 3 \geq 4 + 3$$

$$2x \geq 7$$

$$x \geq 7/2$$

$$x \geq 7/2$$

(2)

(Total for Question 14 is 4 marks)

*15 One sheet of paper is 9×10^{-3} cm thick.

Mark wants to put 500 sheets of paper into the paper tray of his printer.
The paper tray is 4 cm deep.

Is the paper tray deep enough for 500 sheets of paper?
You must explain your answer.

Thickness of 500 sheets :

$$= 9 \times 10^{-3} \times 500$$

$$= 9 \times 5 \times 10^{-3} \times 10^2$$

$$= 45 \times 10^1$$

$$= 4.5 \text{ cm}$$

Paper tray is 4 cm deep

4.5 is greater than 4 cm.

The paper tray is not enough for 500 sheets.

(Total for Question 15 is 3 marks)

16 The normal price of a television is reduced by 30% in a sale.

The sale price of the television is £350

Work out the normal price of the television.

The sale price is only worth 70% of the normal price

$$NP = 30\% + 70\%$$

(100%) (Reduction) (Sale price)

$$70\% \text{ of Normal price} = 350$$



$$0.7 \times NP = 350$$

$$NP = 350 \div 0.7$$
$$= 500$$

$$\frac{70}{100} = 0.7$$

£ 500

(Total for Question 16 is 3 marks)

Other method:

Normal price is 100%

Sale price is 70%

$$\begin{array}{l} \div 7 \left(\begin{array}{l} 70\% \text{ is } \pounds 350 \\ 10\% \text{ is } 350 \div 7 = 50 \end{array} \right) \div 7 \\ 10 \times \left(\begin{array}{l} 100\% \text{ is } 50 \times 10 = \pounds 500 \end{array} \right) \times 10 \end{array}$$

Normal price is £500

17 Sumeet has a pond in the shape of a prism.

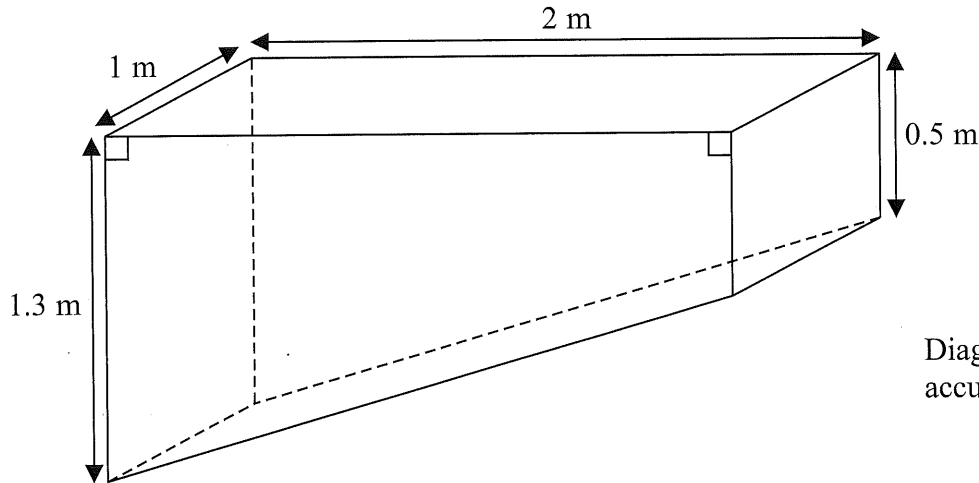


Diagram NOT accurately drawn

The pond is completely full of water.
Sumeet wants to empty the pond so he can clean it.
Sumeet uses a pump to empty the pond.

The volume of water in the pond decreases at a constant rate.
The level of the water in the pond goes down by 20 cm in the first 30 minutes.

Work out how much more time Sumeet has to wait for the pump to empty the pond completely.

Volume of water before decrease:

$$V = \frac{1.3 + 0.5}{2} \times 2 \times 1 = 1.8 \text{ m}^3$$

Volume of water after decrease:

$$V = \frac{(1.3 - 0.2) + (0.5 - 0.2)}{2} \times 2 \times 1 = 1.1 + 0.3 = 1.4 \text{ m}^3$$

Amount of water pumped out in 30 mn is:
 $1.8 - 1.4 = 0.4 \text{ m}^3$

0.4 m^3 pumped in 30 mn.

1.4 m^3 pumped in ?

$$? = 1.4 \times \frac{30}{0.4} = \frac{14}{4} \times 30 = 7/2 \times 30$$

105 mn

(Total for Question 17 is 6 marks)

18 Solve the simultaneous equations

$$\begin{cases} 3 \times \{ 4x + 7y = 1 \\ 4 \times \{ 3x + 10y = 15 \end{cases}$$

$$\begin{array}{r} 12x + 21y = 3 \\ - 12x + 40y = 60 \\ \hline -19y = -57 \\ y = \frac{-57}{-19} = +3 \\ y = 3 \end{array}$$

Substitute $y = 3$ into $4x + 7y = 1$

$$\begin{aligned} 4x + 7 \times 3 &= 1 \\ 4x &= 1 - 21 \\ 4x &= -20 \\ x &= -5 \end{aligned}$$

$$\begin{aligned} x &= \dots -5 \dots \\ y &= \dots 3 \dots \end{aligned}$$

(Total for Question 18 is 4 marks)

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

$$\begin{array}{cccc} 5^{-1} & 0.5 & -5 & 5^0 \\ \frac{1}{5} & 0.5 & -5 & 1 \end{array}$$

$$\dots -5, 5^{-1}, 0.5, 5^0 \dots$$

(Total for Question 19 is 2 marks)

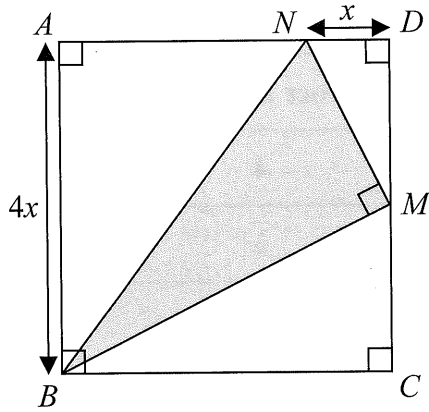


Diagram NOT
accurately drawn

$ABCD$ is a square with a side length of $4x$
 M is the midpoint of DC .
 N is the point on AD where $ND = x$

BMN is a right-angled triangle.

Find an expression, in terms of x , for the area of triangle BMN .
 Give your expression in its simplest form.

$$\text{Area of } BMN = \frac{BM \times MN}{2}$$

$$BM = \sqrt{BC^2 + CM^2}$$

$$= \sqrt{16x^2 + 4x^2} = \sqrt{20x^2}$$

$$MN = \sqrt{ND^2 + DM^2} = \sqrt{x^2 + 4x^2} = \sqrt{5x^2}$$

$$BM = \sqrt{20x^2} = \sqrt{20} \sqrt{x^2} = \sqrt{4 \times 5} \sqrt{x^2} = 2\sqrt{5}x$$

$$MN = \sqrt{5x^2} = \sqrt{5} \sqrt{x^2} = \sqrt{5}x$$

$$\text{Area} = \frac{2\sqrt{5}x \times \sqrt{5}x}{2} = \sqrt{5} \sqrt{5} x^2$$

$$= \sqrt{25} x^2$$

$$\text{Area} = 5x^2$$

$$5x^2$$

(Total for Question 20 is 4 marks)

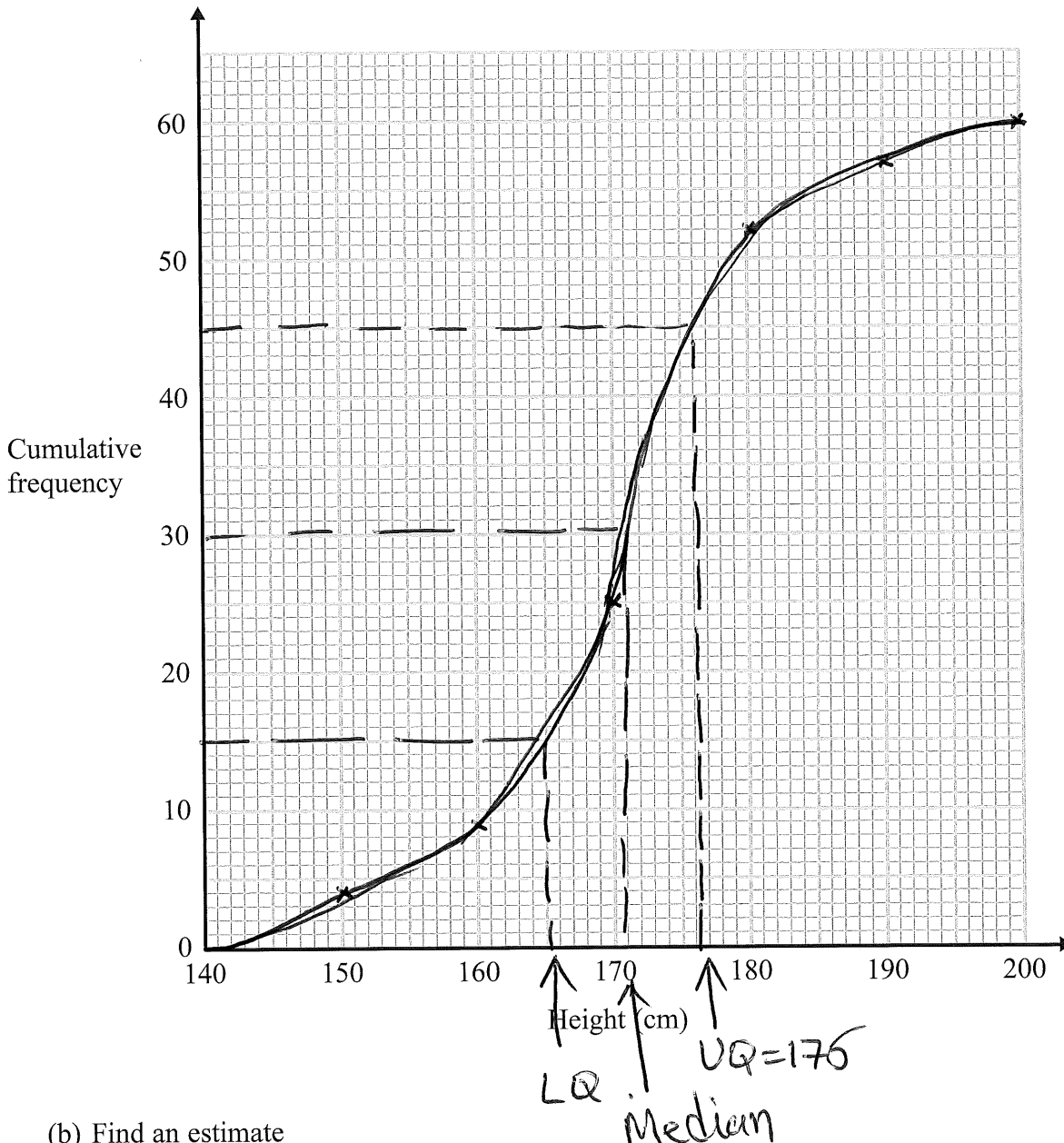
21 The table below shows information about the heights of 60 students.

Height (x cm)	Number of students
$140 < x \leq 150$	4
$150 < x \leq 160$	5
$160 < x \leq 170$	16
$170 < x \leq 180$	27
$180 < x \leq 190$	5
$190 < x \leq 200$	3

CF.
4
9
25
52
57
60

- (a) On the grid opposite, draw a cumulative frequency graph for the information in the table.

(3)



- (b) Find an estimate
 (i) for the median,

accept 172 171 cm

- (ii) for the interquartile range.

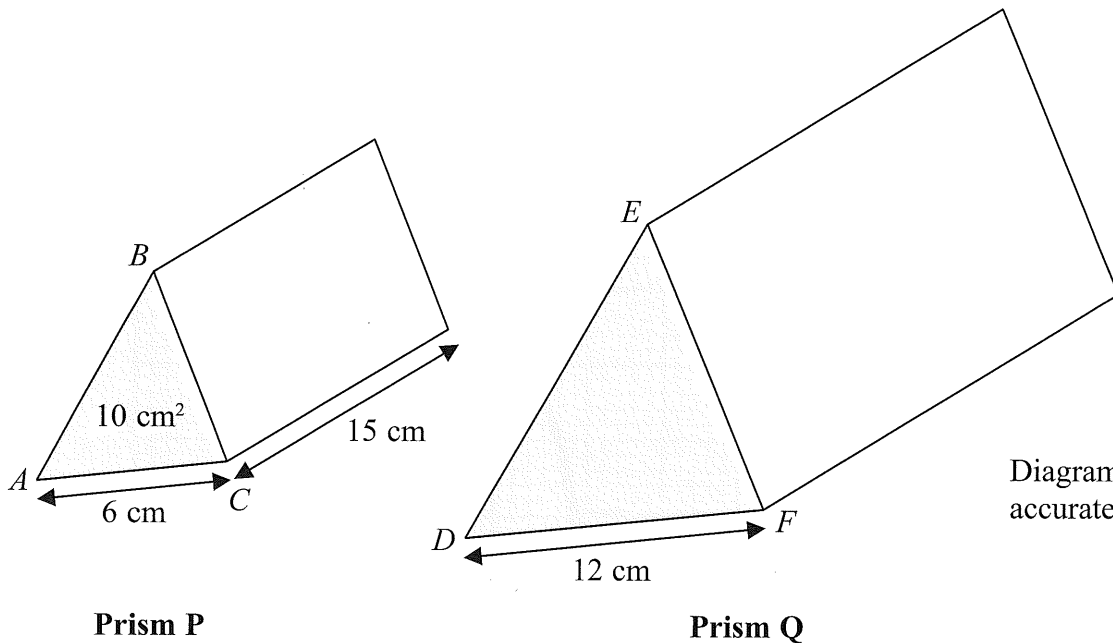
$$IQR = UQ - LQ$$

$$176 - 165 = 11$$

accept 12-14 11 cm
 (3)

(Total for Question 21 is 6 marks)

22 P and Q are two triangular prisms that are mathematically similar.



Prism P has triangle ABC as its cross section.
Prism Q has triangle DEF as its cross section.

$AC = 6$ cm
 $DF = 12$ cm

The area of the cross section of prism P is 10 cm².
The length of prism P is 15 cm.

Work out the volume of prism Q.

$$sf = \frac{12}{6} = 2$$

$$\text{Volume of P} = 10 \times 15 = 150 \text{ cm}^3$$

$$\begin{aligned} \text{Volume of Q} &= \text{Volume of P} \times sf^3 \\ &= 150 \times 2^3 \\ &= 150 \times 8 \\ &= 1200 \end{aligned}$$

$$1200 \text{ cm}^3$$

(Total for Question 22 is 4 marks)

23 Simplify $\frac{4(x+5)}{x^2+2x-15}$

$$\frac{4(x+5)}{(x+5)(x-3)} = \frac{4}{x-3}$$

$$\frac{4}{x-3}$$

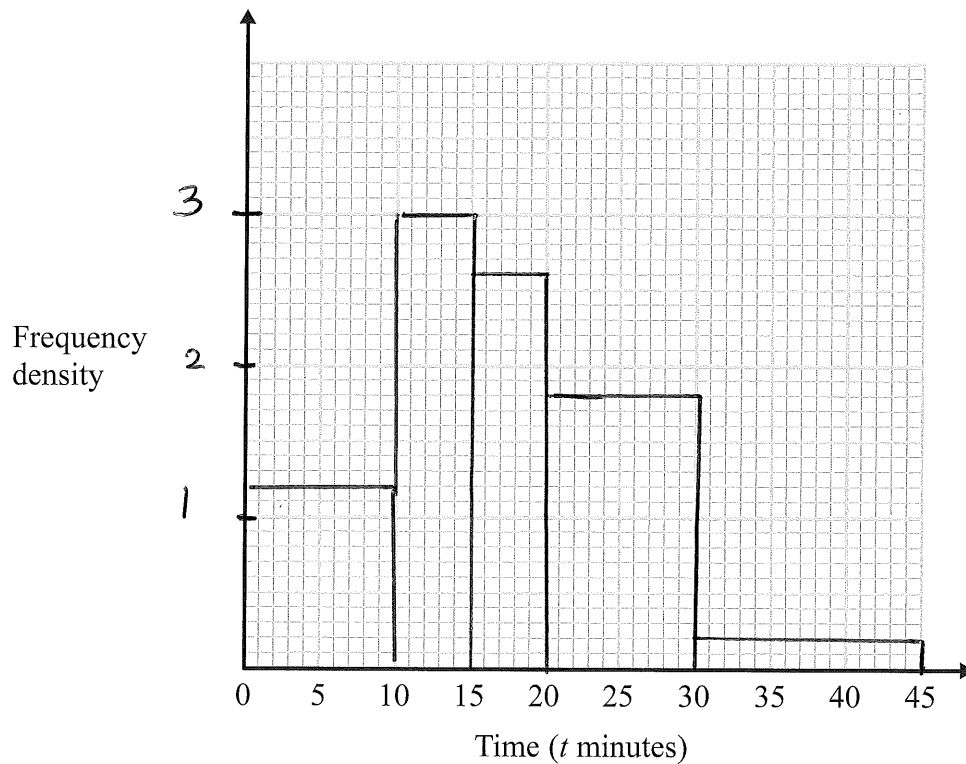
(Total for Question 23 is 2 marks)

24 Bill works for a computer service centre.

The table shows some information about the length of time, t minutes, of the phone calls Bill had.

Time (t minutes)	$0 < t \leq 10$	$10 < t \leq 15$	$15 < t \leq 20$	$20 < t \leq 30$	$30 < t \leq 45$
Number of calls	12	15	13	18	3
<i>Freq. density</i>	$12 \div 10 = 1.2$	$15 \div 5 = 3$	$13 \div 5 = 2.6$	$18 \div 10 = 1.8$	$3 \div 15 = 0.2$

On the grid, draw a histogram to show this information.



(Total for Question 24 is 3 marks)

25 The expression $x^2 - 8x + 21$ can be written in the form $(x - a)^2 + b$ for all values of x .

(a) Find the value of a and the value of b .

$$(x - 4)^2 - 16 + 21$$

$$(x - 4)^2 + 5$$

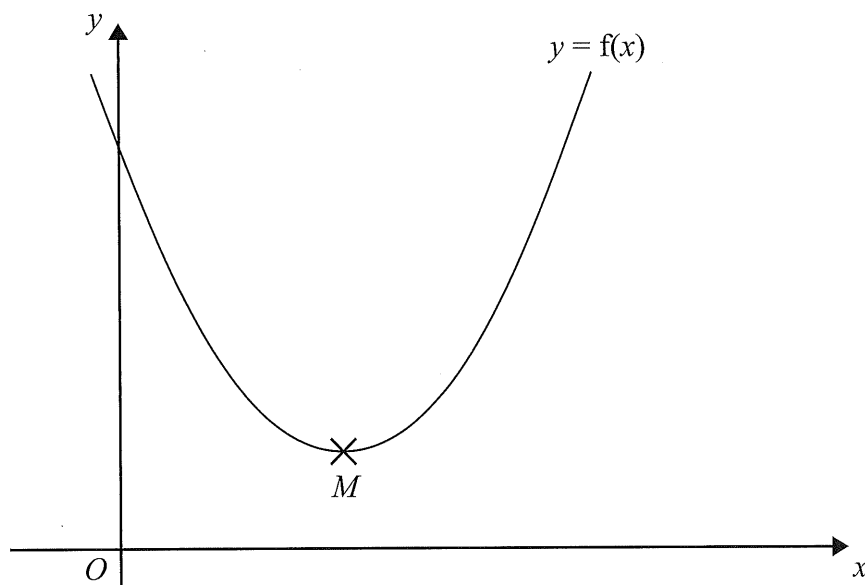
$$a = \dots 4 \dots$$

$$b = \dots 5 \dots$$

(3)

The equation of a curve is $y = f(x)$ where $f(x) = x^2 - 8x + 21$

The diagram shows part of a sketch of the graph of $y = f(x)$.



The minimum point of the curve is M .

(b) Write down the coordinates of M .

$(x - 4)^2 + 5$ is always positive.

$$(\dots 4 \dots, \dots 5 \dots)$$

(1)

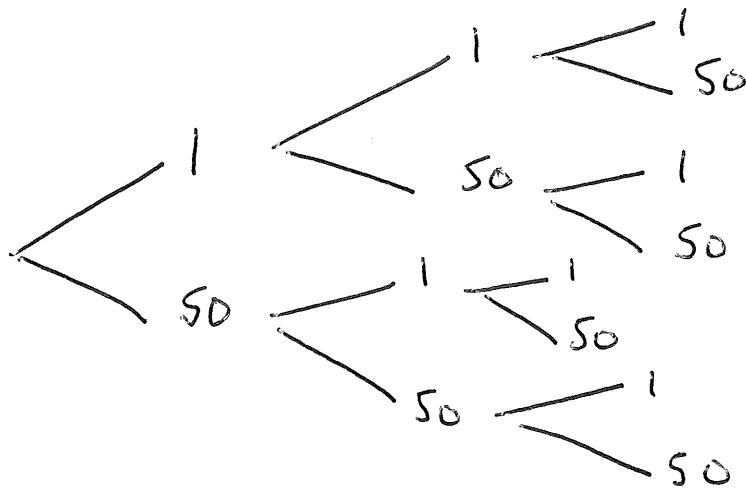
$$x = 4 \quad y = 5$$

(Total for Question 25 is 4 marks)

26 Fiza has 10 coins in a bag.
There are three £1 coins and seven 50 pence coins.

Fiza takes at random, 3 coins from the bag.

Work out the probability that she takes exactly £2.50



$111 = \text{£}3$
 $1150 = \text{£}2.50$
 $1501 = \text{£}2.50$
 $15050 = \text{£}2.00$
 $5011 = \text{£}2.50$
 $50150 = \text{£}2.00$
 $50501 = \text{£}2.00$
 $505050 = \text{£}1.50$

$P(1, 1, 50)$ or $P(1, 50, 1)$ or $P(50, 1, 1)$

$\left. \begin{array}{l} 3 \text{ £1 coins} \\ 7 \text{ 50p coins} \end{array} \right\}$

$$= \left(\frac{3}{10} \times \frac{2}{9} \times \frac{7}{8} \right) + \left(\frac{3}{10} \times \frac{7}{9} \times \frac{2}{8} \right) + \left(\frac{7}{10} \times \frac{3}{9} \times \frac{2}{8} \right)$$

$$= \frac{42}{720} + \frac{42}{720} + \frac{42}{720} = \frac{126}{720}$$

$$\frac{126}{720}$$

(Total for Question 26 is 4 marks)

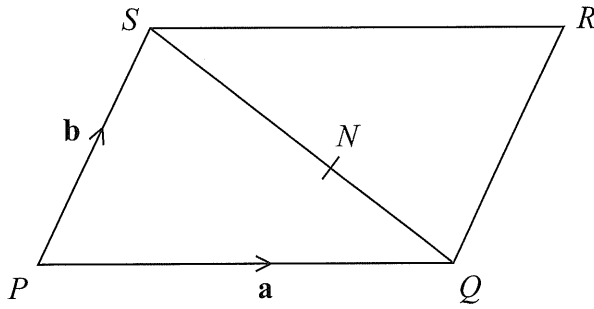


Diagram NOT
accurately drawn

$PQRS$ is a parallelogram.

N is the point on SQ such that $SN : NQ = 3 : 2$

$$\vec{PQ} = \mathbf{a}$$

$$\vec{PS} = \mathbf{b}$$

(a) Write down, in terms of \mathbf{a} and \mathbf{b} , an expression for \vec{SQ} .

$$\vec{SQ} = \vec{SP} + \vec{PQ} = -\mathbf{b} + \mathbf{a}$$

$$\vec{SQ} = \frac{\mathbf{a} - \mathbf{b}}{(1)}$$

(b) Express \vec{NR} in terms of \mathbf{a} and \mathbf{b} .

$$\vec{NR} = \vec{NQ} + \vec{QR}$$

$$\vec{NQ} = \frac{2}{5} \vec{SQ} = \frac{2}{5} (\mathbf{a} - \mathbf{b})$$

$$\vec{QR} = \vec{PS} = \mathbf{b}$$

$$\vec{NR} = \frac{2}{5} (\mathbf{a} - \mathbf{b}) + \mathbf{b}$$

$$= \mathbf{b} - \frac{2}{5} \mathbf{b} + \frac{2}{5} \mathbf{a}$$

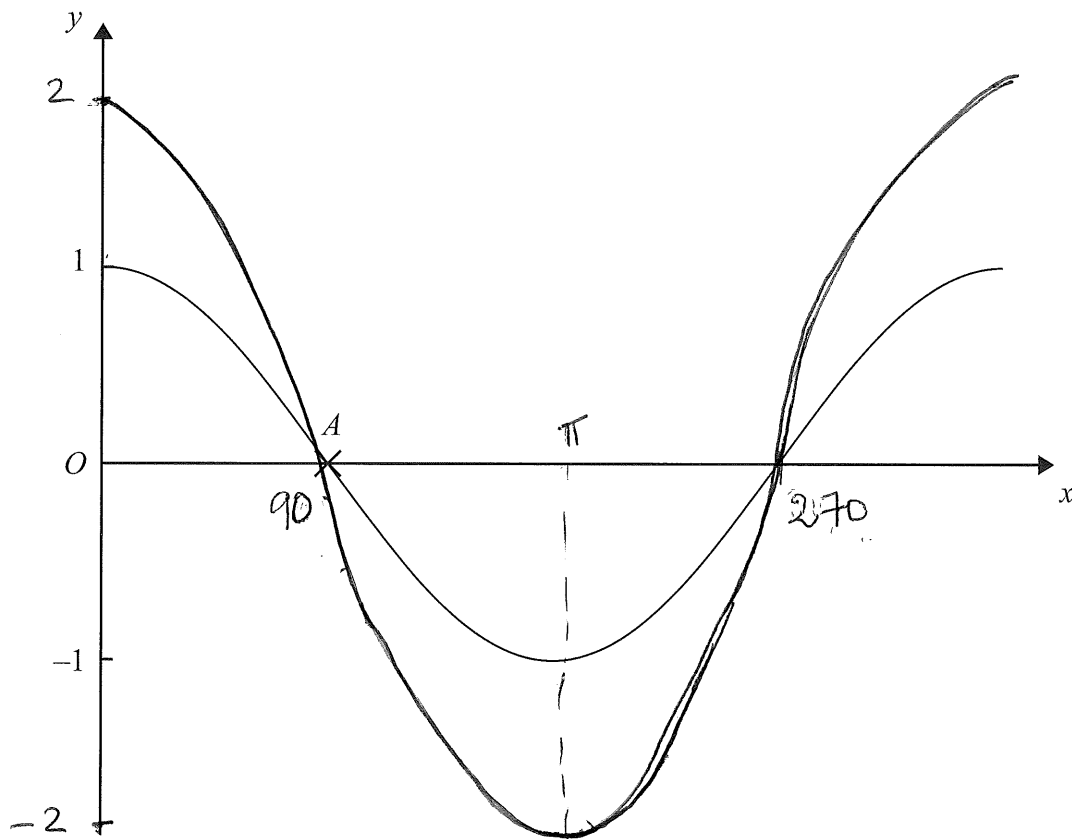
$$= \frac{3}{5} \mathbf{b} + \frac{2}{5} \mathbf{a}$$

$$= \frac{1}{5} (3\mathbf{b} + 2\mathbf{a})$$

$$\vec{NR} = \frac{1}{5} (3\mathbf{b} + 2\mathbf{a}) \quad (3)$$

(Total for Question 27 is 4 marks)

28 The diagram shows a sketch of the graph of $y = \cos x^\circ$



(a) Write down the coordinates of the point A .

(90 , 0)
(1)

(b) On the same diagram, draw a sketch of the graph of $y = 2 \cos x^\circ$

(1)

(Total for Question 28 is 2 marks)

TOTAL FOR PAPER IS 100 MARKS

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