Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

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.

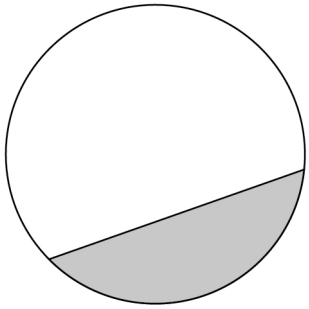
Advice
- In all calculations, show clearly how you work out your answer.

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	
TOTAL	

Do not write outside the box

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

Do not write outside the box

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

4

Do not write outside the box

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

Do not write outside the box

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

Does the population of 540 000 match his claim?
You **must** show your working.

[3 marks]

Answer _____

Turn over for the next question

7

Do not write outside the box

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 _____

Do not write outside the box

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

Do not write outside the box

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 $\leqslant$ length $<$ _____ cm

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

[1 mark]

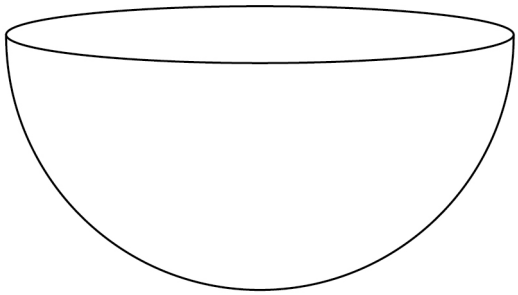
_____ cm $\leqslant$ perimeter $<$ _____ cm

Do not write outside the box

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

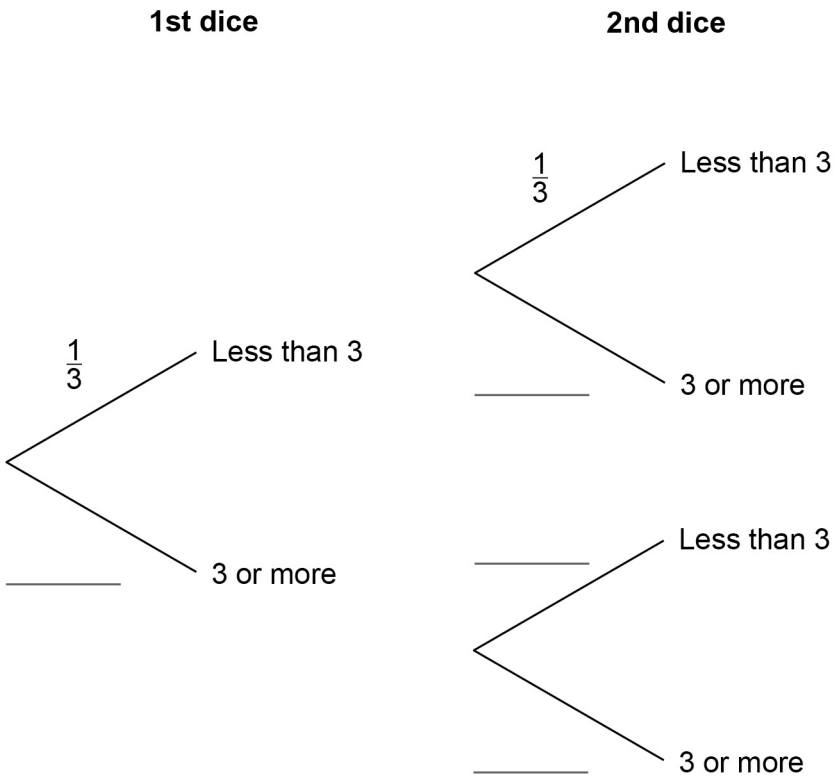
Turn over ►

Do not write outside the box

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 _____

Do not write outside the box

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

[2 marks]

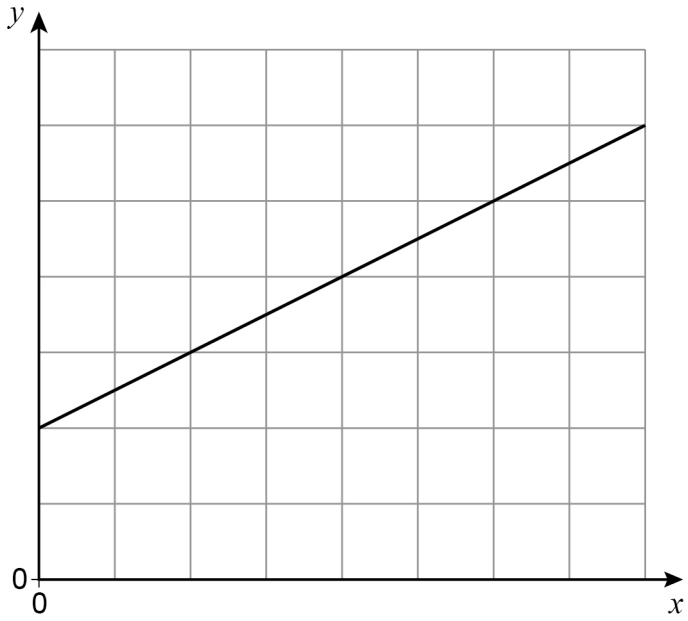
Answer _____

Turn over for the next question

4

Do not write outside the box

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 _____

Do not write outside the box

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

2

Do not write outside the box

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]

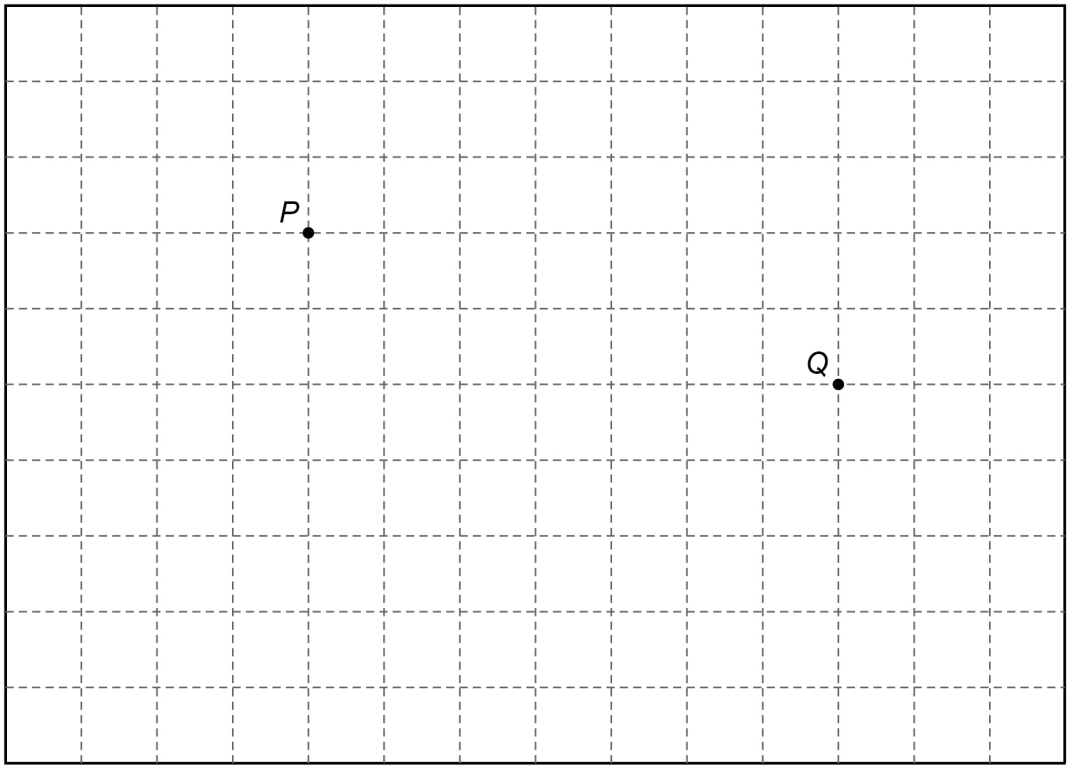
Do not write outside the box

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

5

Do not write outside the box

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

Do not write outside the box

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

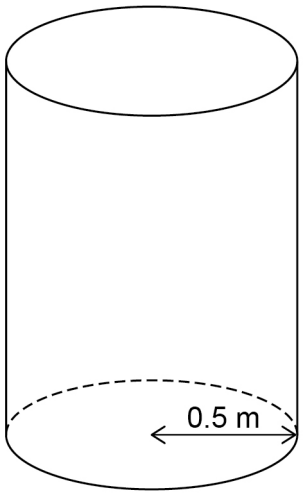
16 (a) The density of the concrete is $2400\ kg/m^3$

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

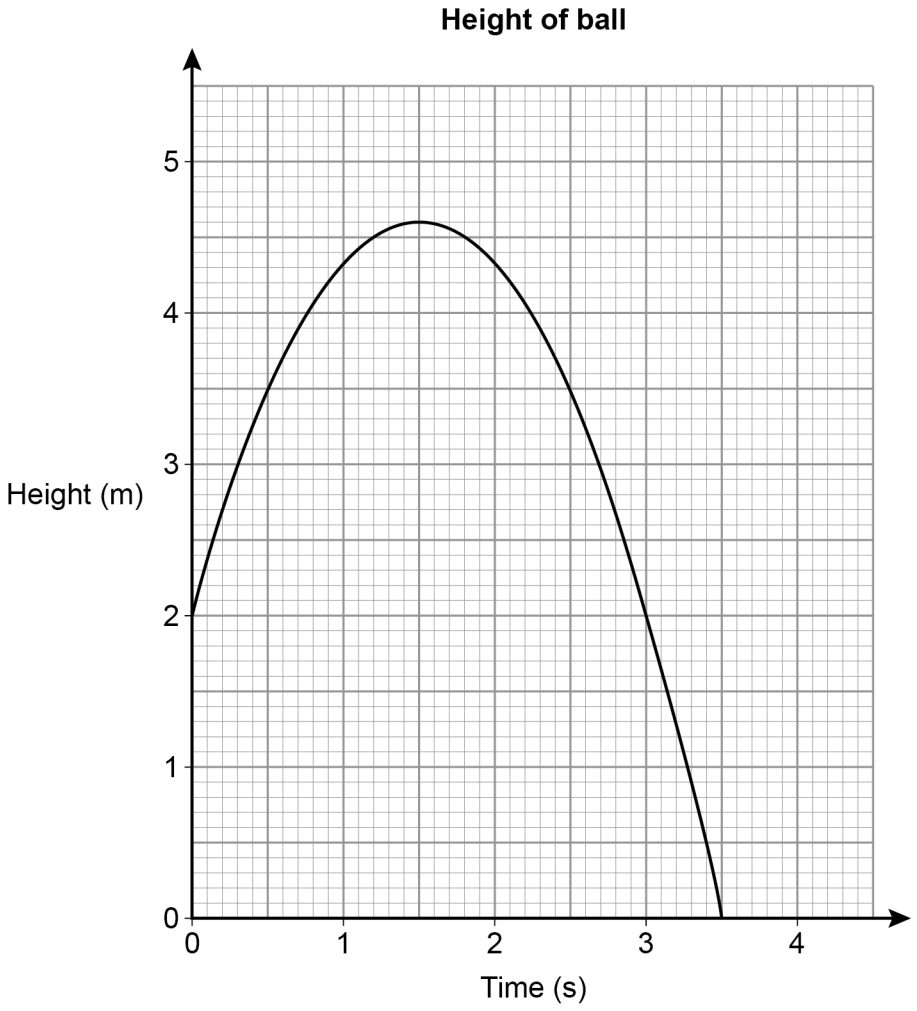
5

Turn over ►

Do not write outside the box

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

Do not write outside the box

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]

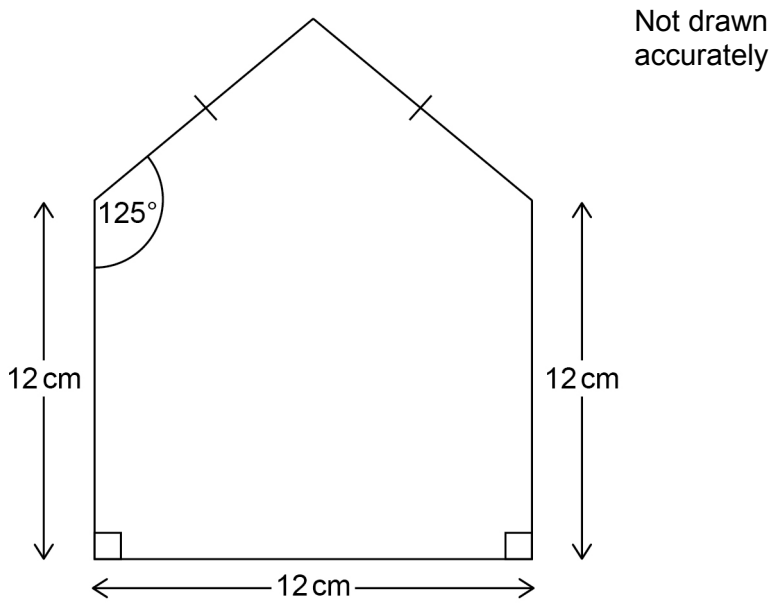
Answer _____ and _____

Turn over for the next question

5

Do not write outside the box

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



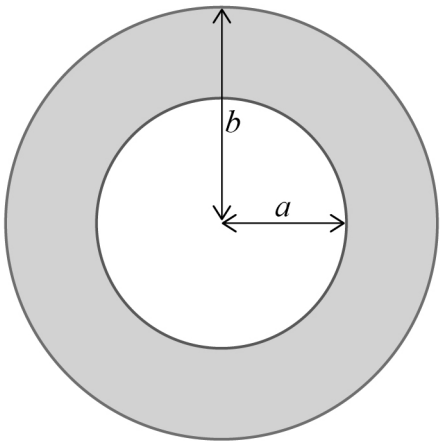
Work out the perimeter of the pentagon.

[4 marks]

Answer _____ cm

Do not write outside the box

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

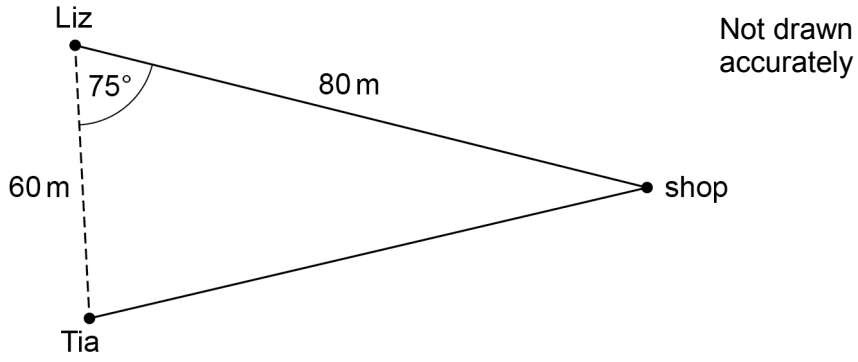
Turn over for the next question

7

Do not write outside the box

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 _____

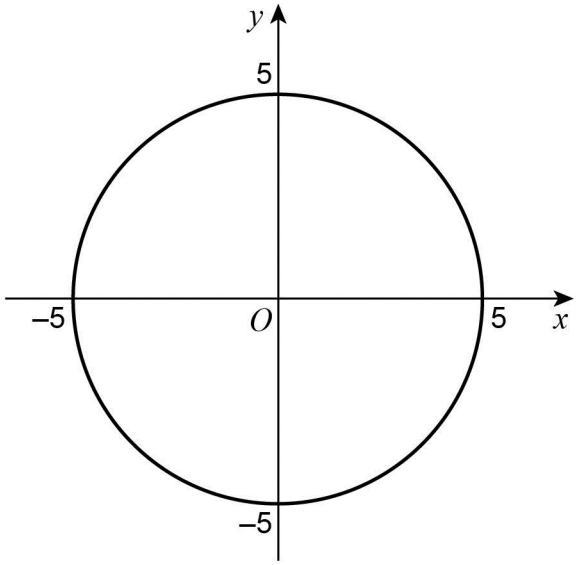
21 (b) In fact, Liz walks at a faster speed than Tia.

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

[1 mark]

Do not write outside the box

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

5

Do not write outside the box

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

Do not write outside the box

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 for the next question

7

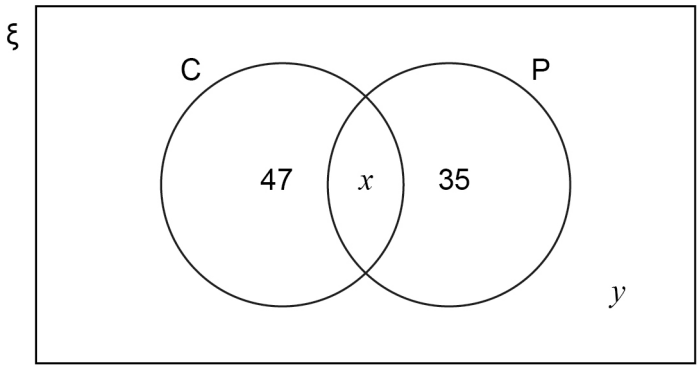
Do not write outside the box

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 _____

Do not write outside the box

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]

Turn over for the next question

8

Do not write outside the box

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

[3 marks]

Do not write outside the box

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

9

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