

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE MATHEMATICS

F

Foundation Tier Paper 2 Calculator

Thursday 7 June 2018

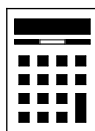
Morning

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	
TOTAL	

Advice

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



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

Answer **all** questions in the spaces provided

- 1 Circle the expression that can be written as $2y$ [1 mark]

$y + y$ y^2 $2 + y$ $y \times y$

- 2 Circle the decimal that is greater than $\frac{3}{10}$ and less than $\frac{2}{5}$ [1 mark]

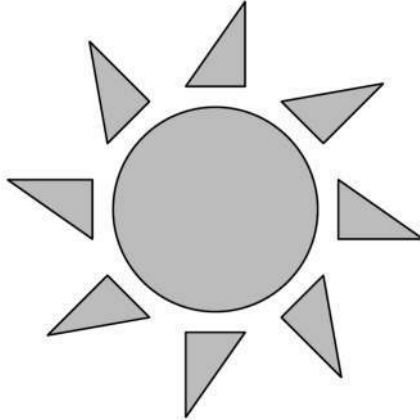
0.32 0.035 0.4 0.24

- 3 What is 625 as a power of 5 ?
Circle your answer. [1 mark]

5^3 5^4 5^5 5^{125}



- 4 Circle the order of rotational symmetry of this drawing.



[1 mark]

0

2

4

8

The drawing can be rotated 8 times within 360° and look the same

- 5 Work out the value of $3^6 - \sqrt{841}$

[2 marks]

Type it into the calculator exactly as it is above

Answer 700

Turn over for the next question



- 6** Gemma has four groups of friends on a social media site.
The table shows the number of friends in each group.

Group	Number of friends
Family	8
Netball	8
School	26
Guides	11

- 6 (a)** Which group is the mode?

[1 mark]

Answer School

School had the highest number of friends

- 6 (b)** Gemma wants a pictogram to show the information.
She has drawn the first two rows.
Complete the pictogram.
Remember to complete the key.

[3 marks]

There are 8 friends in Family and this is represented by 2 symbols. $8/2 = 4$ so each symbol must represent 4 friends

Key: ○ represents 4 friends

Family	○ ○
Netball	○ ○
School	○ ○ ○ ○ ○ ○ ◐
Guides	○ ○ ◐

Dividing the number of friends in School and Guides by 4 then converting into a mixed fraction works out how many symbols should be drawn

To convert into a mixed fraction press SHIFT then the SD button



- 7 e is 3 **more** than d .
 f is 5 **less** than d .

- 7 (a) Write an expression for e in terms of d .

[1 mark]

Answer $d+3$

- 7 (b) Write an expression for f in terms of d .

[1 mark]

Answer $d-5$

- 7 (c) Work out $e - f$
Simplify your answer.

[2 marks]

$$d+3-(d-5)$$

Expressing both e and f in terms of d then subtracting them allows it to be simplified easier. $-(d - 5)$ becomes $-d + 5$. Collecting like terms cancels out d and gives $3 + 5$

Answer 8

Turn over for the next question



8

The numbers 1 to 12 are put in a grid.

2, 4, 5, 7, 10 and 12 are shown.

1) $26 - 12 - 4 - 7 = 3$

2) $26 - 3 - 5 - 10 = 8$

3	8	5	10
12			9
4			1
7	11	2	6

4) The 9 and the 1 remain

Each of the four sides of the grid must add up to 26

Complete the grid using the numbers

1, 3, 6, 8, 9 and 11

3) $26 - 7 - 2 = 17$. The only way of making 17 with the remaining numbers is $6 + 11$ so these numbers must go in these two squares. If 11 went in the bottom right square, in the column on the right $26 - 10 - 11 = 5$, which cannot be possibly made using the remaining 9 and 1. So 6 must go in the bottom right square

[3 marks]

- 9 In this question, use
1 foot = 12 inches
1 inch = 2.5 centimetres
- Change 5 feet 8 inches to centimetres.
- [3 marks]**

$$(5 \times 12 + 8) \times 2.5$$

5 x 12 converts the 5 feet into inches. Adding the 8 inches works out how many inches there are in total. Multiplying this by the 2.5 converts the inches into centimetres

Answer 170 cm

- 10 Which of these numbers has **exactly four** factors?
Circle your answer.
- [1 mark]**

4

8

12

16

The factors of 4: 1, 4, 2. The factors of 8: 1, 8, 2, 4. The factors of 12: 1, 12, 2, 6, 3, 4. The factors of 16: 1, 16, 2, 8, 4

Turn over for the next question



11 Nick has a 6-digit code.

He remembers it as three 2-digit numbers.

The first number is between 10 and 20

The second number is 3 times the first number.

The third number is 5 times the first number.

All six digits are **different**.

Work out the code.

[3 marks]

Enter table mode by pressing MENU then 3. $f(x) = 3x$. $g(x) = 5x$. Start: 11. End: 19. Step: 1

This lists out the possible codes. In the x column are the first numbers. In the f(x) column are the second numbers. In the g(x) column are the third numbers. The possibilities which have repeating digits are: 113355, 123660, 133965, 144270, 154575, 164880, 175185, 195795

Answer 1 8 5 4 9 0

12 How many minutes are there in $5\frac{1}{4}$ hours?

Circle your answer.

[1 mark]

315

325

515

525

$$5\frac{1}{4} \times 60 = 315$$

There are 60 minutes in an hour so multiplying the number of hours by 60 converts it into minutes



- 13 Here is a formula for the amount of water needed to cook rice.

$$w = 1.5r + 0.5$$

w is the number of cups of water needed

r is the number of cups of rice to be cooked

- 13 (a) How many cups of water are needed to cook 7 cups of rice?

[2 marks]

$$1.5(7) + 0.5$$

w is the subject so the formula tells us how to work out the number of cups of water needed. Substituting 7 for r in the right side finds w

Answer

11

- 13 (b) How many cups of rice can be cooked with 20 cups of water?

[3 marks]

$$1.5r = w - 0.5$$

Making r the subject of the formula.
First subtracting 0.5 from both sides

$$r = \frac{w - 0.5}{1.5}$$

Dividing both sides by 1.5

$$\frac{20 - 0.5}{1.5}$$

Substituting 20 for w in the right

Answer

13

Turn over for the next question



14 (a) Use your calculator to work out $9.95^2 \times 29.8$

Give your answer as a decimal.

Write down your full calculator display.

[1 mark]

Type it into the calculator exactly as it is above

Answer 2950.2745

14 (b) Is your answer to part (a) sensible?

Use approximations to decide.

You **must** show your working.

[3 marks]

$$10^2 \times 30 = 3000$$

Rounding each number to 1 significant figure

Tick a box.

Sensible

Not sensible



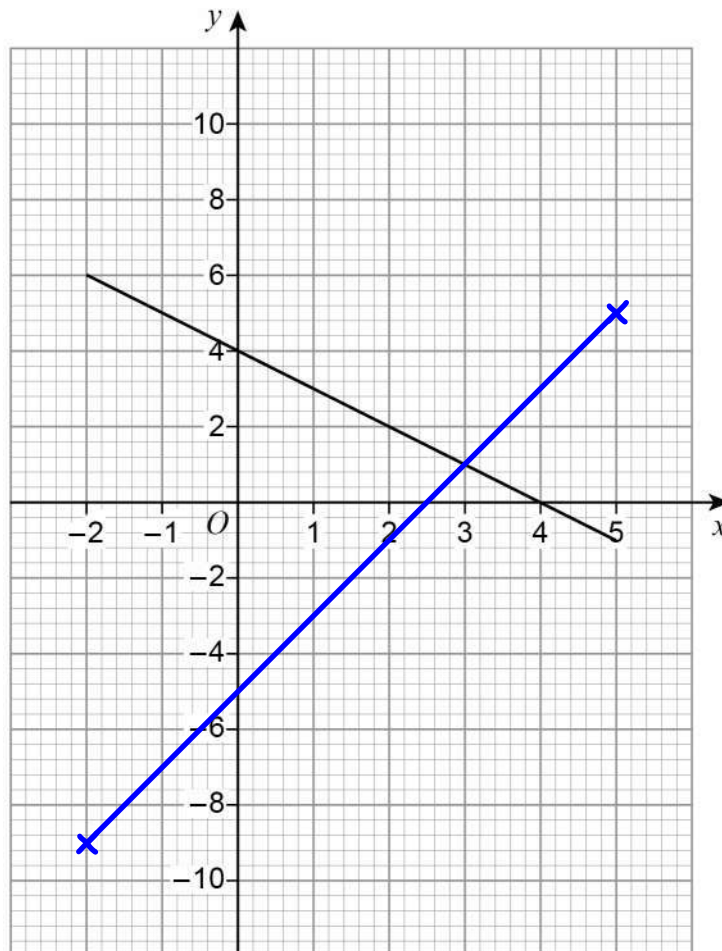
15 The graph of $y = 4 - x$ for values of x from -2 to 5 is shown on the grid.

15 (a) On the grid, draw the graph of $y = 2x - 5$ for values of x from -2 to 5

[3 marks]

$$\begin{aligned} 2 \times -2 - 5 &= -9 \\ 2 \times 5 - 5 &= 5 \end{aligned}$$

Working out the first and last point on the graph then joining them up with a straight line. It must be a straight line as the equation is in the form $y = mx + c$. When $x = -2$, $y = -9$, so the coordinate $(-2, -9)$ is plotted. When $x = 5$, $y = 5$, so the coordinate $(5, 5)$ is plotted



15 (b) Use your graph to solve $2x - 5 = 4 - x$

[1 mark]

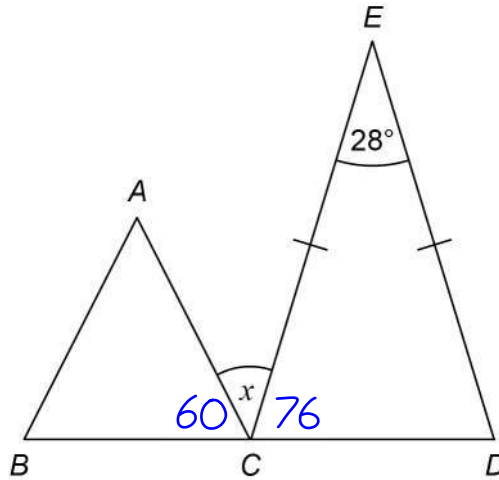
$$x = \underline{\quad 3 \quad}$$

The two graphs cross when $x = 3$. At this point the two graphs are equal to each other



- 16 (a) BCD is a straight line.
Triangle ABC is equilateral.
 $CE = DE$

Not drawn
accurately



Work out the size of angle x .

[4 marks]

$$\frac{180}{3}$$

This works out each of the angles in the equilateral triangle. There are 180° in total in a triangle and all the angles are equal in an equilateral

$$\frac{180-28}{2}$$

This works out the base angles in the triangle CDE , which must be isosceles as two of its sides are equal. $180 - 28$ works out how many degrees remain in the triangle. Dividing this by 2 works out the two remaining angles as they are equal

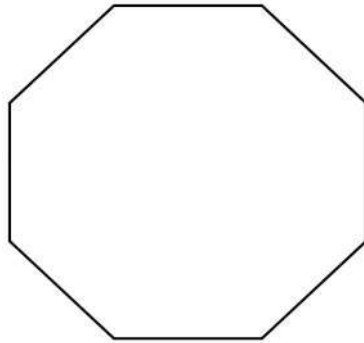
$$180-60-76$$

This works out angle x . The 60° , the 76° and angle x are all angles around point C on the straight line BCD . Angles on a straight line add up to 180° so subtracting the other angles from 180 leaves angle x

Answer 44 degrees



- 16 (b) Amba is working out the size of an **interior** angle of a regular octagon.



Not drawn
accurately

Her method is Interior angle = $360 \div 8$

Is her method correct?

Tick a box.

Yes

No

Give a reason for your answer.

[1 mark]

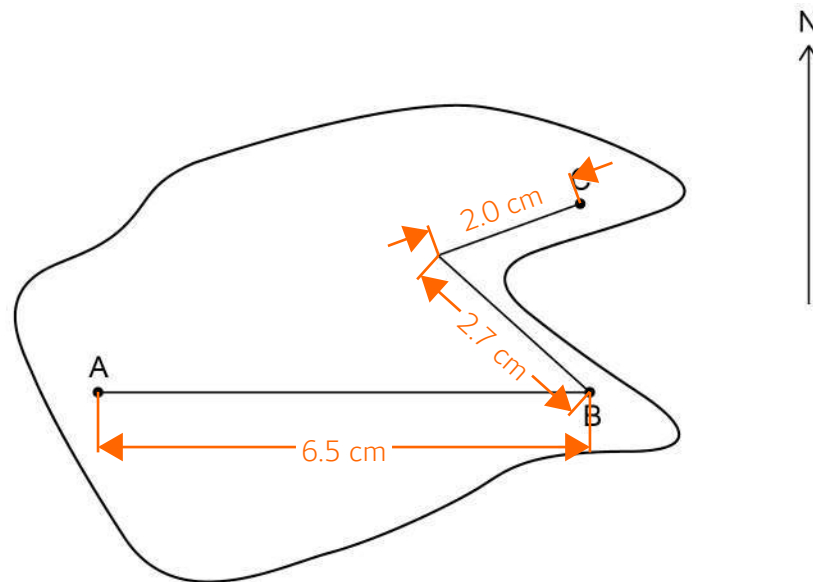
There are more than 360° in an octagon

Turn over for the next question



- 17 Here is a map of an island with cities A, B and C.
The straight lines represent roads.

Scale: 1 cm represents 200 km



- 17 (a) A is due West of B.
Write down the bearing of A from B.

[1 mark]

Answer 270 °

If facing north at B, 270° must be turned clockwise to face toward A



17 (b) Umar drives from A to B on the route shown.

Kaz drives from B to C on the route shown.

Use the map to work out how much further Umar drives than Kaz.

You **must** show your working.

[5 marks]

$$(6.5 - (2.7 + 2)) \times 200$$

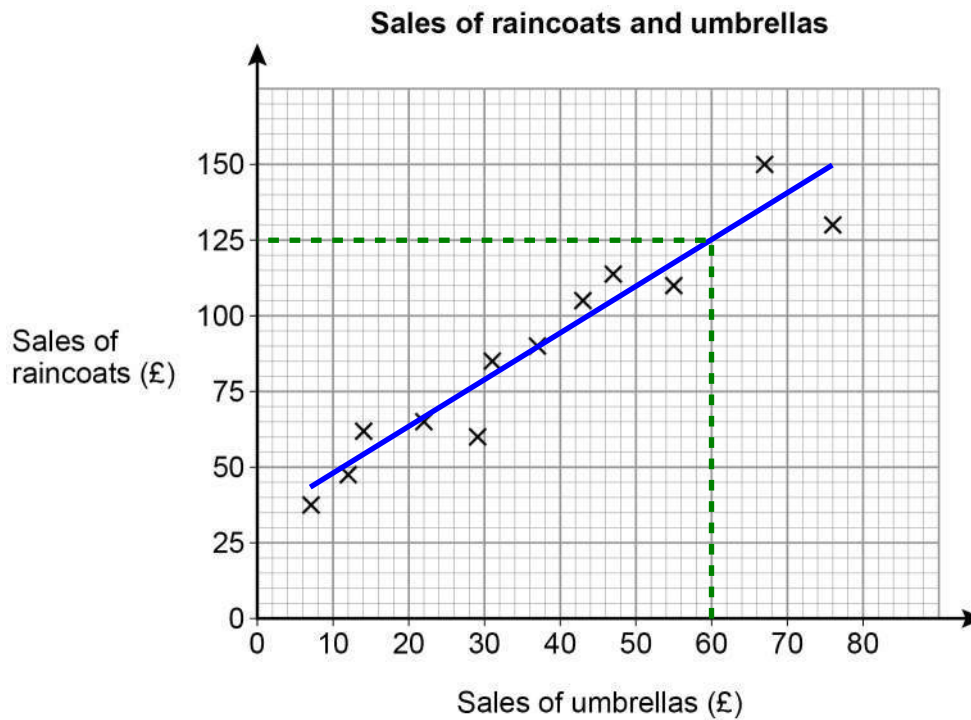
2.7 + 2 works out the total distance in centimetres from B to C on the map. Subtracting this from the 6.5cm measured from A to B on the map works out how much further it is from A to B than B to C on the map. Multiplying this by 200 converts the distance on the map to the actual number of kilometres in real life

Answer 360 km

Turn over for the next question



- 18 A shop sells raincoats and umbrellas.
The scatter graph shows the monthly sales for 12 months.



- 18 (a) Write down the type of correlation shown by the graph.

[1 mark]

Answer Positive

It is positive correlation as both variables increase together.
There would be a positive gradient on the line of best fit

- 18 (b) The manager expects the sales of umbrellas next month to be £60
Draw a line of best fit to estimate the sales of raincoats next month.

[3 marks]

Answer £ 125

Reading up from £60 on the x axis to the line
then across to the y axis makes the estimate



- 19 Multiply out $x(x-4)$
Circle your answer.

[1 mark]

$x^2 - 4$

$2x - 4$

$x^2 - 4x$

$-3x^2$

$x \times x = x^2. x \times -4 = -4x$

- 20 $a : b = 5 : 2$

How many times larger is a than b ?
Circle your answer.

[1 mark]

0.4

1.5

2.5

3

a could be 5 while b could be 2. $2 \times 2.5 = 5$

Turn over ►



21 (a) A circle has radius 4.2 cm

Work out the length of the circumference.

Give your answer to 1 decimal place.

[3 marks]

$$\pi \times 2 \times 4.2$$

Circumference = $\pi \times$ diameter. Diameter = $2 \times$ radius

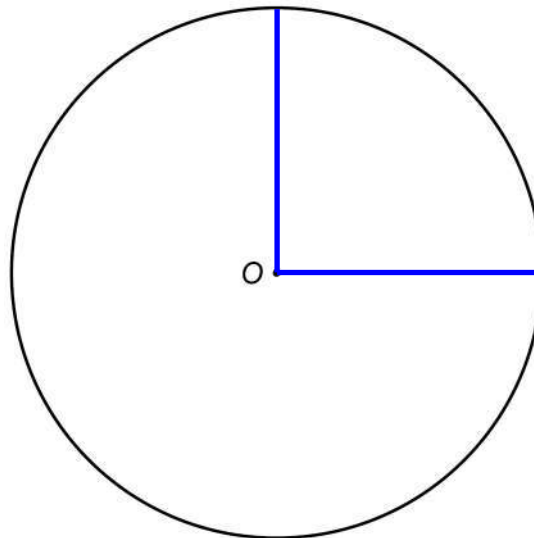
The answer of 26.38937829 is rounded to 1 decimal place. The 3 in the first decimal place rounds up to a 4 as there is an 8 in the next decimal place. Then everything after the first decimal place is set to 0 and ignored

Answer 26.4 cm

21 (b) The circle below has centre O.

Draw a sector on the circle.

[1 mark]



23

Match each sequence to its description.

One has been done for you.

[4 marks]

1 1 2 3 5 8	Arithmetic progression
1 2 4 8 16 32	Geometric progression
1 2 3 4 5 6	Fibonacci sequence
1 3 6 10 15 21	Triangular numbers
1 4 9 16 25 36	Cube numbers
1 8 27 64 125 216	Square numbers

1, 2, 4, 8, 16, 32 is a geometric progression as it is multiplying by the same amount (2) between each term. 1, 2, 3, 4, 5, 6 is an arithmetic progression as the same amount (1) is being added between each term. 1, 3, 6, 10, 15, 21 are triangular numbers as it starts with 1, then adds 2, then adds 3, then adds 4, then adds 5, then adds 6. 1, 4, 9, 16, 25, 36 are square numbers as they are $1^2, 2^2, 3^2, 4^2, 5^2, 6^2$. 1, 8, 27, 64, 125, 216 are cube numbers as they are $1^3, 2^3, 3^3, 4^3, 5^3, 6^3$.



24

The table shows information about the population of a city.

Population in 2001	Population in 2011
420 000	480 000

Liam claims,

“From 2011 to 2021 the population of the city will increase by the same percentage as from 2001 to 2011”

He works out,

$$\begin{aligned} \text{population increase from 2001 to 2011} &= 480\,000 - 420\,000 \\ &= 60\,000 \end{aligned}$$

$$\begin{aligned} \text{population in 2021} &= 480\,000 + 60\,000 \\ &= 540\,000 \end{aligned}$$

Does the population of 540 000 match his claim?

You **must** show your working.

[3 marks]

$$\frac{60000}{420000} \times 100 = 14.2857\%$$

60000/420000 expresses the increase as a fraction of the population in 2001. Multiplying this by 100 converts it into a percentage

$$\frac{60000}{480000} \times 100 = 12.5\%$$

60000/480000 expresses the same increase as a fraction of the population in 2011. Multiplying this by 100 converts it into a percentage

Answer

No

Liam increased by 60000 for both 2001 to 2011 and 2011 to 2021. The percentage increase is different for both of these though



- 25 On three days, Ali throws darts at a target.
Here are his results.

	Number of throws	Number of hits	Number of misses
Monday	20	15	5
Tuesday	30	22	8
Wednesday	40	17	23
Total	90	54	36

- 25 (a) Work out **two** different estimates for the probability of Ali hitting the target.

[2 marks]

Answer $\frac{54}{90}$ and $\frac{17}{40}$

54 out of the total number of throws were hits.
17 out of the 40 throws on Wednesday were hits

- 25 (b) Which of your two answers is the better estimate for the probability of Ali hitting the target?

Give a reason for your answer.

[1 mark]

Answer $\frac{54}{90}$

Reason It was based on more throws



- 26** Theo starts with savings of £18
James starts with no savings.
- Each week from now,
Theo will save £4.50 and James will save £4
- In how many weeks will Theo and James have savings in the ratio 15 : 8 ? **[3 marks]**

45:24

Using table mode by pressing MENU then 3. $f(x) = 18 + 4.50x$. $g(x) = 4x$. Start: 1. End: 30. Step: 1

This lists out the amount of money each person has each week. The x column is the number of weeks. The f(x) column is the amount of money Theo has. The g(x) column is the amount of money James has. Scrolling down until the amount Theo has to the amount James has simplifies to 15 : 8. 45 : 24 can be simplified to 15 : 8 by dividing both sides by 3

Answer _____

6

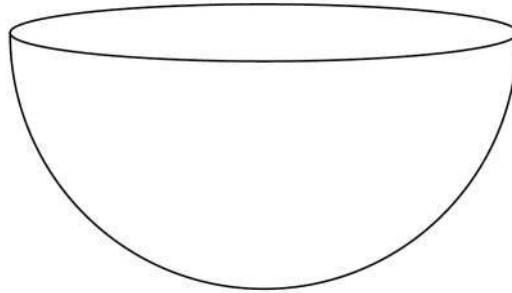
Turn over for the next question



27

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3 \text{ where } r \text{ is the radius}$$

A container is a hemisphere of radius 30 cm



Sand fills the container at a rate of 4000 cm^3 per minute.

Does it take **less than** a quarter of an hour to fill the container?

You **must** show your working.

[3 marks]

 s^d ←

This is basically a speed, distance, time problem. The speed is the rate the sand fills the container and the distance is the volume of the container

$$\frac{\left(\frac{4}{3}\pi \times 30^3\right)}{2} = 14.1$$

$$\frac{\quad}{4000}$$

From the formula triangle, time = distance/speed. The volume of the container is found by substituting in the radius into the volume of a sphere formula then dividing by 2 as it is half of a sphere. The speed is 4000 cm^3 per minute. As the speed is in terms of minutes, the time calculated is in minutes

Quarter of an hour is 15 minutes
as $60/4 = 15$. 14.1 is less than this

Answer _____

Yes



28 The length of each side of a regular pentagon is 8.4 cm to 1 decimal place.

28 (a) Complete the error interval for the length of one side.

[2 marks]

$$8.4 \pm \frac{0.1}{2}$$

$$\underline{8.35} \text{ cm} \leq \text{length} < \underline{8.45} \text{ cm}$$

Adding and subtracting half of the resolution works out the upper and lower bound. The resolution is 0.1 as this is the place value of the first decimal place

28 (b) Complete the error interval for the perimeter.

[1 mark]

$$\underline{8.35} \times 5$$

$$\underline{8.45} \times 5$$

Pentagons have 5 sides. The perimeter is found by multiplying the side length by 5

$$\underline{41.75} \text{ cm} \leq \text{perimeter} < \underline{42.25} \text{ cm}$$

END OF QUESTIONS

