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Write your name here		
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Edexcel GCSE	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
Mathematics A		
Paper 1 (Non-Calculator)		
		Higher Tier
Wednesday 4 November 2015 – Morning		Paper Reference
Time: 1 hour 45 minutes		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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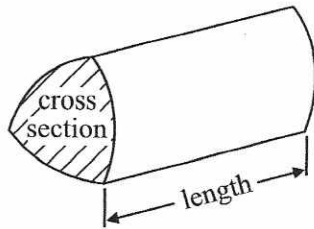
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GCSE Mathematics 1MA0

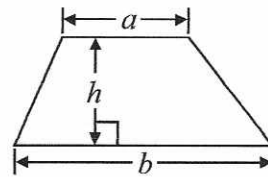
Formulae: Higher Tier

**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

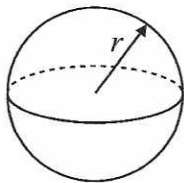


Area of trapezium = $\frac{1}{2}(a + b)h$



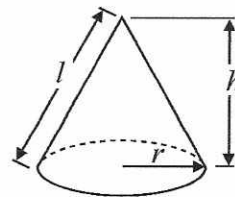
Volume of sphere = $\frac{4}{3}\pi r^3$

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

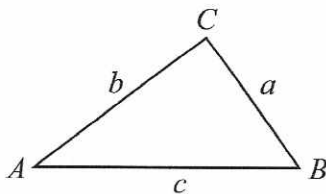


Volume of cone = $\frac{1}{3}\pi r^2 h$

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 Sean wants to go on holiday.

He is going to get a loan of £720 to help pay for the holiday.

Sean will have to pay back the £720 plus interest of 15%.

He will pay this back in 12 equal monthly installments.

How much money will Sean pay back each month?

$$\begin{aligned} 10\% \text{ of } £720 &= £72 \\ 5\% \text{ of } £720 &= £36 \\ 15\% \text{ of } £720 &= £108 \end{aligned}$$

$$£720 + £108 = £828$$

$$\frac{828}{12} = \frac{414}{6} = \frac{207}{3} = £69$$

£ 69

(Total for Question 1 is 4 marks)

2 Use the fact that

$$5.4 \times 36 = 194.4$$

to find the value of

(i) 5.4×3.6

19.44

(ii) 54×360

19440

(Total for Question 2 is 2 marks)

3 Here are the first four terms of an arithmetic sequence.

$$\begin{array}{ccccccc} 6n & 6 & 12 & 18 & 24 & & \\ & 11 & 17 & 23 & 29 & & \\ & \underbrace{\quad} & \underbrace{\quad} & & & & \\ & +6 & +6 & & & & \end{array}$$

(a) Find, in terms of n , an expression for the n th term of this arithmetic sequence.

$6n + 5$
(2)

(b) Is 121 a term of this arithmetic sequence?

You must explain your answer.

$$6n + 5 = 121$$

$$6n = 116$$

$$n = \frac{116}{6}$$

No. $\frac{116}{6}$ is not a whole number.

(2)

(Total for Question 3 is 4 marks)

- 4 There are some black pens, some blue pens, some red pens and some green pens in a box.

The table shows the probabilities that a pen taken at random from the box will be black or will be blue or will be red.

colour	black	blue	red	green
probability	0.3	0.2	0.4	

There are 200 pens in the box.

- (a) Work out the number of black pens in the box.

$$0.3 \times 200$$

$$\frac{60}{(2)}$$

A pen is taken at random from the box.

- (b) Work out the probability that the pen will be green.

$$1 - (0.3 + 0.2 + 0.4)$$

$$1 - 0.9$$

$$\frac{0.1}{(2)}$$

(Total for Question 4 is 4 marks)

5 Here are the ingredients needed to make 8 shortbread biscuits.

16	Shortbread biscuits makes 8 biscuits	4 biscuits	2 biscuits
240		60	30
120		30	15
360		90	45

Tariq is going to make some shortbread biscuits.
He has the following ingredients

330 g butter 200 g caster sugar 450 g flour

Work out the greatest number of shortbread biscuits that Tariq can make with his ingredients.
You must show all your working.

Butter: 2 Biscuits = 30g
 20 Biscuits = 300g
 22 Biscuits = 330g

Caster sugar: 2 Biscuits = ~~30g~~¹⁵
 20 Biscuits = 150g
 4 Biscuits = 30g
 —————
 26 Biscuits = 195g

Flour
 16 Biscuits = 360g
 4 Biscuits = 90g
 —————
 20 Biscuits = 450g

.....20..... biscuits

(Total for Question 5 is 3 marks)

*6

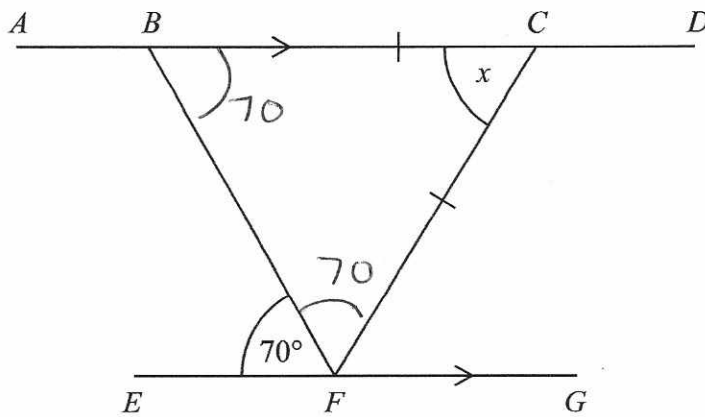


Diagram NOT
accurately drawn

$ABCD$ and EFG are parallel lines.

$BC = CF$

Angle $BFE = 70^\circ$

Work out the size of the angle marked x .

Give reasons for each stage of your working.

$\hat{C}BF = 70^\circ$ Alternate angles are equal

$\hat{B}FC = 70^\circ$ Angles at the base of an isosceles triangle are equal

$x = 40^\circ$ Angles in a triangle add up to 180°

$180 - (70 + 70) = 40^\circ$

(Total for Question 6 is 4 marks)

- 7 Martin wants to find out how often students use the local tram service. He uses this question on a questionnaire.

How often do you use the local tram service?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
a little	sometimes	a lot

- (a) Write down **two** things wrong with this question.

- 1 there is no time scale.
- 2 The options are vague. They should be specific eg 1-2 times, 3-4 times
- (2)

- (b) Design a better question for a questionnaire for Martin to find out how often students use the local tram service.

How often do you use the local tram service a week?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1-2	3-4	5 or more

(2)

(Total for Question 7 is 4 marks)

8 Milk is sold in $\frac{1}{2}$ pint bottles, in 1 pint bottles and in 2 pint bottles.

One weekend a shop sold 100 bottles of milk.

46 of the bottles were sold on Sunday.

15 of the bottles sold on Sunday were 2 pint bottles.

31 of the bottles sold on Saturday were $\frac{1}{2}$ pint bottles.

22 of the bottles sold were 2 pint bottles.

30 of the bottles sold were 1 pint bottles.

How many 1 pint bottles were sold on Sunday?

	saturday	sunday	total
$\frac{1}{2}$ pint	31	17	48
pint	16	14	30
2 pint	7	15	22
total	54	46	100

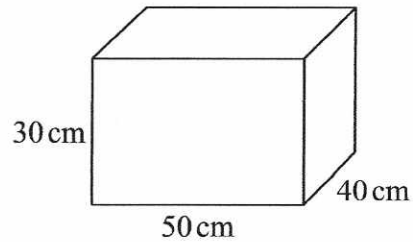
14

(Total for Question 8 is 4 marks)

- *9 The diagram shows a container for oil.
The container is in the shape of a cuboid.
The container is empty.

Diagram **NOT**
accurately drawn

Sally has to fill the container with oil.
A bottle of oil costs £3.50
There are 3000 cm^3 of oil in each bottle.



Sally must **not** spend more than £60 buying the oil.

Can Sally buy enough oil to fill the container?
You must show all your working.

$$\begin{aligned} \text{volume} &= 30 \times 50 \times 40 \text{ cm}^3 \\ &= 60\,000 \text{ cm}^3 \end{aligned}$$

$$\frac{60\,000}{3000} = 20 \text{ bottles required}$$

$$£3.50 \times 10 = £35$$

$$£3.50 \times 20 = £70$$

Sally does not have enough money
to fill the container.

(Total for Question 9 is 4 marks)

10 (a) Expand $x(x + 2)$

$$\frac{x^2 + 2x}{(1)}$$

(b) Expand and simplify $3(y + 2) + 4(x - 1)$

$$3y + 6 + 4x - 4$$

$$\frac{3y + 4x - 2}{(2)}$$

(c) Expand and simplify $(2t - 3)(t + 5)$

$$2t^2 + 10t - 3t - 15$$

$$\frac{2t^2 + 7t - 15}{(2)}$$

(d) Factorise fully $8a^2 + 12a$

$$\frac{4a(2a + 3)}{(2)}$$

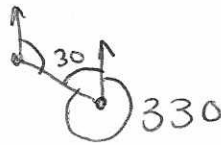
(e) Factorise $y^2 - y - 2$

$$\frac{(y - 2)(y + 1)}{(2)}$$

(Total for Question 10 is 9 marks)

11 Manchester airport is on a bearing of 330° from a London airport.

(a) Find the bearing of the London airport from Manchester airport.



$$\frac{150}{(2)}^\circ$$

The London airport is 200 miles from Manchester airport.

A plane leaves Manchester airport at 10 am to fly to the London airport.
The plane flies at an average speed of 120 mph.

(b) What time does the plane arrive at the London airport?

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{time} = \frac{\text{distance}}{\text{speed}}$$

$$= \frac{200}{120} = \frac{10}{6} = \frac{5}{3} = \underline{1 \text{ hr } 40 \text{ mins}}$$

$$\frac{1140 \text{ am}}{(4)}$$

(Total for Question 11 is 6 marks)

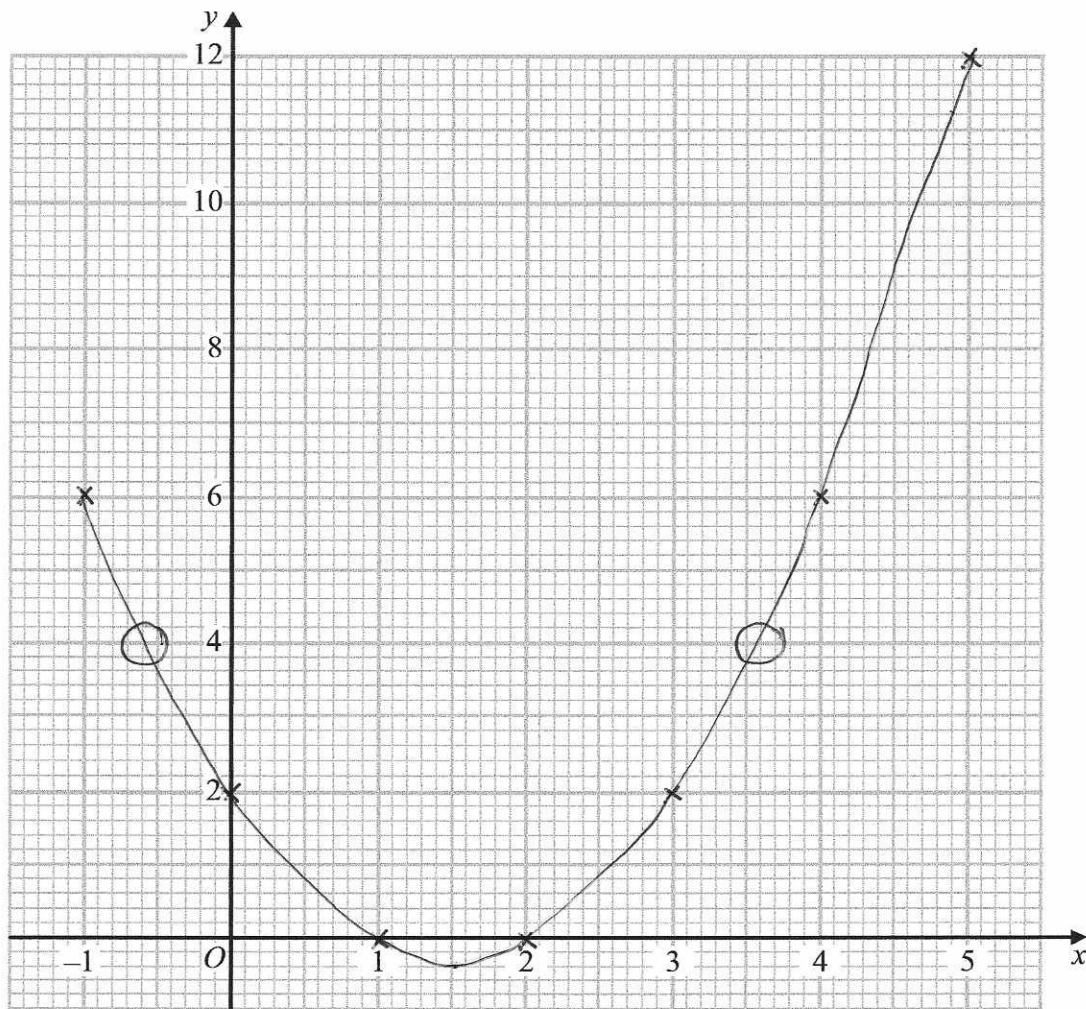
12 (a) Complete the table of values for $y = x^2 - 3x + 2$

x	-1	0	1	2	3	4	5
y	6	2	0	0	2	6	12

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x + 2$ for values of x from -1 to 5

(2)



(c) Find estimates for the solutions of the equation $x^2 - 3x + 2 = 4$

$$x = -0.6 \quad x = 3.6$$

(2)

(Total for Question 12 is 6 marks)

13 There are 18 packets of sweets and 12 boxes of sweets in a carton.

The mean number of sweets in all the 30 packets and boxes is 14

The mean number of sweets in the 18 packets is 10

Work out the mean number of sweets in the boxes.

$$18 \text{ Packets} \times 10 \text{ sweets} = 180 \text{ sweets}$$

12 Boxes

$$30 \text{ Total} \times 14 \text{ sweets} = 420 \text{ sweets}$$

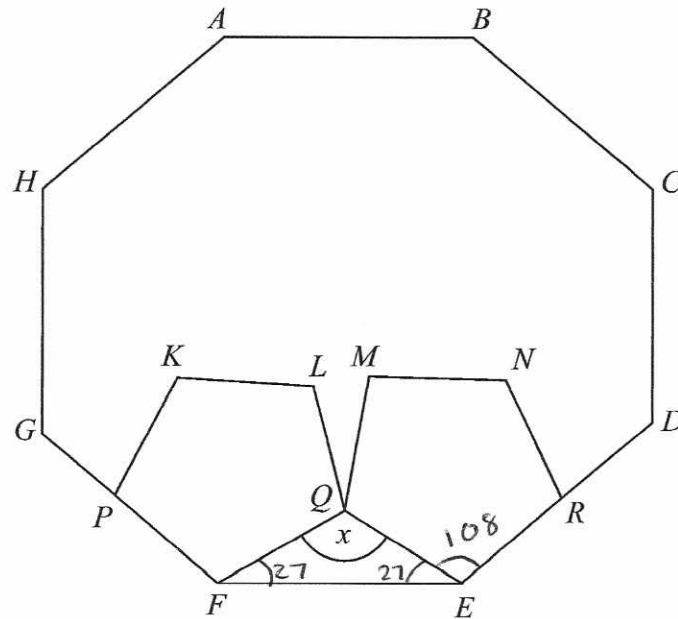
$$\begin{array}{r} 14 \times 10 = 140 \\ 140 \\ \hline 420 \end{array}$$

$$420 - 180 \text{ in the boxes} = 240 \text{ sweets}$$

$$\frac{240}{12} = 20$$

20

(Total for Question 13 is 3 marks)

Diagram NOT
accurately drawn

$ABCDEFGH$ is a regular octagon.
 $KLOFP$ and $MNREQ$ are two identical regular pentagons.

Work out the size of the angle marked x .
 You must show all your working.

$$\text{octagon : exterior angle} = \frac{360}{8} = \frac{180}{4} = \frac{90}{2} = 45^\circ$$

$$\text{pentagon : exterior angle} = \frac{360}{5} = \frac{720}{10} = 72^\circ$$

$$\text{octagon interior angle} = 180 - 45 = 135^\circ$$

$$\text{pentagon : } 180 - 72 = 108^\circ$$

$$\hat{FEQ} = 135 - 108 = 27^\circ$$

(\hat{EFQ} and \hat{FEQ})

$$\begin{aligned} x &= 180 - (27 + 27) \\ &= 180 - 54 \\ &= 126^\circ \end{aligned}$$

126°

(Total for Question 14 is 4 marks)

15 Sue works for a company that delivers parcels.

One day the company delivered 80 parcels.

The table shows information about the weights, in kg, of these parcels.

Weight (w kg)	Frequency
$0 < w \leq 1$	19
$1 < w \leq 2$	17
$2 < w \leq 3$	15
$3 < w \leq 4$	12
$4 < w \leq 5$	10
$5 < w \leq 6$	7

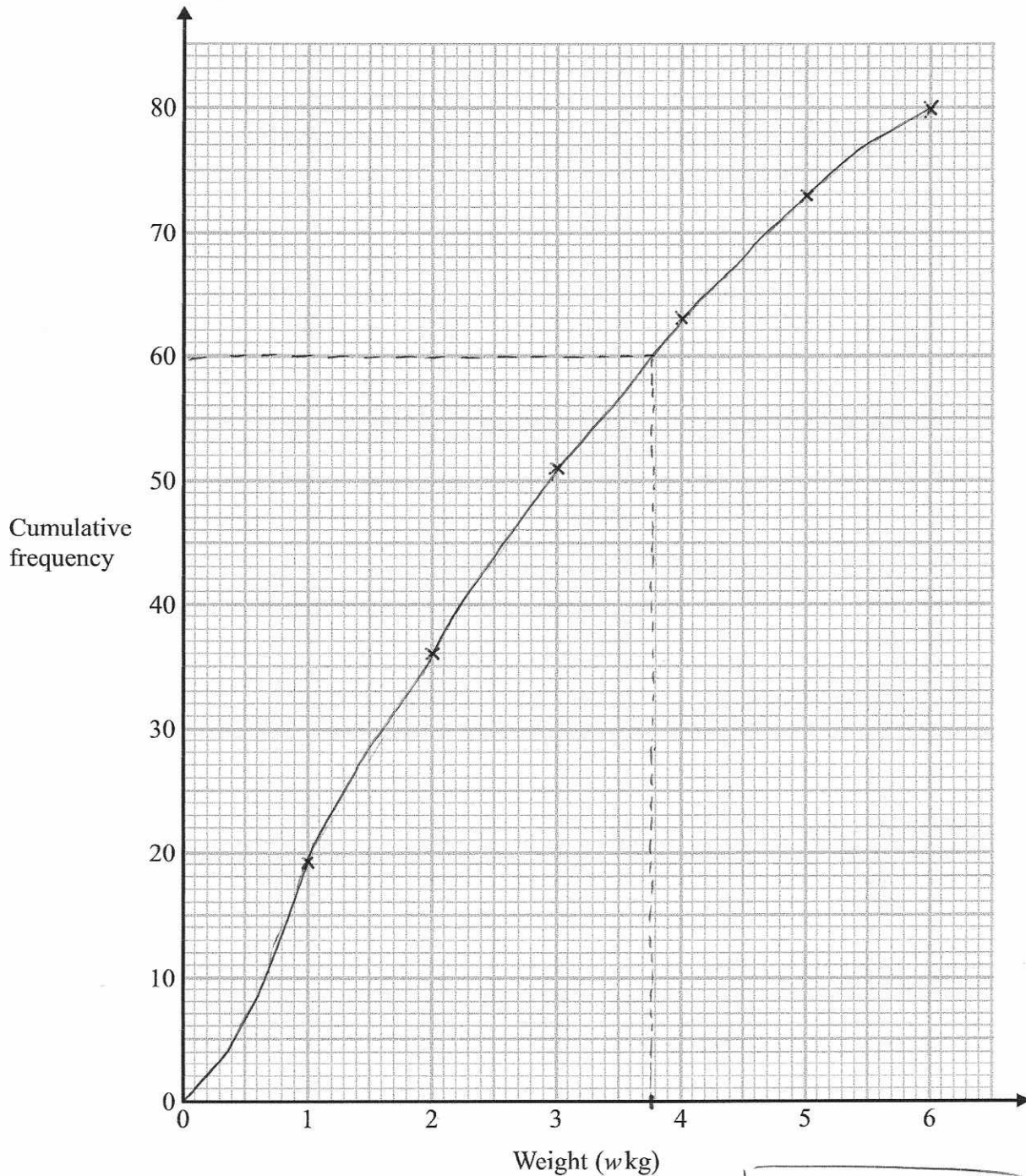
(a) Complete the cumulative frequency table.

Weight (w kg)	Cumulative frequency
$0 < w \leq 1$	19
$0 < w \leq 2$	36
$0 < w \leq 3$	51
$0 < w \leq 4$	63
$0 < w \leq 5$	73
$0 < w \leq 6$	80

(1)

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

(2)



Sue says, "75% of the parcels weigh less than 3.4 kg."

* (c) Is Sue correct? $75\% = 60$
You must show how you get your answer.

3.75 kg

75% of parcels weigh below 3.75 kg (3.6 - 3.8)

Sue is not correct.

(3)

OR
Line drawn up from
3.4

(Total for Question 15 is 6 marks)

- 16 $ABCD$ is a trapezium.
 $STUV$ is a rectangle.

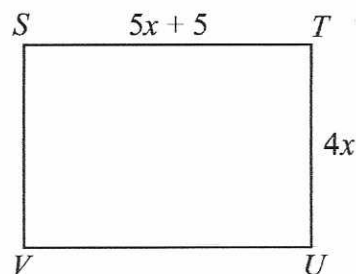
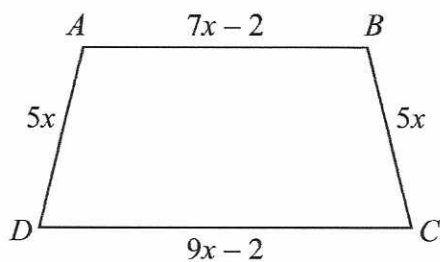


Diagram NOT accurately drawn

All measurements are in centimetres.

The two shapes have the same perimeter.

Work out the length of ST .

$$7x - 2 + 5x + 9x - 2 + 5x = 5x + 5 + 4x + 5x + 5 + 4x$$

$$\begin{array}{r} 26x - 4 \\ -18x \\ \hline 8x - 4 \end{array} = \begin{array}{r} 18x + 10 \\ -18x \\ \hline 10 \end{array}$$

$$8x - 4 = 10$$

$$+4 \quad +4$$

$$8x = 14$$

$$x = \frac{7}{4} = 1.75 \text{ cm}$$

$$\begin{array}{l} 10 \times 1.75 = 17.5 \\ 5 \times 1.75 = 8.75 \end{array}$$

$$\begin{aligned} ST &= 5(1.75) + 5 \\ &= 8.75 + 5 \\ &= 13.75 \end{aligned}$$

$$\underline{13.75} \text{ cm}$$

(Total for Question 16 is 5 marks)

17 Solve

$$2x + 3y = \frac{2}{3} \quad \times 3$$

$$3x - 4y = 18 \quad \times 2$$

$$6x + 9y = 2$$

$$6x - 8y = 36$$

$$17y = -34$$

$$y = -2$$

$$3x - 4(-2) = 18$$

$$3x + 8 = 18$$

$$3x = 10$$

$$x = \frac{10}{3}$$

$$x = \frac{10}{3}$$

$$y = -2$$

(Total for Question 17 is 4 marks)

18 Rationalise the denominator of $\frac{10}{\sqrt{5}}$

Give your answer in its simplest form.

$$\frac{10 \times \sqrt{5}}{\sqrt{5} \times \sqrt{5}}$$

$$\frac{10\sqrt{5}}{5}$$

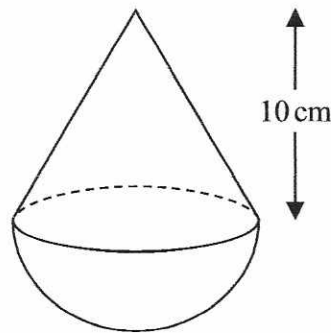
$$2\sqrt{5}$$

$$2\sqrt{5}$$

(Total for Question 18 is 2 marks)

19 The diagram shows a solid shape.

Diagram **NOT** accurately drawn



The solid shape is made from a hemisphere and a cone.
The radius of the hemisphere is equal to the radius of the base of the cone.

The cone has a height of 10 cm.
The volume of the cone is $270\pi \text{ cm}^3$.

Work out the total volume of the solid shape.
Give your answer in terms of π .

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

$$270\pi = \frac{1}{3} \pi r^2 (10)$$

$$27 = \frac{1}{3} r^2 \quad \begin{array}{l} \div 10 \\ \times 3 \end{array}$$

$$81 = r^2$$

$$\underline{\underline{r = 9}}$$

$$\text{Volume of hemisphere} = \frac{1}{2} \left(\frac{4}{3} \pi r^3 \right)$$

$$= \frac{1}{2} \left(\frac{4}{3} \pi (9)^3 \right)$$

$$= \frac{4}{6} \pi (9)^3$$

$$= \frac{2}{3} \pi (9)^3$$

$$= 486\pi$$

~~$$\begin{array}{r} 9 \times 9 \times 9 \\ 81 \times 9 \\ 81 \\ \times 9 \\ \hline 729 \end{array}$$~~

$$\frac{2}{3} \times 9 \times 9 \times 9$$

$$6 \times 9 \times 9$$

$$\begin{array}{r} 81 \\ \times 6 \\ \hline 486 \end{array}$$

$$\begin{array}{r} 270\pi \\ + 486\pi \\ \hline 756\pi \end{array}$$

$$\underline{\underline{756\pi \text{ cm}^3}}$$

(Total for Question 19 is 5 marks)

*20

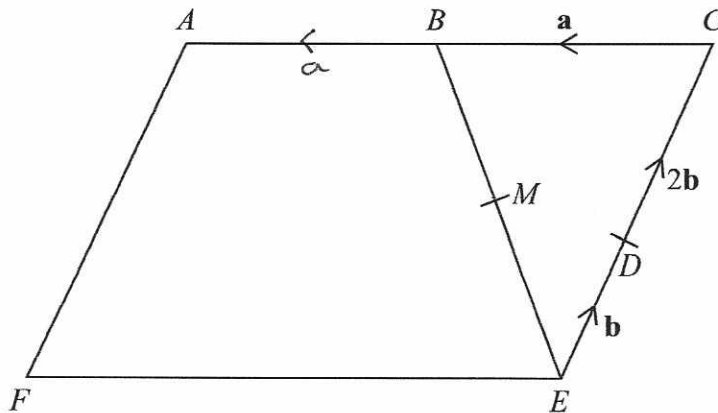


Diagram NOT accurately drawn

$ACEF$ is a parallelogram.
 B is the midpoint of AC .
 M is the midpoint of BE .

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

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

$$\vec{DC} = 2\mathbf{b}$$

Show that AMD is a straight line.

$$\vec{BM} = \frac{1}{2} \vec{BE}$$

$$\vec{BE} = -\mathbf{a} - 3\mathbf{b}$$

$$\vec{BM} = -\frac{1}{2}\mathbf{a} - \frac{3}{2}\mathbf{b}$$

$$\vec{AM} = \vec{AB} + \vec{BM}$$

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

$$= -\frac{3}{2}\mathbf{a} - \frac{3}{2}\mathbf{b}$$

$$\vec{AD} = -2\mathbf{a} - 2\mathbf{b}$$

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

$$\vec{AD} = -2(\mathbf{a} + \mathbf{b})$$

AMD is a straight line \vec{AM} and \vec{AD} are parallel
 and both pass through A

(Total for Question 20 is 5 marks)

21 (a) Write as a single fraction in its simplest form $\frac{5}{2-x} - \frac{4}{x}$

$$\frac{5(x)}{(2-x)(x)} - \frac{4(2-x)}{x(2-x)}$$

$$\frac{5x}{x(2-x)} - \frac{4(2-x)}{x(2-x)}$$

$$\frac{5x - 4(2-x)}{x(2-x)}$$

$$\frac{5x - 8 + 4x}{x(2-x)}$$

$$\frac{9x - 8}{x(2-x)} \quad (3)$$

(b) Make y the subject of the formula

$$t = \frac{2-3y}{y+2}$$

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

$$ty + 2t = 2 - 3y$$

$$ty + 3y + 2t = 2$$

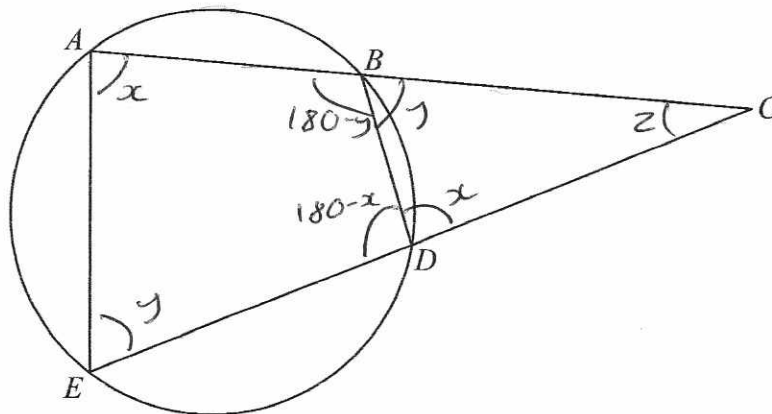
$$ty + 3y = 2 - 2t$$

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

$$y = \frac{2-2t}{t+3}$$

(4)

(Total for Question 21 is 7 marks)



A, B, D and E are points on a circle.
 ABC and EDC are straight lines.

Prove that triangle BCD is similar to triangle ECA .
 You must give reasons for your working.

$$\text{Let } \hat{BAE} = x$$

$$\hat{BDE} = 180 - x \quad \text{opposite angles in a cyclic quadrilateral add to } 180^\circ$$

$$\hat{BDC} = x \quad \text{angles on a straight line add to } 180^\circ$$

$$\text{Let } \hat{AEC} = y$$

$$\hat{ABD} = 180 - y \quad \text{opposite angles in a cyclic quadrilateral add to } 180$$

$$\hat{CBD} = y \quad \text{angles on a straight line add to } 180$$

The angle at C is common to both triangles
 (z)

BCD has angles xyz as does ECA

\therefore they are similar

(Total for Question 22 is 5 marks)