

JUNE
2013
14

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 $1793 \times 185 = 331\,705$

write down the value of

(a) 1.793×185

331.705

(b) $331\,705 \div 1.85$

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.

$$\begin{array}{r} 10\% = 24 \\ 5\% = 12 \\ \hline 15\% = 36 \end{array}$$

$$\frac{1}{4} = 60 \Rightarrow \frac{3}{4} = 180$$

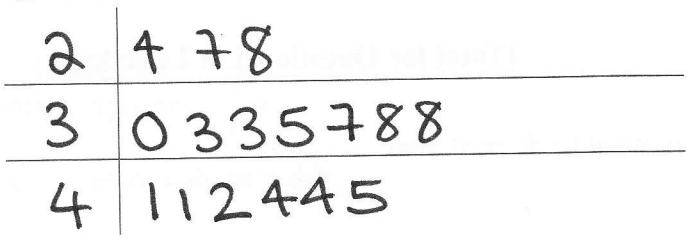
$\therefore 216$ know $\Rightarrow 24$ do not know (4)

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.



Key:
3|5 means 3.5kg

(Total for Question 3 is 3 marks)

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

$6 + 3t$
(1)

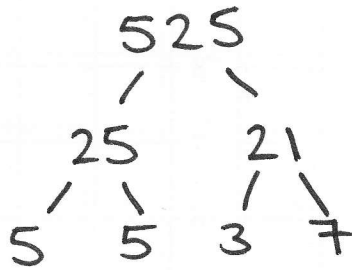
(b) Expand $3x(2x + 5)$

$6x^2 + 15x$
(2)

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

$m^2 + 13m + 30$
(2)

(Total for Question 4 is 5 marks)



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

(Total for Question 5 is 3 marks)

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

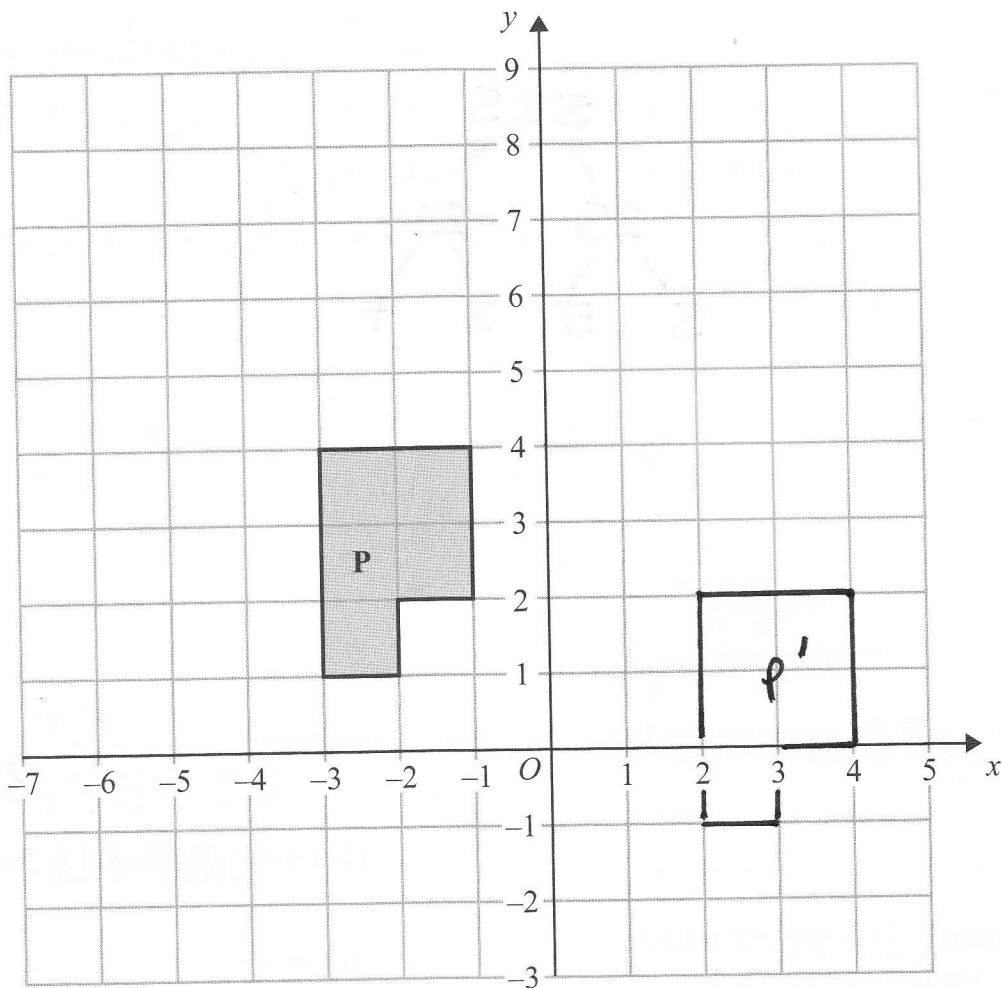
Work out the number on the 4th card.

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

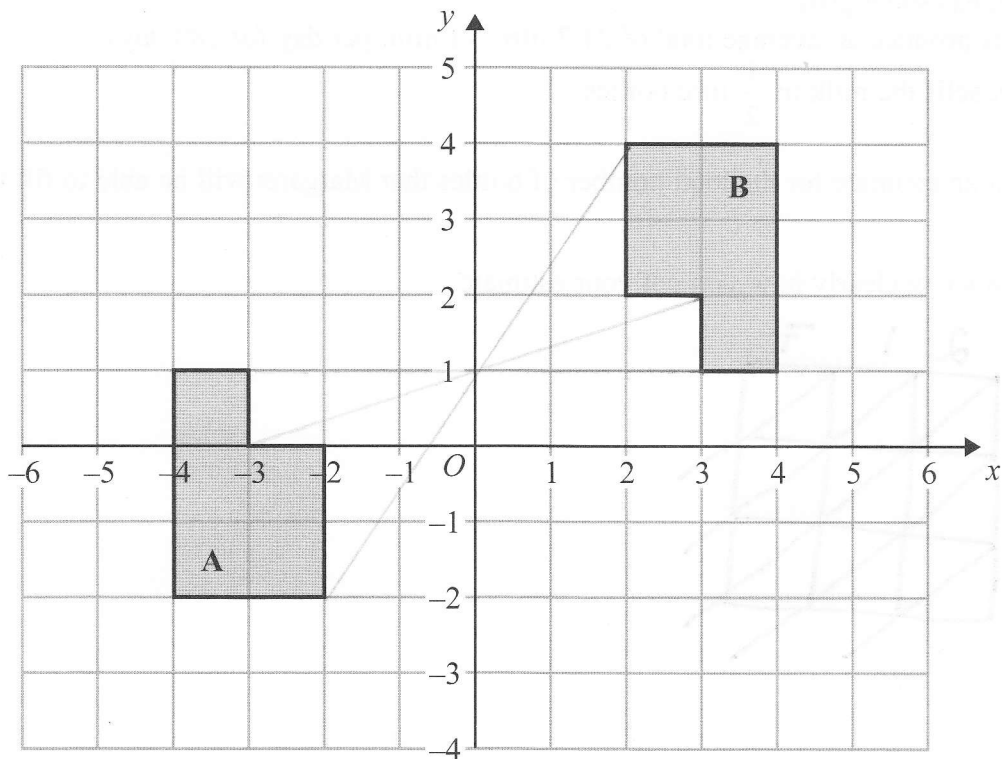
$$12 + 6 + 15 + ? = 40$$

7

(Total for Question 6 is 3 marks)



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



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

Rotation, 180° about (0,1)

(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.

$$20 \times 280 = 5600$$

$$\div \frac{1}{2} = \times 2$$

$$\underline{11200} \text{ lt} \quad (3)$$

(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.

$$\text{lcm}(50, 80) = 400$$

$$\text{Matt} = 8 \text{ laps} ; \text{ Dan} = 5 \text{ laps.} \quad (3)$$

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

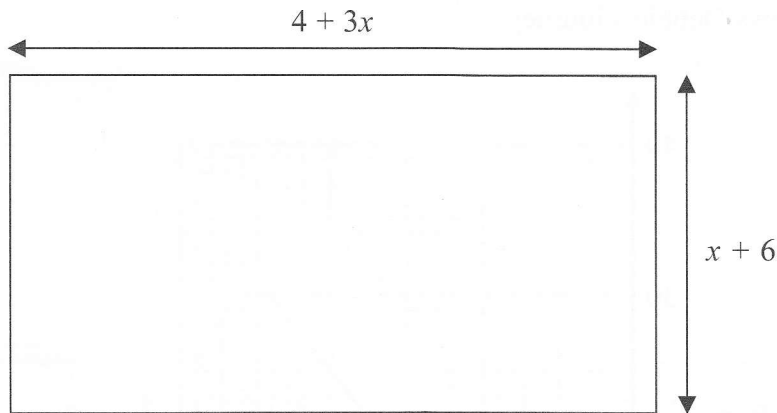


Diagram **NOT**
accurately drawn

All measurements are in metres.

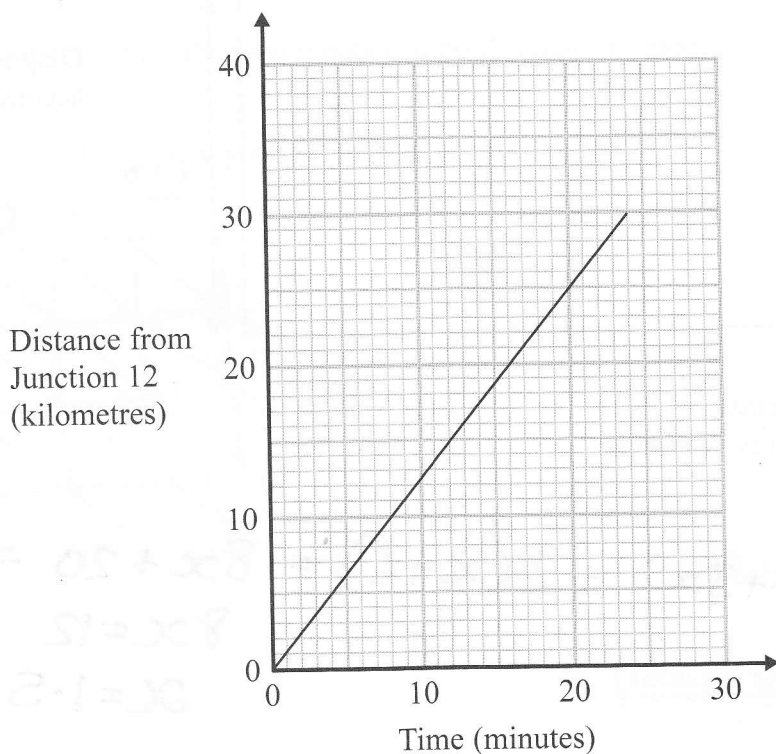
The perimeter of the garden is 32 metres.

Work out the value of x

$$\begin{aligned} P &= 2(4 + 3x) + 2(x + 6) = 8x + 20 = 32 \\ 8x &= 12 \\ x &= 1.5 \quad (4) \end{aligned}$$

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

The travel graph shows Debbie's journey.



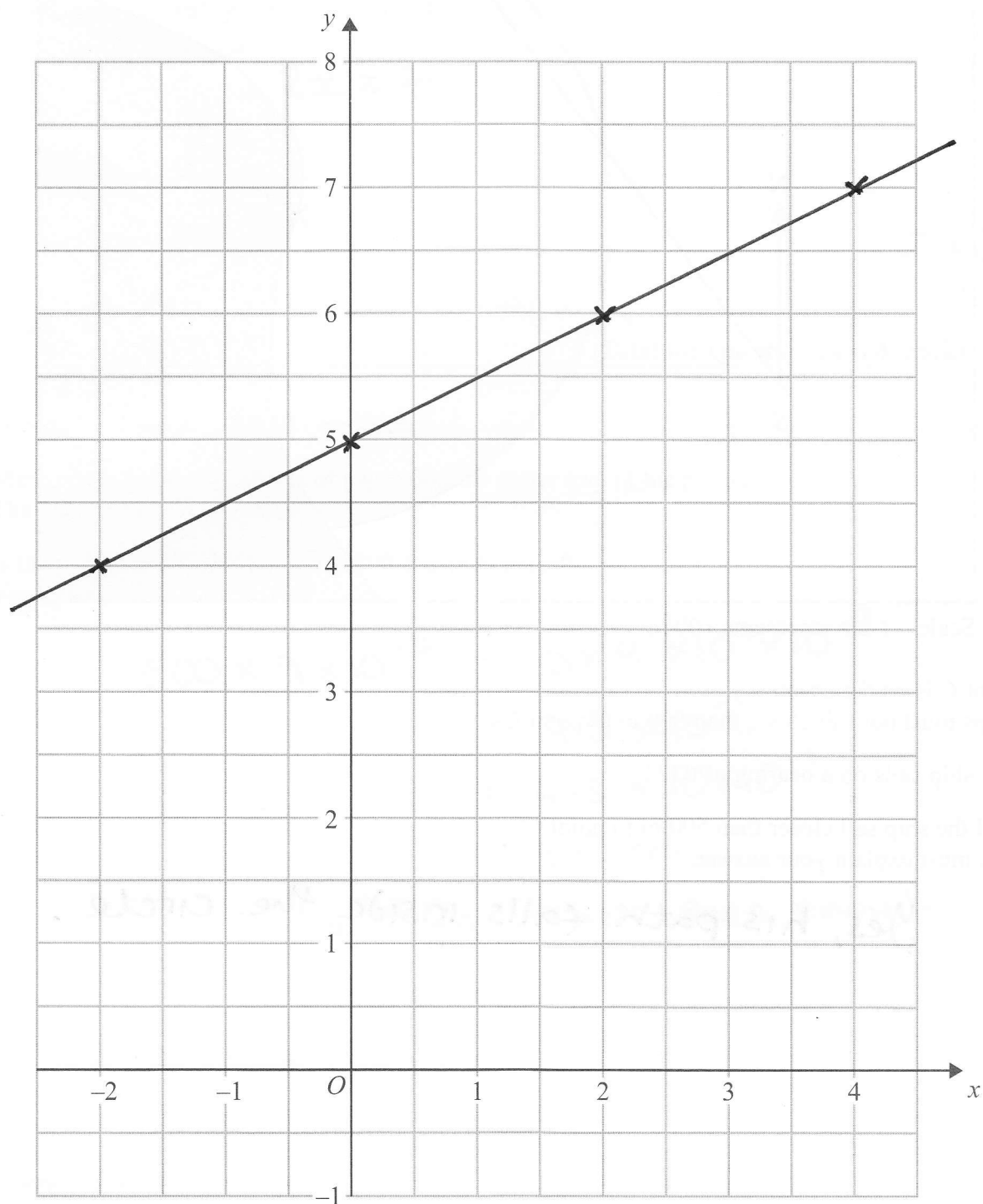
Ian also drove from Junction 12 to Junction 13 on the same motorway.
He drove at an average speed of 66 km/hour.

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

Debbie = 25 km in 20 min ($\times 3$)
75 km in 1 hr $\Rightarrow$ 75 km/h.

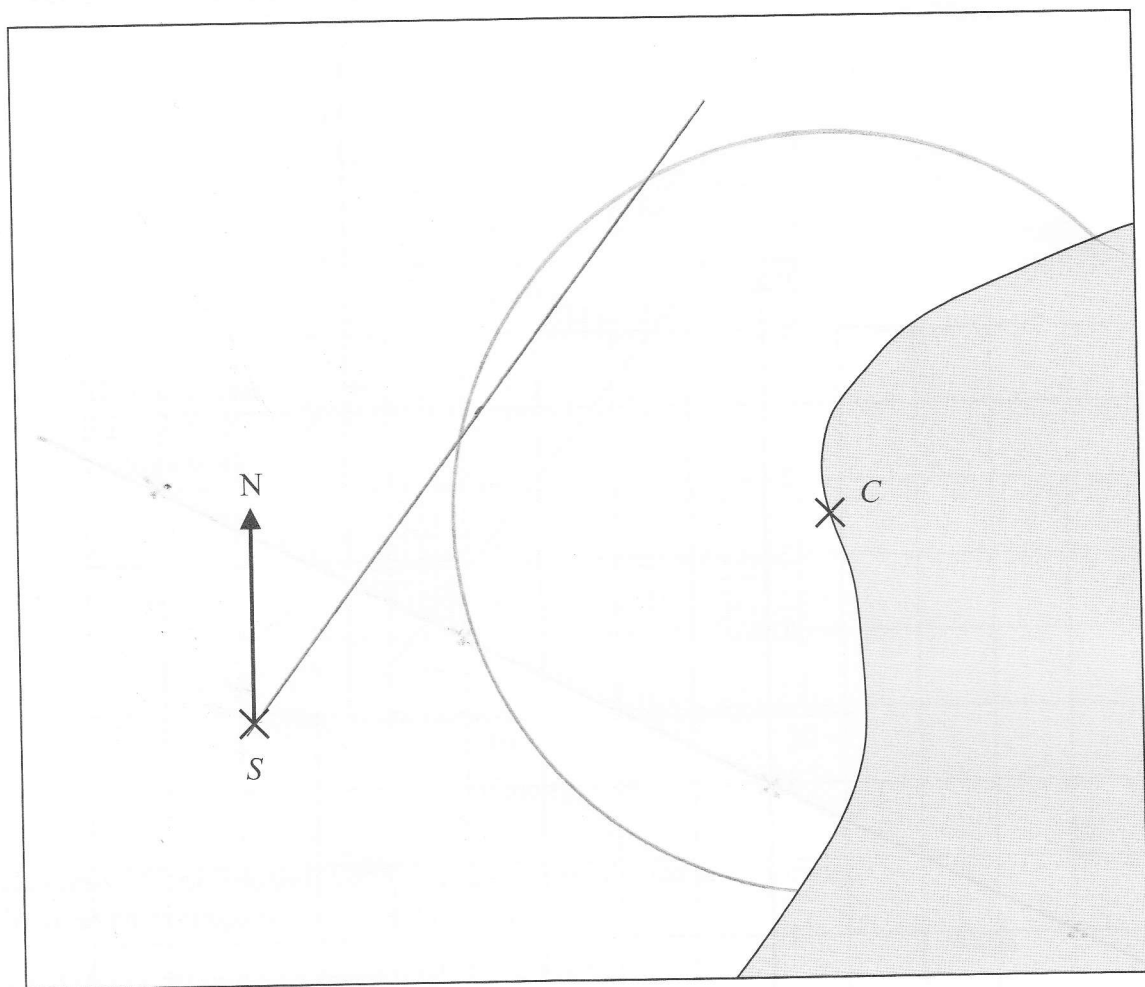
$\therefore$ Debbie is faster.

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



(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 .

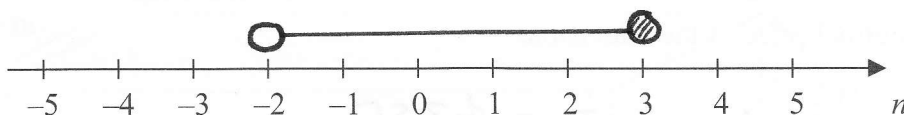
The ship sails on a bearing of 037°

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

Yes, his path falls inside the circle.

14 $-2 < n \leq 3$

(a) Represent this inequality on the number line.



(2)

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

$$2x \geq 7$$

$$x \geq 3.5$$

(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.

$$\begin{aligned} 500 \times 9 \times 10^{-3} &= 5 \times 9 \times 10^2 \times 10^{-3} \\ &= 45 \times 10^{-1} \\ &= 4.5 \times 10 \times 10^{-1} \\ &= 4.5 \text{ cm} \end{aligned}$$

No, tray is not deep enough. (3)

(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.

$$\text{normal} \times 0.7 = \text{£}350$$

↖ ↗

$$\text{normal} = \text{£}500$$

$$\begin{aligned} 350 \div \frac{7}{10} &= 350 \times \frac{10}{7} \\ &= \frac{3500}{7} \end{aligned}$$

alt 70% = £350

(÷7) 10% = £50

(×10) 100% = £500

£ 500

(Total for Question 16 is 3 marks)

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

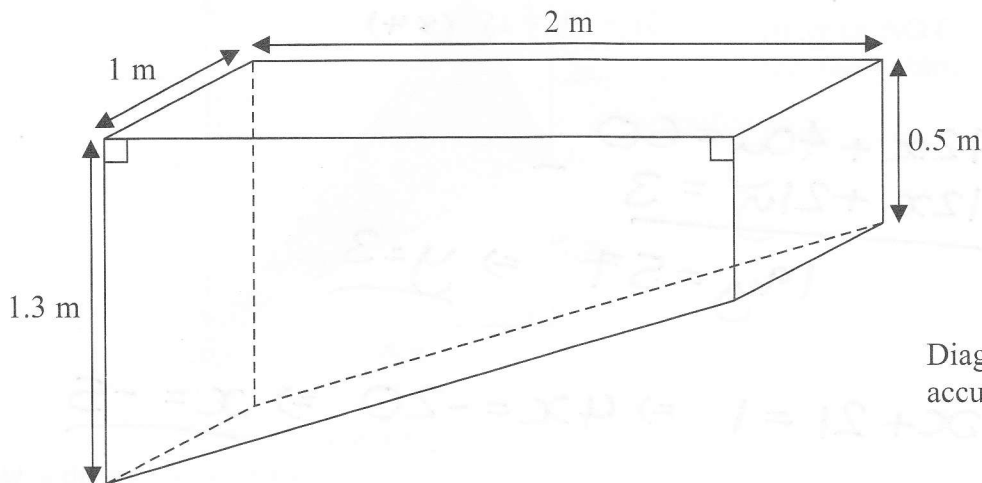


Diagram **NOT**
accurately drawn

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.

$$\text{Area of trapezium} = \frac{(1.3 + 0.5) \times 2}{2} = 1.8$$

$$\text{Volume} = 1.8 \times 1 = 1.8 \text{ m}^3$$

Volume of water in first 30 min

$$\begin{array}{c} 2 \\ \text{1} \\ \text{0.2} \end{array} \begin{array}{c} \text{---} \\ \text{---} \\ \text{---} \end{array} = 0.4 \text{ m}^3 \quad \therefore 1.4 \text{ m}^3 \text{ remaining}$$

$$\frac{1.4}{0.4} = \frac{14}{4} = 3.5 \text{ (x30)} = 105 \text{ min}$$

105 min

18 Solve the simultaneous equations

$$4x + 7y = 1 \quad (\times 3)$$

$$3x + 10y = 15 \quad (\times 4)$$

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

$$4x + 21 = 1 \Rightarrow 4x = -20 \Rightarrow x = -5$$

$$x = -5$$

$$y = 3$$

(Total for Question 18 is 4 marks)

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

$$5^{-1}$$

$$0.5$$

$$-5$$

$$5^0$$

$$\frac{1}{5} = 0.2$$

$$(-5, 5^{-1}, 0.5, 5^0) \quad -5, 0.2, 0.5, 1$$

(Total for Question 19 is 2 marks)

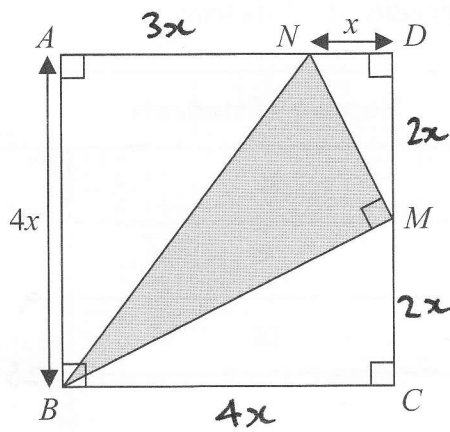


Diagram NOT
accurately drawn

$ABCD$ 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.

$$\begin{array}{lcl}
 \begin{array}{c} A \quad 4x \quad D \\ | \quad \quad | \\ 4x \quad \quad \\ | \quad \quad | \\ B \quad \quad C \end{array} & = 16x^2 & \begin{array}{c} A \quad 3x \quad N \\ | \quad \quad | \\ 4x \quad \quad \\ | \quad \quad | \\ B \quad \quad \end{array} = \frac{12x^2}{2} = 6x^2 & \begin{array}{c} N \quad x \quad D \\ | \quad \quad | \\ \quad \quad \quad \\ | \quad \quad | \\ \quad \quad M \end{array} = \frac{2x^2}{2} = x^2
 \end{array}$$

$$\begin{array}{c} M \\ | \\ 2x \\ | \\ B \quad 4x \quad C \end{array} = \frac{8x^2}{2} = 4x^2$$

$$\begin{aligned}
 \therefore \text{Area } \triangle BMN &= 16x^2 - 6x^2 - x^2 - 4x^2 \\
 &= \underline{5x^2} \quad (4)
 \end{aligned}$$

$$5x^2$$

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

4

9

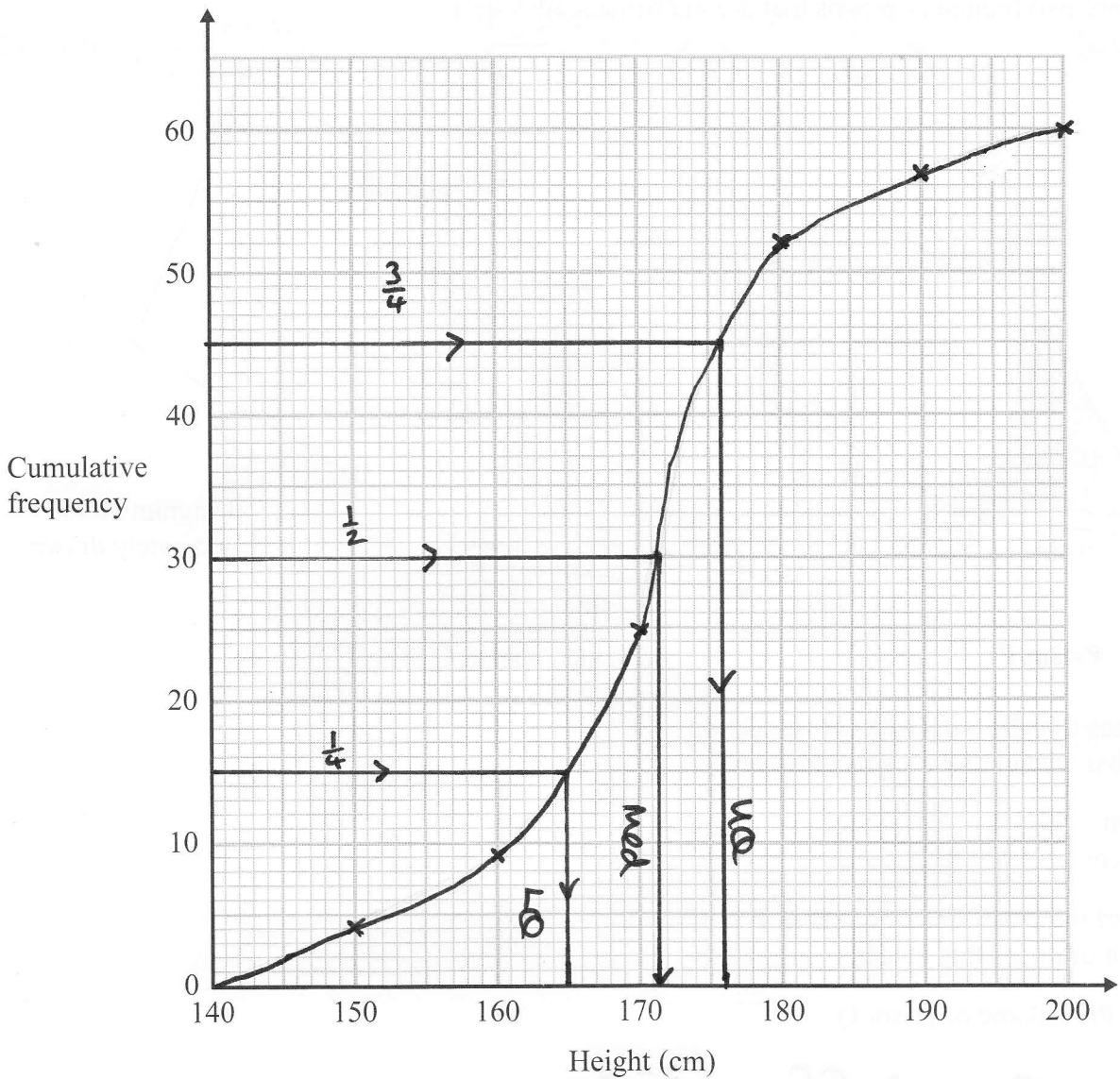
25

52

57

60

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



(b) Find an estimate

(i) for the median,

171

cm

(ii) for the interquartile range.

176 - 165

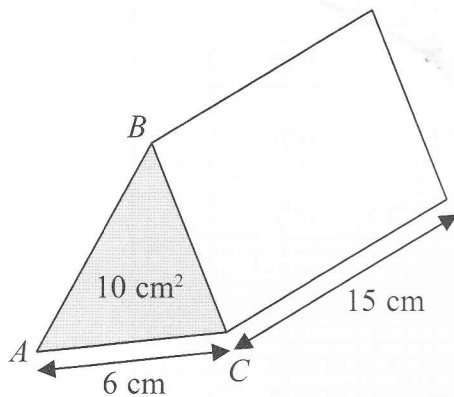
11

cm

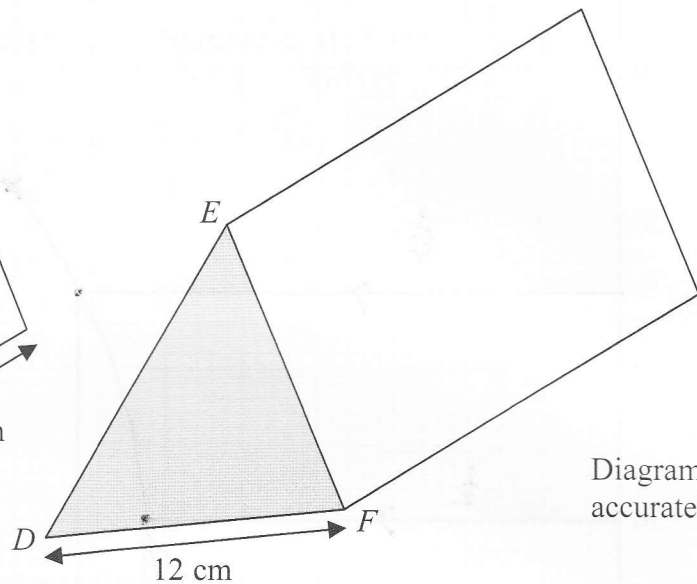
(3)

(Total for Question 21 is 6 marks)

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



Prism P



Prism Q

Diagram **NOT** accurately drawn

Prism P has triangle ABC as its cross section.

Prism Q has triangle DEF as its cross section.

$$AC = 6 \text{ cm}$$

$$DF = 12 \text{ cm}$$

The area of the cross section of prism P is 10 cm^2 .

The length of prism P is 15 cm.

Work out the volume of prism Q.

$$sf_L = 2 \Rightarrow sf_v = 2^3 = 8$$

$$Vol_p = 10 \text{ cm}^2 \times 15 \text{ cm} = 150 \text{ cm}^3$$

$$\therefore Vol_q = 150 \times 8 = 1200 \text{ cm}^3$$

(4)

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

$$= \frac{\cancel{4(x+5)}}{(x-3)\cancel{x(x+5)}} = \frac{4}{x-3} \quad (2)$$

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

cw

10

5

5

10

15

f.d

1.2

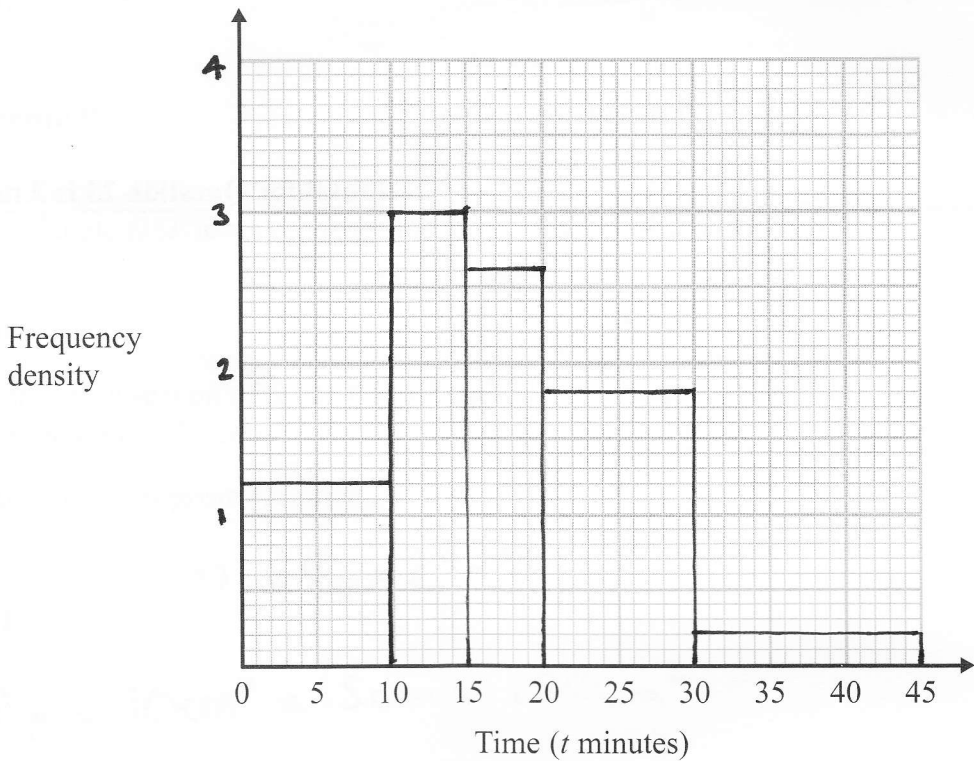
3

2.6

1.8

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 .

$$\begin{aligned}(x-4)^2 - 16 + 21 \\ (x-4)^2 + 5\end{aligned}$$

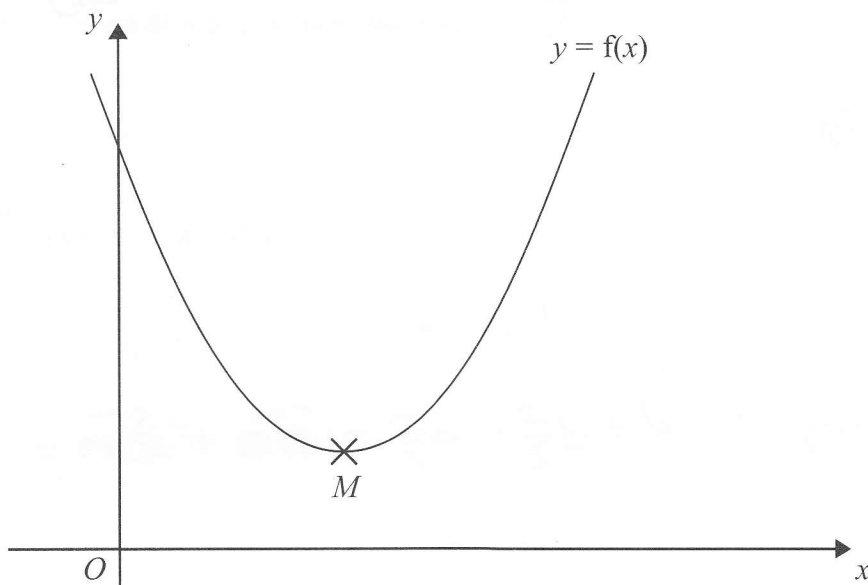
$$a = 4$$

$$b = 5$$

(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 .

$$(4, 5)$$

(1)

(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

$$\left. \begin{array}{ccc} \text{£1} & \text{£1} & 50\text{p} \\ \text{£1} & 50\text{p} & \text{£1} \\ 50\text{p} & \text{£1} & \text{£1} \end{array} \right\} 3 \times \frac{3}{10} \times \frac{2}{9} \times \frac{7}{8} = \frac{126}{720}$$
$$= \frac{7}{40} \quad (4)$$

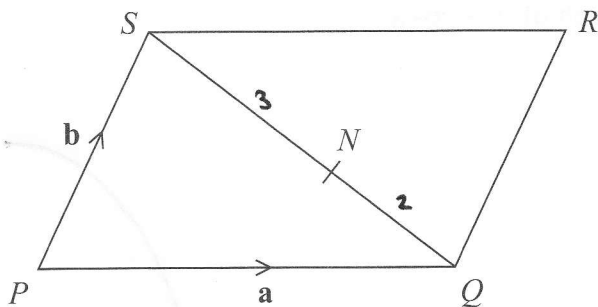


Diagram **NOT**
accurately drawn

$PQRS$ 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 $\vec{SQ}$.

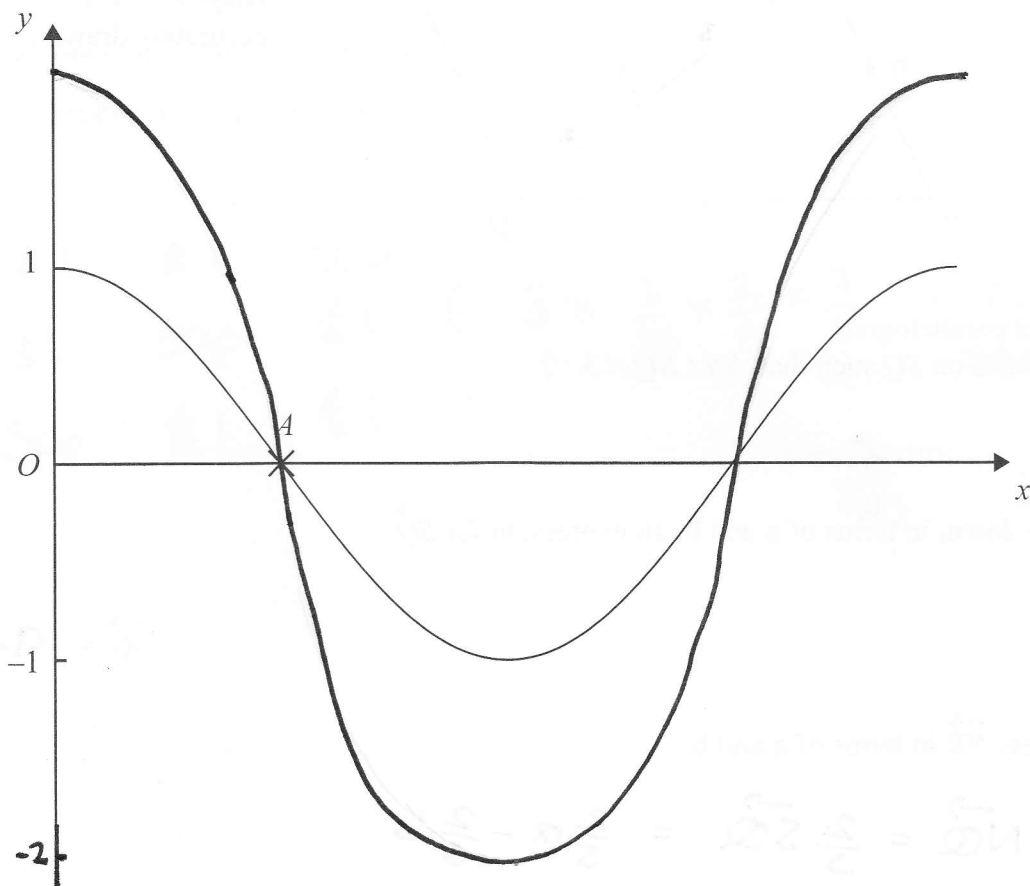
$$\vec{SQ} = \underline{\mathbf{a} - \mathbf{b}} \quad (1)$$

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

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

$$\vec{NR} = \vec{NQ} + \vec{QR} = \frac{2}{5} \mathbf{a} - \frac{2}{5} \mathbf{b} + \mathbf{b} = \frac{2}{5} \mathbf{a} + \frac{3}{5} \mathbf{b} \quad (4)$$

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)