

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

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Forename(s)

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Candidate signature

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I declare this is my own work.

# GCSE MATHEMATICS

# H

Higher Tier

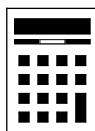
Paper 2 Calculator

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.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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.

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	
<b>TOTAL</b>	

## Advice

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



Answer **all** questions in the spaces provided.

Do not write  
outside the  
box

- 1** Circle the factor of  $x^2 - 5x$  **[1 mark]**

$x - 1$

$-5x$

$x - 5$

$5x$

- 2**  $A$  is half of  $B$ .  
Work out the ratio  $A : B$   
Circle your answer. **[1 mark]**

$1 : 2$

$2 : 1$

$1 : 3$

$3 : 1$

- 3** The first three terms of a geometric progression are  $\frac{2}{3}$   $\frac{4}{9}$   $\frac{8}{27}$   
Circle the fourth term. **[1 mark]**

$\frac{10}{81}$

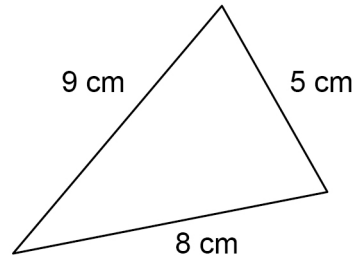
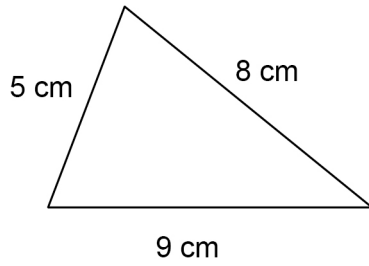
$\frac{14}{81}$

$\frac{16}{81}$

$\frac{32}{81}$



4

Not drawn  
accurately

Circle the reason why these triangles are congruent.

[1 mark]

ASA

RHS

SAS

SSS

5

Solve  $10x = 62.4 - 3x$ 

[2 marks]

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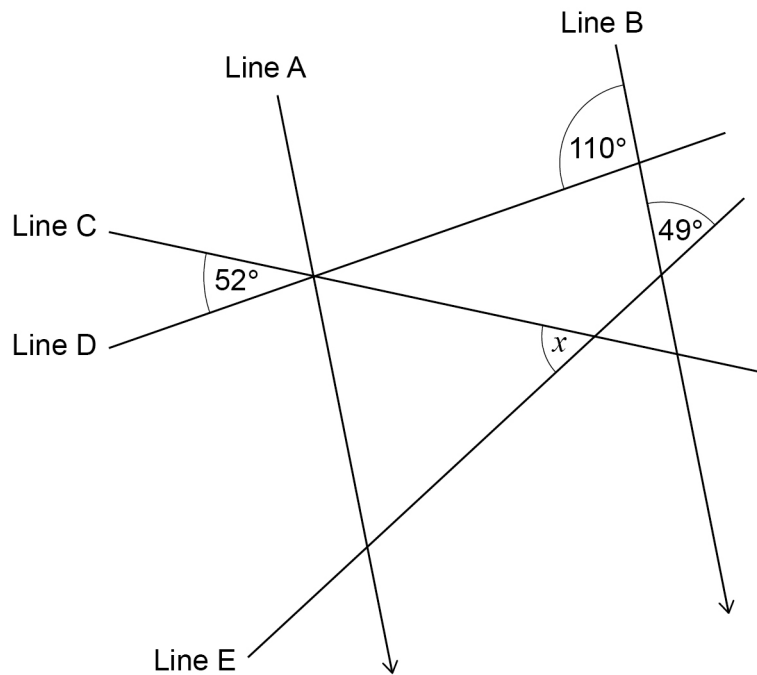
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 $x =$  \_\_\_\_\_

- 6 Lines A, B, C, D and E intersect as shown.  
Lines A and B are parallel.



Not drawn  
accurately

Work out the size of angle  $x$ .

[3 marks]

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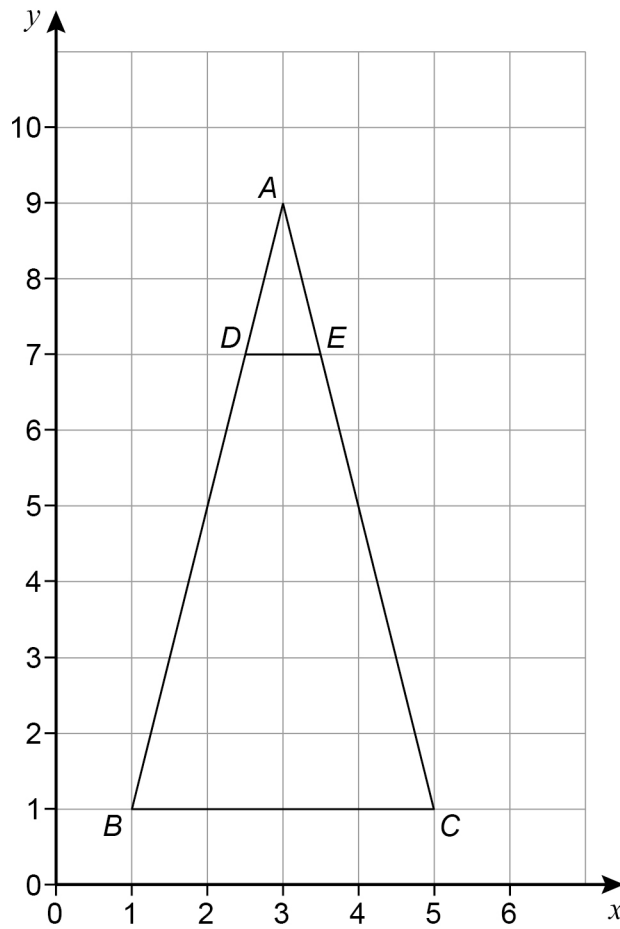
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Answer \_\_\_\_\_ degrees





8



Describe fully the **single** transformation that maps triangle  $ABC$  to triangle  $ADE$ .

[3 marks]

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9

A ball contains  $5000 \text{ cm}^3$  of air.

More air is pumped into the ball at a rate of  $160 \text{ cm}^3$  per second.

The ball is full of air when it becomes a sphere with radius  $15 \text{ cm}$



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

Does it take **less than** 1 minute to fill the ball?

You **must** show your working.

[4 marks]

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10

 $p$  is a positive number. $n$  is a negative number.

For each statement, tick the correct box.

**[4 marks]**

	Always true	Sometimes true	Never true
$p + n$ is positive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$p - n$ is positive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$p^2 + n^2$ is positive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
$p^3 \div n^3$ is positive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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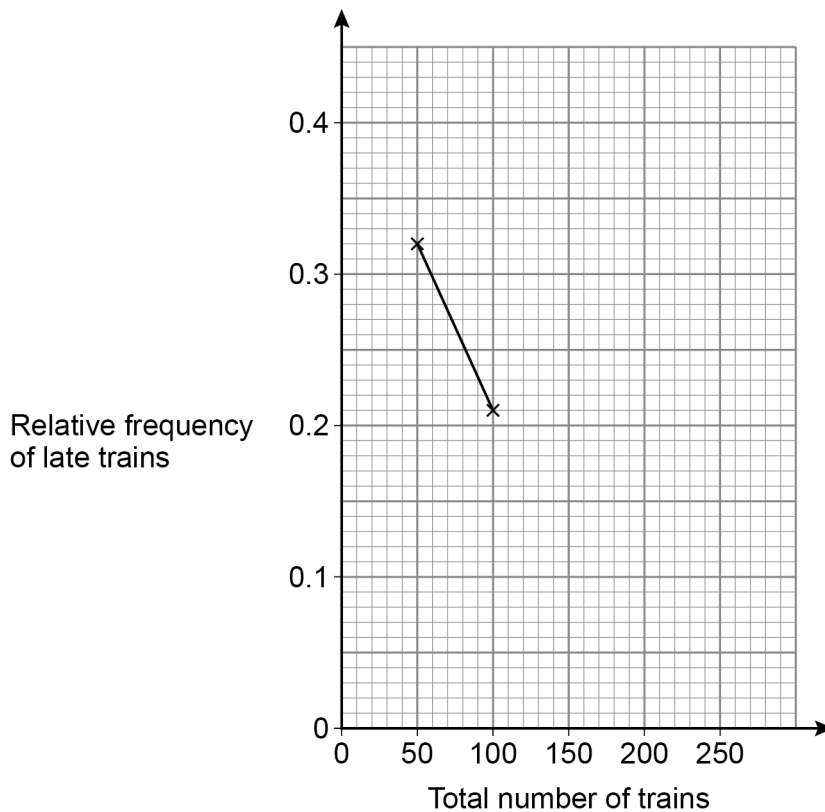


- 11** 250 trains arrived at a station.  
The number of trains that were late was recorded after every 50 trains.  
The table shows some information about the results.

<b>Total number of trains</b>	50	100	150	200	250
<b>Total number of late trains</b>	16	21	36	38	55
<b>Relative frequency of late trains</b>	0.32	0.21			

- 11 (a)** Complete the relative frequency graph.

**[3 marks]**



- 11 (b)** Write down the best estimate of the probability that a train arriving at the station is late.

**[1 mark]**

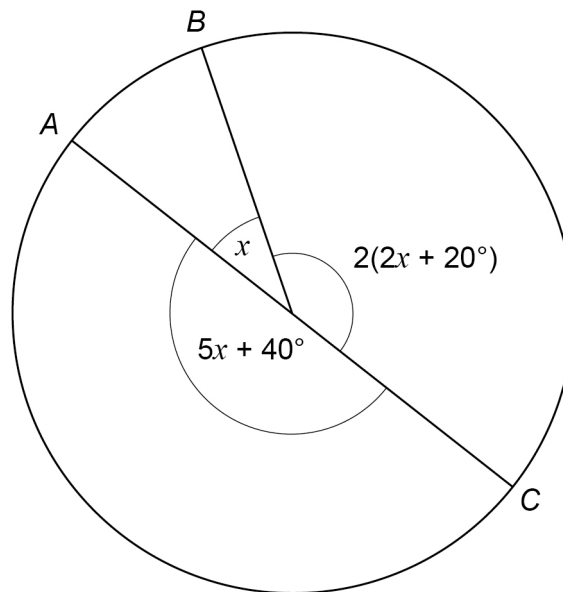
Answer \_\_\_\_\_



12

$A$ ,  $B$  and  $C$  are three points on a circle.  
The radii from  $A$ ,  $B$  and  $C$  are shown.

Not drawn  
accurately



Is  $AC$  a diameter of the circle?

You **must** show your working.

[3 marks]

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13

A straight line

has gradient 6

and

passes through the point (3, 19)

Work out the equation of the line.

Give your answer in the form  $y = mx + c$ **[3 marks]**

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Answer \_\_\_\_\_

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

**14** The population of butterflies in a park is 4200

**14 (a)** Assume that the population increases by 12% each day.

Show that after 20 days the population would be greater than 40 000

**[2 marks]**

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**14 (b)** In fact, the population  
increases by 13% each day for 19 days  
then  
**decreases** by 8% for 1 day.

After the 20 days, is the actual population greater than 40 000 ?

Tick a box.

Yes

No

Show working to support your answer.

**[2 marks]**

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- 14 (c) The expected number of visitors to the park each day depends on the temperature.

Temperature	Expected number of visitors each day
Less than 21°C	700
21°C or more	900

On each of the 30 days in June

the park is open

the probability that the temperature is less than 21°C is 0.4

Work out the **total** number of expected visitors to the park in June.

[3 marks]

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Answer \_\_\_\_\_



**15**  $L$  is directly proportional to  $D^2$

$$L = 85 \text{ when } D = 10$$

**15 (a)** Work out an equation connecting  $L$  and  $D$ .

**[3 marks]**

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Answer \_\_\_\_\_

**15 (b)** Work out the value of  $L$  when  $D = 5$

**[2 marks]**

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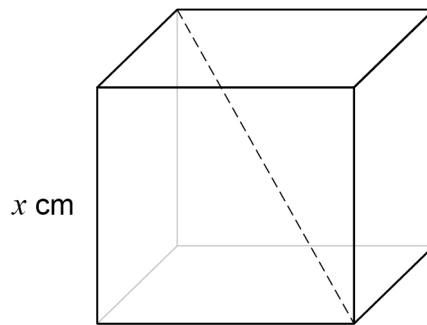
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Answer \_\_\_\_\_



- 16** Here is a cube with edge length  $x$  cm  
One diagonal is shown.



- 16 (a)** Circle the length, in centimetres, of the diagonal.

[1 mark]

$\sqrt{3}x$

$\sqrt[3]{3x^2}$

$\sqrt{x^3}$

$\sqrt[3]{3}x$

- 16 (b)** The total length, in centimetres, of the edges of the cube is a multiple of 18  
Circle the correct statement.

[1 mark]

$x$  is a  
whole number

$x$  is not a  
whole number

$x$  might be a  
whole number

Turn over for the next question

Turn over ►



- 17** 20 people were asked which device they used more often, laptop or phone.  
The table shows the results.

	Laptop	Phone
Male	2	9
Female	4	5

- 17 (a)** One male and one female are chosen at random.

Work out the probability that **exactly** one of them said laptop.

**[3 marks]**

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Answer \_\_\_\_\_

- 17 (b)** Two males are chosen at random.

Work out the probability that they **both** said phone.

**[2 marks]**

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Answer \_\_\_\_\_



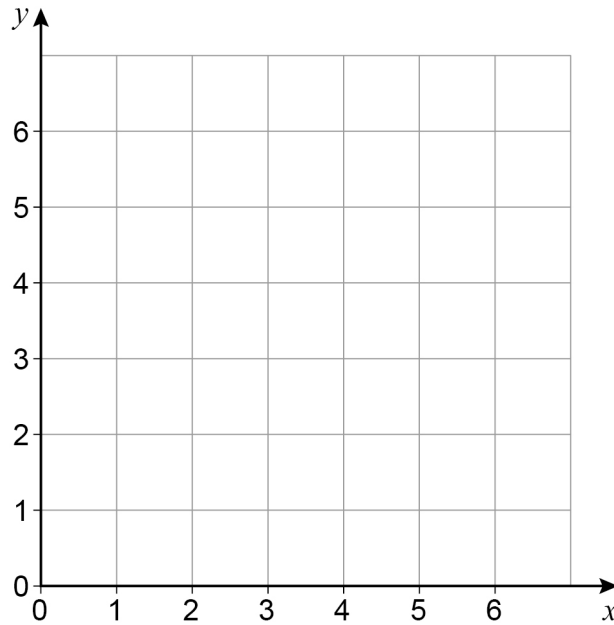


18 On the grid, identify the region represented by

$$x \leq 5 \quad y \leq 4 \quad x + y > 6$$

Label the region R.

[3 marks]

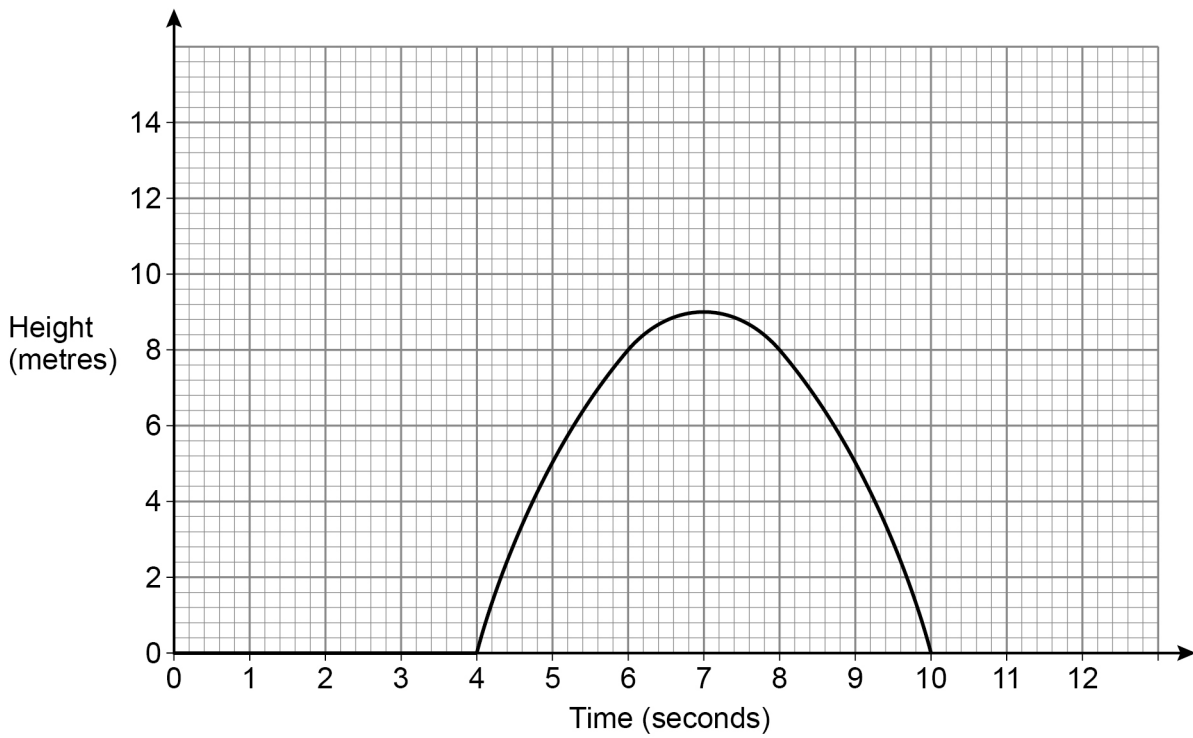


Turn over for the next question

Turn over ►



- 19 The graph shows the height above ground of a toy rocket for 10 seconds.



- 19 (a) For how long is the rocket in the air?  
Circle your answer.

[1 mark]

10 seconds

9 seconds

6 seconds

4 seconds



- 19 (b)** Using the graph, estimate the speed of the rocket after 6 seconds.  
State the units of your answer.

**[3 marks]**

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Answer \_\_\_\_\_

- 20** A square has an area of 0.25 square metres.  
Circle the length, in **centimetres**, of one side of the square.

**[1 mark]**

0.5 cm

5 cm

50 cm

500 cm

**Turn over for the next question**

**Turn over ►**





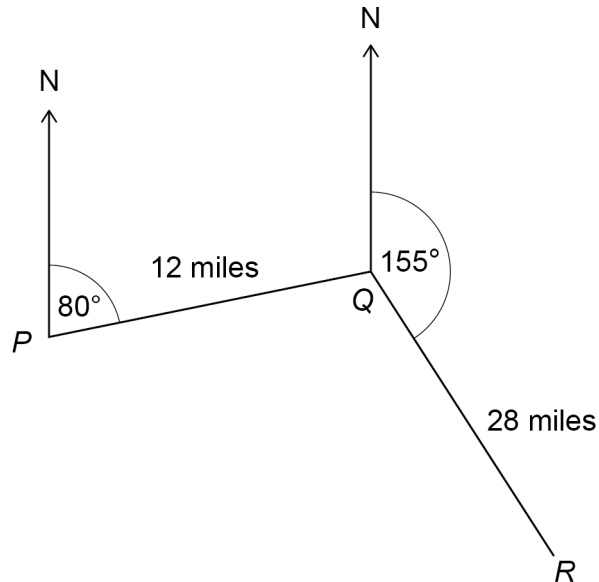


23

A ship sails from  $P$  to  $Q$  and then from  $Q$  to  $R$ .

$Q$  is 12 miles from  $P$ , on a bearing of  $080^\circ$

$R$  is 28 miles from  $Q$ , on a bearing of  $155^\circ$



Not drawn  
accurately

Work out the direct distance from  $P$  to  $R$ .

**[4 marks]**

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Answer \_\_\_\_\_ miles



24

The flight of a plane was in two stages.  
The table shows information about the flight.

	Distance (miles)	Speed (mph)	Time (hours)
<b>1st stage</b>	731	$x$	$\frac{731}{x}$
<b>2nd stage</b>	287	$x - 24$	$\frac{287}{x - 24}$

In total, the flight lasted 2 hours.

Work out the value of  $x$ .

**[5 marks]**

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Answer \_\_\_\_\_



25 The equation of a curve is  $y = x^2 + 14x + 52$

By completing the square, work out the coordinates of the turning point.

You **must** show your working.

[3 marks]

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Answer ( \_\_\_\_\_ , \_\_\_\_\_ )

**END OF QUESTIONS**





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outside the  
box*

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ANSWER IN THE SPACES PROVIDED**







