

Please write clearly in block capitals.

Centre number

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Candidate number

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Candidate signature

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# GCSE MATHEMATICS

# H

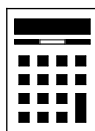
Higher Tier          Paper 3 Calculator

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

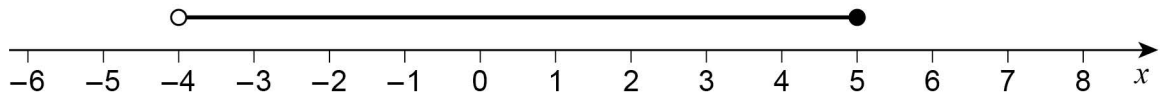
- In all calculations, show clearly how you work out your answer.

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	
<b>TOTAL</b>	



Answer **all** questions in the spaces provided

- 1 Circle the inequality shown by the diagram.



[1 mark]

$$-4 \leq x < 5$$

$$-4 \leq x \leq 5$$

$$-4 < x < 5$$

$$-4 < x \leq 5$$

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

Circle the ratio  $x : y$

[1 mark]

$$1 : 100$$

$$100 : 1$$

$$1 : 2$$

$$2 : 1$$

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

Circle the expression for the  $n$ th term of the sequence.

[1 mark]

$$-12 - 2n$$

$$-8 - 2n$$

$$n + 2$$

$$2n - 12$$



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

[1 mark]

$$y = -5$$

$$x - y = 0$$

$$x = 3$$

$$x + y = 0$$

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

[2 marks]

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Answer \_\_\_\_\_

**Turn over for the next question**



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

[2 marks]

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Answer \_\_\_\_\_

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

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

In which class interval is the median?

Circle your answer.

[1 mark]

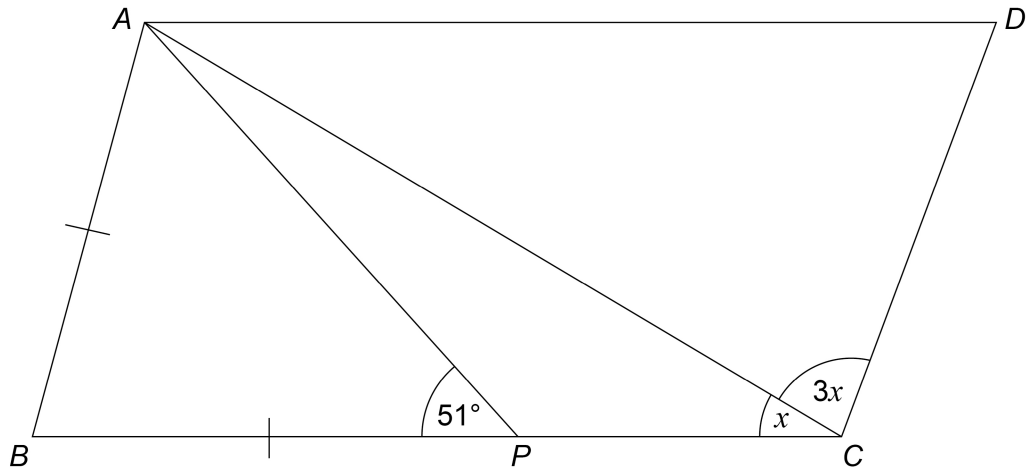
$0 < t \leq 5$        $5 < t \leq 10$        $10 < t \leq 15$        $15 < t \leq 20$



8  $ABCD$  is a parallelogram.

$$AB = BP$$

Not drawn  
accurately



Work out the size of angle  $x$ .

[4 marks]

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Answer \_\_\_\_\_ degrees

Turn over for the next question

Turn over ►



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

[2 marks]

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Answer \_\_\_\_\_

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

[2 marks]

Distance	Time	Speed	Acceleration
m	s		



10

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

[2 marks]

•  
 $A$ •  
 $B$ 

Turn over for the next question

6

Turn over ►





- 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]**

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Answer £ \_\_\_\_\_

**Turn over for the next question**



**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]**

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Answer \_\_\_\_\_

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

How does this affect the arrival time?

**[1 mark]**

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

Shortest time 30 minutes

Lower quartile 2 hours

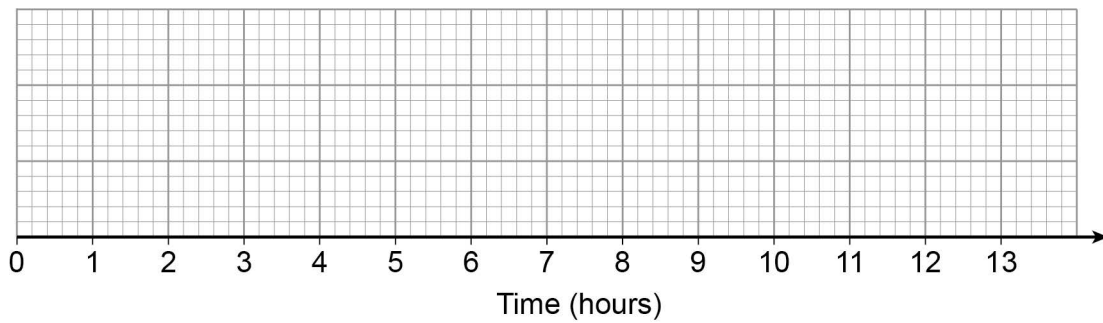
Longest time 12 hours

Interquartile range 3 hours

Median time 4 hours

Draw a box plot to show this information.

**[3 marks]**

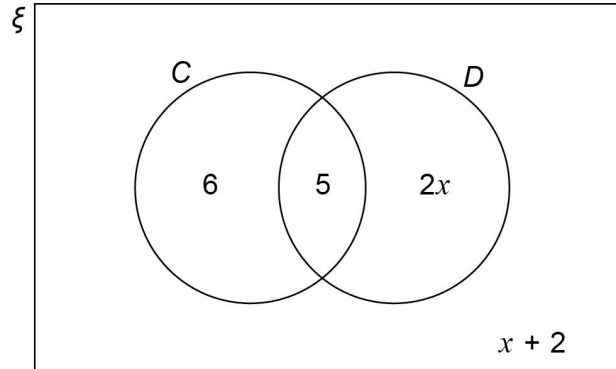


**Turn over for the next question**



14

In the Venn diagram

 $\xi$  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]**


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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]**


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Answer \_\_\_\_\_



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

Turn over ►



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]**

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Answer \_\_\_\_\_

18

Expand and simplify  $(3x^2 + 2)(2x + 5) - 6x(x^2 - 3)$ **[4 marks]**

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Answer \_\_\_\_\_

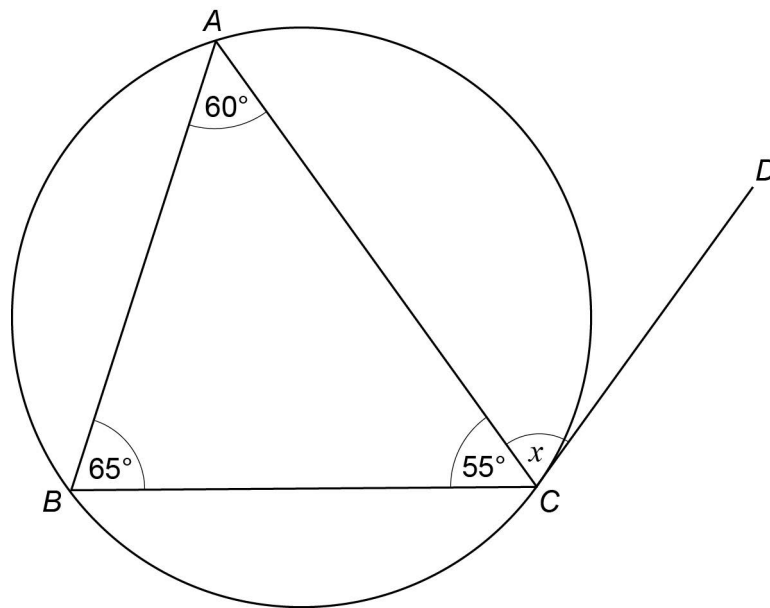


19

$A$ ,  $B$  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

Turn over ►



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]**

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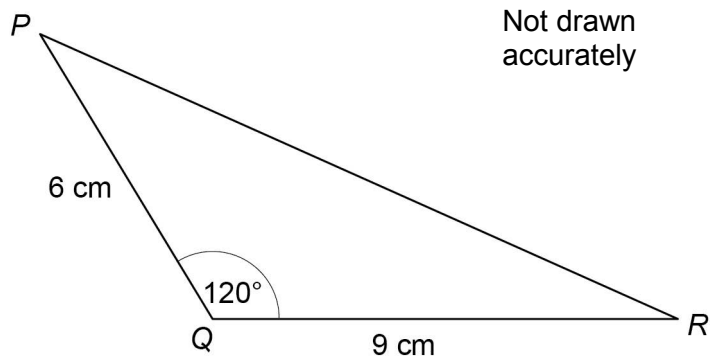
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Answer \_\_\_\_\_



22

Here is a triangle.

Work out the length  $PR$ .**[3 marks]**

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

**Turn over for the next question**

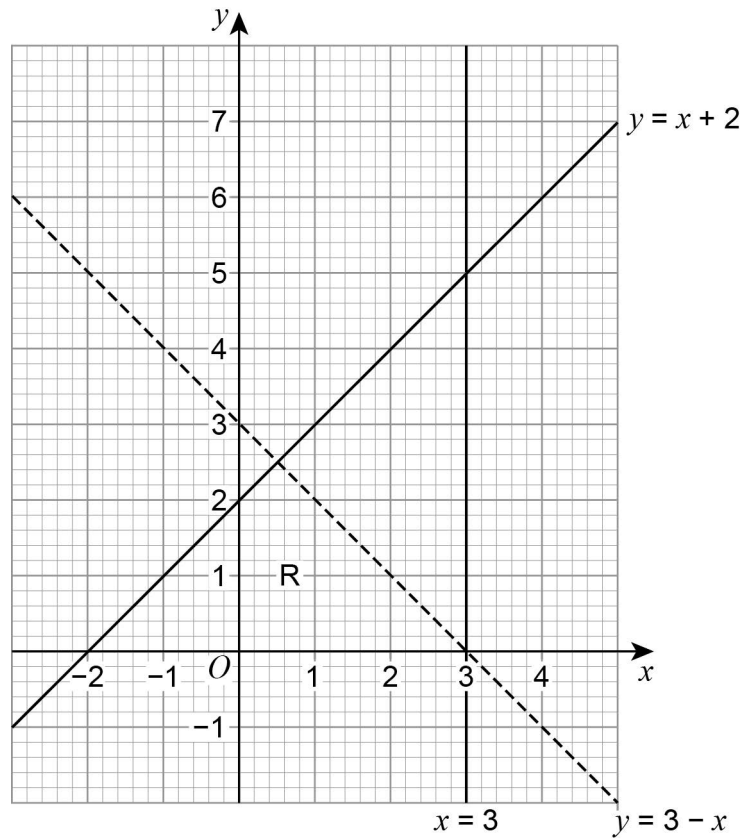
7
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**Turn over ►**

23

Joe draws this graph to identify the region R represented by

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

Make **two** criticisms of his graph.**[2 marks]**

Criticism 1

\_\_\_\_\_

\_\_\_\_\_

Criticism 2

\_\_\_\_\_

\_\_\_\_\_



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

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

**[3 marks]**

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Answer \_\_\_\_\_ : \_\_\_\_\_

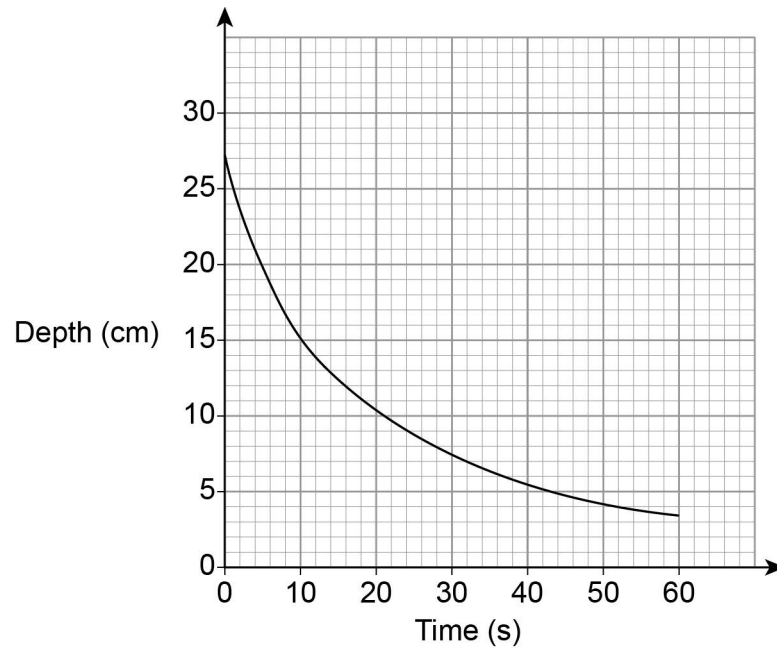
**Turn over for the next question**



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]**


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Answer \_\_\_\_\_ cm/s



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]

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Turn over for the next question

Turn over ►



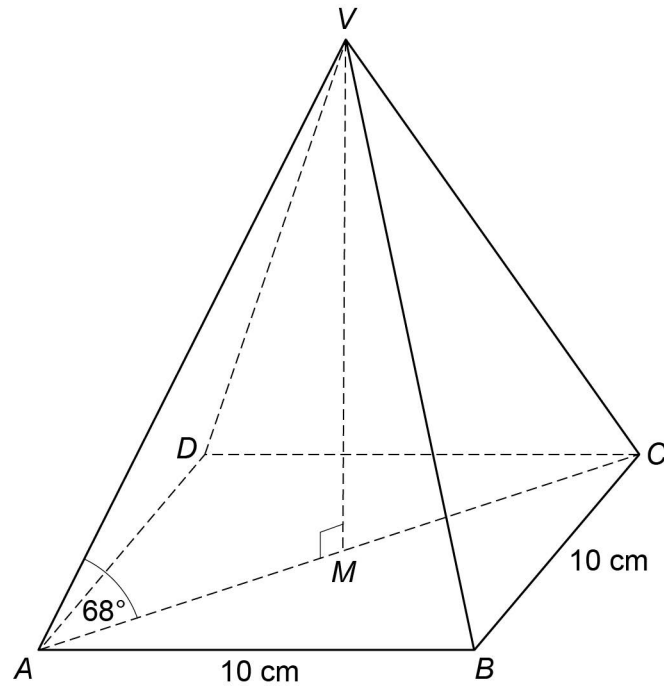
27

$VABCD$  is a square-based pyramid.

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

Angle  $VMA$  is  $90^\circ$

Angle  $VAM$  is  $68^\circ$



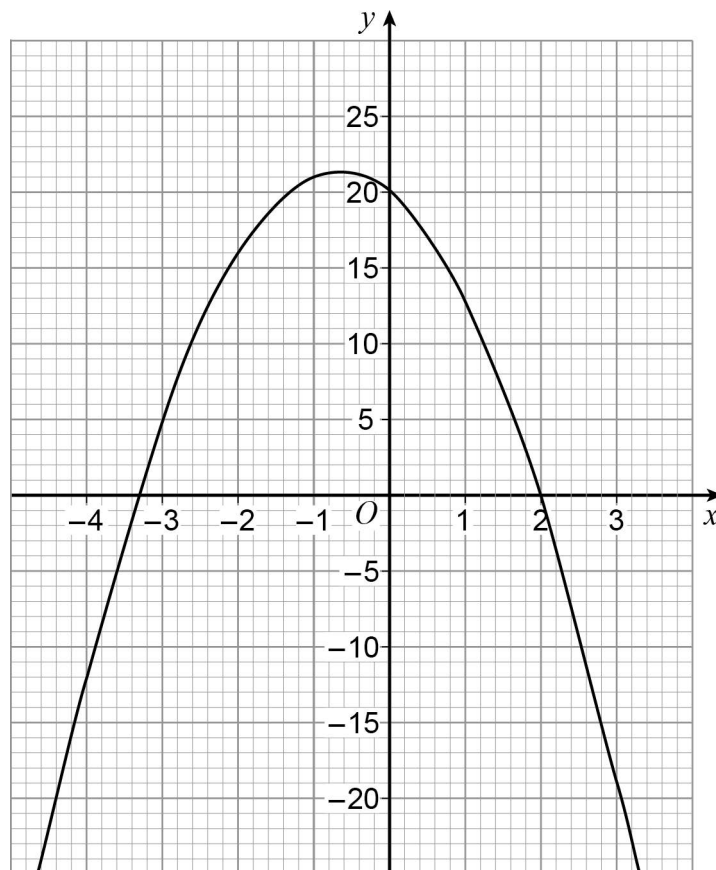
$$\text{Volume of pyramid} = \frac{1}{3} \times \text{area of base} \times \text{perpendicular height}$$







29

Here is the graph of  $y = f(x)$  where  $f(x)$  is a quadratic function.Write down all the **integer** solutions of  $f(x) \geq 0$ **[2 marks]**


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Answer \_\_\_\_\_

**Turn over for the next question****Turn over ►**

**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]**

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Answer \_\_\_\_\_

**END OF QUESTIONS**



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