Please write clearly in block capitals.

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

Surname _____

Forename(s) _____

Candidate signature _____

GCSE MATHEMATICS

H

Higher Tier Paper 3 Calculator

Wednesday 8 November 2017 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.
- 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.

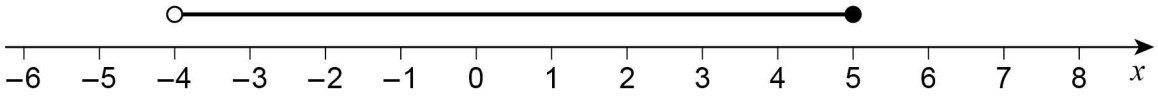
Advice
- In all calculations, show clearly how you work out your answer.

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	
TOTAL	

Do not write outside the box

Answer **all** questions in the spaces provided

1 Circle the inequality shown by the diagram.



[1 mark]

$-4 \leqslant x < 5$ $\quad$ $-4 \leqslant x \leqslant 5$ $\quad$ $-4 < x < 5$ $\quad$ $-4 < x \leqslant 5$

2 y is 100% **more** than x.

Circle the ratio $x : y$

[1 mark]

1 : 100 $\quad$ 100 : 1 $\quad$ 1 : 2 $\quad$ 2 : 1

3 The first four terms of a sequence are –10 –8 –6 –4

Circle the expression for the nth term of the sequence.

[1 mark]

$-12 - 2n$ $\quad$ $-8 - 2n$ $\quad$ $n + 2$ $\quad$ $2n - 12$

Do not write outside the box

4 Circle the equation of the line that is parallel to the x-axis.

[1 mark]

$y = -5$ $\quad$ $x - y = 0$ $\quad$ $x = 3$ $\quad$ $x + y = 0$

5 Multiply out and simplify $(x - 8)^2$

[2 marks]

Answer _____

Turn over for the next question

6

Do not write outside the box

6 Show that 268 can be written as the sum of a power of 3 and a square number.

[2 marks]

Answer _____

7 Here is some information about the times taken by 40 people to fill in a form.

Time, *t* minutes	**Number of people**
$0 < t \leqslant 5$	3
$5 < t \leqslant 10$	9
$10 < t \leqslant 15$	11
$15 < t \leqslant 20$	17

In which class interval is the median?

Circle your answer.

[1 mark]

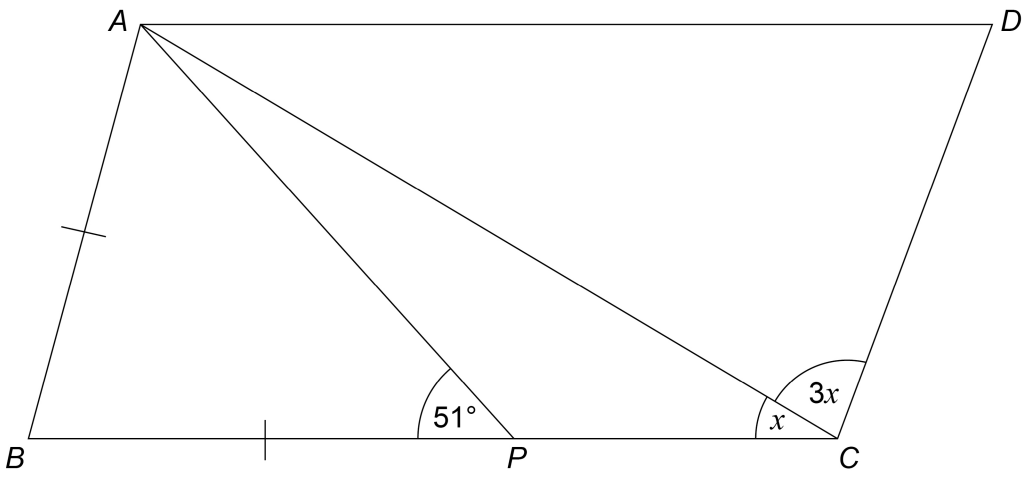
$0 < t \leqslant 5$ $\quad$ $5 < t \leqslant 10$ $\quad$ $10 < t \leqslant 15$ $\quad$ $15 < t \leqslant 20$

Do not write outside the box

8 *ABCD* is a parallelogram.

AB = *BP*

Not drawn accurately



Work out the size of angle x.

[4 marks]

Answer _____ degrees

Turn over for the next question

7

Do not write outside the box

9 (a) Rearrange $v = u + at$ to make t the subject of the formula.

[2 marks]

Answer _____

9 (b) Complete this table with consistent metric units.

[2 marks]

Distance	**Time**	**Speed**	**Acceleration**
m	s		

Do not write outside the box

10 Construct a locus of points that are the same distance from points *A* and *B*.

[2 marks]

Turn over for the next question

6

Do not write outside the box

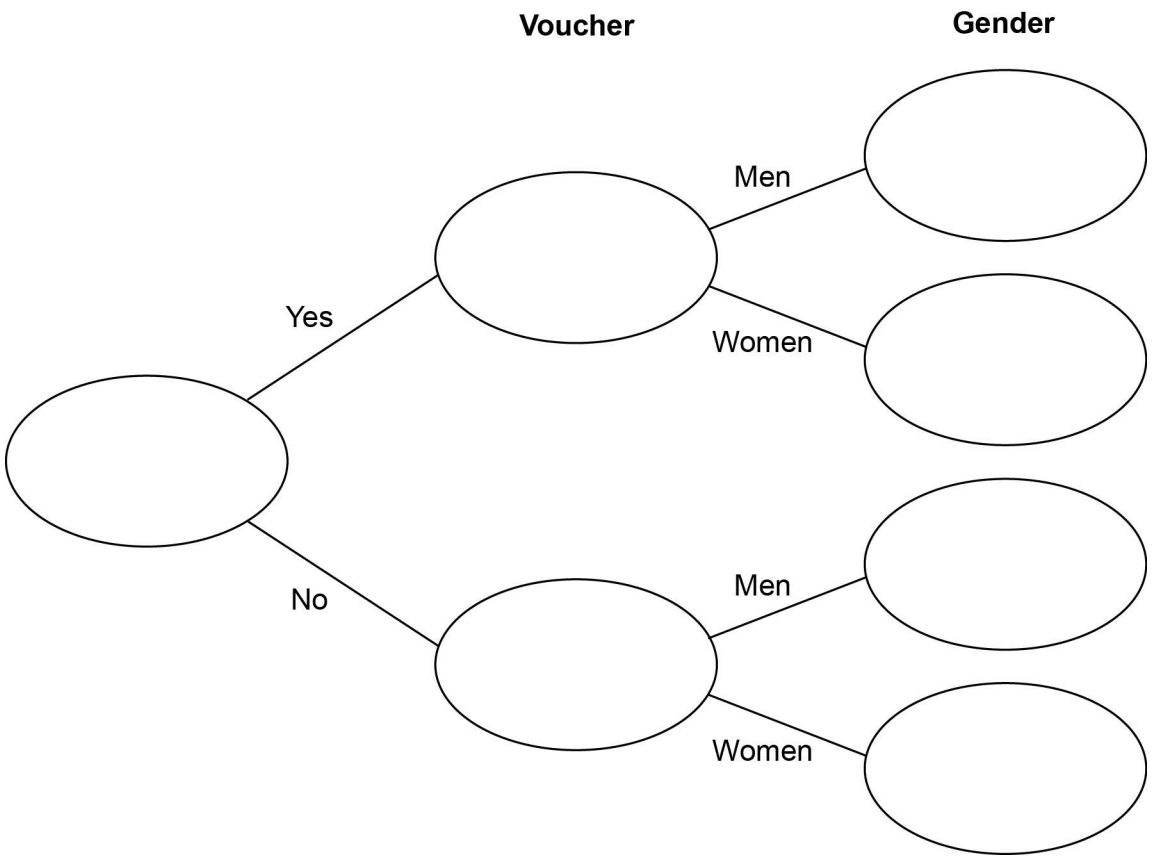
11 42 men and 38 women visit a restaurant.

44 of these people have a voucher.

Three times as many men as women do **not** have a voucher.

11 (a) Complete the frequency tree.

[4 marks]



Do not write outside the box

11 (b) A voucher takes **15% off** the bill.

After using the voucher, the bill for a meal is £27.20

How much was the bill before using the voucher?

[3 marks]

Answer £ _____

Turn over for the next question

7

Do not write outside the box

12 The distance by road from Newport to London is 140 miles.

Tom travels by coach from Newport to London.
The coach leaves Newport at 1.30 pm

12 (a) He assumes the coach will travel at an average speed of 50 mph

Use his assumption to work out the arrival time in London.

[3 marks]

Answer _____

12 (b) In fact, the coach has a lower average speed.

How does this affect the arrival time?

[1 mark]

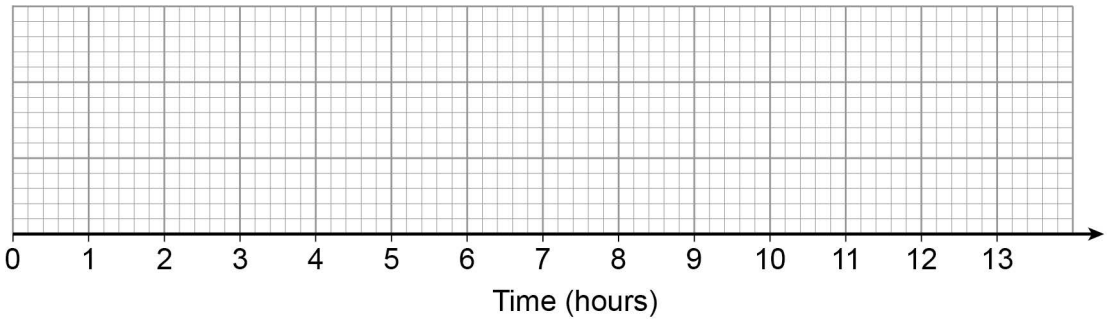
Do not write outside the box

13 Here is some information about the length of time cars stayed in a car park.

Shortest time	30 minutes	Lower quartile	2 hours
Longest time	12 hours	Interquartile range	3 hours
		Median time	4 hours

Draw a box plot to show this information.

[3 marks]



Turn over for the next question

7

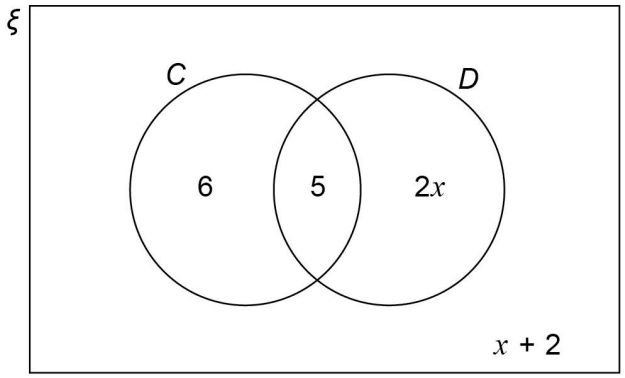
Do not write outside the box

14 In the Venn diagram

ξ represents 31 students in a class

C is students who have a cat

D is students who have a dog



14 (a) One student from the class is picked at random.

Work out the probability that the student has a dog.

[3 marks]

Answer _____

14 (b) One of the students who has a cat is picked at random.

Work out the probability that this student has a dog.

[1 mark]

Answer _____

Do not write outside the box

15 Circle the highest common factor (HCF) of $6xy^2$ and $4x^3y$

[1 mark]

$2xy^2$ $2xy$ $12x^3y^2$ $24x^4y^3$

16 $f(x) = x^2 - x^3$

Circle the value of $f(-3)$

[1 mark]

18 –18 36 –36

Turn over for the next question

6

Do not write outside the box

17 At a football game

number of men : number of women : number of children = 13 : 5 : 7

There are 4152 **more** men than women.

Work out the number of children at the game.

[3 marks]

Answer _____

18 Expand and simplify $(3x^2 + 2)(2x + 5) - 6x(x^2 - 3)$

[4 marks]

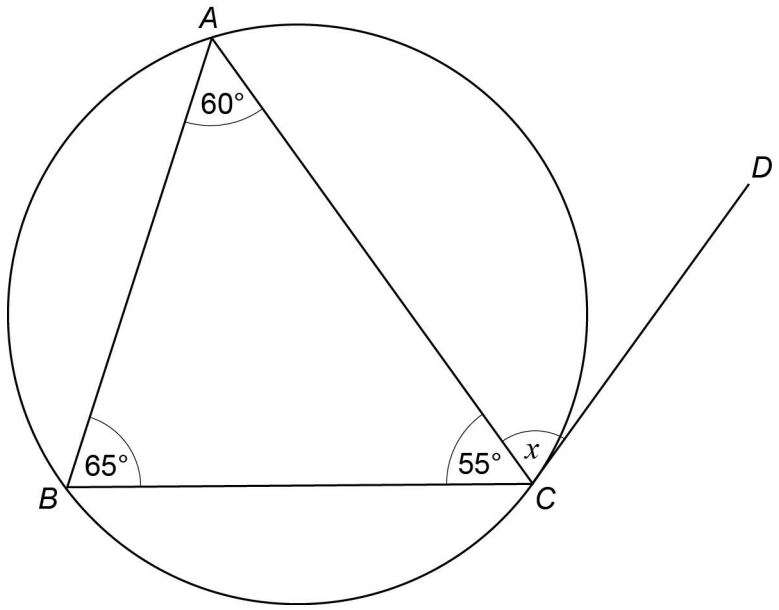
Answer _____

Do not write outside the box

19 *A*, *B* and *C* are points on a circle.

CD is a tangent to the circle.

Not drawn accurately



Write down the size of angle x.

Give a reason for your answer.

[2 marks]

Answer _____ degrees

Reason _____

Turn over for the next question

9

Do not write outside the box

20 w is a positive number.

x is 10% more than w.

y is 10% less than x.

Which statement is true?

Tick **one** box.

[1 mark]

$w < x$ and $w < y$ ☐

$w < x$ and $w = y$ ☐

$x > y$ and $w > y$ ☐

$x > y$ and $w = y$ ☐

21 N is a number.

As a product of prime factors in index form $N = 2 \times 3^4 \times y^3$

Work out $3N^2$ as a product of prime factors in index form.

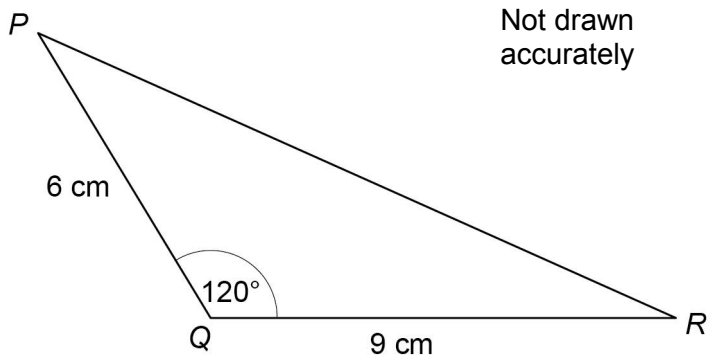
Give your answer in terms of y.

[3 marks]

Answer _____

Do not write outside the box

22 Here is a triangle.



Work out the length *PR*.

[3 marks]

Answer _____ cm

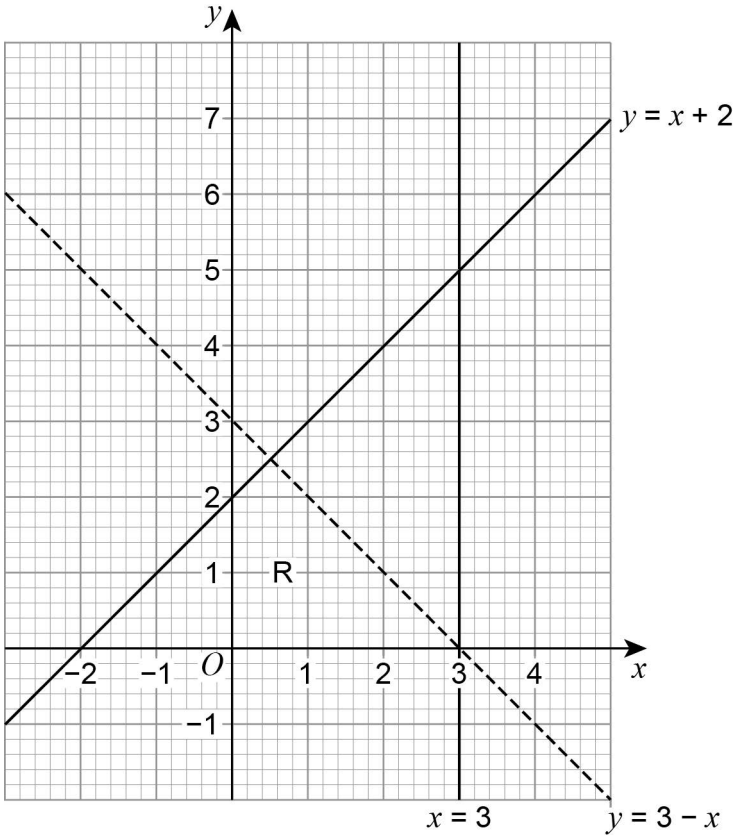
Turn over for the next question

7

Do not write outside the box

23 Joe draws this graph to identify the region R represented by

$$y \leqslant x + 2 \quad \text{and} \quad y > 3 - x \quad \text{and} \quad x < 3$$



Make **two** criticisms of his graph.

[2 marks]

Criticism 1 _____

_____

Criticism 2 _____

_____

Do not write outside the box

24 $a : b = 9 : 4$ and $10b = 7c$

Work out $a : c$ in its simplest form.

[3 marks]

Answer _____ : _____

Turn over for the next question

5

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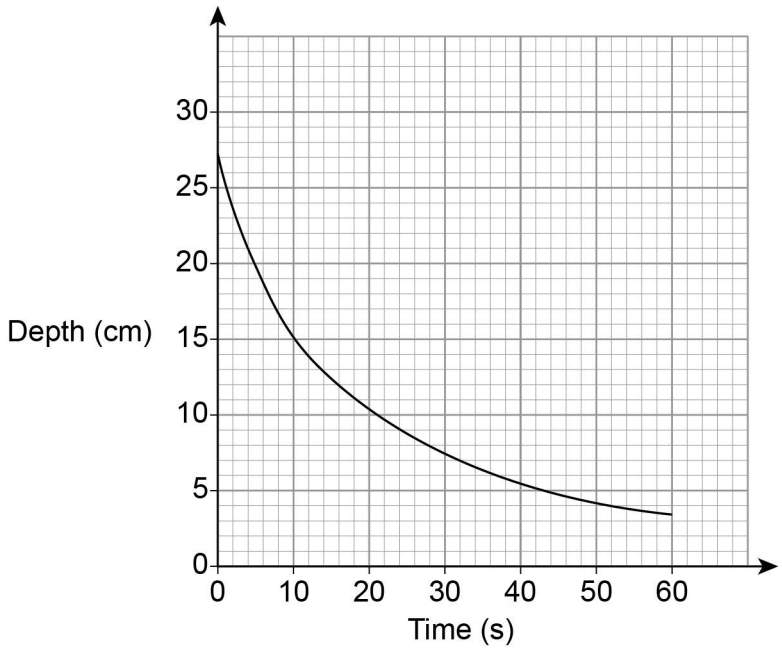
25 Liquid is leaking out of a container.

The graph shows the depth of the liquid for 60 seconds.



Use the graph to work out an estimate of the rate of decrease of depth at 10 seconds.

You **must** show your working.

[3 marks]

Answer _____ cm/s

Do not write outside the box

26 $a^2 - b^2 \equiv (a + b)(a - b)$

a and b are positive whole numbers with $a > b$

$a^2 - b^2$ is a **prime** number.

Why are a and b consecutive numbers?

[2 marks]

Turn over for the next question

5

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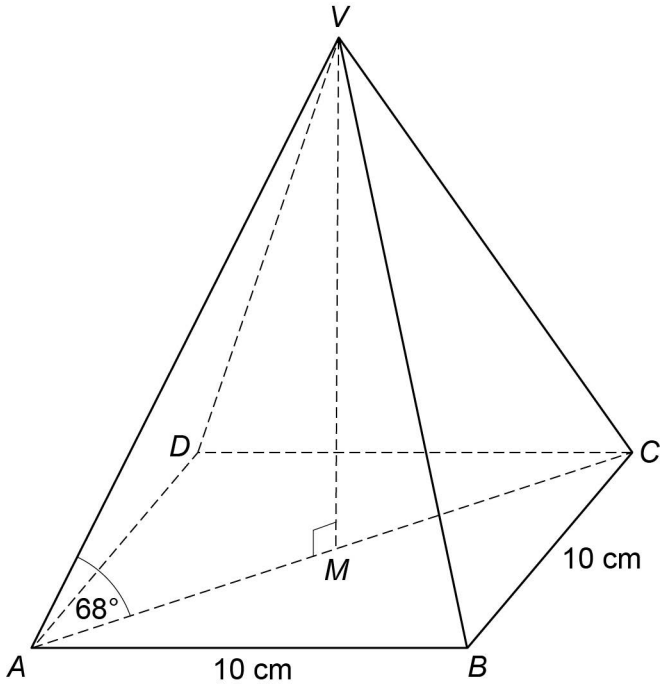
27 *VABCD* is a square-based pyramid.

The horizontal base *ABCD* has side length 10 cm and centre *M*.

Angle *VMA* is 90°

Angle *VAM* is 68°



Volume of pyramid = $\frac{1}{3}$ × area of base × perpendicular height

Do not write outside the box

Work out the volume of the pyramid.

[6 marks]

Answer _____ cm^3

Turn over for the next question

6

Do not write outside the box

28 $y = p \times q^{x-1}$ where p and q are numbers.

$y = 10$ when $x = 1$

$y = 0.3125$ when $x = 6$

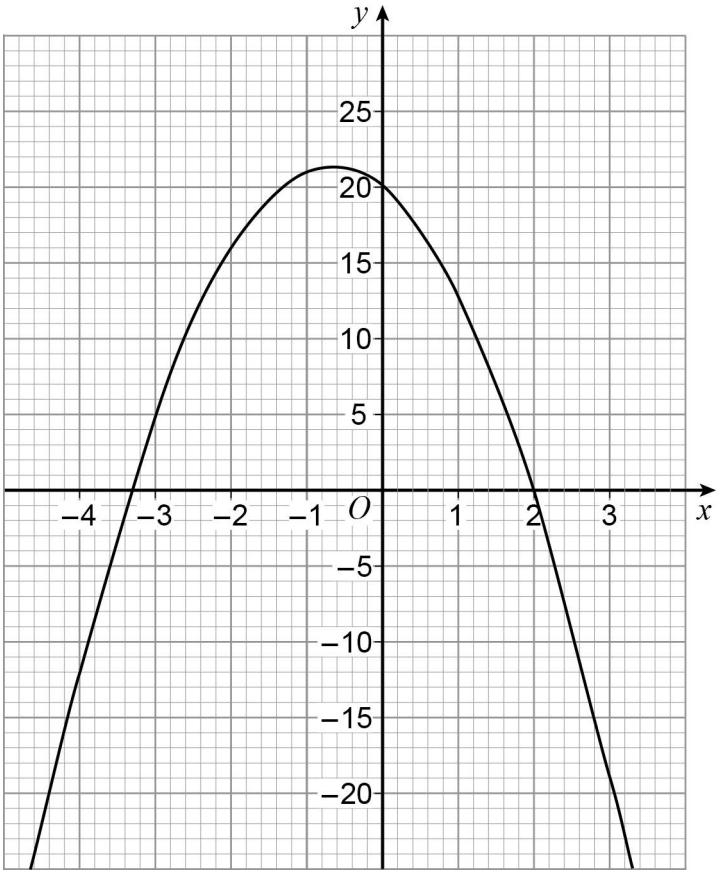
Work out the value of y when $x = 3$

[5 marks]

Answer _____

Do not write outside the box

29 Here is the graph of $y = f(x)$ where $f(x)$ is a quadratic function.



Write down all the **integer** solutions of $f(x) \geqslant 0$

[2 marks]

Answer _____

Turn over for the next question

7

Do not write outside the box

30 $f(x) = \frac{x}{3} + 4$ for all values of x.

$g(x) = 6x^2 + 3$ for all values of x.

Work out $fg(x)$.

Give your answer in the form $ax^2 + b$ where a and b are integers.

[2 marks]

Answer _____

END OF QUESTIONS

2

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