



Model Solutions

Please write clearly in block capitals.

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GCSE MATHEMATICS

F

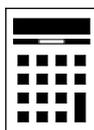
Foundation Tier Paper 2 Calculator

Thursday 8 November 2018 Morning Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24–25	
26–27	
TOTAL	

Advice

In all calculations, show clearly how you work out your answer.

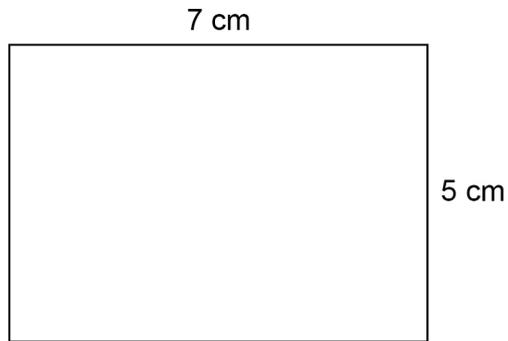


N 0 V 1 8 8 3 0 0 2 F 0 1

Answer **all** questions in the spaces provided

1 Here is a rectangle.

Not drawn
accurately



Work out the perimeter.

Circle your answer.

$$P = 7 + 5 + 7 + 5$$

[1 mark]

12 cm

24 cm

35 cm

70 cm

2 Circle the number **greater** than -0.9

[1 mark]

~~-0.901~~

-0.89

~~-0.91~~

$$\begin{aligned} & \frac{-9}{10} \\ & = -0.9 \end{aligned}$$



3 Simplify $8x - 3 + 6x$
Circle your answer.

$$8x + 6x = 14x - 3$$

[1 mark]

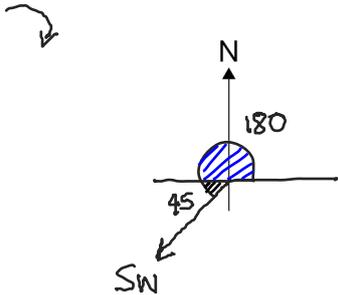
$2x - 3$

$11x$

$5 + 6x$

$14x - 3$

4 What is the angle of turn clockwise from South West to East?



Circle your answer.

$$180 + 45 = 225$$

[1 mark]

45°

135°

225°

315°

Turn over for the next question



- 5 Lucy works for 37 hours per week.
Her weekly wage is £303.40
She receives a pay increase of 25p per hour.
Work out her new weekly wage.

[2 marks]

Current hourly wage: $303.40 \div 37 = \text{£}8.20$ per hour

$$8.20 + 0.25 = \text{£}8.45 \text{ per hour}$$

$$8.45 \times 37 = 312.65$$

Answer £ 312.65



6 (a) Complete the bank statement.

[3 marks]

Date	Description	Credit (£)	Debit (£)	Balance (£)
01/09/18	Starting balance			1140.79
06/09/18	Car repairs		256.00	884.79
17/09/18	Gas bill		87.31	797.48
24/09/18	Salary	2069.75		2867.23

-256

-87.31

+2069.75

6 (b) Write down the meaning of 'Debit' as used in the bank statement.

[1 mark]

Money coming out of the account

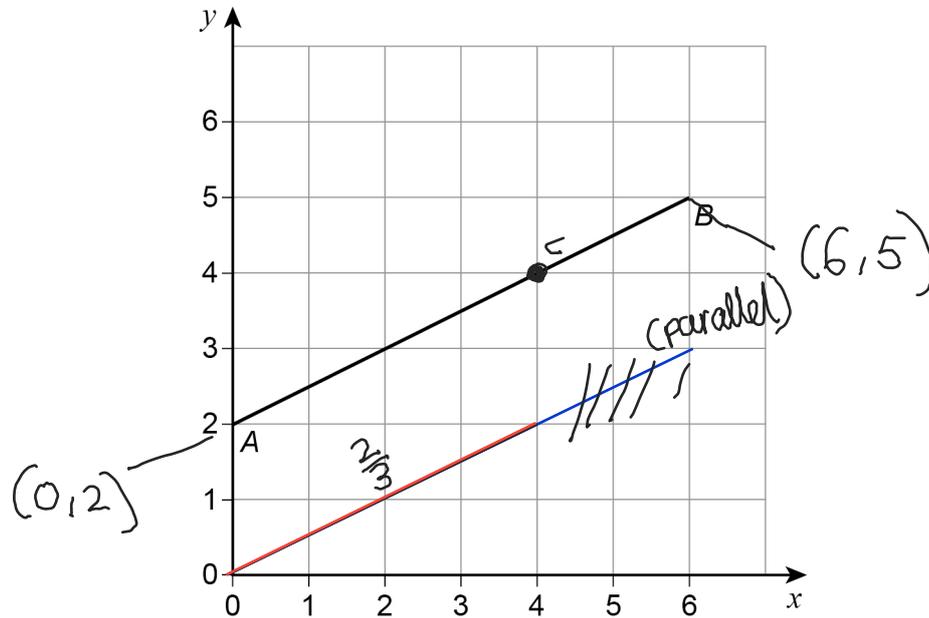
Turn over for the next question



7 Line AB is shown on the grid.

A is the point $(0, 2)$

B is the point $(6, 5)$



7 (a) Work out the coordinates of the midpoint of the line AB . $\left(\frac{6+0}{2}, \frac{5+2}{2}\right)$ [1 mark]

Answer $(\underline{3}, \underline{3.5})$



- 7 (b) C is another point on AB .
 C is closer to B than to A .
The coordinates of C are whole numbers.

Work out the coordinates of C .

[1 mark]

Answer (4 , 4)

- 7 (c) On the grid, draw a line from point $(0, 0)$ that is
parallel to AB
and
two thirds as long as AB .

[2 marks]

Turn over for the next question



8 Lena is at the gym.

8 (a) She will use each of these pieces of equipment once.

Rowing machine (R) Stepper (S)

Treadmill (T) Bike (B)

Lena will use the rowing machine first.

List all the possible orders in which she could use the four pieces of equipment.

RSTB

RSBT

RTSB

RTBS

RBST

RBTS

[2 marks]

Use systematic listing - start with R and
find combinations in a pattern.
e.g. do RS first, then RT, etc.



- 8 (b) The table shows how long Lena spends on each piece of equipment.

Rowing machine	15 minutes
Stepper	13 minutes
Treadmill	35 minutes
Bike	1 hour 30 minutes

Lena starts on the rowing machine at 1.50 pm

She has a break for 4 minutes between pieces of equipment.

What time does she finish on her last piece of equipment?

[3 marks]

$$\text{Total Break} = 4 \times 3 = 12 \text{ min}$$

$$\text{Total Time} = 15 + 13 + 35 + 90 + 12 = 165 \text{ min}$$

$$165 \text{ min} = 2 \text{ h } 45 \text{ min}$$

$$1:50 + 2 \text{ h } 45 \text{ min} =$$

$$2:35 + 2 \text{ h} = 4:35 \text{ pm}$$

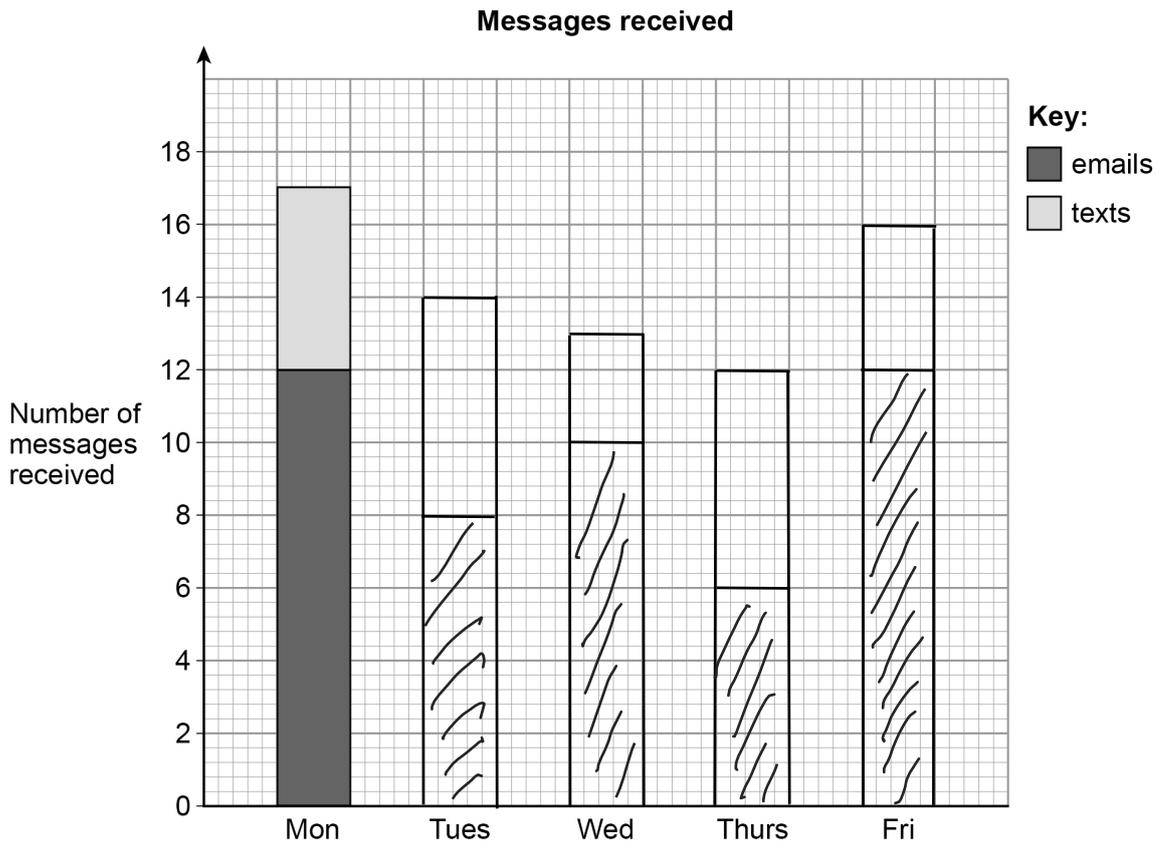
Answer 4:35 pm



9 The table shows the number of messages Sam received each day for five days.

	Messages	
	Number of emails	Number of texts
Monday	12	5
Tuesday	8	6
Wednesday	10	3
Thursday	6	6
Friday	12	4

9 (a) Sam draws a composite bar chart to represent the data.
He has drawn the bar for Monday.



Complete the chart.

[2 marks]



9 (b) In total, what fraction of the messages were emails?

Give your answer in its simplest form.

[3 marks]

$$\text{Total} = 12 + 8 + 10 + 6 + 12 + 5 + 6 + 3 + 6 + 4 = 72$$

$$\text{Total email} = 12 + 8 + 10 + 6 + 12 = 48$$

$$\frac{\text{email}}{\text{total}} \rightarrow \frac{48}{72} = \frac{2}{3}$$

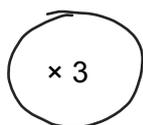
Answer $\frac{2}{3}$

10 Each side of a square is made 3 times as long.

What happens to the perimeter?

Circle your answer.

[1 mark]



x 6

x 9

x 12

Turn over for the next question



11 Here is a list of ingredients needed to make 6 pancakes.

Flour	120 grams
Eggs	2
Milk	210 millilitres

11 (a) Complete the list of ingredients needed to make 9 pancakes.

[3 marks]

$$\times \frac{9}{6} = \times \frac{3}{2}$$

Flour	<u>180 grams</u>	$120 \times \frac{3}{2}$
Eggs	<u>3 eggs</u>	$2 \times \frac{3}{2}$
Milk	<u>315 ml</u>	$210 \times \frac{3}{2}$

11 (b) Convert 210 millilitres to fluid ounces.

Use 1 fluid ounce = 28.4 millilitres

Give your answer to 1 decimal place.

[2 marks]

$$\begin{array}{l} \times \frac{210}{28.4} \\ \hline \end{array} \quad \begin{array}{l} 1 \text{ ounce} = 28.4 \\ \hline \end{array} \quad \begin{array}{l} \div \frac{210}{28.4} \\ \hline \end{array}$$

$$\begin{array}{l} \hline 7.394 \dots = 210 \text{ ml} \\ \hline \end{array}$$

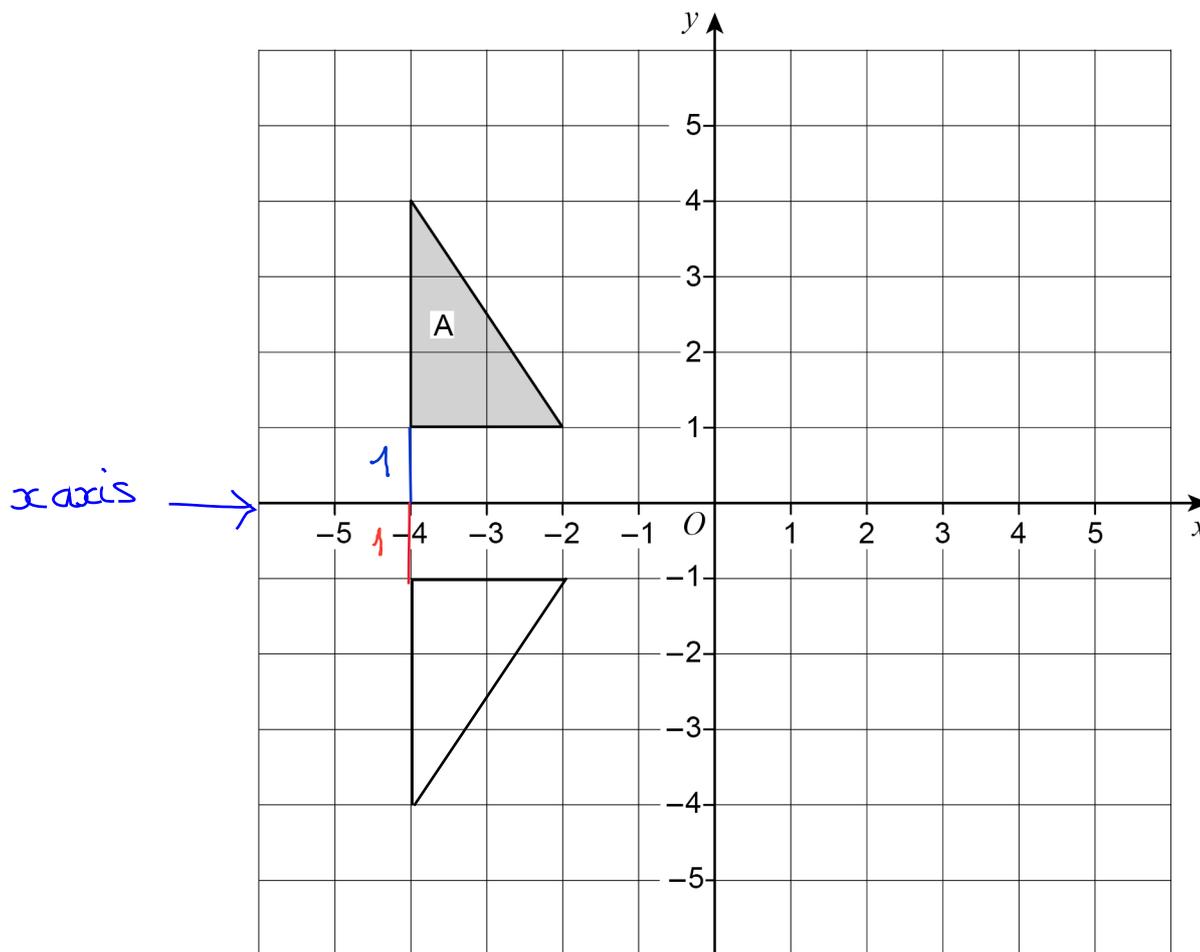
Answer 7.4 fluid ounces



Do not write
outside the
box

12 Reflect shape A in the x -axis.

[2 marks]



Turn over for the next question

7

Turn over ►



13 A charity sends an appeal letter to 3000 people.
The letter asks for a donation of money.

Here is some information about the last appeal letter the charity sent out.

- | | |
|---|--|
| ① | $\frac{1}{2}$ of the people who were sent the letter made a donation. |
| ② | The average donation was £8.60 |
| ③ | $\frac{1}{3}$ of the people who made a donation filled in a tax form.
The government adds 25% to the donations of these people. |

13 (a) Using this information,
work out the amount the charity can expect to receive from this appeal.

[6 marks]

Number of ppl donating: $3000 \times \frac{1}{2} = 1500$

Total revenue: $1500 \times 8.60 = \pounds 12900$

Government: $\frac{1}{3}$ of 12900 = 4300
 25% of 4300 = 1075

total: $12900 + 1075$

Answer $\pounds 13975$



13 (b) The average donation from the people who filled in a tax form was more than £8.60

How does this affect your answer to part (a)?

Tick **one** box.

It should be lower

It should be higher

It should stay the same

Give a reason.

[1 mark]

The 25% will be larger, therefore
there will be more collected by
the government.

Turn over for the next question

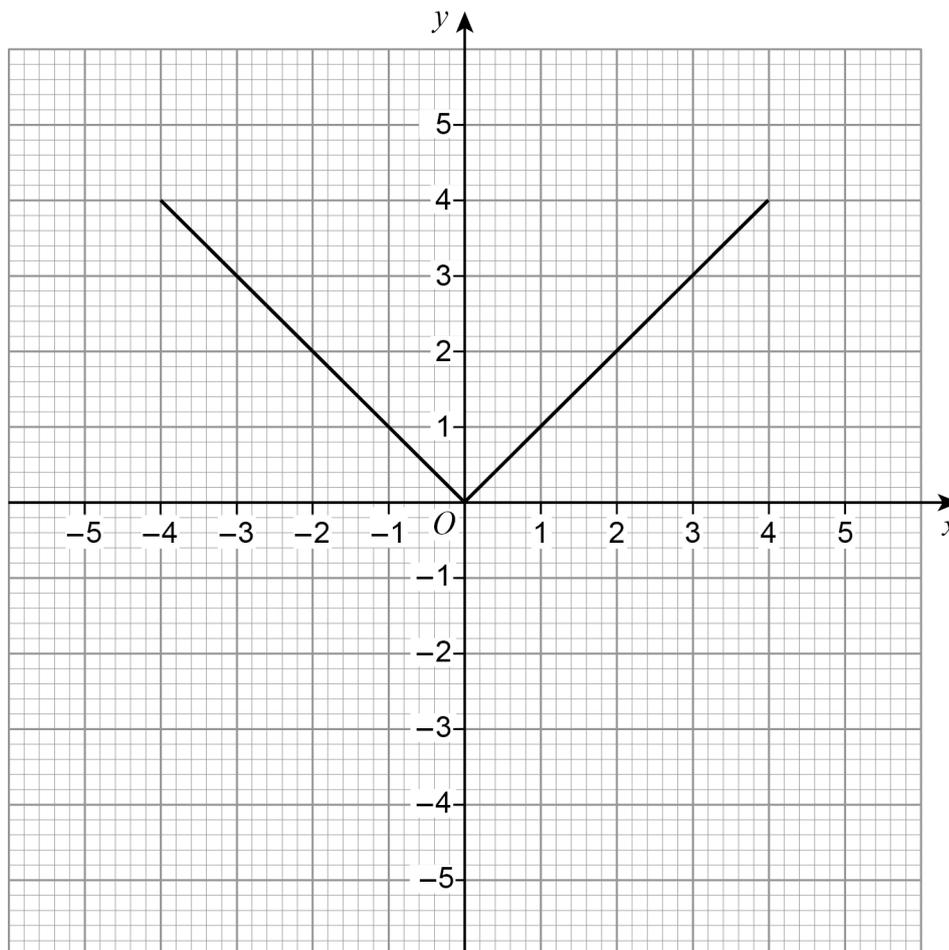
7

Turn over ►



14 Lee wants to draw the graph of $y = x$ for values of x from -5 to 5

Here is his graph.



Make two **different** criticisms of his graph.

[2 marks]

Criticism 1 The graph only goes from $x = -4$ to $x = 4$.

Criticism 2 The graph shown is $y = -x$ up to 0.

The y-values on the left side of the graph are on the wrong side of the x-axis.



- 15 A company uses this formula to work out the cost, £ A , of a taxi ride.

$$A = 4 + 1.8m + b$$

£4 is a fixed charge

m is the number of miles travelled

£ b is a charge for booking online

- 15 (a) Clare books a taxi online and travels 8 miles.
She pays £20 altogether.

How much is the charge for booking online?

[3 marks]

$$A = 4 + 1.8m + b$$

$$20 = \overset{\text{substitute}}{4} + 1.8 \times 8 + b$$

$$ \underset{\text{add}}{18.4}$$

$$\begin{array}{r} -18.4 \quad 20 = \quad 18.4 + b \quad -18.4 \\ \searrow \\ 1.6 = b \end{array}$$

Answer £ 1.60

- 15 (b) A different company
has a fixed charge of £3
charges £1.90 per mile
has no charge for booking online. +0

Write a formula for the cost, £ C , of a taxi ride with this company.

[1 mark]

Answer $C = 3 + 1.9m$

6

Turn over ►



16 What does $(A \cap B)$ represent in $P(A \cap B)$?

Circle your answer.

\cap = 'intersect' = AND

$A \cap B = A$ AND B

[1 mark]

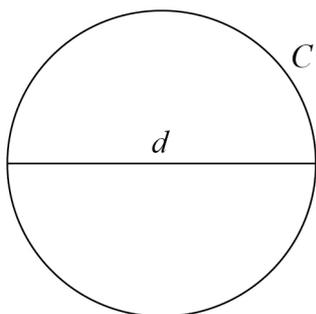
A or B or both

A but not B

not A and not B

A and B

17 A circle has circumference C and diameter d .



$$C = kd$$

What **value** does the constant k represent?

$$C = \pi \times d$$

[1 mark]

Answer $k = \pi$



18 There are 240 cows on a farm.

18 (a) On the farm,

number of bulls : number of cows = 1 : 30

How many bulls are there?

$$\begin{array}{l} \text{bulls} \quad \text{cows} \\ 1 : 30 \\ \times 8 \quad \quad \quad \times 8 \\ \hline 8 : 240 \end{array}$$

[1 mark]

Answer 8 bulls

18 (b) Assume

the 240 cows produce milk for 10 months each year

each cow produces an average of 25 litres of milk per day.

Estimate the total milk production, in litres, of the 240 cows in one year.

You **must** show your working.

[4 marks]

$$240 \times 25 = 6000 \text{ l milk a day}$$

$$7 \text{ days} \times 4 \text{ week} \times 10 \text{ month} = 280 \text{ days}$$

$$\begin{array}{l} 6000 \times 280 \\ = 1680000 \end{array}$$

Answer 1680000 litres

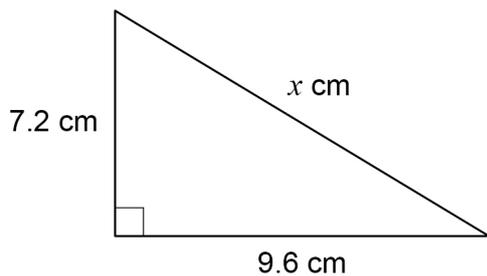
7

Turn over ►



19 Here is a right-angled triangle.

Not drawn
accurately



Show that $x = 12$

[2 marks]

Pythag : $a^2 + b^2 = c^2$

$$7.2^2 + 9.6^2 = x^2$$

$$144 = x^2$$

$$\sqrt{144} \quad \left(\quad \right) \quad \sqrt{x}$$
$$12 = x$$



20 Work out the values of a and b in the identity

$$\overbrace{5(7x + 8)} + \overbrace{3(2x + b)} \equiv ax + 13$$

[4 marks]

$$\text{LHS: } 35x + 40 + 6x + 3b$$

$$= \underline{41x} + 40 + 3b \equiv \underline{ax} + 13$$

$$a\cancel{x} = 41\cancel{x}$$

$$a = 41$$

$$40 + 3b = 13$$

$$3b \stackrel{-40}{=} -27$$

$$b \stackrel{\div 3}{=} -9$$

$$a = \underline{41} \quad b = \underline{-9}$$

21 The first four terms of a linear sequence are

$$7 \quad \xrightarrow{+4} \quad 11 \quad \xrightarrow{+4} \quad 15 \quad \xrightarrow{+4} \quad 19$$

Circle the expression for the n th term.

Difference = 4

[1 mark]

~~$n + 6$~~

$4n + 3$

~~$7n + 4$~~

~~$n + 4$~~



22 Here is some information about 20 trains leaving a station.

Number of minutes late, t	Number of trains $= f$	Midpoint $= x$	fx
$0 \leq t < 5$	12	2.5	30
$5 \leq t < 10$	7	7.5	52.5
$10 \leq t < 15$	1	12.5	12.5
$t \geq 15$	0	—————→	

2.5×12

7.5×7

12.5×1

20

Total = 95.0

22 (a) Work out an estimate of the mean number of minutes late.

[3 marks]

$$\text{mean} = \frac{\text{total frequency}}{\text{total number of trains}} = \frac{95}{20}$$

$$= 4.75$$

Answer 4.75 minutes



22 (b) The station manager looks at the information in more detail.

Number of minutes late, t	Number of trains
$0 \leq t < 2$	12
$2 \leq t < 4$	0
$4 \leq t < 6$	7
$6 \leq t < 8$	0
$8 \leq t < 10$	0
$10 \leq t < 12$	1

← midpoint is lower

} Midpoint in this category is lower than (a)

He works out an estimate of the mean using this information.

How does his estimate compare with the answer to part (a)?

Tick **one** box.

[1 mark]

Higher than part (a)

Same as part (a)

Lower than part (a)

Not possible to tell

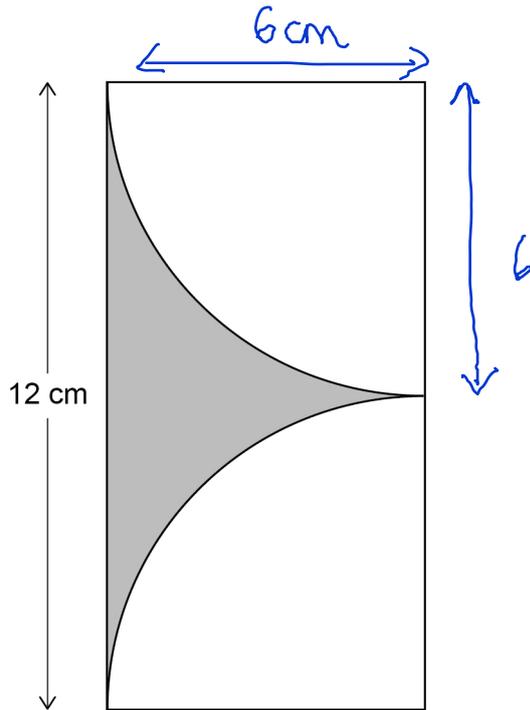
4

Turn over ►



23

Two identical quarter circles are cut from a rectangle as shown.



Not drawn
accurately

Work out the shaded area.

[4 marks]

$$\text{Area of rectangle} : 12 \times 6 = 72$$

$$\text{Area of Quarter Circle} : \frac{1}{4} \pi r^2$$

$$: \frac{1}{4} \times \pi \times 6^2 = 9\pi$$

$$2 \text{ Quarter Circle: } 18\pi$$

$$\text{Shaded} = 72 - 18\pi$$

$$= 15.45 \dots$$

Answer 15.5 cm²
(3sf)



24

The diagrams show the position of a tap when off and fully on.

The tap is fully on when the angle of turn is 180°

Off



Fully on



When fully on, water flows out of the tap at 14 litres per minute.

The rate at which water flows out is in direct proportion to the angle of turn.

The tap is turned 135°



The water flows into a tank with a capacity of 79.8 litres.

Will it take **less than** $7\frac{1}{2}$ minutes to fill the tank?

You **must** show your working.

[4 marks]

$$180^\circ = 14\text{ l out per min}$$

$$\times \frac{3}{4} \rightarrow 135^\circ = 10.5\text{ l out per min}$$

In 7.5 min,

$$10.5 \times 7.5 = 78.75\text{ l flows out}$$

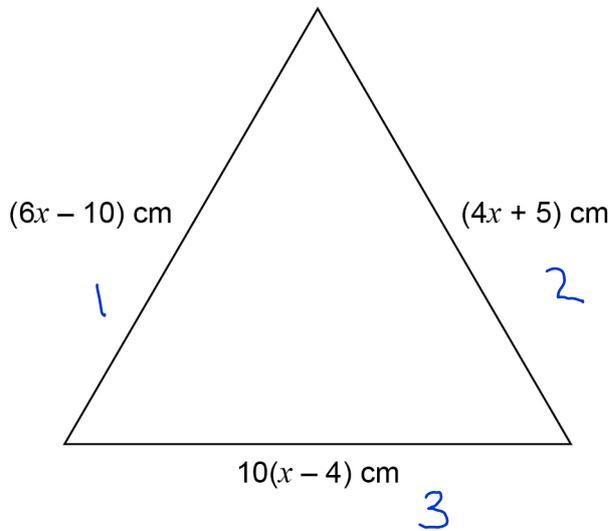
No, $78.75 < 79.8$ so the tank isn't full



25

This triangle is equilateral.

- side lengths are equal



Not drawn
accurately

Is the perimeter of the triangle greater than one metre?

You **must** show your working.

[5 marks]

$$6x - 10 = 4x + 5$$

$$2x - 10 = 5$$

$$2x = 15$$

$$x = 7.5$$

$$\text{length 1: } 6(7.5) - 10 = 35 \text{ cm}$$

$$2: 4(7.5) + 5 = 35 \text{ cm}$$

$$3: 10(7.5 - 4) = 10 \times 3.5 = 35 \text{ cm}$$

$$P = 35 \times 3 = 105 \text{ cm} = 1 \text{ m } 5 \text{ cm}$$

The perimeter is greater
than 1m



26 An approximation for the value of π is given by

$$4\left(1 - \frac{22}{57} + \frac{22}{85} - \frac{22}{105} + \frac{22}{117} - \frac{22}{242}\right)$$

Use your calculator to show that this approximation is within 0.1 of 3.14

[2 marks]

$$= 4 (0.7604599\dots)$$

$$= 3.041839$$

$$3.041839 + 0.1 = 3.141839$$

27 Work out

$$\frac{9.12 \times 10^{10}}{3.2 \times 10^4}$$

Give your answer in standard form.

[2 marks]

$$= \frac{9.12}{3.2} \times \frac{10^{10}}{10^4}$$

$$= 2.85 \times 10^6$$

Answer 2.85×10^6

END OF QUESTIONS



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