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Worked Solutions

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
MATHEMATICS

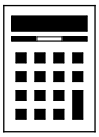
F

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.

Advice

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

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	

Please note that these worked solutions have neither been provided nor approved by AQA and may not necessarily constitute the only possible solutions. Please refer to the original mark schemes for full guidance.

Any writing in blue indicates what must be written in order to answer the questions and get the marks. The worked solutions have been designed to show the smallest amount of work which needs to be done to answer the question.

Anything written in green in a cloud doesn't have to be written in the exam.

Anything written in orange in a rectangle doesn't have to be written in the exam and is there to show what should be put into a calculator or measured using a ruler or protractor.

If you find any mistakes or have any requests or suggestions, please send an email to curtis@cgmaths.co.uk

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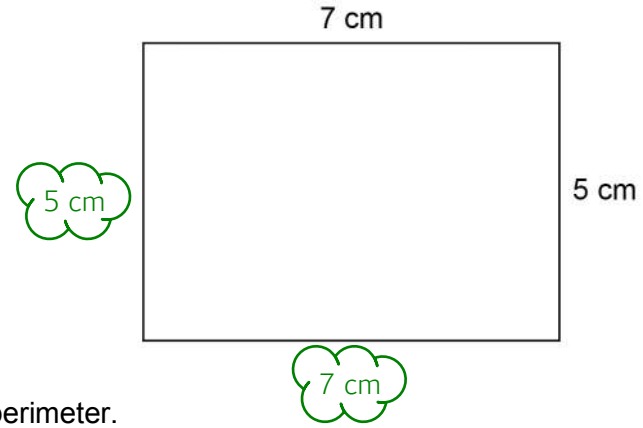
Answer **all** questions in the spaces provided

Do not write outside the box

1 Here is a rectangle.

Not drawn accurately



Work out the perimeter.

Circle your answer.

[1 mark]

12 cm 24 cm 35 cm 70 cm

Perimeter is all of the sides on the outside added together. 7 + 5 + 7 + 5 = 24

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

[1 mark]

–0.901 –0.89 –0.91 $-\frac{9}{10}$

To be greater, it has to be less negative

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3 Simplify $8x - 3 + 6x$

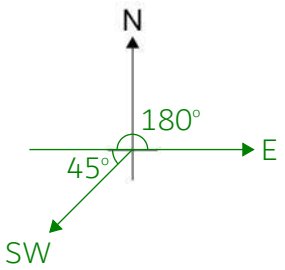
Circle your answer.

[1 mark]

$2x - 3$ $11x$ $5 + 6x$ $14x - 3$

Collect the like terms. 8x + 6x = 14x.
The -3 stays separate and unchanged

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



Circle your answer.

[1 mark]

45° 135° 225° 315°

It is 45 degrees clockwise from South West to West then it is another 180 degrees clockwise from West to East. 45 + 180 = 225

Turn over for the next question

4

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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]

303.40+37×0.25

She earns an extra £0.25 each hour for 37 hours so 37 x 0.25 works out the extra money. Adding this to the original weekly wage works out the new weekly wage

Answer £ 312.65

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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

1140.79 - 256.00

Ans - 87.31

Ans + 2069.75

Credit means money gained and debit means money spent

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

[1 mark]

Money spent

Turn over for the next question

6

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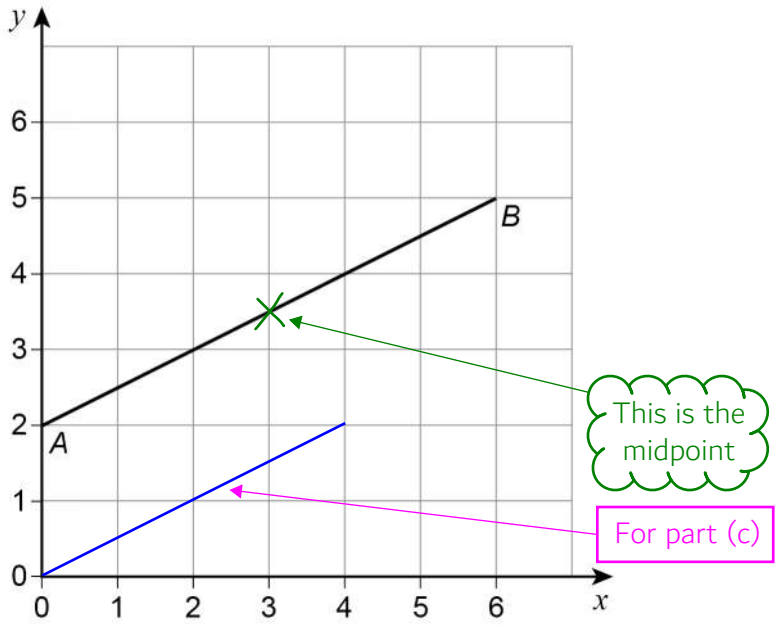
7 Line *AB* is shown on the grid.

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*.

[1 mark]

Answer (3 , 3.5)

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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)

This is the only point closer to B (on the right of the midpoint) which has whole number coordinates (on the grid lines)

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]

AB goes up 3 and right 6. 2/3 of these means it goes up 2 and right 4

Turn over for the next question

4

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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.

[2 marks]

RSTB
RSBT
RTSB
RTBS
RBST
RBTS

The possible orders are listed systematically

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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]

1:50+0:15+0:13+0:35+1:30+0:04x3

1°50° + 0°15° + 0°13° + 0°35° + 1°30° + 0°04° x 3 = 4°35'0''

°,,, Press the button on the left to get the °

There are 3 breaks of 4 minutes as there are 3 gaps between the equipment

Answer 4:35 pm

5

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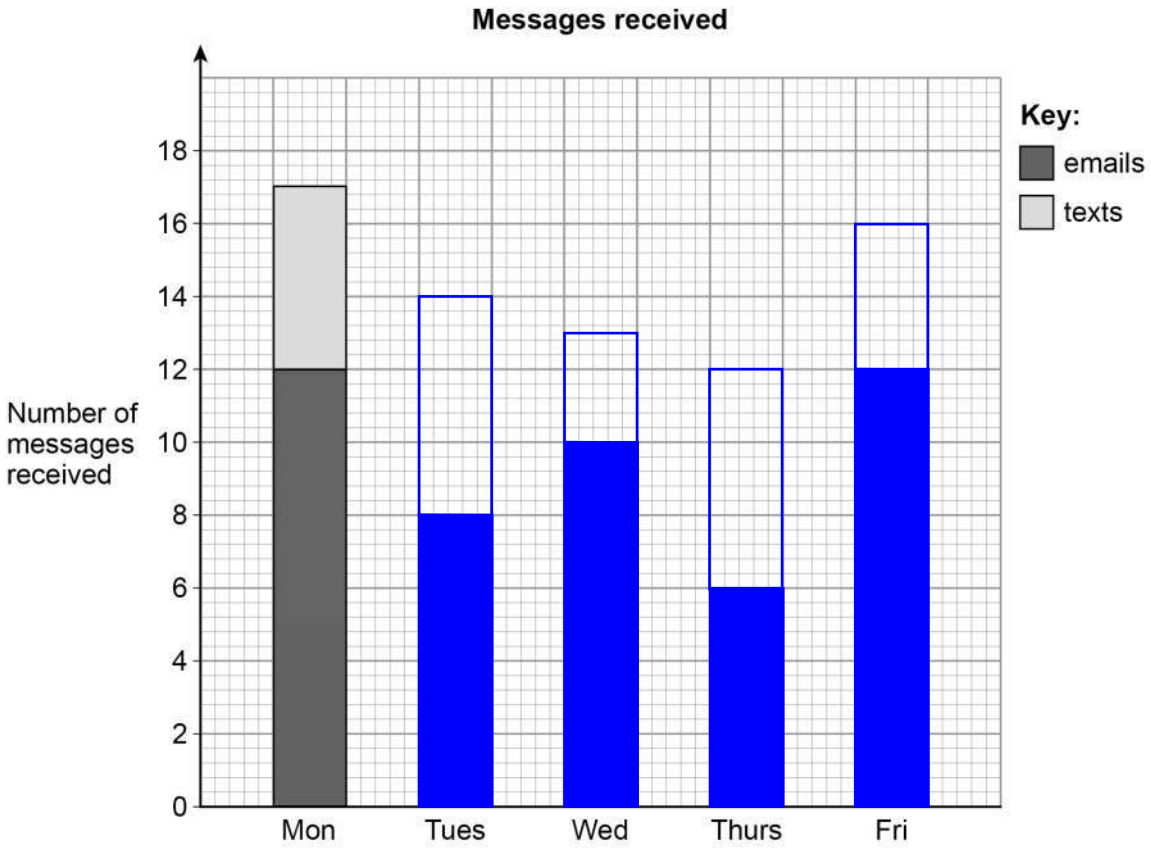
9 The table shows the number of messages Sam received each day for five days.

	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]

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

Give your answer in its simplest form.

[3 marks]

$\frac{48}{72}$

Adding all the emails gives 12 + 8 + 10 + 6 + 12 = 48. Adding the emails and the texts gives 48 + 5 + 6 + 3 + 6 + 4 = 72. So 48 out of the 72 messages were emails

Typing in 48/72 into the calculator simplifies the fraction

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]

(× 3) × 6 × 9 × 12

If the side length was 1cm, the perimeter would be 1 x 4 = 4cm. If the side length is 3 times as long it would be 3cm, the perimeter would be 3 x 4 = 12cm. 12 is 3 times 4

Turn over for the next question

6

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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]

Divide each of the amounts of ingredients by 6 to work out the amount for 1 pancake then multiply by 9 to get the amount needed for 9 pancakes

Flour	180g	120/6 x 9
Eggs	3	2/6 x 9
Milk	315ml	210/6 x 9

11 (b) Convert 210 millilitres to fluid ounces.

Use 1 fluid ounce = 28.4 millilitres

Give your answer to 1 decimal place.

[2 marks]

210/28.4

Every 28.4 millilitres is 1 fluid ounce so dividing 210 by 28.4 works out how many lots of 28.4 it is and therefore how many fluid ounces it is

Answer 7.4 fluid ounces

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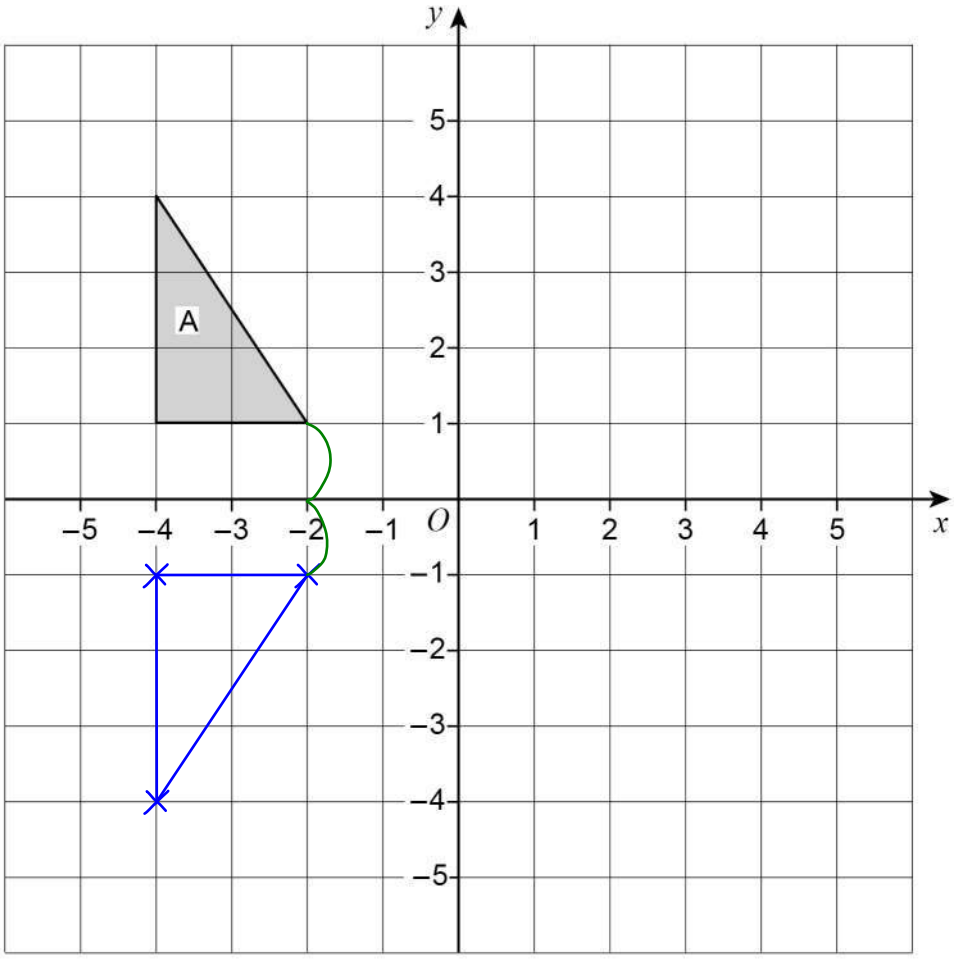
12 Reflect shape A in the x-axis.

[2 marks]



Reflecting the corners first. Counting the number of jumps to the x-axis then doing the same amount of jumps on the other side

Turn over for the next question

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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.

$\frac{1}{2}$ of the people who were sent the letter made a donation.
The average donation was £8.60
$\frac{1}{3}$ 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]

$\frac{1}{2} \times 3000 \times 8.60 + \frac{1}{3} \times \frac{1}{2} \times 3000 \times 8.60 \times 0.25$

1/2 of the 3000 people give an average donation of £8.60

Working out what the government adds. 1/3 of 1/2 of the 3000 people filled in a tax form and each one means an extra 25% of £8.60 added. 25% as a decimal is 0.25 so multiplying 8.60 by 0.25 finds 25% of it

Answer £ 13975

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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]

25% of a higher amount will be more.

Turn over for the next question

7

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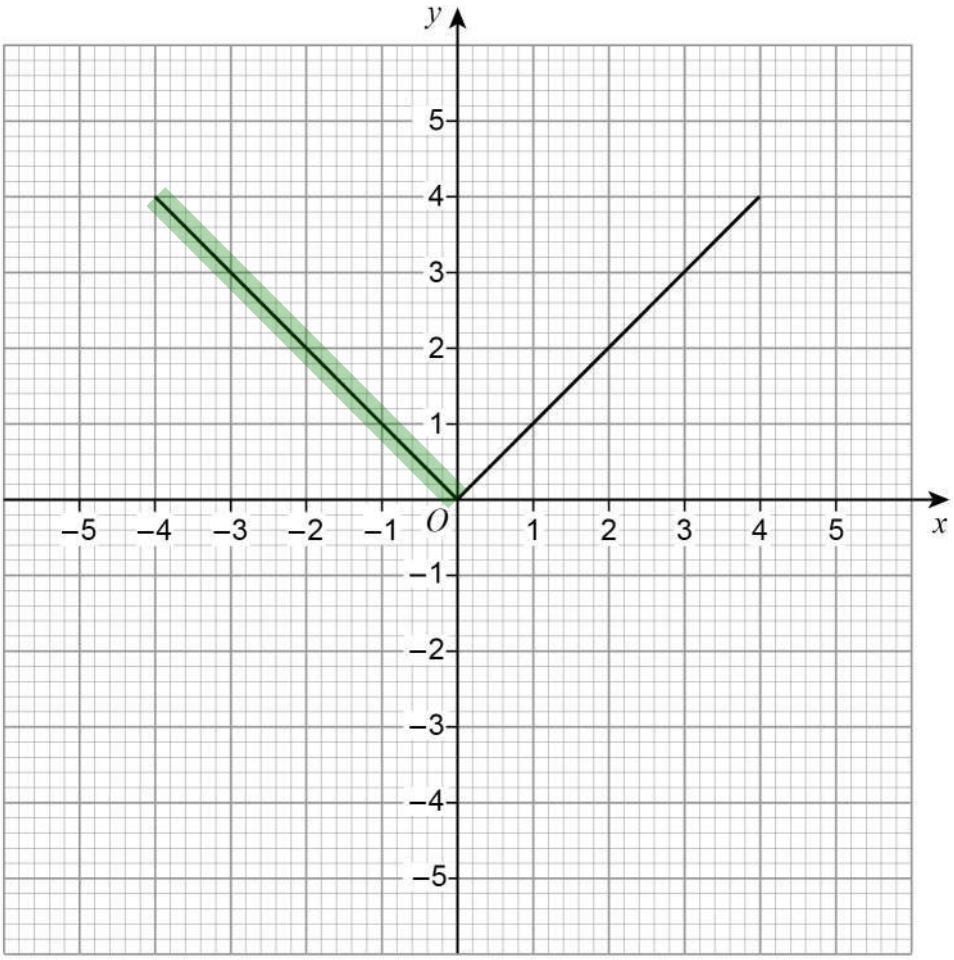
14 Lee wants to draw the graph of $y = x$ for values of x from –5 to 5

Here is his graph.



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

[2 marks]

Criticism 1 Not from -5 to 5

It is only plotted for values of x from -4 to 4

Criticism 2 y doesn't equal x where x < 0

Highlighted in green

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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]

$b = 20 - 4 - 1.8(8)$

Rearranging the equation to make b (the charge for booking online) the subject by subtracting 4 and 1.8m from both sides. Then substituting in 20 for A (the cost) and 8 for m (the miles travelled)

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.

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

[1 mark]

Answer $C = 3 + 1.9m$

Cost is £3 plus £1.90 per mile

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16 What does (A ∩ B) represent in P(A ∩ B) ?

Circle your answer.

[1 mark]

The intersection of A and B

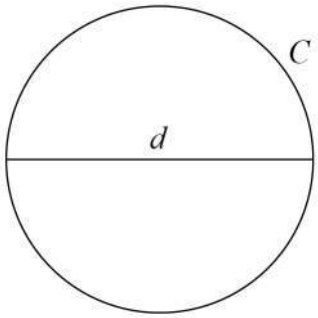
A or B or both

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?

[1 mark]

Answer π

Circumference = π x diameter

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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?

[1 mark]

$\frac{240}{30}$

30 parts represent the number of cows. Dividing this by 30 works out 1 part, which represents the number of bulls

Answer 8

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]

$25 \times 240 \times 30 \times 10$

240 lots of 25 litres (on average) are produced per day. Multiplying this by 30 (as there are about 30 days in each month) works out an estimate of the amount produced per month. Multiplying this by 10 works out an estimate for the amount produced in 10 months

Answer 1800000 litres

7

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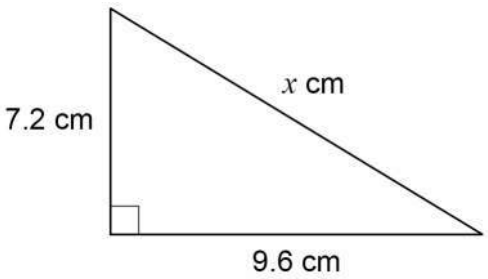
19 Here is a right-angled triangle.

Not drawn accurately



Show that $x = 12$

[2 marks]

$\sqrt{7.2^2 + 9.6^2} = 12$

Pythagoras' Theorem can be used to work out the missing side. $a^2 + b^2 = c^2$, where c is the longest side and a and b are the two shorter sides. x is the longest side, so rearranging to make c the subject gives $c = \sqrt{a^2 + b^2}$

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

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

[4 marks]

$35x + 40 + 6x + 3b$

Expanding the brackets. Equating the coefficients: there are 41x (35x + 6x) on the left side and ax on the right so a must be 41

$40 + 3b = 13$

The constants on the left side are 40 + 3b and on the right they are 13. These must be equal

$b = \frac{13 - 40}{3}$

Rearranging to find b by subtracting 40 from both sides then dividing both sides by 3

$a =$ 41 $b =$ −9

21 The first four terms of a linear sequence are

7 11 15 19

Circle the expression for the nth term.

[1 mark]

$n + 6$ $4n + 3$ $7n + 4$ $n + 4$

The sequence goes up by 4 each time so must involve 4n

7

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

Number of minutes late, t	Number of trains	Midpoint	
$0 \leqslant t < 5$	12	2.5	12 x 2.5 = 30
$5 \leqslant t < 10$	7	7.5	7 x 7.5 = 52.5
$10 \leqslant t < 15$	1	12.5	1 x 12.5 = 12.5
$t \geqslant 15$	0		

There are no trains in this category so it can be ignored

Each category has a range of 5. Dividing 5 by 2 then adding this on to each of the lowest number in each category works out the midpoints. 5/2 = 2.5. 0 + 2.5 = 2.5. 5 + 2.5 = 7.5. 10 + 2.5 = 12.5

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

[3 marks]

$\frac{30+52.5+12.5}{12+7+1+0}$

Mean = total/number. An estimate of the total is found by multiplying the midpoint by the frequency for each category then adding them all together. The number is the total number of trains

Answer 4.75 minutes

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

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

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

As the midpoints of the categories for the 12, 7 and 1 trains are lower

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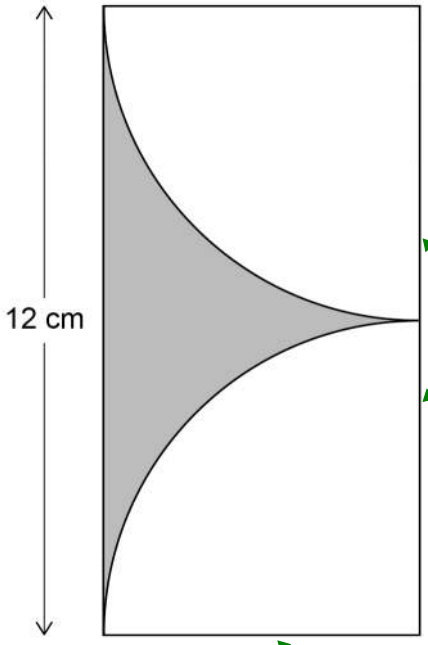
23 Two identical quarter circles are cut from a rectangle as shown.



Not drawn accurately

Two radii are 12cm in length. So the radius must be 6cm

As the radius is 6cm, this length is also 6cm

Work out the shaded area.

[4 marks]

$12 \times 6 - 2 \times \frac{1}{4} \times \pi \times 6^2$

Subtracting the area of the two quarter circles from the area of the rectangle leaves the shaded area

Area of rectangle = length x width. The length is 12cm and the width is 6cm

Area of the two quarter circles. πr^2 works out the area of the full circle. Multiplying by 1/4 finds one of the quarter circles. Multiplying by 2 finds both of the quarter circles

Answer 15.5 cm^2

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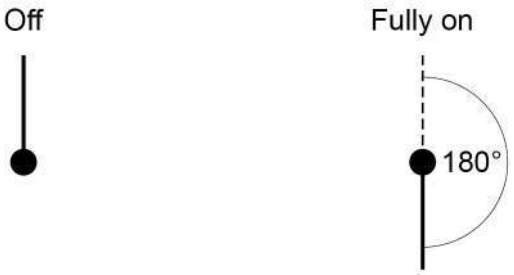
24 The diagrams show the position of a tap when off and fully on.

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



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]

s^d_t

This is basically a speed distance time problem as the rate it is filled is the speed, the capacity is the distance and we are trying to calculate the time. From the formula triangle, time = distance/speed

$\frac{79.8}{\frac{135}{180} \times 14} = 7.6$

Dividing the capacity of 79.8 litres (distance) by the rate it is filled (speed). The rate it is filled is proportional to the angle of turn and the tap is turned 135 degrees out of the 180 degrees so as when it is fully on it lets out 14 litres per minute, 135/180 x 14 works out the rate

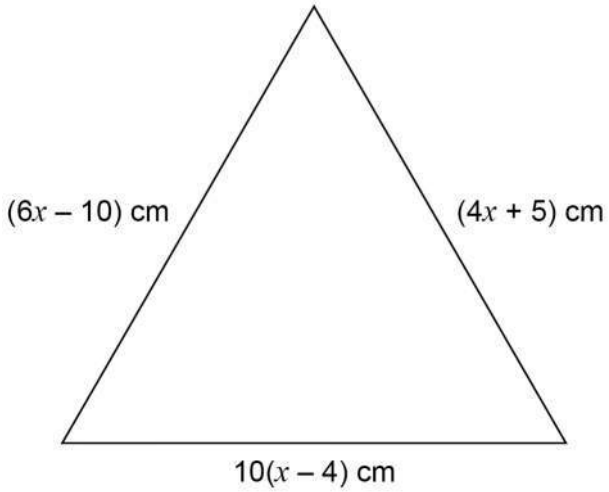
No

It would take 7.6 minutes, which is more than $7\,{}^{1}/_{2}$ minutes

8

Do not write outside the box

25 This triangle is equilateral.



Not drawn accurately

Is the perimeter of the triangle greater than one metre?

You **must** show your working.

[5 marks]

$6x - 10 = 4x + 5$ ← The triangle is equilateral so all the sides are equal. Setting two of the sides equal to each other creates an equation in terms of x which can be solved

$2x = 15$ ← Subtracting 4x from both sides to bring all the x terms to the same side then adding 10 to both sides

$x = 7.5$ ← Dividing both sides by 2 finds x

$(6(7.5) - 10) \times 3 = 105$ ← Substituting 7.5 for x in the side (6x - 10) to work out its length. Multiplying by 3 as all the side are equal so this works out the perimeter

Yes ← One metre is 100 centimetres. 105 cm is greater than this

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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]

3.14 − 3.041... = 0.09...

Subtracting the approximation from 3.14 gives 0.09816038107

Typing the approximation into the calculator gives 3.041839619

Subtracting the approximation from 3.14 works out the difference. As this is less than 0.1, it is within 0.1 of 3.14

27 Work out $\dfrac{9.12\times10^{10}}{3.2\times10^{4}}$

Give your answer in standard form.

[2 marks]

2850000

Typing it into the calculator exactly as it is above gives this

To be in standard form, it needs to be in the form a x 10^n, where $1 \le a < 10$ and n is an integer. To get 2.85, which is between 1 and 10, it needs to be divided by 10 6 times so 2.85 needs to be multiplied by 10^6 to make up for this

Answer 2.85×10^{6}

END OF QUESTIONS

9

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