A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE
MATHEMATICS

H

Higher Tier Paper 2 Calculator

8300/2H

Thursday 7 June 2018 Morning

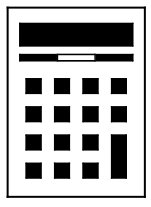
Time allowed: 1 hour 30 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

For this paper you must have:

- **a calculator**
- **mathematical instruments.**



INSTRUCTIONS

- **Use black ink or black ball-point pen. Draw diagrams in pencil.**
- **Answer ALL questions.**
- **You must answer the questions in the spaces provided. Do not write 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.**

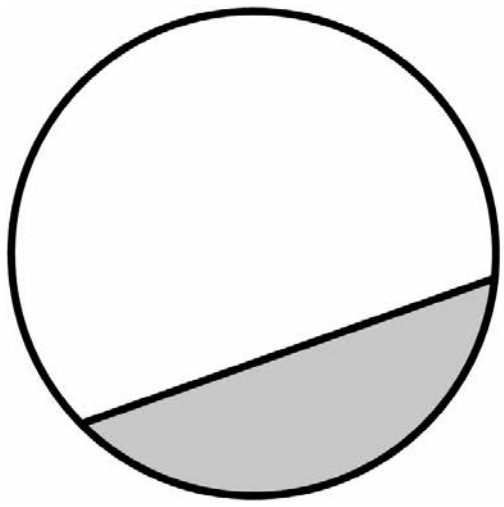
ADVICE

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

DO NOT TURN OVER UNTIL TOLD TO DO SO

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]

0.25×10^{4} 6×10^{7}

38×10^{-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%

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

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[Turn over]

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,

population increase from 2001 to 2011

= 480 000 – 420 000

= 60 000

population in 2021

= 480 000 + 60 000

= 540 000

9

Does the population of 540 000 match his claim?

You MUST show your working.
[3 marks]

Answer

7

7 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

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]

Answer _____

6

[Turn over]

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 ⩽ length < _____ cm

9 (b) Complete the error interval for the perimeter. [1 mark]

_____ cm ⩽ perimeter < _____ cm

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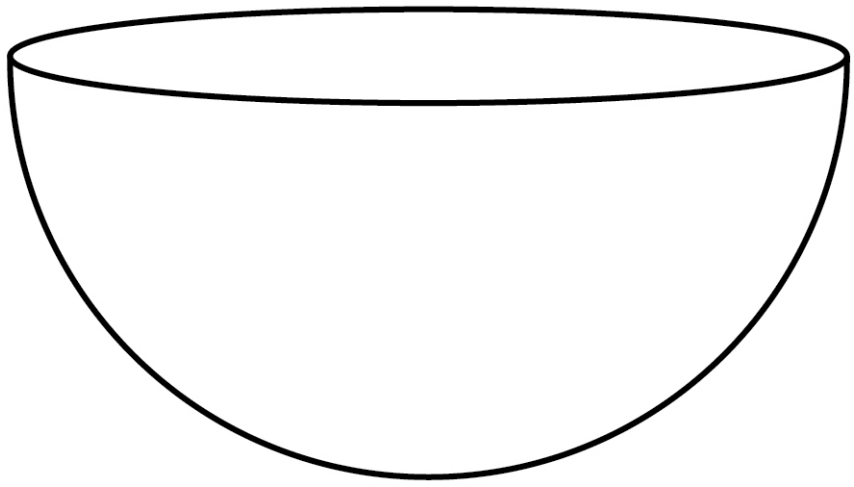
[Turn over]

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

where r 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?

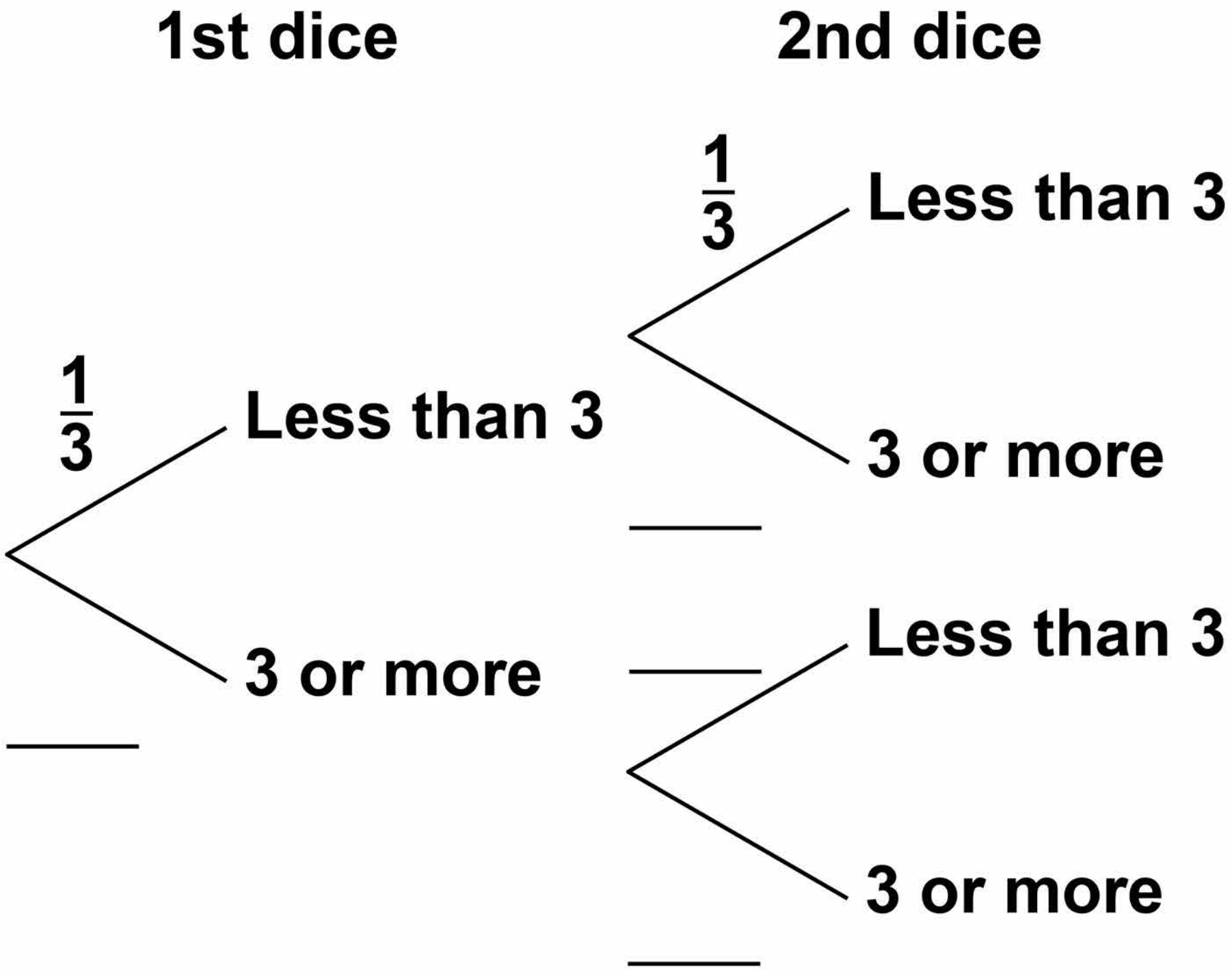
You MUST show your working.
[3 marks]

Answer _____

[6]

11 **Two ordinary fair dice are rolled.**

11 (a) **Complete the tree diagram.**
[1 mark]



11 (b) Work out the probability that BOTH dice land on a number less than 3 [1 mark]

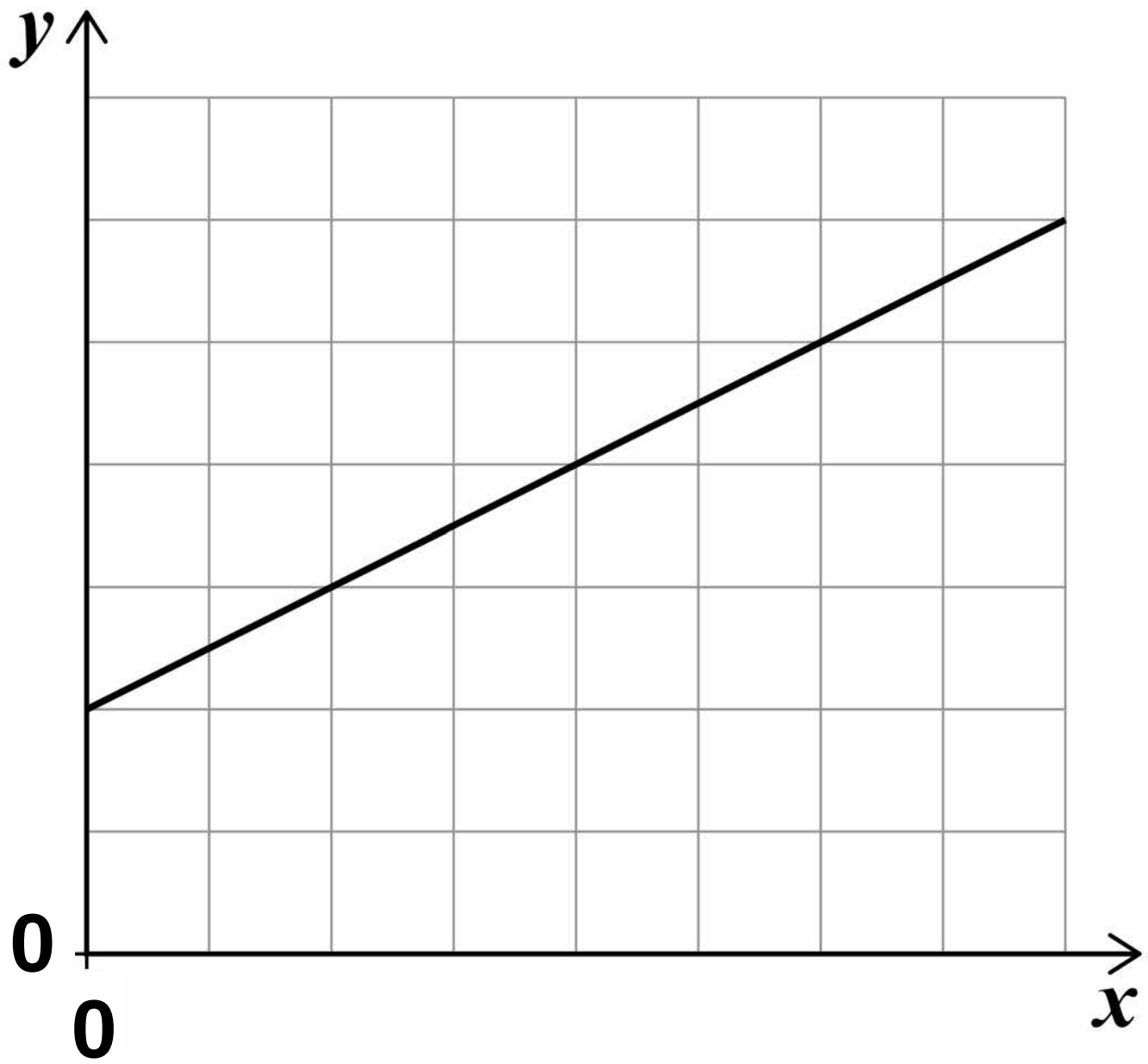
Answer

11 (c) Work out the probability that EXACTLY ONE of the dice lands on a number less than 3
[2 marks]

Answer

12 **Take the sides of all squares of the grid to be 1 cm long.**

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

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]

BLANK PAGE

[Turn over]

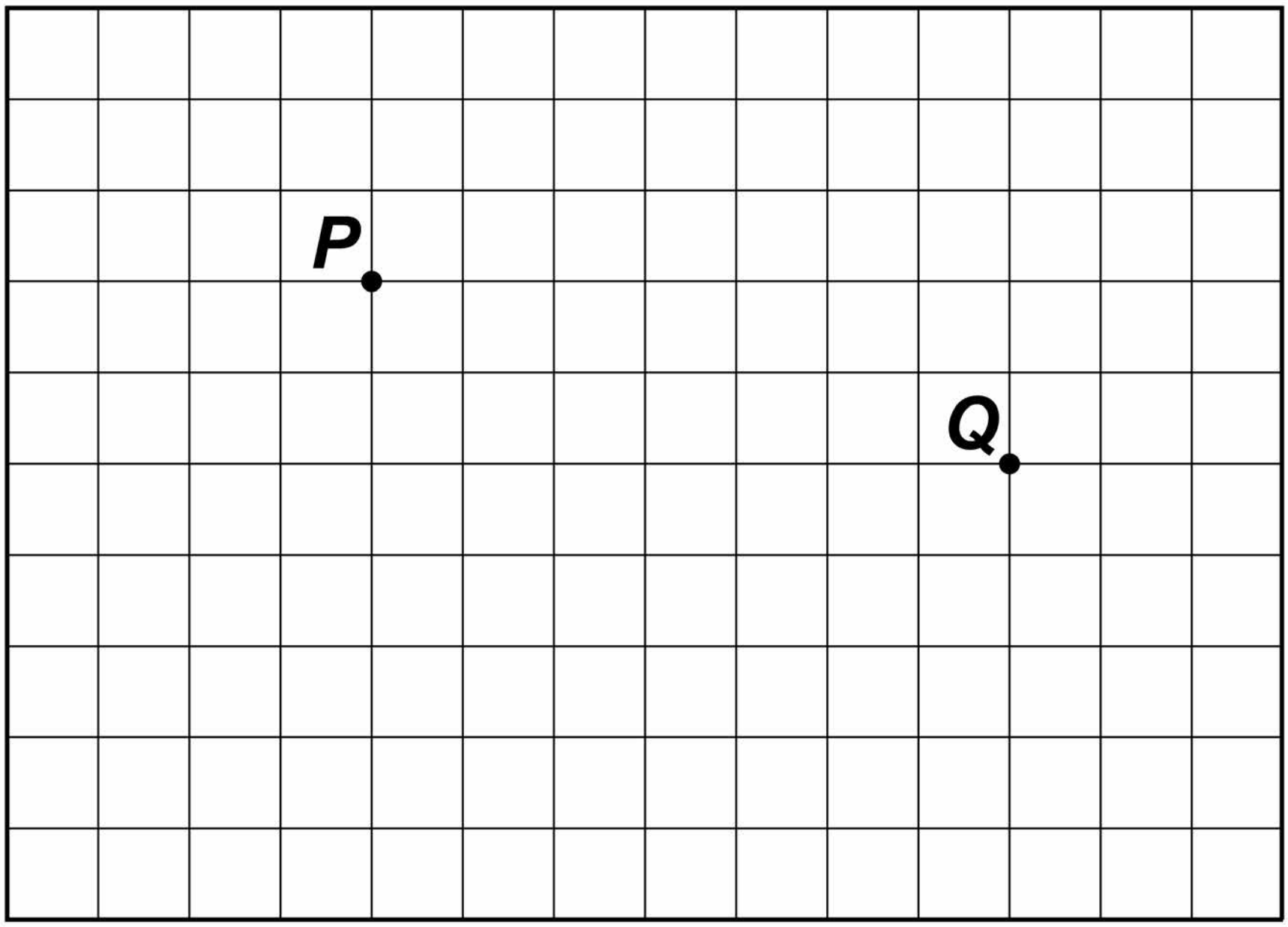
14 **The scale drawing, on page 25, represents a garden.**

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

Take the sides of all squares of the grid to be 1 cm long.



Using a pair of compasses, show the region that water from BOTH sprinklers reaches. [2 marks]

5

15 100 men and 100 women took a test.

SCORES

	Median	Interquartile range	Range
Men	28	7.5	31
Women	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**

[Turn over]

16 Some concrete has volume $3.8\ m^3$

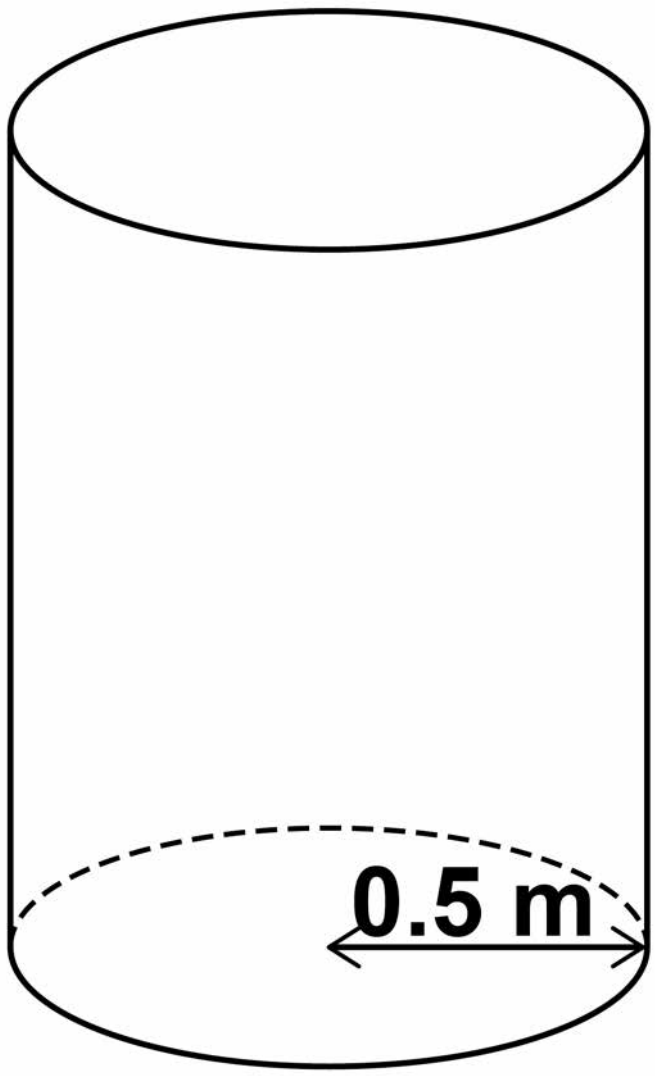
16 (a) The density of the concrete is $2400\ kg/m^3$

Work out the mass of the concrete. [2 marks]

Answer _____ kg

16 (b) **The 3.8 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**

5

17 A ball is thrown vertically upwards.

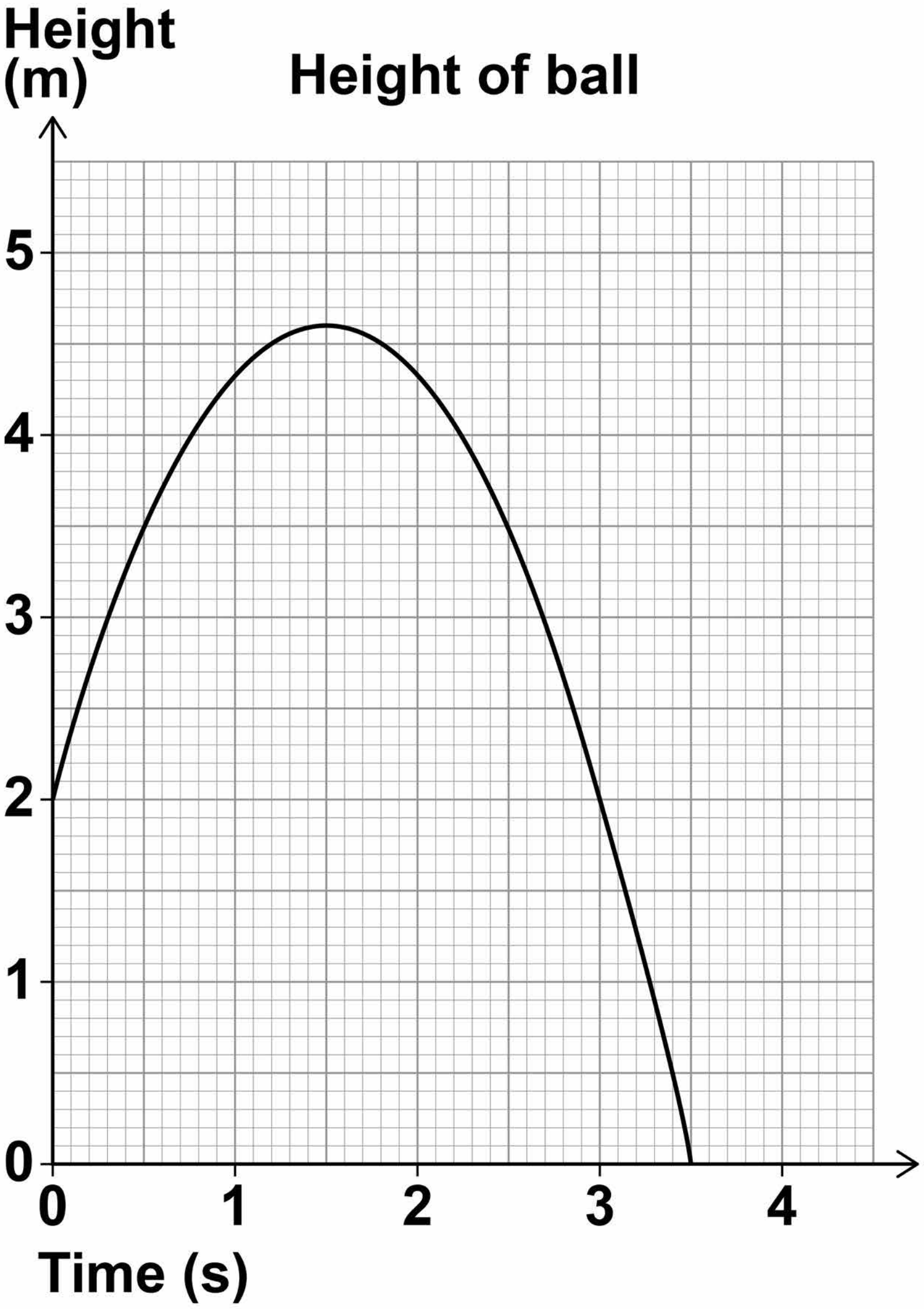
The graph, on the opposite page, shows the height of the ball above the ground after it is thrown.

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



[Turn over]

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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.

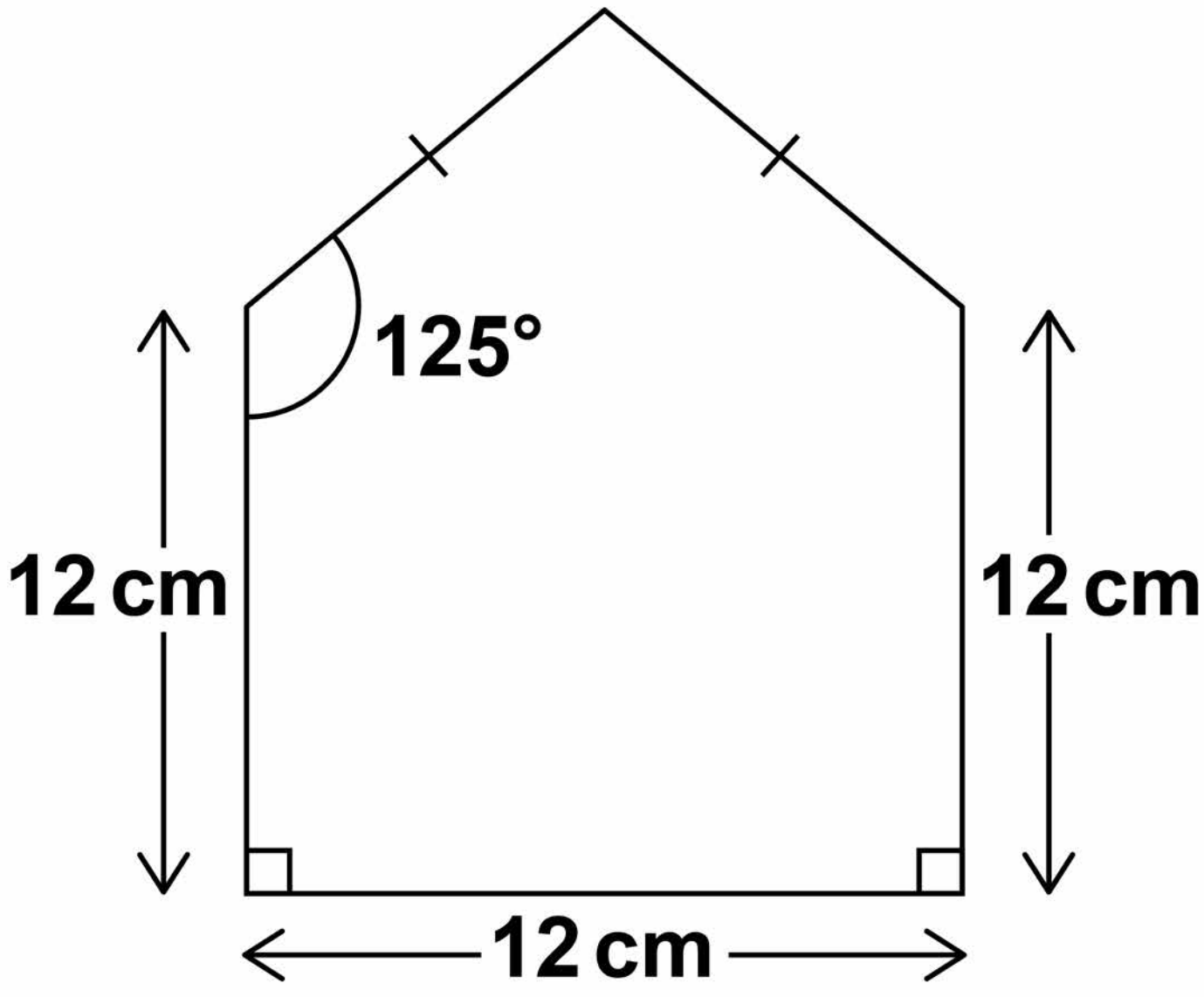
Work out the two integers.
[1 mark]

Answer _____ and _____

5

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

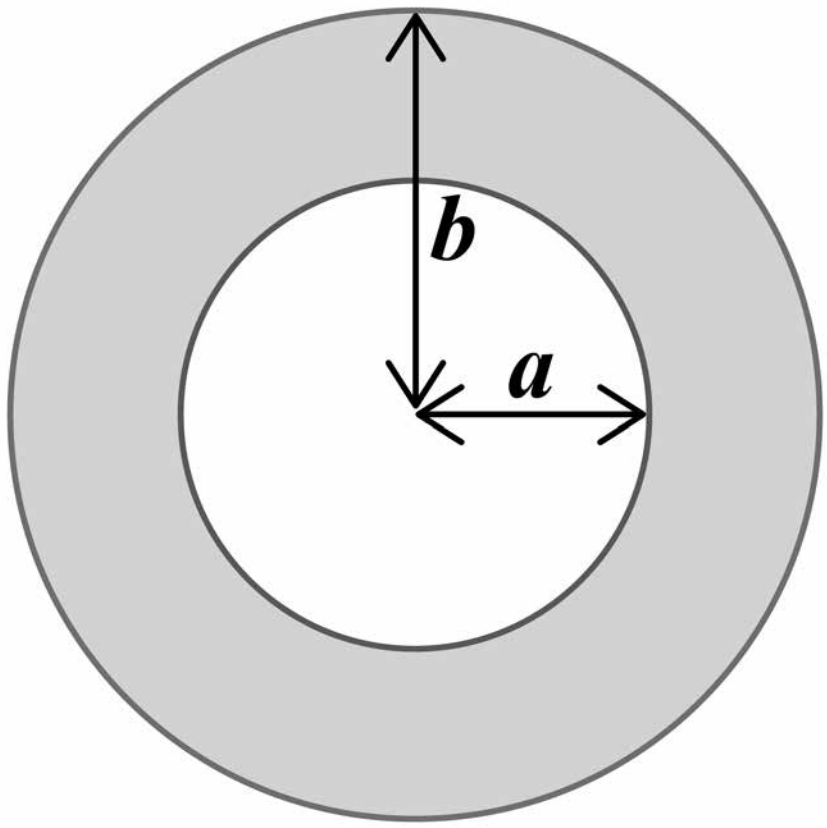
The diagram is not drawn accurately.



Work out the perimeter of the pentagon. [4 marks]

Answer _____ **cm**

20 **Here is an inflated swimming ring with dimensions in centimetres.**



The volume of the ring, V 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

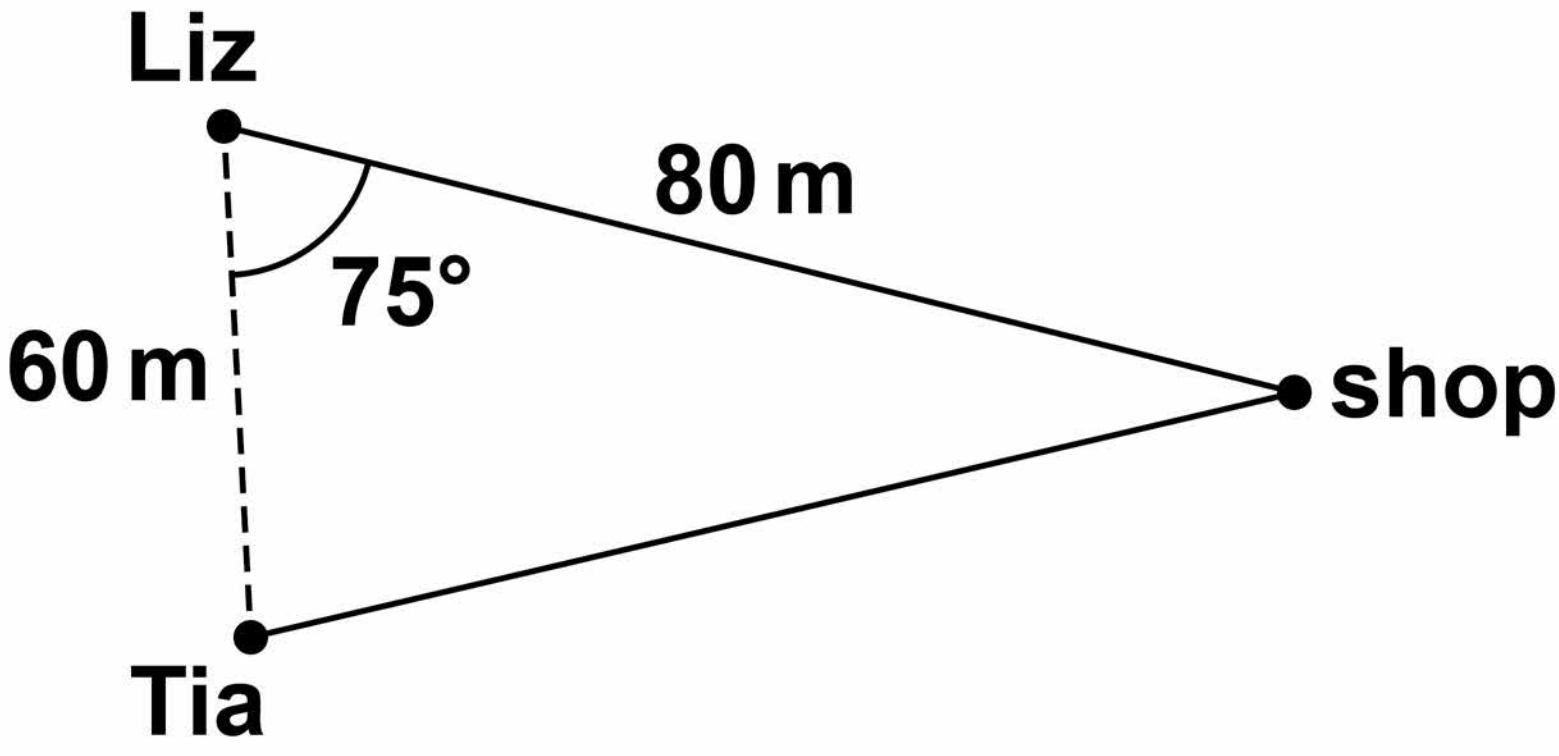
Give your answer to 3 significant figures. [3 marks]

Answer _____ **cm ^{3}**

21 Liz and Tia are walking towards a shop along different straight paths.

The diagram shows their positions at 2 pm

The diagram is not drawn accurately.



21 (a) Assume they walk at the same speed.

Who will arrive at the shop first?

You MUST show your working.

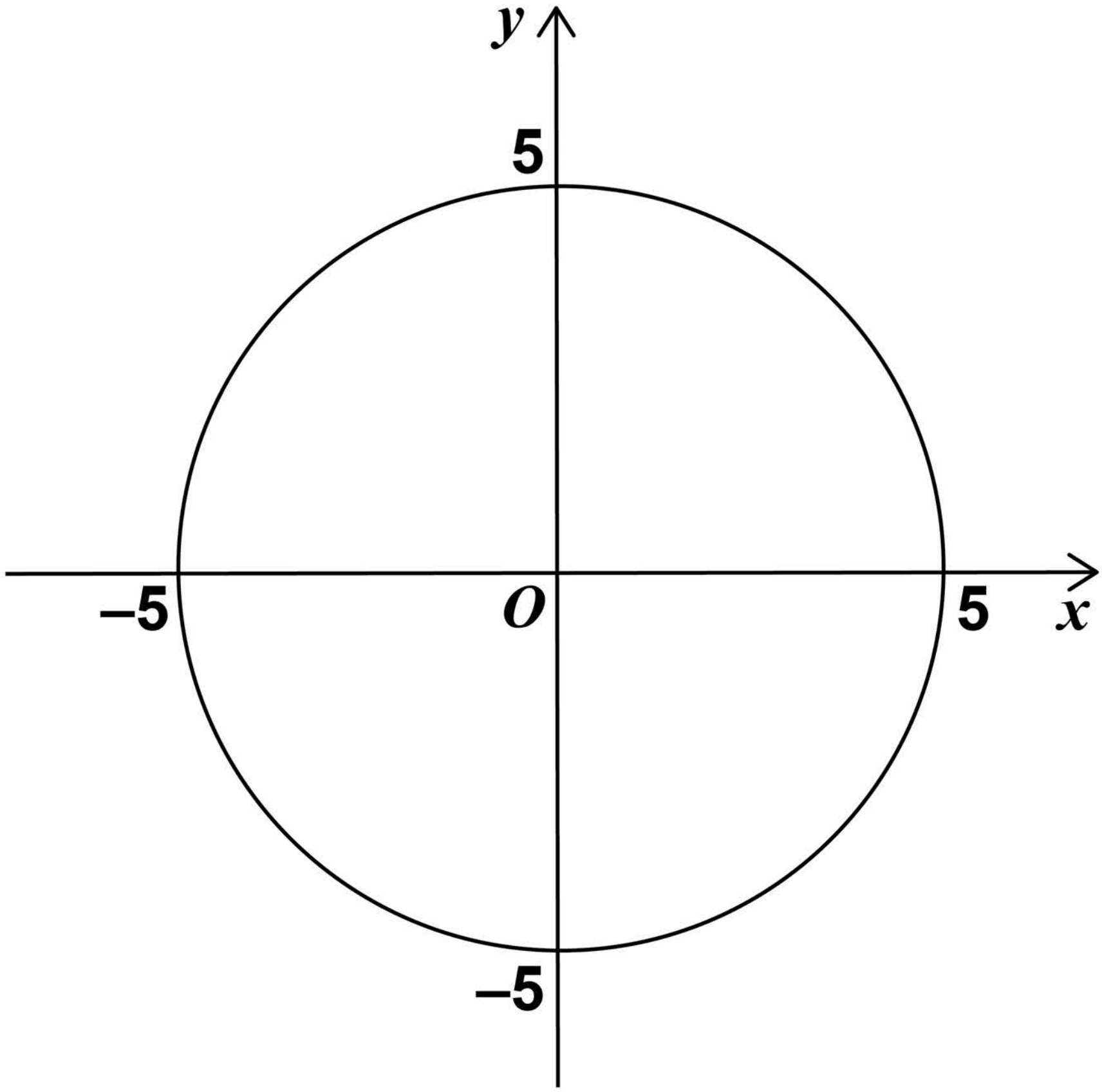
[3 marks]

Answer _____

21 (b) In fact, Liz walks at a faster speed than Tia.

How does this affect the answer to part (a)? [1 mark]

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



What is the equation of the circle?
Circle your answer. [1 mark]

$x^2 + y^2 = 25$ $x^2 + y^2 = 5$

$x^2 + y^2 = 10$ $x^2 + y^2 = 100$

5

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23 Solids X and Y are similar.

X has volume 64 cm ^{3}

Y has volume 343 cm ^{3}

The surface area of X is 176 cm ^{2}

Work out the surface area of Y.
[3 marks]

Answer _____ 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^3

Which has the greater capacity?

Tick ONE box.

☐ Tank

☐ Container

☐ Cannot tell

Show working to support your answer. [4 marks]

[Turn over]

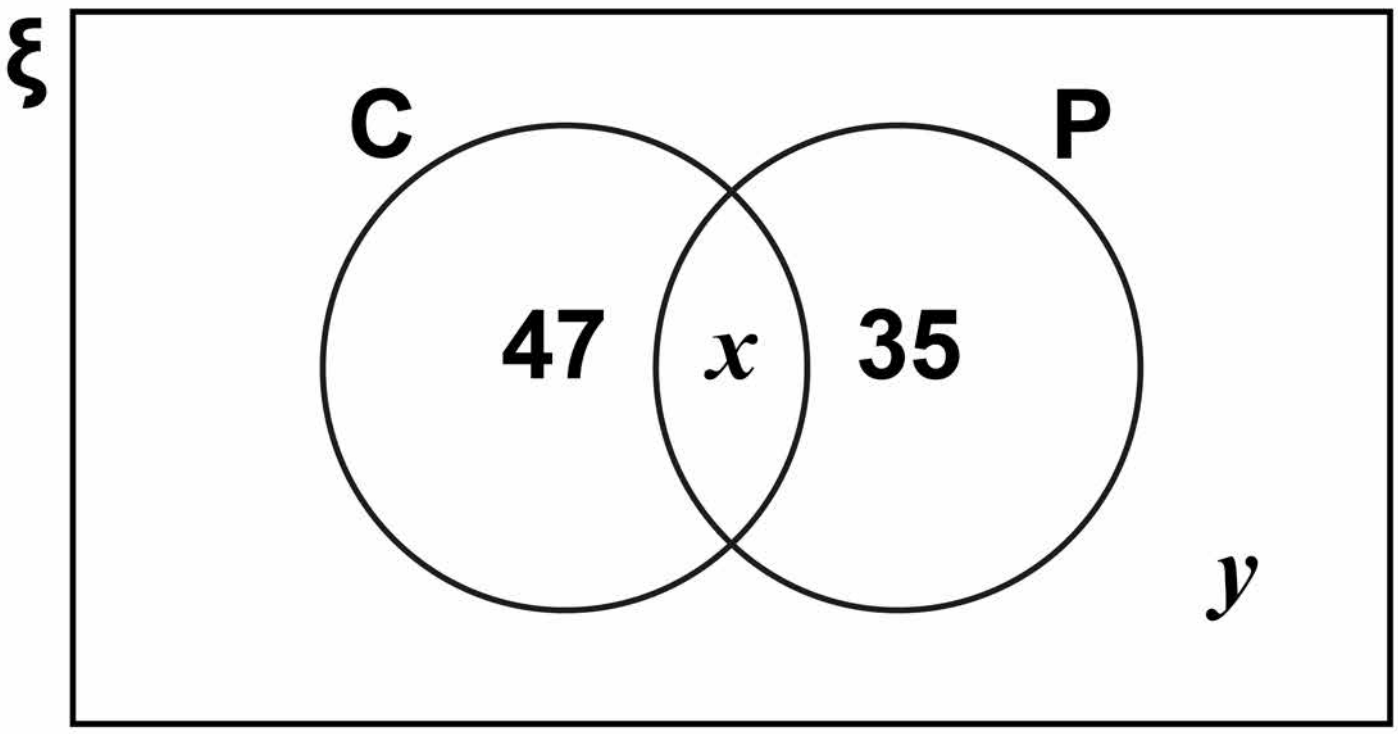
7

25 The Venn diagram shows some information about 150 students.

ξ = 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]

Answer

26 A curve has equation

$y = 4x^2 + 5x + 3$

A line has equation

$y = x + 2$

Show that the curve and the line have EXACTLY one point of intersection.

Do NOT use a graphical method.

[4 marks]

8

27 Prove algebraically that $2.7\dot{5}$ converts to the fraction $\frac{124}{45}$

[3 marks]

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]

$x =$

9

END OF QUESTIONS

There are no questions printed on this page

For Examiner's Use	
Pages	Mark
4–5	
6–9	
10–13	
14–17	
18–19	
20–21	
22–25	
26–29	
30–33	
34–37	
38–41	
43–45	
46–48	
49–51	
TOTAL	