

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
APPLICATIONS OF MATHEMATICS**

A382/01

Paper 2
(Foundation Tier)

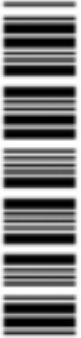
Candidates answer on the Question Paper

OCR Supplied Materials:
None

- Other Materials Required:**
- Geometrical instruments
 - Tracing paper (optional)
 - Scientific or graphical calculator

SPECIMEN

Duration: 1 hour 30 minutes



Candidate Forename		Candidate Surname	
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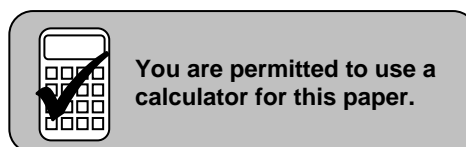
Centre Number						Candidate Number			
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INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Your answers should be supported with appropriate working. Marks may be given for a correct method even if the answer is incorrect.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided.

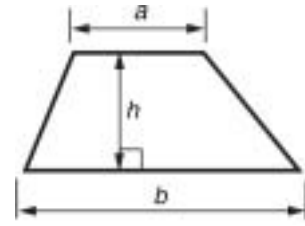
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **90**.
- Use the π button on your calculator or take π to be 3.142 unless the question says otherwise.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*).
- This document consists of **24** pages. Any blank pages are indicated.

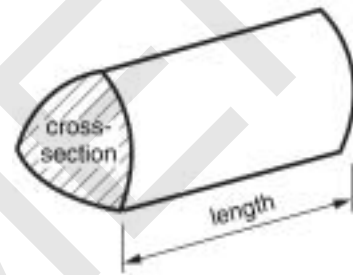


Formulae Sheet: Foundation Tier

Area of trapezium = $\frac{1}{2}(a + b) h$

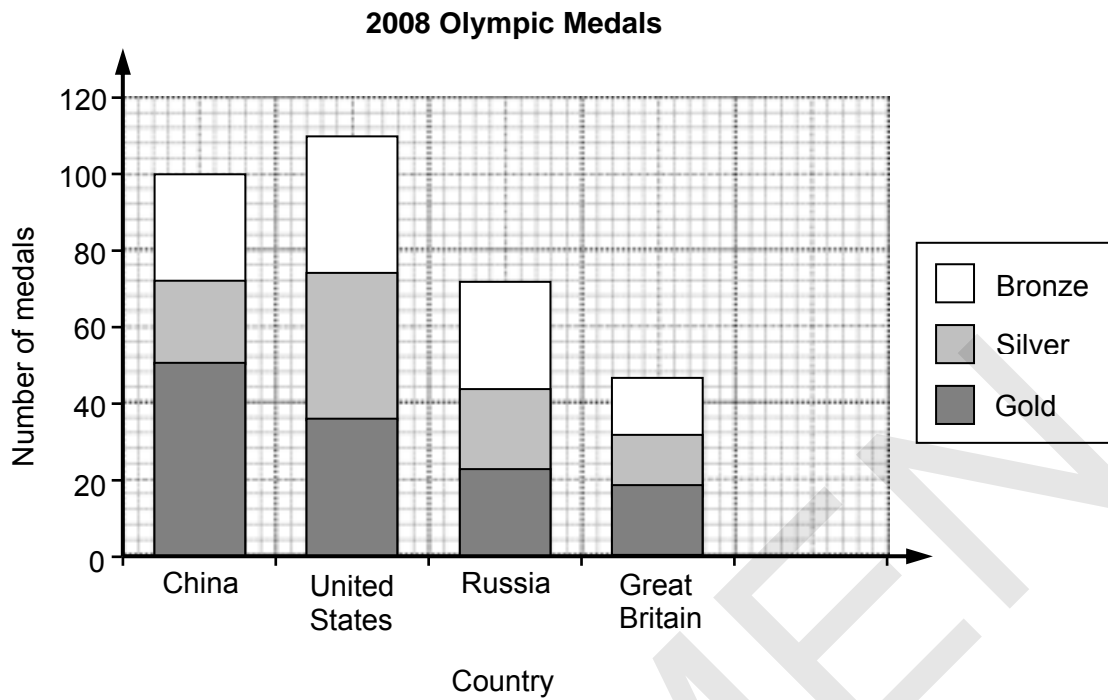


Volume of prism = (area of cross-section) \times length



PLEASE DO NOT WRITE ON THIS PAGE

1



The chart shows the numbers of gold, silver and bronze medals won by four countries in the 2008 Olympic Games.

(a) How many gold medals did Great Britain win?

(a) _____ [1]

(b) How many bronze medals did China win?

(b) _____ [2]

(c) Which two of the four countries won the same number of silver medals?

(c) _____ [1]

(d) Germany won 16 gold medals, 10 silver medals and 15 bronze medals.

Draw a bar to represent Germany's medals on the chart above.

[2]

- 2 Blondin was a famous tightrope walker.
In 1859 he became the first person to tightrope walk across Niagara Falls.



A rope was stretched horizontally across the 335 m wide Niagara Falls.
When Blondin was halfway across the rope sagged by 18 m from the horizontal.
The walk took 20 minutes.

- (a) How long ago did Blondin tightrope walk across Niagara Falls?

(a) _____ [2]

- (b) What was Blondin's average speed in metres per minute to walk the 335 m across the Niagara Falls?

(b) _____ metres per minute [2]

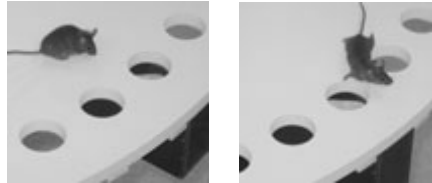
- (c) The rope sagged at its centre.

What angle to the horizontal did Blondin have to walk at this point?

(c) _____ ° [4]

- 3 (a) The Barnes maze is used for humane experiments with mice. It is a white circular table with 20 holes round the edge. The holes are numbered from 1 to 20.

Under one hole there is a box called the drop box.
Mice are night creatures.
They want to get down into the darkness of the drop box.



The shorter this time, the better the mouse's memory.

Amy selects Hole 13 for the drop box.

- (i) When a mouse is released it goes to Hole 13 straight away.

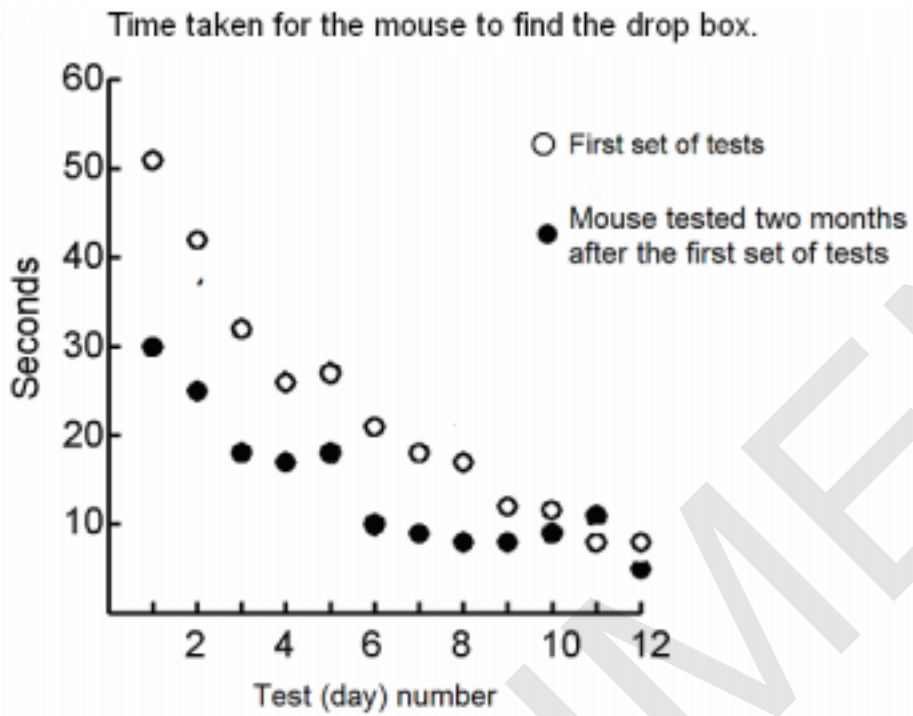
What is the probability of the mouse going straight to Hole 13 by chance?

(a)(i) _____ [1]

- (ii) What is the probability of a mouse going straight to Hole 12, Hole 13 or Hole 14 by chance?

(ii) _____ [2]

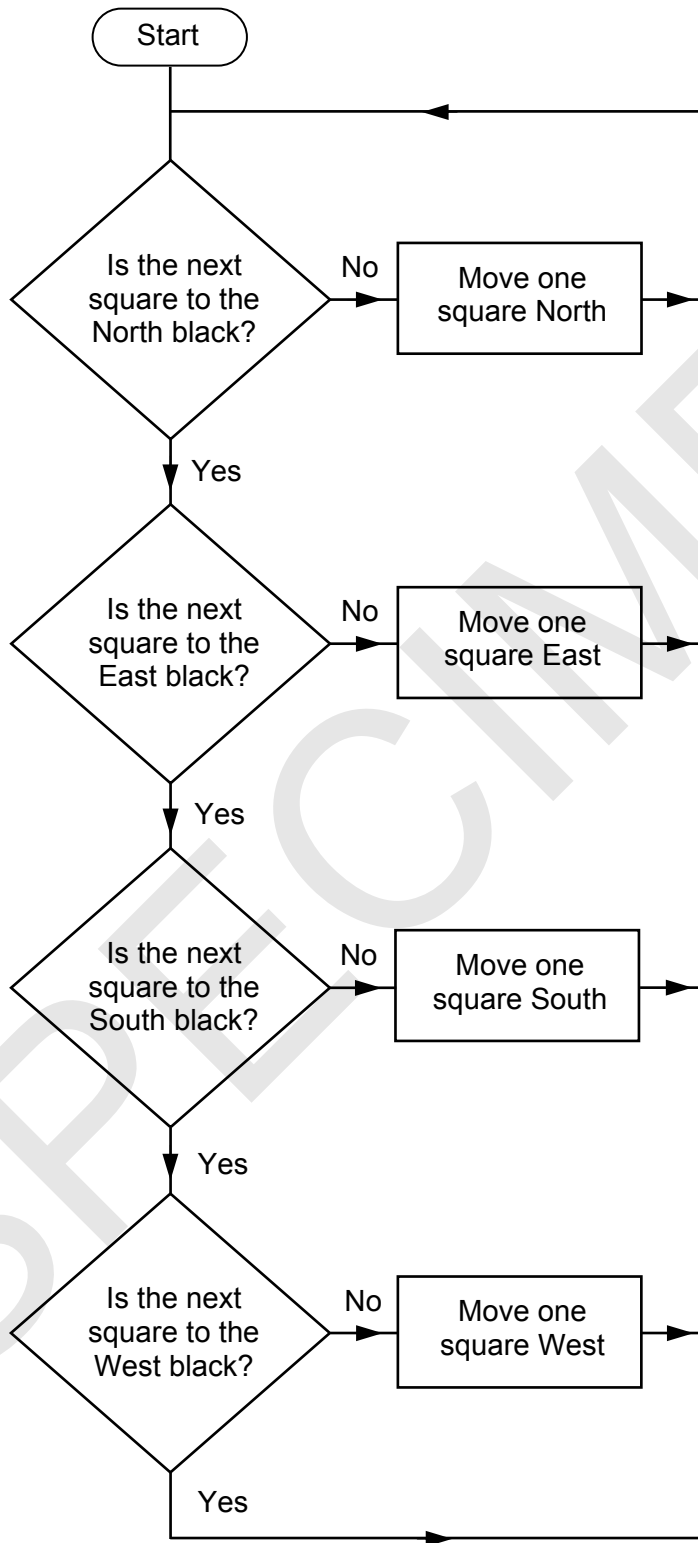
- (iii) Amy timed how long the mouse took to find the drop box every day for 12 days. She re-tested the mouse two months later. Here are her results.

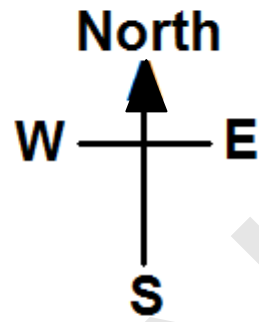
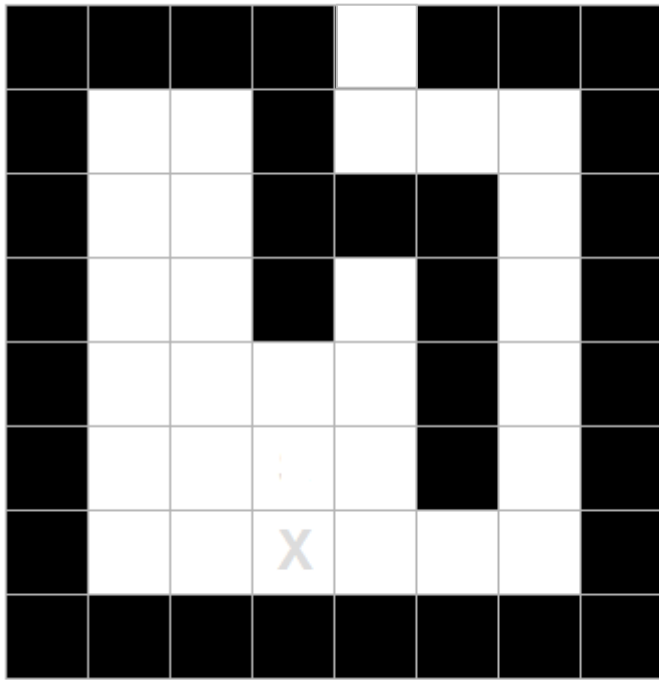


Write down three things you can tell from the graph.

[3]

- (b) Mazes have been used to investigate if robots can learn.
This flow chart is a start by some students to build a robot that can find its way through a maze.





(i) Starting from **X** use the flow chart to show the path taken on the maze. [3]

(ii) Explain whether the flow chart works to solve the maze.

[2]

- 4 Raschid can take the train to get to work. Alternatively, he can drive. He times his journey from home to work, in minutes, on a number of days. The table shows these times in minutes.

Train	25	32	28	36	27	29	
Car	20	45	38	24	31	19	28

- (a) Find the mean time for each method of travel.

Train _____ minutes

Car _____ minutes [4]

- (b) Find the range of the times for each method of travel.

Train _____ minutes

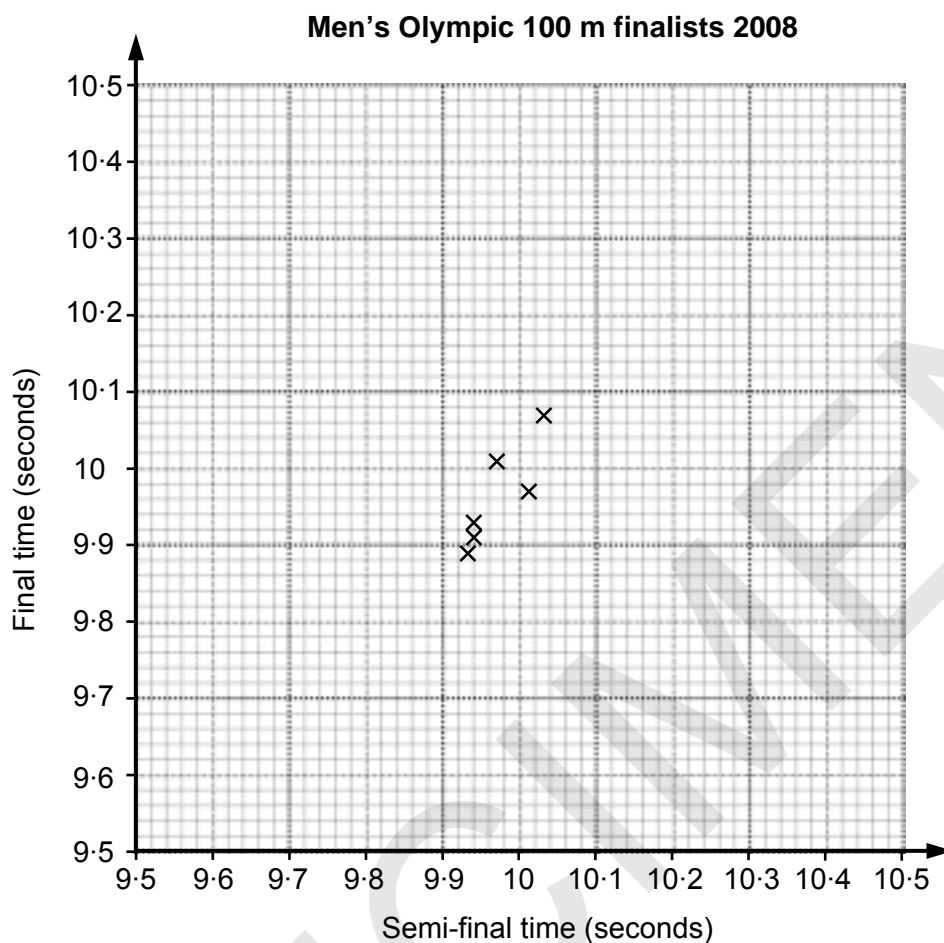
Car _____ minutes [2]

- (c) Raschid needs to be at work by 9:00 am. He works next to the train station. One morning he is ready to leave at 8:23; too late to catch the 8:20 am train.

Should he wait for the next train at 8:30 or should he drive?
You must explain your answer.

_____ [2]

- 5 The scatter graph shows the time taken to run the final and the semi-final for six of the runners in the Men's 100 m race in the 2008 Olympics.



- (a) The times for two runners are missing from the graph. Plot the points from the information in the table.

Semi-final time (seconds)	9.85	9.91
Final time (seconds)	9.69	9.95

[2]

- (b) What type of correlation does the scatter graph show?

[1]

- (c) Describe, in words, the relationship between semi-final time and final time. Do not use the word correlation in your answer.

[1]

- 6 Three friends get together to buy 12 bottles of shampoo at a total cost of £9.60. They will share the cost in proportion to the number of bottles they take.

Bernice takes 3 bottles of shampoo.
Chris takes 5 bottles of shampoo.
Daisy takes the rest of the shampoo.

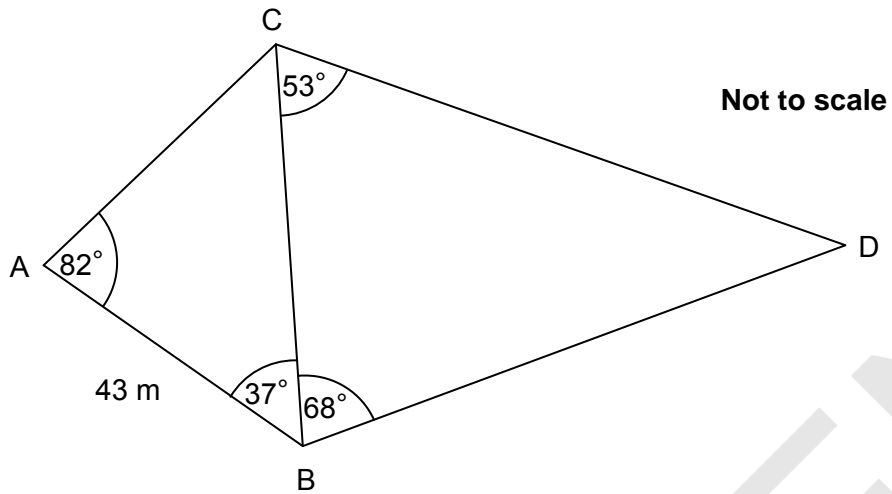
Work out how much each of them pays.

Bernice £ _____

Chris £ _____

Daisy £ _____ [5]

7 A surveyor measures a flat plot of land. He makes a rough sketch showing his measurements.

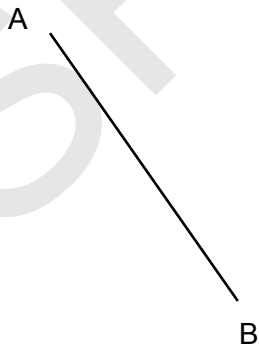


(a) What should angle ACB measure?

(a) _____ ° [2]

(b) Draw a scale drawing of the plot of land. Use a scale 1 cm to represent 10 m.
Line AB has been drawn for you.

Scale: 1 cm represents 10 m



[4]

(c) (i)

Measure CD on your scale drawing.

(c)(i) _____ cm [1]

(ii) How long is CD on the actual plot of land?

(ii) _____ m [1]

SPECIMEN

8 In the lounge of the local football club there is a coin tower made from 5p coins.

To start the tower people put coins round a bottle.



The money is being collected for the local hospice.

Ella and Leo are arguing.



By the time the tower reaches half-way to the ceiling it will be worth about a thousand pounds!!!

Rubbish, more like a couple of hundred - if you're lucky!



Ella finds this on the Royal Mint website.

United Kingdom 5p Coin



First Issued	Smaller version - June 1990 (Larger version introduced 1968, demonetised 1990)
Specifications (Since 1990)	
Diameter	18.0mm
Weight	3.25g
Thickness	1.7mm
Composition	Cupro-nickel (75% copper, 25% nickel)
Obverse	Portrait of Her Majesty the Queen
Designers	1990-1997 - Raphael Maklouf 1998 to date - Ian Rank-Broadley FRBS
Reverse	1968-2008 - Christopher Ironside
Designers	2008 - Matthew Dent
Edge	Milled

Who is right, Ella or Leo?

Support your answer with a clear argument and calculations.

[6]

- 9 The table shows the times of sunrise and sunset in Oxbridge.
All times are in Greenwich Mean Time (GMT).

Date	Time of sunrise hours:minutes (GMT)	Time of sunset hours:minutes (GMT)
1st January	08:13	15:54
1st March	06:47	17:39
1st May	04:27	19:28
1st July	03:39	20:29
1st September	05:10	18:49
1st November	06:58	16:29

- (a) (i) On which of these six **dates** did the sun rise earliest?

(a)(i) _____ [1]

- (ii) On which of these six **dates** did the sun set earliest?

(ii) _____ [1]

- (iii) Calculate the time between sunrise and sunset on **1st March**.
Give your answer in hours and minutes.

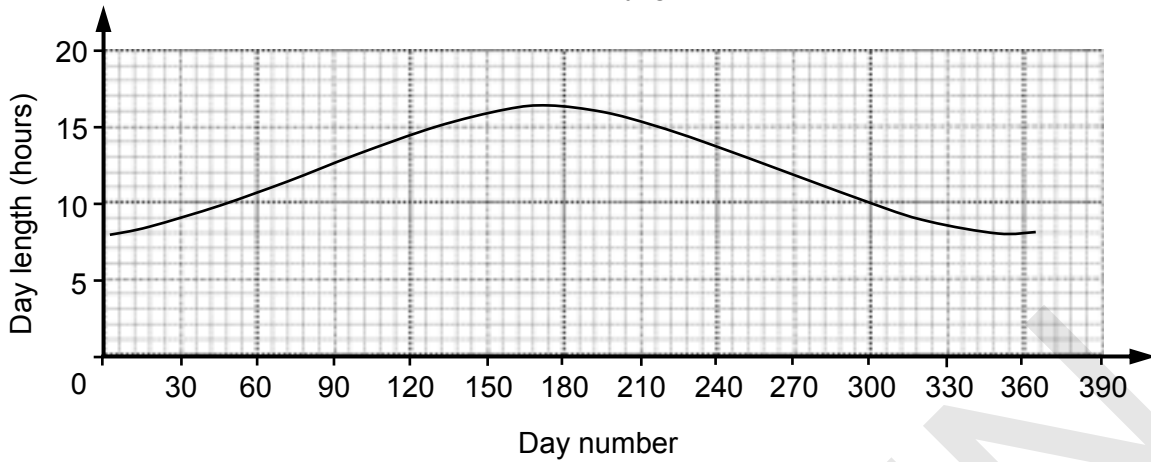
(iii) _____ hours _____ minutes [2]

- (iv) Ariana wants to draw a graph showing the number of hours of daylight.
To do this she needs to have the time between sunrise and sunset as a decimal.

Change your answer to part (a)(iii) to hours, giving your answer to two decimal places.

(iv) _____ hours [3]

Hours of daylight



The graph above shows the number of hours of daylight for each day in 2009. January 1st is day number 1; January 2nd is day 2, and so on.

- (b)(i) Put a cross (x) on the graph at the point representing 1st September.
A calendar for 2009 is shown below.

2009																																							
January										February										March										April									
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S												
5	6	7	8	9	10	11	2	3	4	5	6	7	8	2	3	4	5	6	7	8	6	7	8	9	10	11	12												
12	13	14	15	16	17	18	9	10	11	12	13	14	15	9	10	11	12	13	14	15	13	14	15	16	17	18	19												
19	20	21	22	23	24	25	16	17	18	19	20	21	22	16	17	18	19	20	21	22	20	21	22	23	24	25	26												
26	27	28	29	30	31	23	24	25	26	27	28	23	24	25	26	27	28	29	27	28	29	30																	
													30	31																									
May										June										July										August									
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S												
4	5	6	7	8	9	10	1	2	3	4	5	6	7	6	7	8	9	10	11	12	3	4	5	6	7	8	9												
11	12	13	14	15	16	17	8	9	10	11	12	13	14	13	14	15	16	17	18	19	10	11	12	13	14	15	16												
18	19	20	21	22	23	24	15	16	17	18	19	20	21	20	21	22	23	24	25	26	17	18	19	20	21	22	23												
25	26	27	28	29	30	31	22	23	24	25	26	27	28	27	28	29	30	31	24	25	26	27	28	29	30														
							29	30										31																					
September										October										November										December									
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S												
7	8	9	10	11	12	13	5	6	7	8	9	10	11	2	3	4	5	6	7	8	7	8	9	10	11	12	13												
14	15	16	17	18	19	20	12	13	14	15	16	17	18	9	10	11	12	13	14	15	14	15	16	17	18	19	20												
21	22	23	24	25	26	27	19	20	21	22	23	24	25	16	17	18	19	20	21	22	21	22	23	24	25	26	27												
28	29	30	26	27	28	29	30	31	23	24	25	26	27	28	29	28	29	30	31																				
													30																										

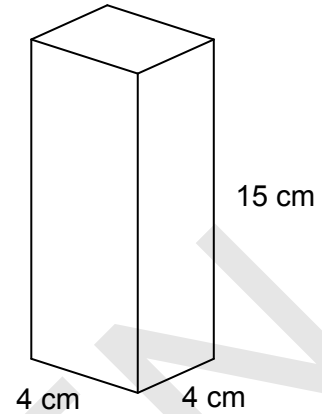
[3]

- (ii) About how many hours of daylight are there on the longest day of the year?

(b)(ii) _____ hours [1]

- 10 (a) The diagram shows a cuboid drink carton.
It has a square base, 4 cm by 4 cm, and is 15 cm tall.

Calculate the volume of the carton.



(a) _____ cm³ [2]

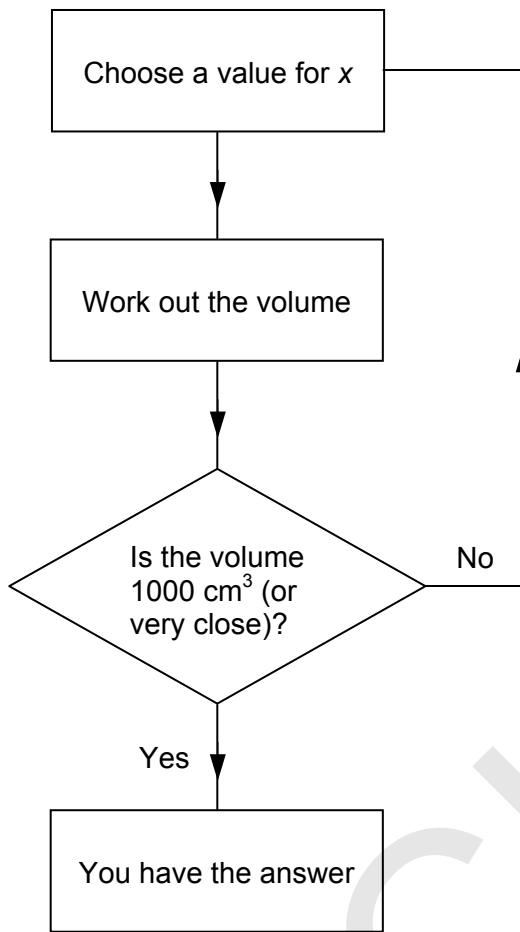
- (b) A supplier is planning a new drink carton in the shape of a cuboid.
It will have a square base, x cm by x cm, and its height will be 9 cm more than its width.
In cubic centimetres, the volume, V , of the carton will be given by $V = x^3 + 9x^2$.

So, for example, when $x = 4$, $V = 4^3 + 9 \times 4^2 = 64 + 9 \times 16 = 64 + 144 = 208$.

Find x so that the volume of the carton is 1000 cm^3 . Give your answer to one decimal place.

(b) _____ [4]

(c) A flow chart showing a method to work out the answer to part (b) is shown below.



Suggest two ways in which the flow chart could be improved.

1 _____

2 _____

[2]

- 11 Ryan wants to take hang-gliding lessons.
He lives in Preston; the lessons will be near to New Mills on Saturdays.

(a) Ryan looks on the internet and finds some information about train times.

Saturday											
Outward via Manchester Piccadilly											
Preston (Lancs)	dep.	06:47		07:47		08:47		09:47		10:47	
Manchester Piccadilly	arr.	07:27		08:27		09:27		10:27		11:27	
Manchester Piccadilly	dep.		07:44		08:45		09:45		10:45		11:45
New Mills Central	arr.		08:11		09:13		10:13		11:11		12:13

Saturday												
Return via Manchester Piccadilly												
New Mills Central	dep.	18:01		19:01		20:01		20:30		21:30		23:30
Manchester Piccadilly	arr.	18:32		19:32		20:32		21:03		22:05		00:03
Manchester Piccadilly	dep.		18:46		19:46		20:46		21:46		22:16	00:35
Preston (Lancs)	arr.		19:33		20:33		21:33		22:33		22:54	01:35

- (i) Ryan is being met at New Mills Central station at 09:30.

What time train should he catch from Preston?

(a)(i) _____ [1]

- (ii) How long has he got to change trains at Manchester Piccadilly?

(ii) _____ minutes [1]

- (iii) He's been told he'll be in plenty of time to be back in New Mills Central by 7 pm.

What time can Ryan expect to get back to Preston?

(iii) _____ [1]

(b) Ryan finds this information about the risk of very serious accidents.

Sport	Number of very serious accidents	Activity	Estimate of probability of very serious accident
American Football	18	1 400 000 players	0.0000128
BASE Jumping	27	21 000 jumps	0.00128
Hang-gliding	3	100 000 flights	
Horse Riding	30	1 800 000 riders	0.0000166
Skiing	111	57 000 000 visits	
Skydiving	63	2 500 000 jumps	

Ryan is worried about the risk of very serious accidents.

Use Ryan's information to show how safe or otherwise hang-gliding is compared to the other sports in his list.

[4]

- (c) When he was at a height of 600 m Ryan thought he could just see Manchester United's stadium.

Ryan found this information in a book.

As you climb higher into the sky you can also see further.

The distance, d kilometres, you can see from a height, h metres, is given by

$$d = \sqrt{12h}.$$

Ryan looked at this map when he got home.



Could Ryan have seen Manchester United's stadium?
Support your answer with some calculations.

[5]

12* Sanjay has returned from holiday and wants to change some euros (€) back into pounds (£).

A euro is worth less than a pound.

Sanjay sees these commission-free rates advertised.

Bank	
euro (€)	
We buy at	1.1374
We sell at	1.1265

Money Exchange	
euro (€)	
We buy at	1.1462
We sell at	1.1175

This means the bank buys euros at a rate of 1.1374 euros for a pound and sells euros at a rate of 1.1265 euros a pound.

Explain whether Sanjay should use the bank or the money exchange.

[3]

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Q3 images of Barnes maze © Med Associates Inc, Product Number: ENV-562-R

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OXFORD CAMBRIDGE AND RSA EXAMINATIONS
General Certificate of Secondary Education
APPLICATIONS OF MATHEMATICS

A382/01

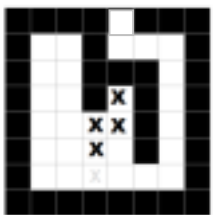
Paper 2 (Foundation)

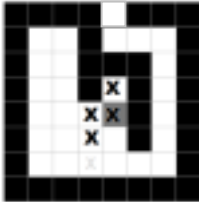
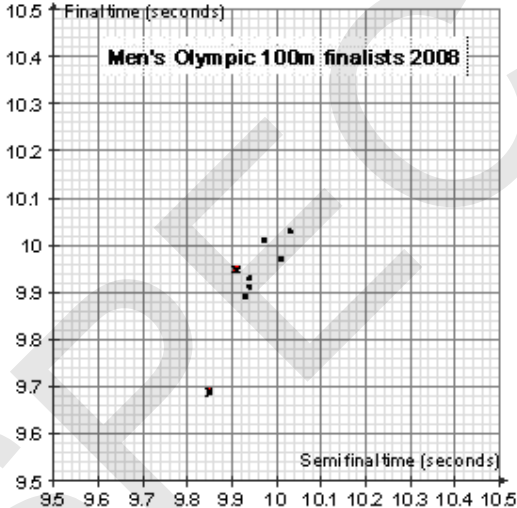
Specimen Mark Scheme


The maximum mark for this paper is **90**.

SPECIMEN

This document consists of **6** printed pages.

1	(a)	19	1	Allow answer in range 18-20 (whole numbers only)
	(b)	26-29 (whole numbers only)	2	Allow B1 for answer in range 25 or 30
	(c)	China and Russia	1	
	(d)	Correct total height (40 or just over) Correct divisions	1 1	
2	(a)	2009 – 1859 = 150 (years) (151 years in 2010)	1 1	2009 will change over time First mark may be implied by from the second mark.
	(b)	16.75 (metres/min.)	2	1 for attempt to divide any number by "20".
	(c)	Some evidence of sketching the situation Accurate scale drawing and scale Angle in range (4 to 8) [°] (If done by trig, not expected, $\tan\beta = \frac{18}{167.5} = 0.107\dots$ $\beta = 6.1336^\circ$)	1 2 1	1 Include attempt at scale drawing – whatever the quality. 2 Give 1 mark if scale stated and used for at least 1 lengths, or if no scale stated, but otherwise correct. 2 - Award 1 for using just one of the correct numbers. 1 for final answer.
3	(a)	(i) $\frac{1}{20}$	1	
		(ii) $\frac{3}{20}$	2	1 for denominator of 20
		(iii) <ul style="list-style-type: none"> • Mice learning gets slower • After about 10 weeks it levels out • Mice still remember even after two months • After about 10 weeks there is no real difference between them. 	3	1 each (max. of 3) for reasons like these. Only award credit once for Instances of comparing particular pairs of values – credit is more overall statements.
	(b)	(i) 	3	3 for all four points correct 2 for two correct 1 first point correct from starting cross

		<p>(ii) The flow chart doesn't work, it gets stuck on the grey square and just goes North and back again from it.</p> 	<p>2</p> <p>*Full credit for clear description in "good English"</p> <p>1 if less than clear but some mention of going "up and down again and again".</p>	
4	(a)	<p>Train</p> $\frac{177}{6} = 29.5$ <p>Car</p> $\frac{205}{7} \approx 29.3$	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Adding (either)</p> <p>Dividing by number of values (either)</p>
	(b)	<p>Train 11</p> <p>Car 26</p>	<p>1</p> <p>1</p>	
	(c)	<p>Train because there is a chance that he might not get there on time by car but probably will by train.</p> <p>or</p> <p>Car because he might have a short journey time and get to work early.</p>	<p>2</p>	<p>Allow B1 for partial explanation eg "Car is a bit quicker on average" or "Train times are more reliable" Or "Car gets you straight there"</p>
5	(a)		<p>1</p> <p>1</p>	
	(b)	<p>Positive correlation</p>	<p>1</p>	
	(c)	<p>Those who were faster in the semi final tend to be faster in the final too.</p>	<p>1</p>	<p>Allow alternative sensible comments eg "Runners tend to run faster in the final than in the semi final (but this is not always the case)".</p>

6	<p>80p a bottle Bernice £2.40</p> <p>Chris £4</p> <p>Daisy £3.20</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>For £9.60 divided by 12 or 2 or 4 (may be implied by correct ans for Bernice)</p> <p>For £9.60 – costs for Bernice and Chris or 4 bottles (may be implied by correct answer for Daisy)</p>
7	(a) $180^\circ - (82^\circ + 37^\circ) = 61^\circ$	1 1	
	(b) Angle at A Angle at B D in correct place All four vertices labelled	1 1 1 1	
	(c) (i) 5.3 cm (allow 5 cm to 5.6 cm)	1	
	(ii) 53 m (ft from (i))	1	
8	<p>There 17 coins in a layer so a layer is worth 85p</p> <p>The tower is between 1m and 2 m tall</p> <p>Which means it is (100 to 200) $\div 0.17$ = (588 to 1176) layers</p> <p>Which is worth between about £500 and £1000. So Ella is closest.</p>	1 1 1 1 1	
9	(a) (i) 1st July	1	
	(ii) 1st January	1	
	(iii) 10h 52m	2	B1 for sight of 06:47 or 17:39
	(iv) 10.87 ft from part (ii)	3	<p>M2 $10 \frac{52}{60}$ or $17 \frac{39}{60} - 6 \frac{47}{60}$ or 7.83...</p> <p>M1 $17 \frac{39}{60}$, $6 \frac{47}{60}$ or $\frac{52}{60}$ or ...8(3...)</p>
	<p>(b) (i) $1+28+31+30+31+30+31+31+1=244$ or $\frac{2}{3}$ of year is about 243 days</p> 	1 1 1	<p>M1 Adds 3 or more month numbers or attempts $\frac{2}{3}$ of 365</p> <p>A1 244 ± 3.</p> <p>Point on graph between day 241 and 251</p>
	(ii) About 17 hours	1	Allow any and in range 16 to 18

10	(a)	240	2	M1 $4 \times 4 \times 15$
	(b)	7.7 www	4	M1 for trial giving $V > 1000$ M1 for trial between 7 and 8 M1 for better trial between 7 and 8 B1 for 7.7
	(c)	<ul style="list-style-type: none"> Have a box to decide whether volume is too big or too small Choose a different x to the ones you have used Say how near the volume needs to be to 1000 (or how accurate x needs to be) Break down volume calculation into stages 	2	B1 for each different sensible suggestion (max 2 marks)
11	(a)	(i) 7:47	1	Allow all common time formats
		(ii) 18 (minutes)	1	Allow follow through from part (i)
		(iii) 20:33	1	Allow all common time formats
	(b)	<p>Successful attempt to complete the probabilities in the right-hand column of the table.</p> <p>Comparing their probability for hang gliding with the other values.</p> <p>Making a clear and valid conclusion on the basis of these (their own) figures</p>	2 1 1	<p>For 1 or 2 correct award 1 [hang gliding : 0.00003 Skiing: 0.0000019 Skydiving : 0.000025]</p> <p>Clearly and in "good English"</p>
	(c)	<p>Attempt to measure map distance.</p> <p>Converting map distance into real distance.</p> <p>Successful attempt to use height (600 m) in the appropriate formula $d = \sqrt{12 \times 600} = 84.85(28\dots)$</p> <p>Comparing d with distance via map and making the relevant statement.</p>	1 1 1 1 1	

12*	<p>Structured argument, which includes supporting calculations eg a possible solution is to suppose Sanjay has 100 euros. At the bank he would get $100 \div 1.1374 = \text{£}87.92$. At the money exchange he would get $100 \div 1.1462 = \text{£}87.24$ therefore the bank is the better option. Clearly expressed recommendation.</p> <p>Comparison between bank and money exchange rates with minor errors in working or correct working with unclear recommendation</p> <p>No relevant comment or calculation.</p>	<p>3</p> <p>1-2</p> <p>0</p>	<p>For lower mark – an incomplete or incorrect attempt to compare the sell rates of the bank and the money exchange or partially correct working with a badly expressed conclusion.</p>
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SPECIMEN

Assessment Objectives and Functional Elements Grid

GCSE Applications of Mathematics

A382/01 (Foundation)

Qn	Topic	AO1	AO2	AO3	Functional
1	Read and draw chart	4	2		
2a	Subtraction	2			
2b	Speed		2		
2c	Scale drawing		4		
3a	Probability	3		3	3
3b	Flow chartt	3		2	5
4	Mean, range, decision	6		2	2
5	Scatter graph	3		1	
6	Direct proportion		5		
7	Scale drawing	8			
8	Estimation calc		4	2	6
9a	Time, fractions	4	3		
9b	Interp graph	1	3		4
10	Vol, T&I, flow chart	6		2	2
11a	Reading table	3			
11b	Risk/probability		3	1	
11c	Scales, formula	3	1	1	5
12*	Finance			3	3
	TOTAL	46	27	17	30