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Candidate number

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# GCSE MATHEMATICS

# H

Higher Tier

Paper 2 Calculator

Thursday 7 June 2018

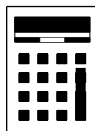
Morning

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.

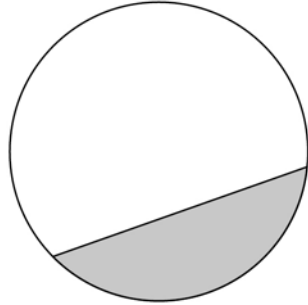
## Advice

- 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	
28–29	
<b>TOTAL</b>	

Answer **all** questions in the spaces provided

1 Here is a circle.



Circle the word that describes the shaded part.

[1 mark]

segment

chord

sector

arc

2 Circle the number that is in standard form.

[1 mark]

$0.25 \times 10^4$

$6 \times 10^7$

$38 \times 10^{-3}$

$4 \times 10^{\frac{1}{2}}$

3  $y$  is  $1\frac{1}{2}$  times  $x$ .

Circle the ratio that is equivalent to  $y : x$

[1 mark]

2 : 5

5 : 2

3 : 2

2 : 3

4 Work out 40 as a percentage of 10  
Circle your answer.

[1 mark]

4%

25%

300%

400%

Turn over for the next question

5

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

- 6 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]**

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Answer \_\_\_\_\_

**Turn over for the next question**

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

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

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

[2 marks]

Answer \_\_\_\_\_ and

- 7 (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 \_\_\_\_\_

Reason \_\_\_\_\_

\_\_\_\_\_

8

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]**

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Answer \_\_\_\_\_

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

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

[2 marks]

cm  $\leq$  length < cm

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

[1 mark]

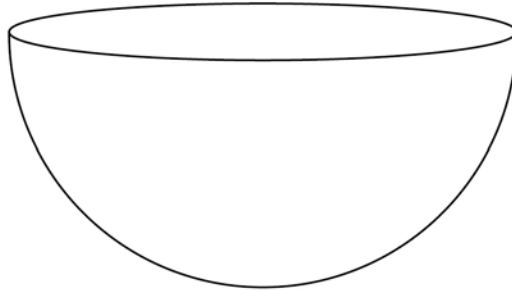
\_\_\_\_\_ cm  $\leq$  perimeter < cm



10

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

A container is a hemisphere of radius 30 cm



Sand fills the container at a rate of  $4000 \text{ cm}^3$  per minute.

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

You **must** show your working.

[3 marks]

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Answer \_\_\_\_\_



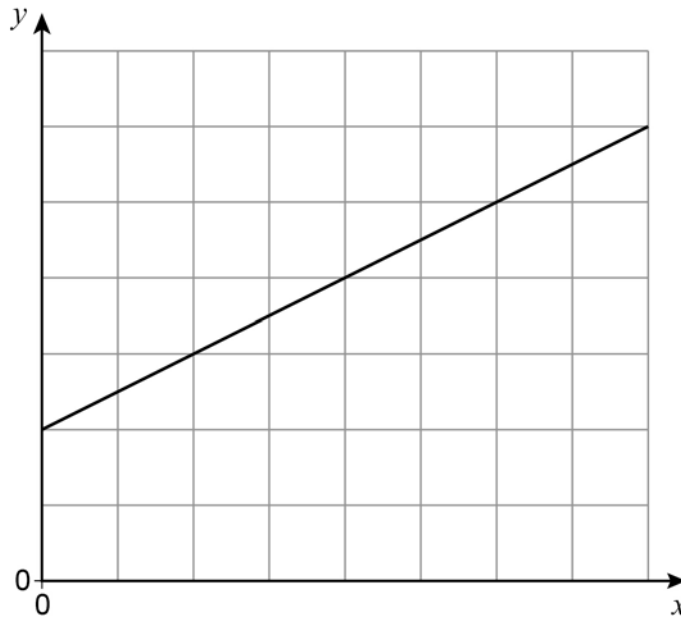
11 (c) Work out the probability that **exactly one** of the dice lands on a number less than 3

[2 marks]

Answer

Turn over for the next question

- 12 A straight line is drawn on the centimetre grid.



Fay assumes that the scale is 1 cm represents 1 unit.

- 12 (a) Use her assumption to work out the gradient of the line.

[1 mark]

Answer

**12 (b)** In fact, the scale is 1 cm represents 2 units.

Which statement is correct?

Tick **one** box.

**[1 mark]**

The answer to part (a) is too big

The answer to part (a) stays the same

The answer to part (a) is too small

**Turn over for the next question**

13

Show that, for  $x \neq -1$  $\frac{8x^2 - 8}{4x + 4}$  simplifies to the form  $ax + b$  where  $a$  and  $b$  are integers.**[3 marks]**

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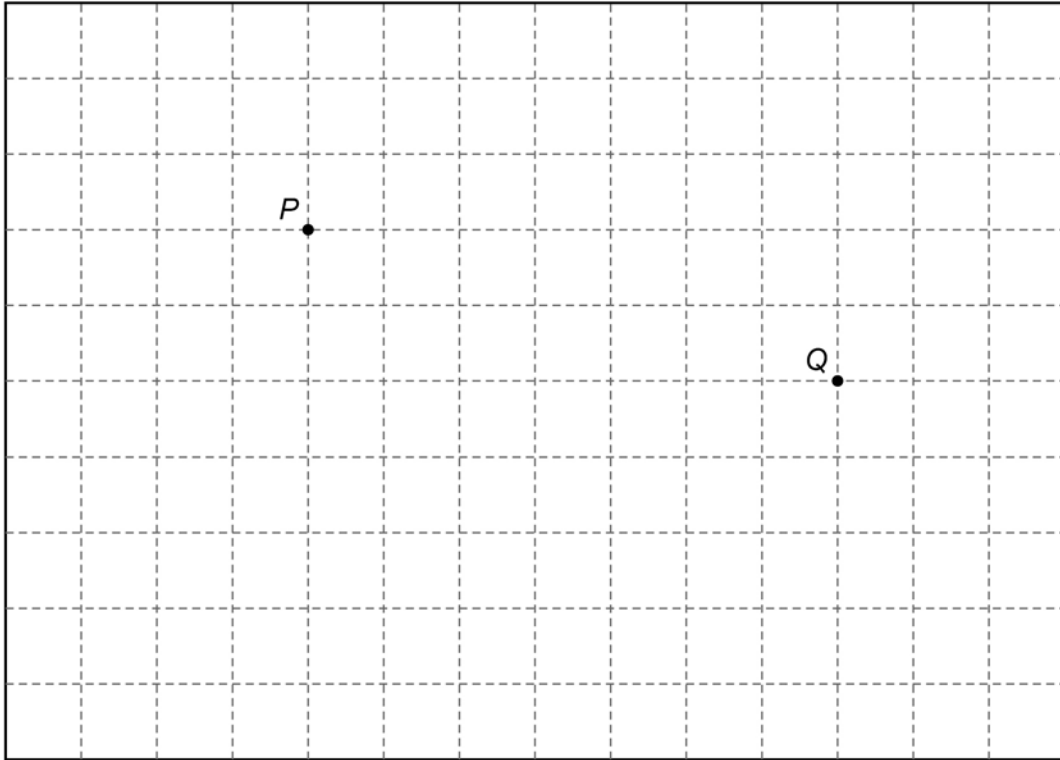
14

The scale drawing represents a garden.

Water from a sprinkler at  $P$  reaches up to 20 metres from  $P$ .

Water from a sprinkler at  $Q$  reaches up to 25 metres from  $Q$ .

**Scale:** 1 cm represents 5 m



Using a pair of compasses,

show the region that water from **both** sprinklers reaches.

**[2 marks]**

**Turn over for the next question**

15 100 men and 100 women took a test.

**Scores**

	<b>Median</b>	<b>Interquartile range</b>	<b>Range</b>
<b>Men</b>	28	7.5	31
<b>Women</b>	30	9	37

Using this data, which statement **must** be true?

Tick **one** box.

[1 mark]

Men had a higher average score than women

Men had more consistent scores than women

A woman had the highest score

A man had the lowest score



**16** Some concrete has volume  $3.8 \text{ m}^3$

**16 (a)** The density of the concrete is  $2400 \text{ kg/m}^3$

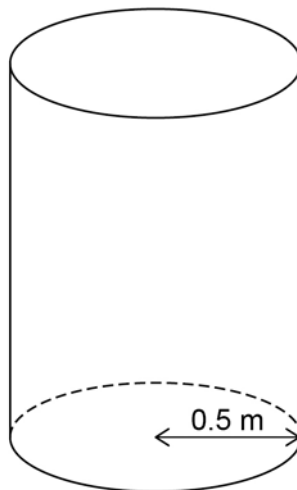
Work out the mass of the concrete.

**[2 marks]**

Answer

kg

**16 (b)** The  $3.8 \text{ m}^3$  of concrete is made into the shape of a cylinder.  
The base has radius  $0.5$  metres.



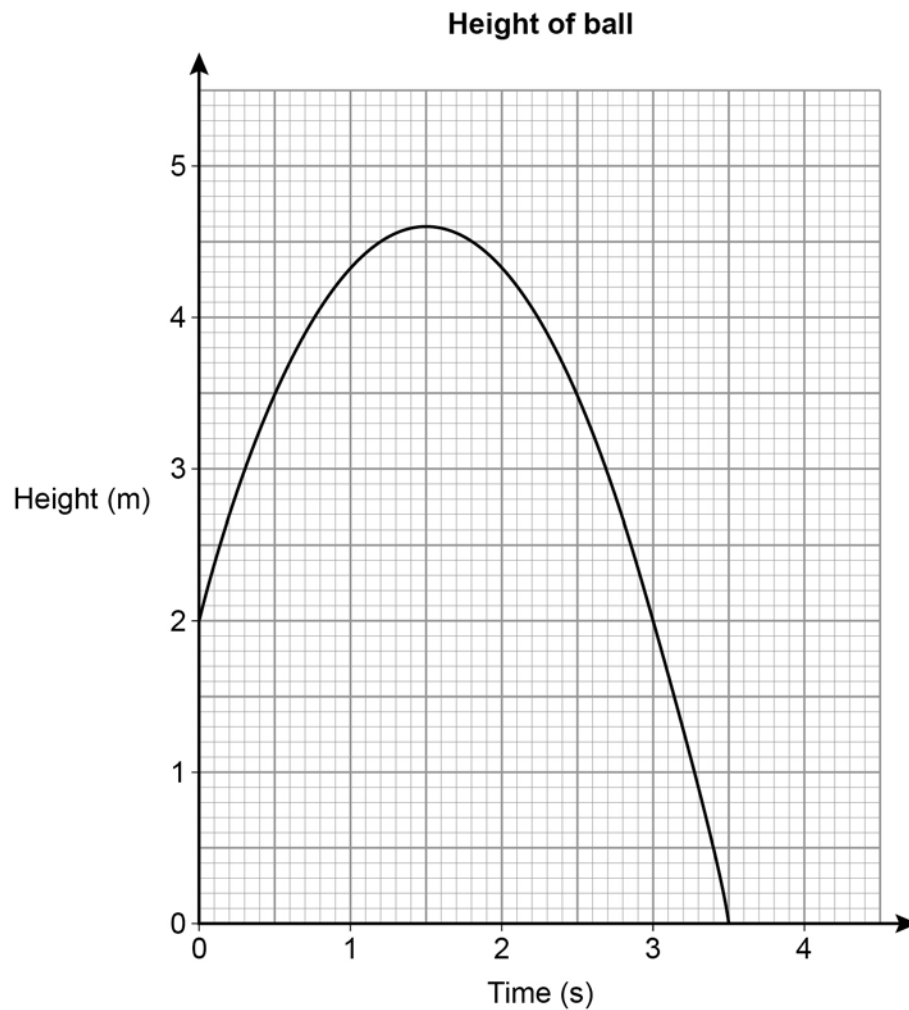
Work out the height of the cylinder.

**[2 marks]**

Answer

m

- 17** A ball is thrown vertically upwards.  
The graph shows the height of the ball above the ground after it is thrown.



- 17 (a)** For how many seconds is the ball at a height of **more than 2 metres**?

**[1 mark]**

Answer \_\_\_\_\_ s

- 17 (b)** After how many seconds is the ball at instantaneous rest when it is in the air?

**[1 mark]**

Answer \_\_\_\_\_ s

**17 (c)** Work out the average speed of the ball when it is moving downwards.

**[2 marks]**

Answer

m/s

**18** The solution of  $3^x = 300$  lies between two consecutive integers.  
Work out the two integers.

**[1 mark]**

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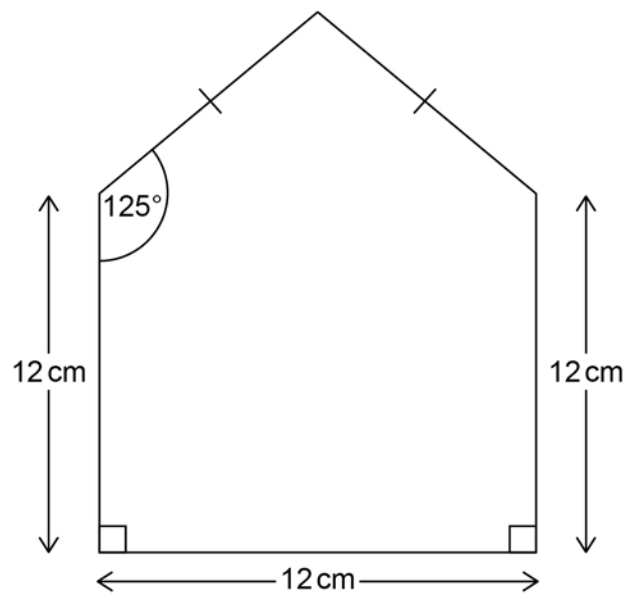
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Answer \_\_\_\_\_ and \_\_\_\_\_

**Turn over for the next question**

19

A pentagon is made from a square and an isosceles triangle.

Not drawn  
accurately

Work out the perimeter of the pentagon.

**[4 marks]**

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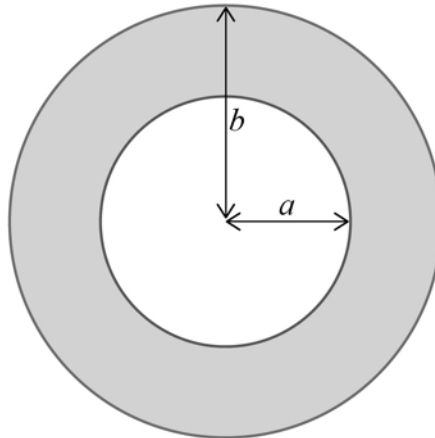
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Answer \_\_\_\_\_ cm

20

Here is an inflated swimming ring with dimensions in centimetres.



The volume of the ring,  $V \text{ cm}^3$ , is given by

$$V = 0.25\pi^2(b - a)^2(b + a)$$

Work out the volume when  $a = 20$  and  $b = 30$

Give your answer to 3 significant figures.

[3 marks]

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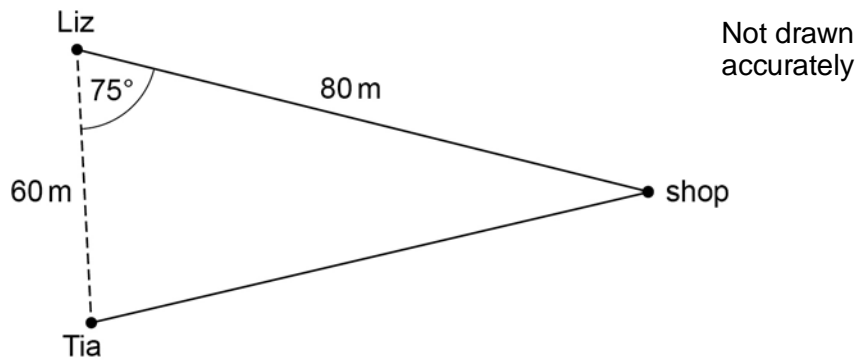


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Answer \_\_\_\_\_  $\text{cm}^3$

Turn over for the next question

- 21** Liz and Tia are walking towards a shop along different straight paths.  
The diagram shows their positions at 2 pm



- 21 (a)** Assume they walk at the same speed.  
Who will arrive at the shop first?  
You **must** show your working.

**[3 marks]**

Answer

- 21 (b)** In fact, Liz walks at a faster speed than Tia.  
How does this affect the answer to part (a)?

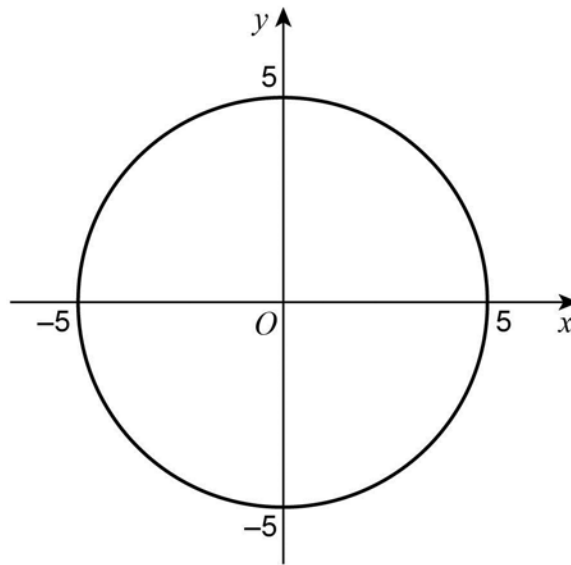
**[1 mark]**

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- 22 A circle, centre  $O$ , passes through  $(5, 0)$ .



What is the equation of the circle?

Circle your answer.

[1 mark]

$x^2 + y^2 = 25$

$x^2 + y^2 = 5$

$x^2 + y^2 = 10$

$x^2 + y^2 = 100$

Turn over for the next question

**23**

Solids X and Y are similar.

X has volume  $64 \text{ cm}^3$ Y has volume  $343 \text{ cm}^3$ The surface area of X is  $176 \text{ cm}^2$ 

Work out the surface area of Y.

**[3 marks]**

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Answer \_\_\_\_\_  $\text{cm}^2$



24

A tank is a cuboid measuring 50 cm by 35 cm by 20 cm

All lengths are to the **nearest centimetre**.

A container has a capacity of **exactly** 34 litres.

1 litre = 1000 cm<sup>3</sup>

Which has the greater capacity?

Tick **one** box.

Tank

Container

Cannot tell

Show working to support your answer.

**[4 marks]**

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**Turn over for the next question**

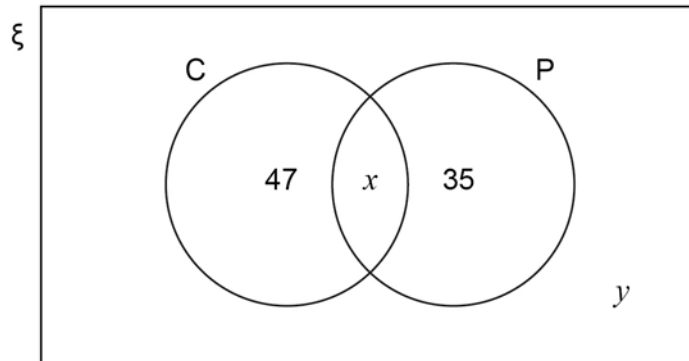
25

The Venn diagram shows some information about 150 students.

$\xi$  = 150 students

C = students who study Chemistry

P = students who study Physics



The probability that a Physics student, chosen at random, also studies Chemistry is  $\frac{5}{12}$

One of the 150 students is chosen at random.

Work out the probability that the student does **not** study either Chemistry or Physics.

**[4 marks]**

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Answer \_\_\_\_\_





**28**       $f(x) = 5 - x$       and       $g(x) = 3x + 7$

**28 (a)**      Simplify       $f(2x) + g(x - 1)$

**[3 marks]**

Answer

**28 (b)**      Solve       $g^{-1}(x) = 2x$

**[3 marks]**

$x =$

**END OF QUESTIONS**

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