

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

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.

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				
TOTAL				

Answer all questions in the spaces provided.

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

[1 mark]

- x-1
- -5x
- *x* − 5
- 5*x*

2 A is half of B.

Work out the ratio A: B

Circle your answer.

[1 mark]

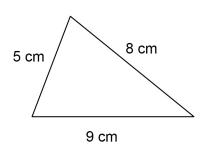
- 1:2
- 2:1
- 1:3
- 3:1
- The first three terms of a geometric progression are $\frac{2}{3}$ $\frac{4}{9}$ $\frac{8}{27}$

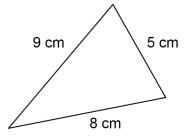
Circle the fourth term.

[1 mark]

- 10 81
- $\frac{14}{81}$
- 16 81
- 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

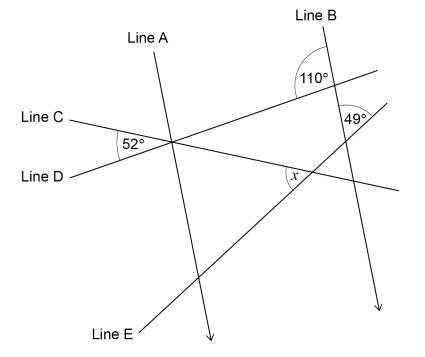
[2 marks]

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 <i>x</i> .	[3 marks]

Answer _____ degrees



	7	102 boy	s and 85	girls	took a	test.
--	---	---------	----------	-------	--------	-------

The table shows information about the mean marks.

	Boys	Girls
Number of students	102	85
Mean mark	68.5	72.4

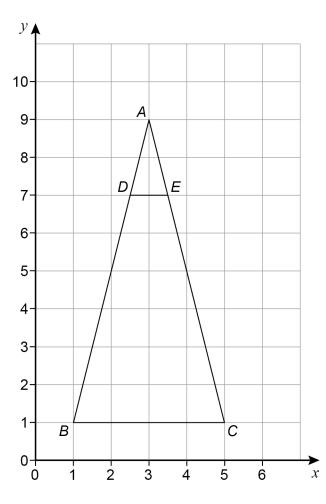
The pass mark for the test was 70

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.

[4 marks]

7

10	p is a positive number.			
	<i>n</i> is a negative number.			
	For each statement, tick the cor	rect box.		[4 marks]
				[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.

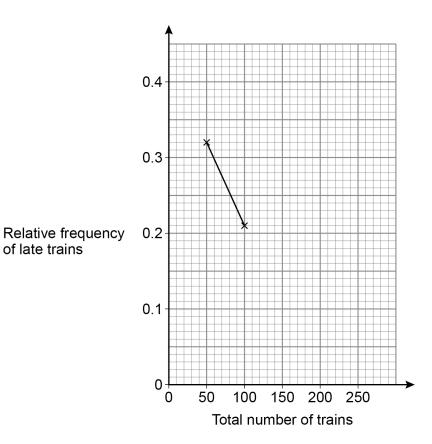
The number of trains that were late was recorded after every 50 trains.

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.

[3 marks]



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

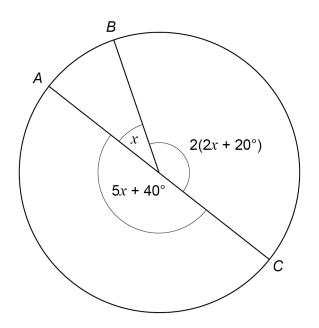
Answer			

8

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.

Tod mast snow your working.	[3 marks]



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 r
Answer	

Turn over for the next question

_

Do not write outside the box





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] 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]



Do not write outside the box

14	(c)	The expected number of visitors to the park each day depends on the temperature.
	(0)	The expected hamber of violetic to the park each day deponds 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]
Ansv	wer		

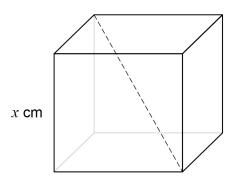


Do not write outside the L is directly proportional to D^2 15 L = 85 when D = 1015 (a) Work out an equation connecting L and D. [3 marks] Answer _____ 15 (b) Work out the value of L when D = 5[2 marks] Answer



box

16 Here is a cube with edge length x cmOne 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

			Laptop	Phone	
		Male	2	9	
		Female	4	5	
7 (a)	One male and one	e female are cho	osen at random.		
	Work out the prob	ability that exac	tly one of them s	aid laptop.	
	Work out the prob	ability that exac	tly one of them sa	aid laptop.	[3 n

Answer	

17 (b) Two males are chosen at random.

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

		[2 marks]

Answer _____

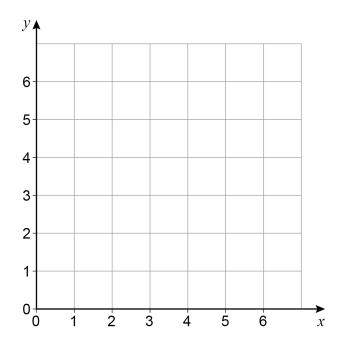


On the grid, identify the region represented by

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

Label the region R.

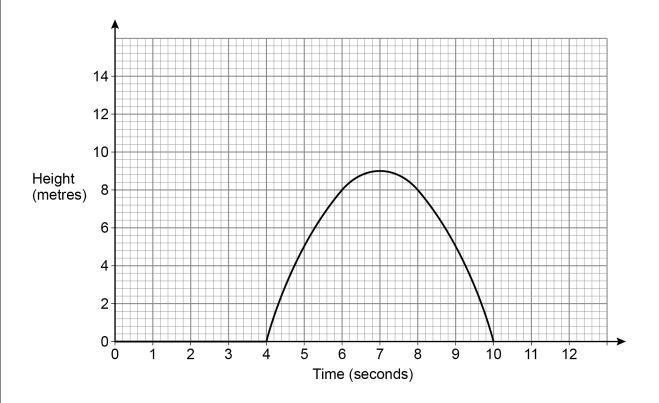
[3 marks]



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



19 (b)	Using the graph, estimate the	speed of the re	ocket after 6 secon	ds.	Do not wr outside the box
	State the units of your answe	r.		[3	marks]
	Answer				
20	A square has an area of 0.25	square metres			
	Circle the length, in centimet	res, of one side	e of the square.	F4	mark]
				ין	mark]
	0.5 cm	5 cm	50 cm	500 cm	
	Turn o	ver for the nex	t question		

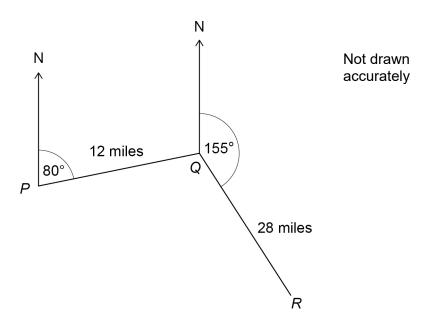
21	x is an integer.					
	Prove that	$35 + (3x + 1)^2 - 2x(4x - 3)$	is a square number.	[4 marks]		



L	iam is trying to remember a 3-digit code.
Н	e 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.
L	iam tries at random a code that matches the rule.
V	/ork out the probability that this is the correct code.
	[4 marks]
_	
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	Answer



A ship sails from P to Q and then from Q to R.
Q is 12 miles from P, on a bearing of 080°
R is 28 miles from Q, on a bearing 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.

	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.

vork out the value of x .	[5 marks]
Answer	

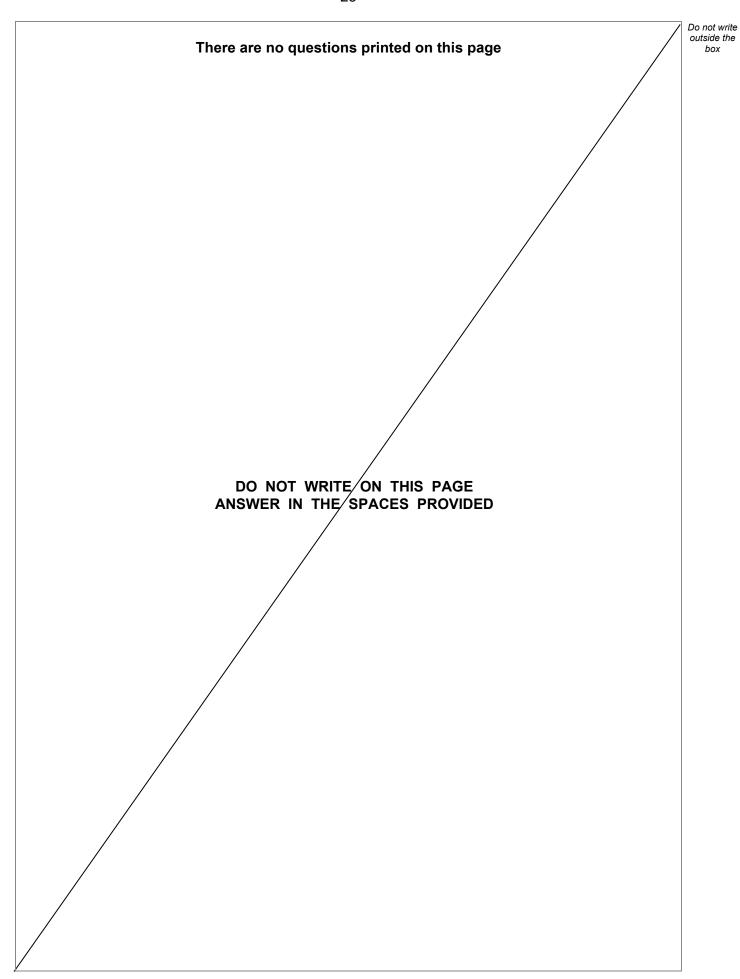


25	The equation of a curve is $y = x^2 + 14x + 52$	
	By completing the square, work out the coordinates of the turning point.	
	You must show your working.	[3 marks]
	Answer (,)	

END OF QUESTIONS

3







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



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