

Please write clearly in	ո block capitals.	
Centre number	Candidate number	
Surname		
Forename(s)		
Candidate signature	I declare this is my own work.	ノ

GCSE MATHEMATICS

Н

Higher Tier

Paper 2 Calculator

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a calculator
- mathematical instruments.



Instructions

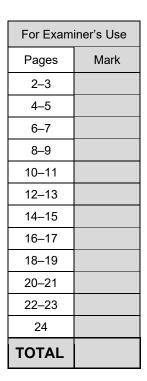
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), 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.

Advice

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



Answer all questions in the spaces provided.

1 Circle the factor of $x^2 - 5x$

[1 mark]

$$x - 1$$

$$-5x$$

2 A is half of B.

Work out the ratio A: B

Circle your answer.

[1 mark]

The first three terms of a geometric progression are $\frac{2}{3}$ $\frac{4}{9}$ $\frac{8}{2}$

Circle the fourth term.

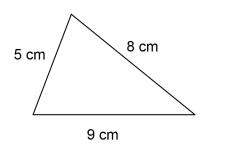
[1 mark]

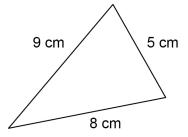
$$\frac{14}{81}$$

$$\frac{32}{81}$$



4





Circle the reason why these triangles are congruent.

[1 mark]

Not drawn accurately

ASA

RHS

SAS

SSS

•

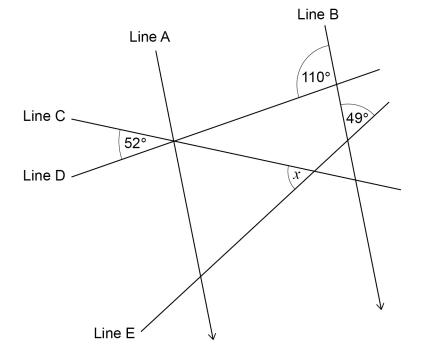
[2	marks
L4	iiiai nəj

$$\chi =$$

6



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



Work out the size of angle x.

Not drawn accurately

[3 marks]

Answer _____ degrees



7 102 boys and 85 girls took a test.

The pass mark for the test was 70

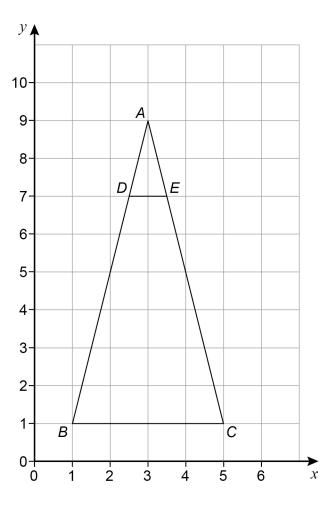
The table shows information about the mean marks.

	Boys	Girls
Number of students	102	85
Mean mark	68.5	72.4

Was the mean mark for all of these students greater than the pass mark?			
You must show your working.			
	[3 marks]		



8



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



[3 marks]

9 A ball contains 5000 cm³ of air.

More air is pumped into the ball at a rate of 160 cm³ per second. The ball is full of air when it becomes a sphere with radius 15 cm



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

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

You **must** show your working.

7



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outside the
box

10	p is a positive number.			
	n is a negative number.			
	For each statement, tick the cor	rect box.		[4 marks]
		Always true	Sometimes true	Never true
	p+n is positive			
	p-n is positive			
	$p^2 + n^2$ is positive			
	$p^3 \div n^3$ is positive			



11 250 trains arrived at a station.

The number of trains that were late was recorded after every 50 trains.

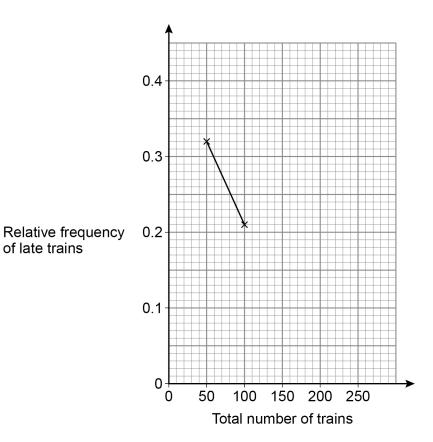
The table shows some information about the results.

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

11 (a) Complete the relative frequency graph.

of late trains

[3 marks]



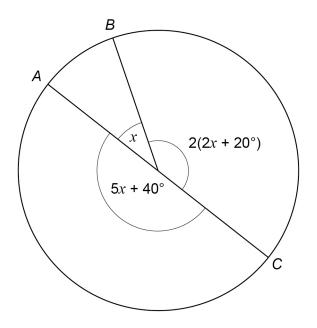
11 (b) Write down the best estimate of the probability that a train arriving at the station is late. [1 mark]

Answer			

12	A, B and C are three points on a c	ircle
----	------------------------------------	-------

The radii from A, B and C are shown.

Not drawn accurately



Is AC a diameter of the circle?

You **must** show your working.

Tod must show your working.	[3 marks]



	Do no outsi
A straight line	b
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 m	narks]
Answer	

Turn over for the next question

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	The population of butterflies in a park is 4200		Do no outsid
(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]	
(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]	



14	(c)	The expected number of visitors to the park each day depends on the temperature.
	(-)	The expected frames of the first paint each, deponde on the formation of

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.

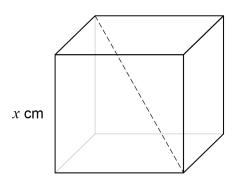
			[3 marks]
An	swer		



T :		
	rectly proportional to D^2 when $D=10$	
<i>L</i> 03	WHOLL DE TO	
Work o	out an equation connecting L and D .	[3 marks]
	Answer	
	7415W61	
Work o	out the value of L when $D=5$	[2 marks]
	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]

$$\sqrt{3} x$$

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

$$\sqrt{x^3}$$

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

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

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

		Female	4	5	
17 (a)	One male and one followers			aid laptop.	[3 marks]
					[c
	An	swer			
17 (b)	Two males are chos	en at random	1.		
	Work out the probab	oility that they	both said phone.		[2 marks]
	An	swer			

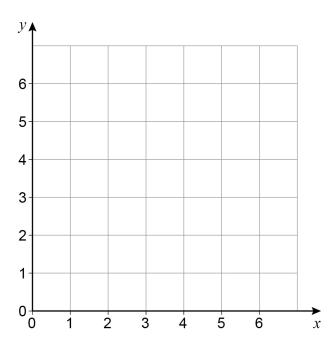


On the grid, identify the region represented by

$$x \le 5$$
 $y \le 4$ $x + y > 6$

Label the region R.

[3 marks]

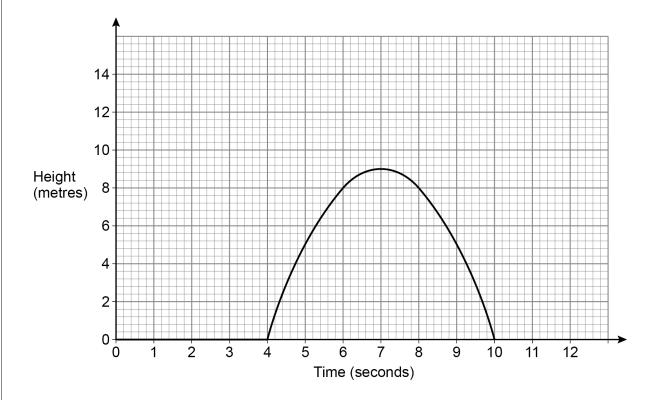


Turn over for the next question

8



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



)				ocket after 6 secon	ds.		outsid be
	State the units	s of your ans	wer.			[3 marks]	
		Angwor					
		Allswei _					
	A square has	an area of 0.	25 square metres				
			25 square metres			[1 mark]	
	Circle the leng				500 cm	[1 mark]	
	Circle the leng	gth, in centin	netres, of one side	e of the square.	500 cm	[1 mark]	
	Circle the leng	gth, in centin	netres, of one side	e of the square.	500 cm	[1 mark]	
	Circle the leng	gth, in centin	netres, of one side	e of the square.	500 cm	[1 mark]	
	Circle the leng	gth, in centin	netres, of one side	e of the square.	500 cm	[1 mark]	
	Circle the leng	gth, in centin	netres, of one side	e of the square.	500 cm	[1 mark]	
	Circle the leng	gth, in centin	netres, of one side	e of the square.	500 cm	[1 mark]	



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arks]	

Prove that	$35 + (3x + 1)^2$	– 2r(4r -	- 3)	is a square number.	
T TOVE that	00 + (0x + 1)	Σ λ(Τ λ	0)	is a square number.	[4 ɪ



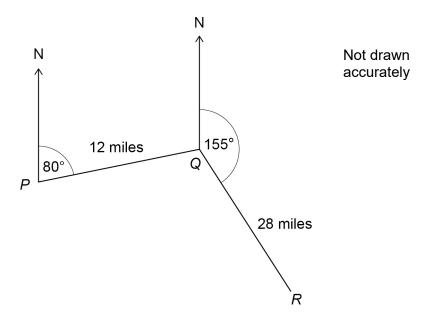
22	Liam is trying to remember a 3-digit code. He knows the rule that the first digit is a cube number the second digit is a factor of 16 the third digit is an odd number.	
	Liam tries at random a code that matches the rule.	
	Work out the probability that this is the correct code.	[4 marks]
	Answer	

_

Do not write outside the box



23	A ship sails from <i>P</i> to <i>Q</i> and then from <i>Q</i> to <i>R</i> .
	Q is 12 miles from P, on a bearing of 080°
	R is 28 miles from Ω , on a hearing of 155°



Work out the direct distance from <i>P</i> to <i>R</i> .	[4 marks]
Answer	miles



The flight of a plane was in two stages.

The table shows information about the flight.

Answer

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

In total, the flight lasted 2 hours.	
Work out the value of x .	[E marka]
	[5 marks]

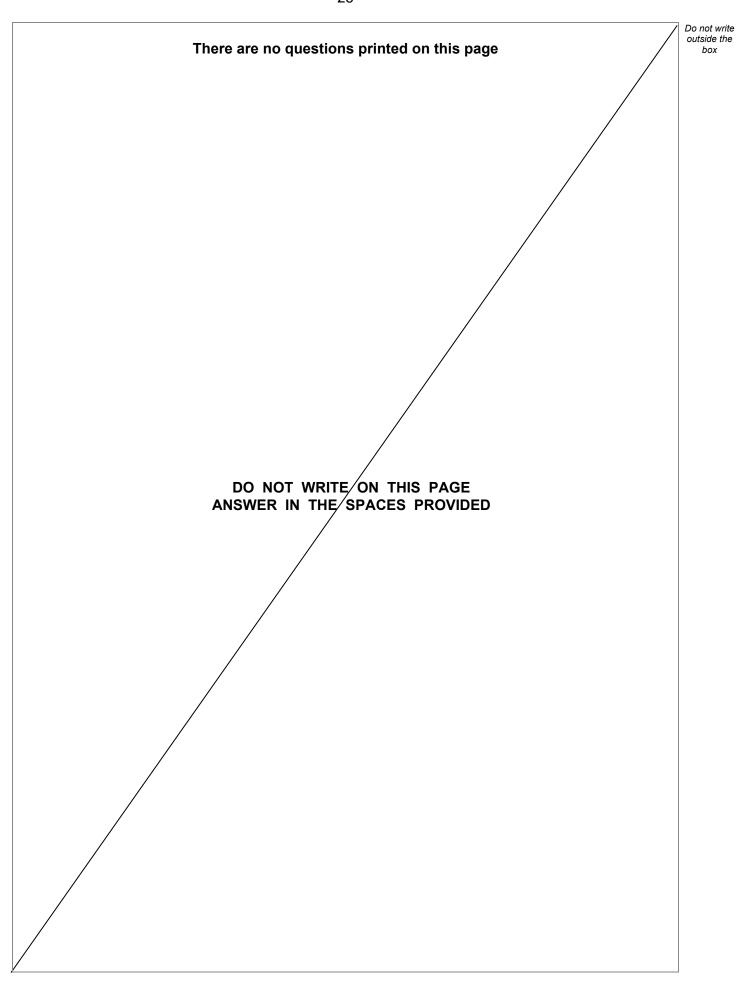


24		-
The equation of a curve is $y = x^2 + 14x + 52$		Do r outs
By completing the square, work out the coordinates of the turning point.		
You must show your working.	[3 marks]	
Answer (,)		
Allewei (,)		

END OF QUESTIONS

3







Question number	Additional page, if required. Write the question numbers in the left-hand margin.



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