OCR
RECOGNISING ACHIEVEMENT

F

Tuesday 15 January 2013 – Afternoon

GCSE APPLICATIONS OF MATHEMATICS

A382/01 Applications of Mathematics 2 (Foundation Tier)

A316910113

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Scientific or graphical calculator
- Geometrical instruments
- Tracing paper (optional)

Duration: 1 hour 30 minutes

A 3 8 2 0 1

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure 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.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

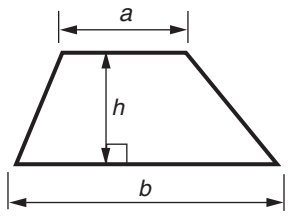
INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- Your Quality of Written Communication is assessed in questions marked with an asterisk (*****).
- The total number of marks for this paper is **90**.
- This document consists of **32** pages. Any blank pages are indicated.

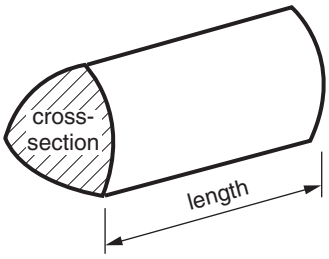
You are permitted to use a calculator for this paper

Formulae Sheet: Foundation Tier

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



Volume of prism = (area of cross-section) × length



PLEASE DO NOT WRITE ON THIS PAGE

1 **(a)** Banknotes were first used in China.

This note was printed in the year 830.

The first UK banknote was printed 967 years later.

In what year was the first UK banknote printed?

Image has been removed due to third party copyright restrictions.

Details:

One Kwan note from the Tang Dynasty.

(a) _____ **[1]**

(b) Banknotes are usually stored in bundles.
There are 500 notes in each bundle.

How much is a bundle of £50 notes worth?

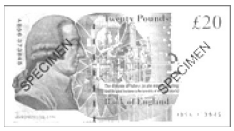
(b) £ _____ **[2]**

(c) Solve this puzzle.

How can Anil and Josh share these six banknotes so that they each get the same amount of money?

(c) Anil: _____ Josh: _____ **[3]**

(d) Here is some information about four UK banknotes.

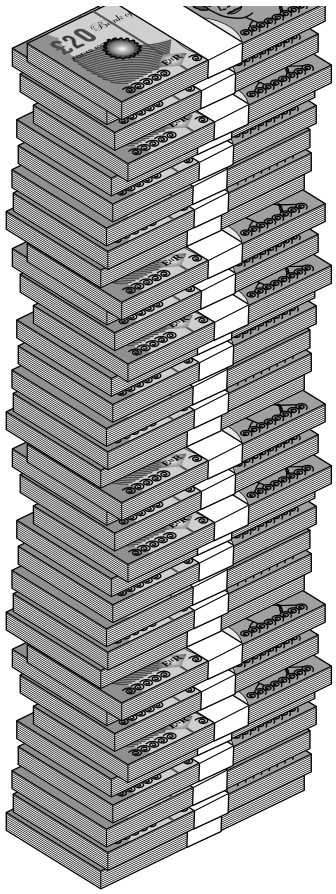
Note	Size
£5 	135 mm by 70 mm
£10 	142 mm by 75 mm
£20 	149 mm by 80 mm
£50 	156 mm by 85 mm

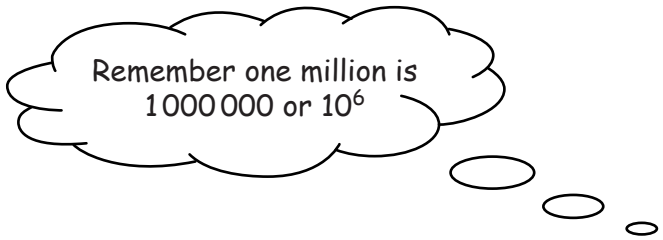
(i) Machines that accept banknotes need to check their size.

Which of the four banknotes is the same size as this outline?

(d)(i) £ _____ **[1]**

Each banknote is 0.1 mm thick and weighs about 1 gram.





(ii) How tall is a stack of £20 notes worth £1 million?
Remember to state the correct units.

(ii) _____ **[3]**

(iii) Would £1 million in £20 notes be too heavy for an average person to carry?
Show your working clearly and state any assumptions you make.

_____

_____

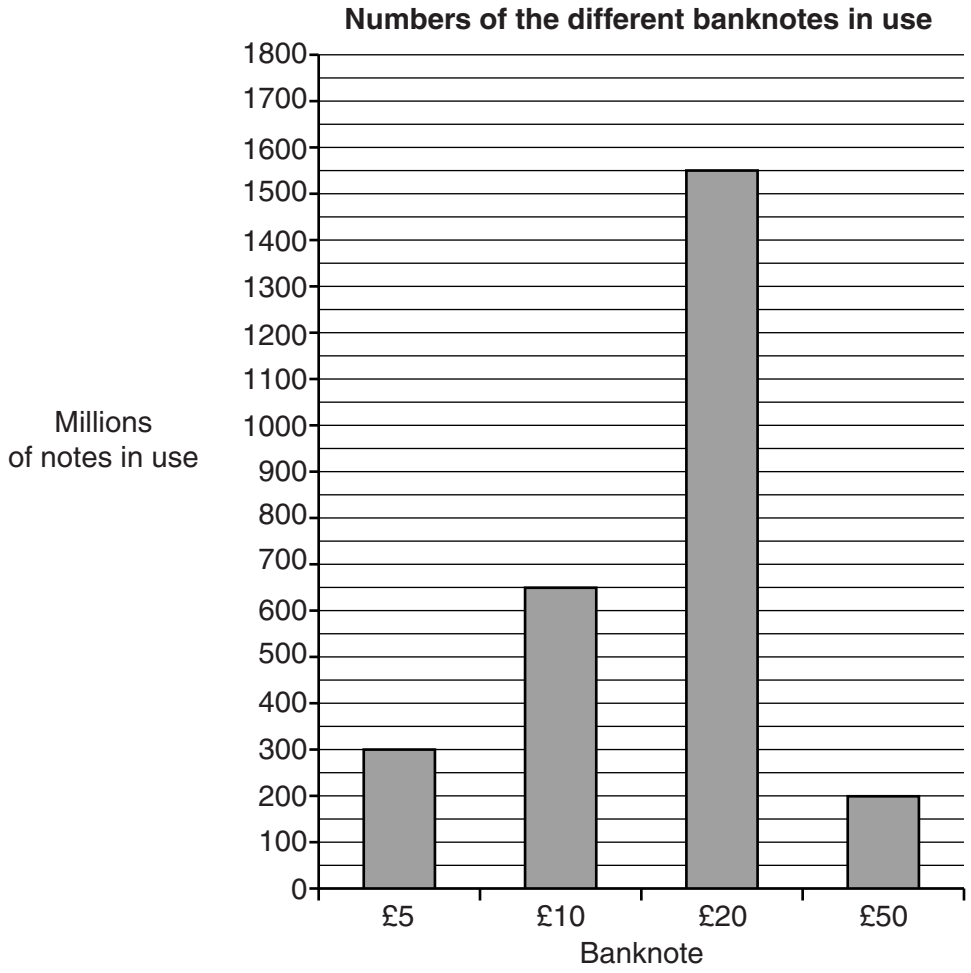
_____

_____

_____

_____ **[3]**

(e) This graph shows the **number**, in millions, of each kind of banknote in use.



The value of all the coins in use is £3700 million.

Is this more or less than the value of all the banknotes in use?
Show the calculations you use to justify your answer.

_____

_____

_____

_____

_____

_____

_____ **[3]**

(f) The Bank of England says that about 0.03% of banknotes in use are forgeries.

(i) Complete the sentence below using a word chosen from this box.

impossible	certain	evens
very likely	very unlikely	unlikely

It is _____ that the next banknote you see will be a forgery. **[1]**

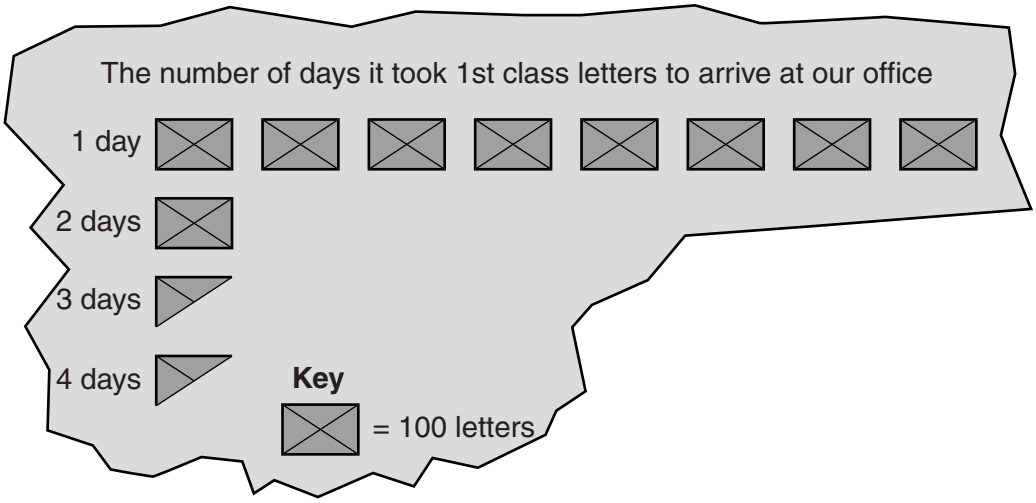
(ii) Complete the sentence below using fractions chosen from this box.

$\frac{3}{100}$	$\frac{3}{1000}$	$\frac{3}{10000}$	$\frac{9997}{10000}$	$\frac{997}{1000}$	$\frac{97}{100}$

The probability that the next banknote you see is a forgery is _____ ,

but the probability that it is not a forgery is _____ . **[2]**

2 **(a)** A newspaper records how many days letters with a 1st class stamp take to arrive.



(i) How many 1st class letters took 1 day to arrive?

(a)(i) _____ **[1]**

(ii) How many 1st class letters took **more** than 1 day to arrive?

(ii) _____ **[1]**

(iii) 1st class letters which take more than one day to arrive are counted as late.

Does this headline agree with the survey?
You **must** support your answer with calculations.

_____

_____

_____ **[2]**

(b) Amy wants to compare her post with the newspaper's.
She uses the postmarks on the 1st class letters she receives on Fridays.
Here are her results, in days.

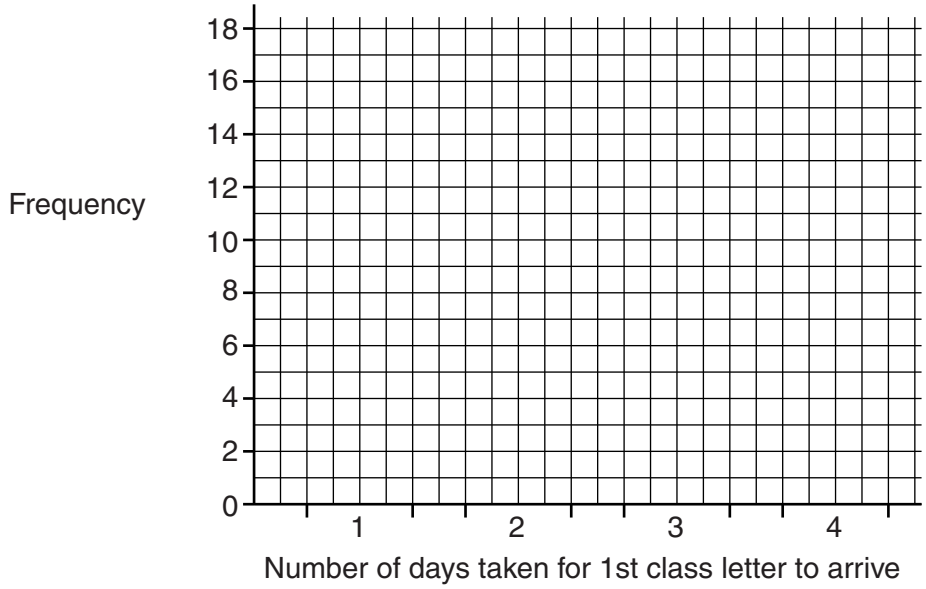
1	2	4	1	1	1	1	1	1	1
1	3	1	1	1	1	2	1	1	1

(i) Complete this tally and frequency table for Amy's post.

Number of days for 1st class letter to arrive	Tally	Frequency
1		
2		
3		
4		
	Total:	

[2]

(ii) Draw a bar chart on the grid below to show Amy's results.



[2]

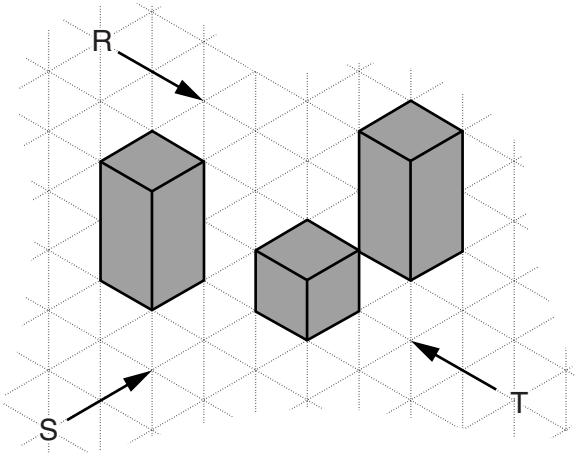
(iii) Do Amy's results match the newspaper headlines?
Show how you decided.

_____

_____ **[1]**

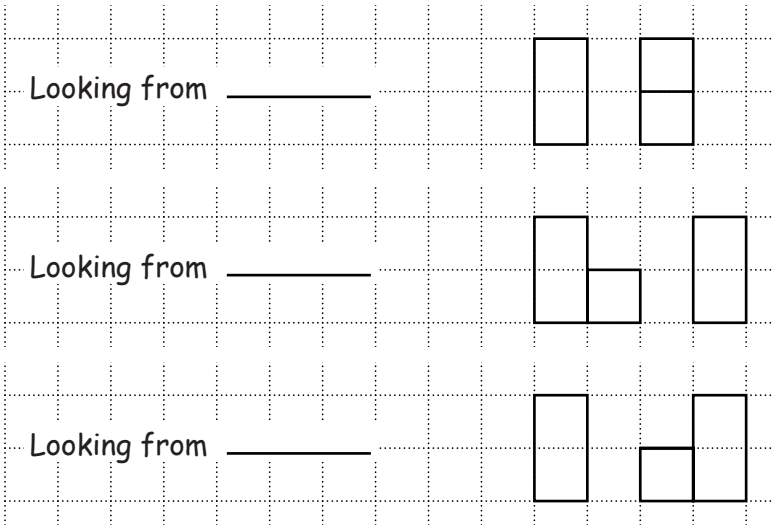
3 The Holocaust memorial in Berlin is an arrangement of cuboids.

(a) Tom is investigating designs made from cuboids.
He arranges some cuboids like this.



Here are some of his sketches.

Match each sketch to the direction in which it is viewed: R, S or T.



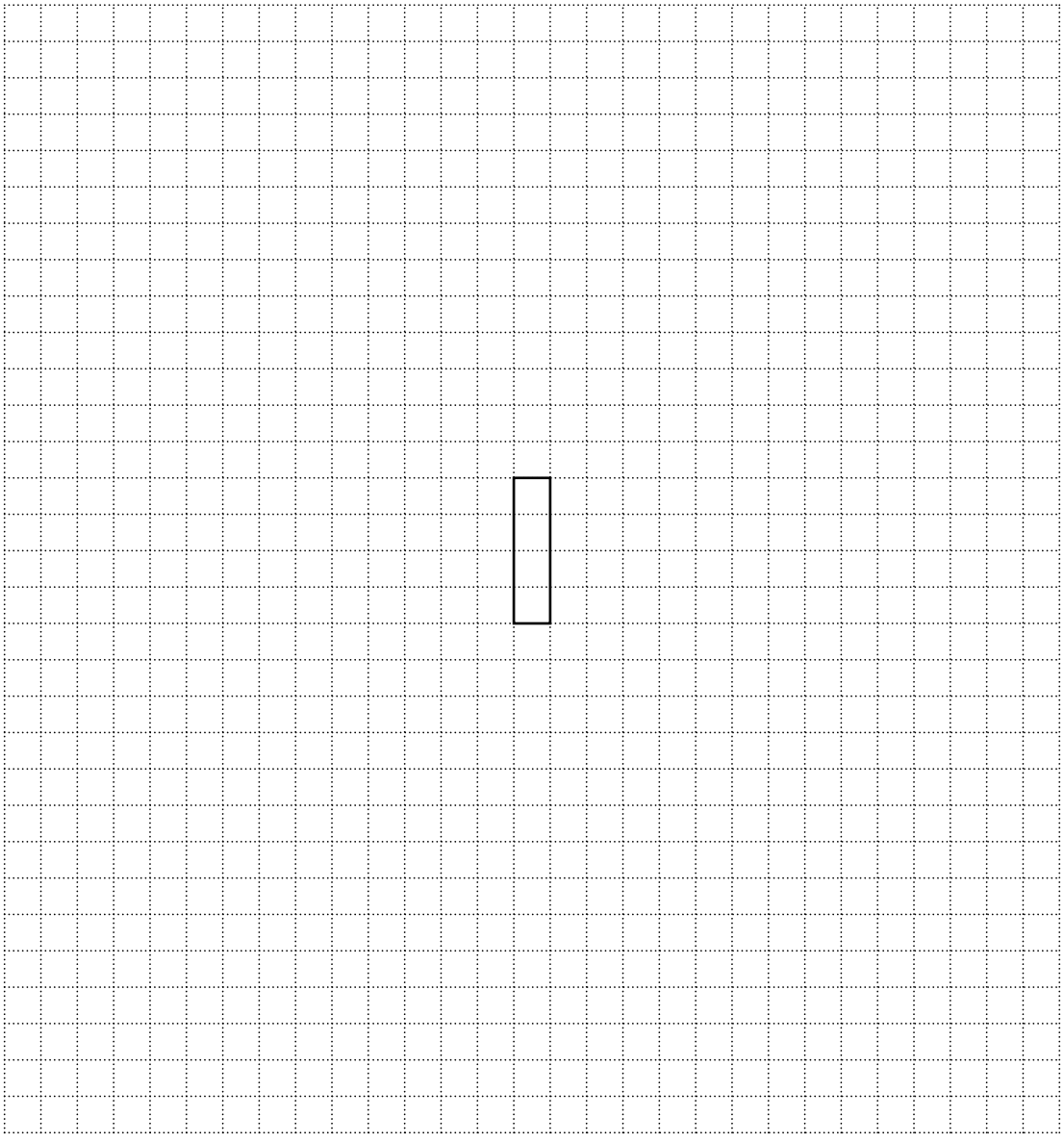
[2]

(b) Tom found that a cuboid, measuring 1 unit by 4 units by 9 units appeared in the film *2001 A Space Odyssey*.

It was called the Monolith and had special powers!

(i) He decided to make a model of the Monolith.

Draw a suitable net for Tom's model Monolith on the grid.
The base is drawn for you.



[3]

(ii) Tom wondered what was special about the Monolith's dimensions.
He uses a formula to work out the greatest distance between two corners.

Complete his calculation.

$$\text{Distance} = \sqrt{1^2 + 4^2 + 9^2}$$

_____

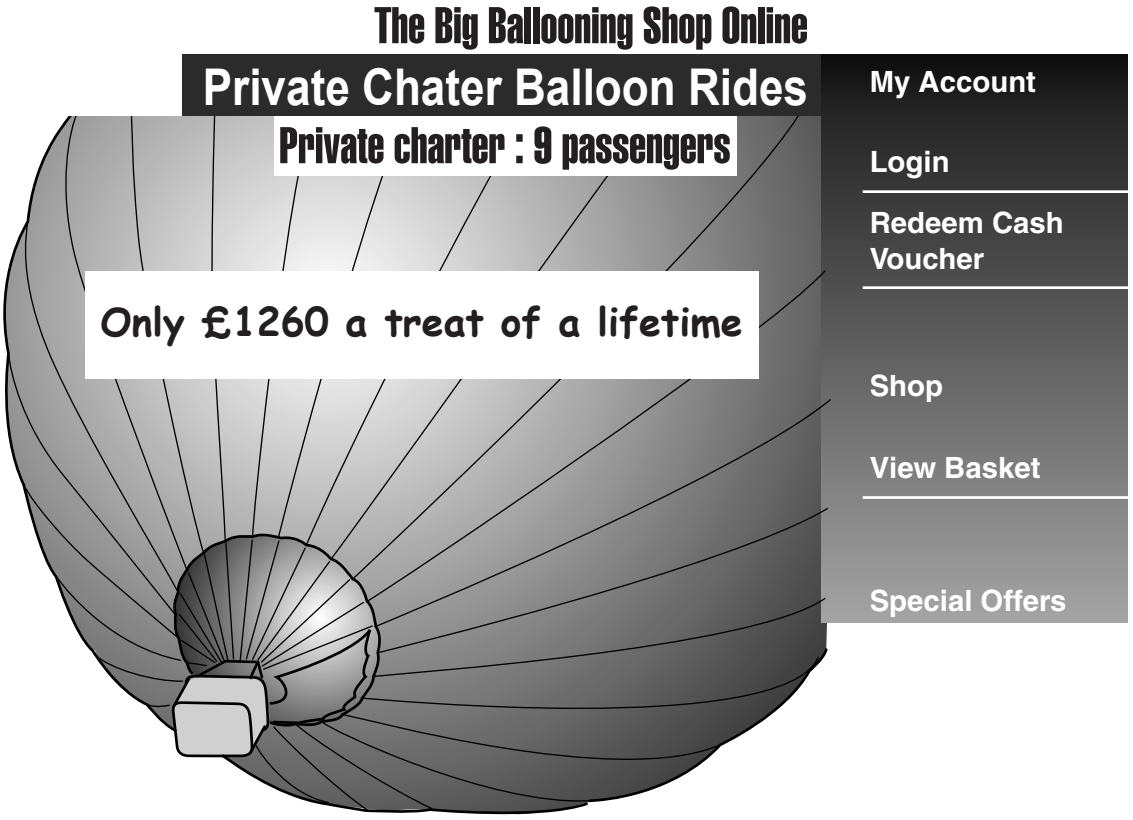
_____

_____

_____

_____ **[2]**

4 Andy and Drew want to celebrate their anniversary.
They decide to arrange a balloon flight in September with their friends.
Andy sees this offer.



(a) The balloon flight costs £1260.
Andy and Drew share the cost in proportion to the number of people they each invite.
Andy invites 3 people and Drew invites 4 people.

How much do Andy and Drew each pay?

(a) Andy: £ _____

Drew: £ _____

[3]

Some of their friends want to know a bit more about hot air balloon flights.
Drew jots down the notes below.

- Balloons fly at about 1000 m and flights last about 3 to 4 hours on average
- When you go up the temperature drops from what it was on the ground
  This drop in temperature, d°C, depends on the height, h metres
  The formula is $d = 0.005 \times h$
- The average temperature on the ground at about the time we'll be flying is 17 °C
- Wind speeds greater than 4 m/s are not safe for hot air balloons
- To change a speed in miles per hour into m/s
  multiply the speed in miles per hour by 0.447
- To change a speed in m/s into miles per hour multiply the speed in m/s by 2.237

(b) Julie reads the notes.

Use Drew's notes to decide whether Julie is correct.
Support your answer with calculations.

_____

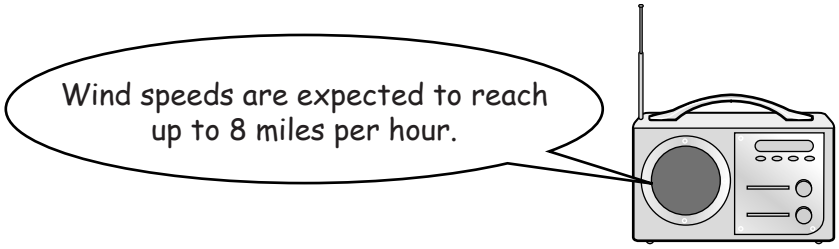
_____

_____

_____

_____ **[3]**

(c) Drew hears this weather forecast.



Use Drew's notes to work out whether this is a safe wind speed.

_____

_____

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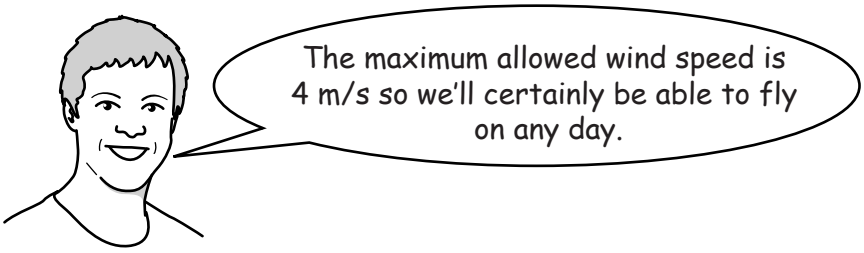
_____

_____ **[2]**

(d) Andy reads that the average wind speed for September, when they hope to fly, is 3.6 m/s.



Why is Andy wrong?

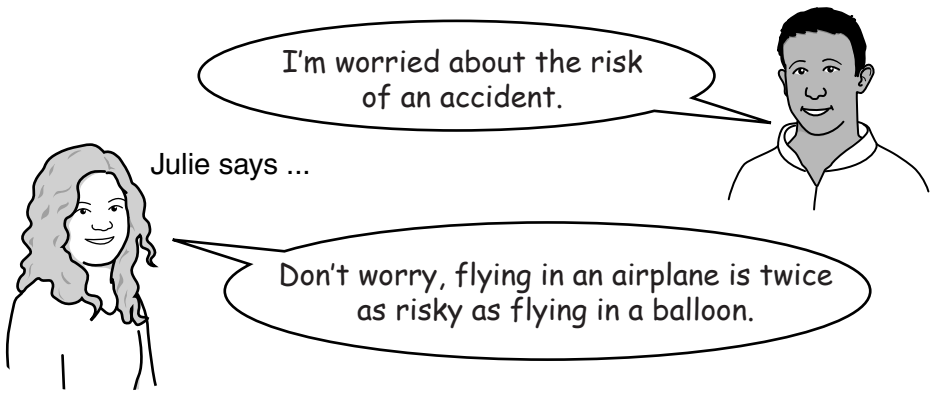
_____

_____

_____

_____ **[1]**

(e)*



She finds this information on an American ballooning webpage on the internet.

Number of accidents for airplanes and hot air balloons and the total number of flying hours for each (for the last two years)

Airplanes

Accidents	Total number of flying hours
3760	50 345 000

Hot air balloons

Accidents	Total number of flying hours
39	116 700

Is Julie correct?
Justify your answer using Julie's information.
Show the calculations you use.

_____

_____

_____

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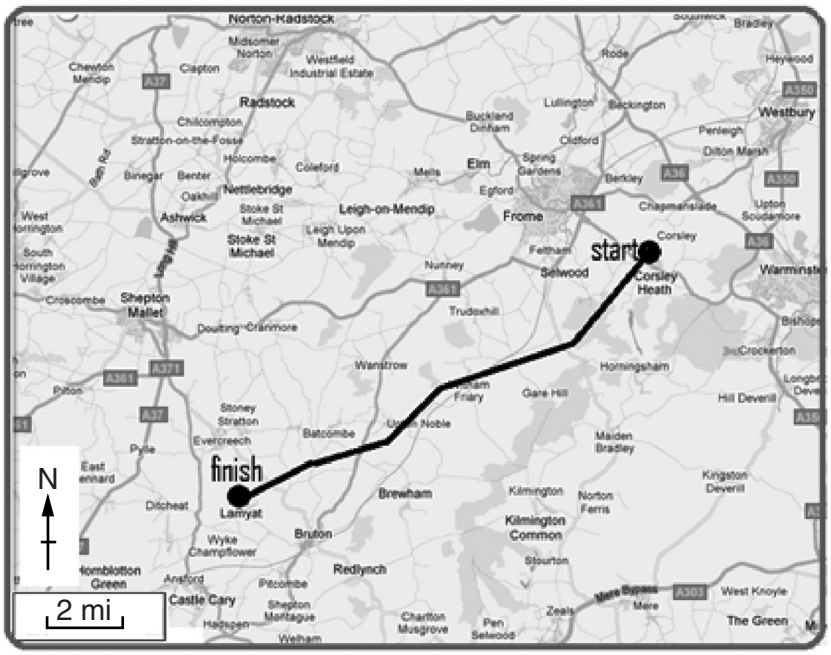
_____

_____ **[4]**

The friends had a safe and enjoyable flight.

(f) On Andy's mobile he has an app which shows the route the balloon took.



Scale: 1 cm represents 2 miles

(i) Approximately in what direction did the balloon travel?

(f)(i) _____ **[1]**

(ii) Estimate how far the balloon travelled.

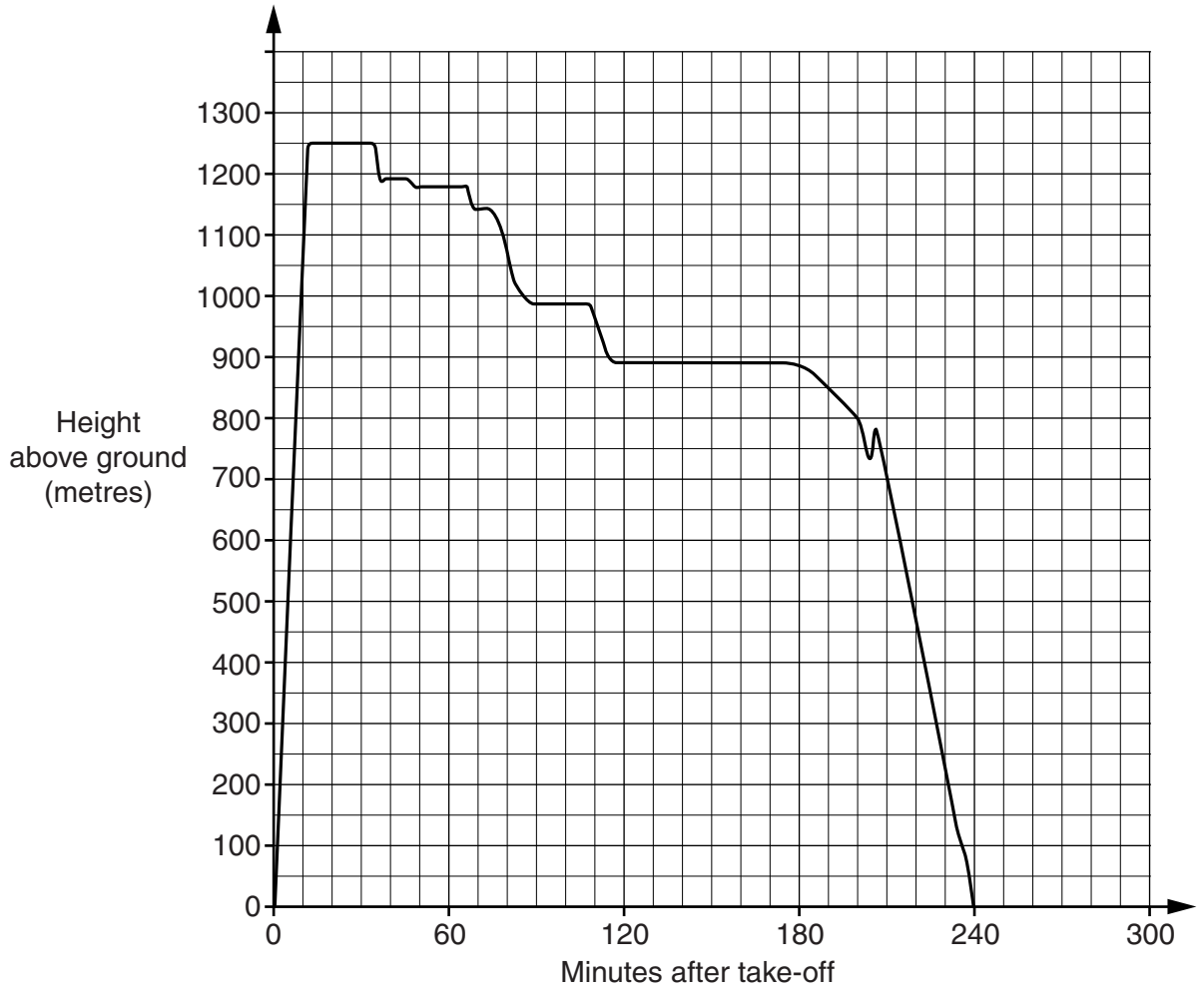
(ii) _____ miles **[2]**

(iii) The flight lasted 4 hours.

What was the balloon's average speed for the flight?

(iii) _____ miles per hour **[2]**

(g) Andy's app also records the height above ground of the balloon.



(i) What was the maximum height of the balloon?

(g)(i) _____ m **[1]**

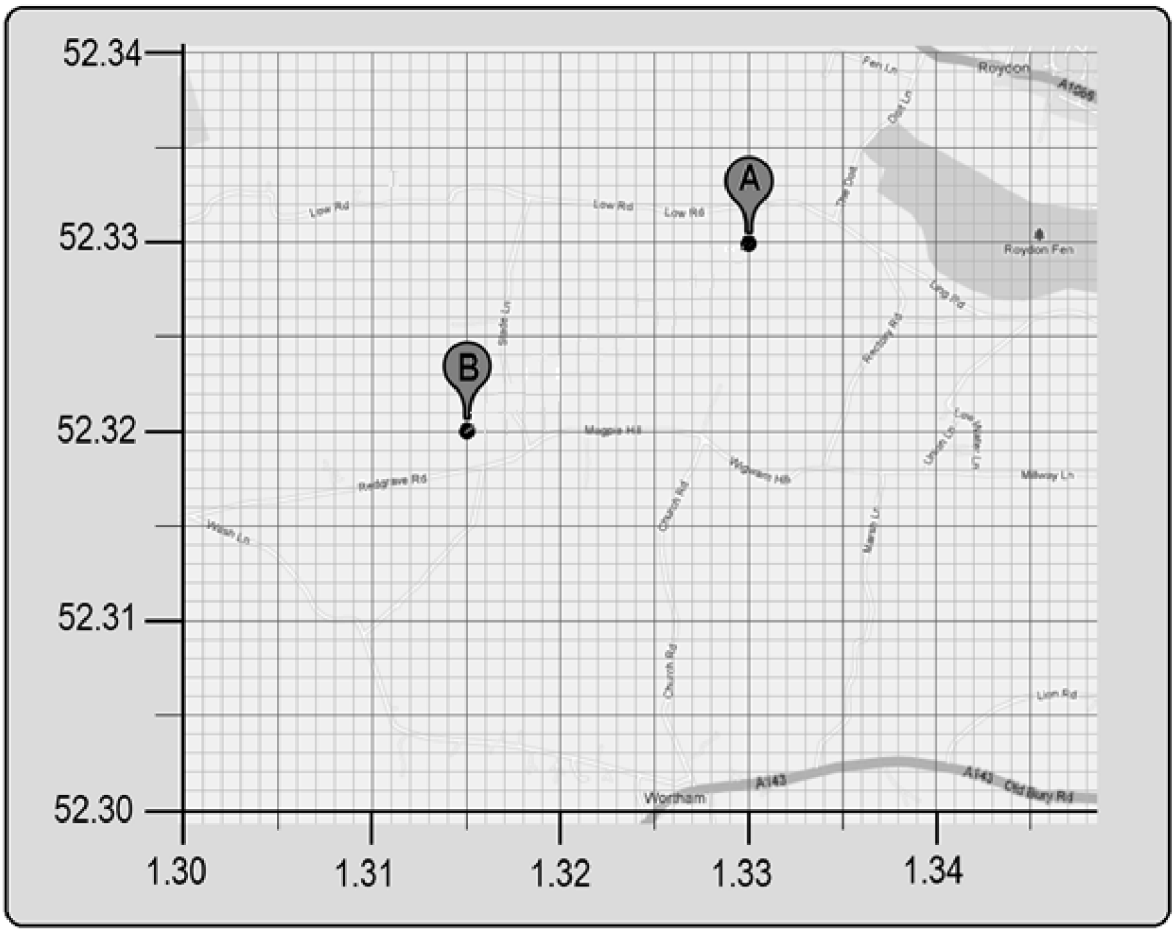
(ii) How many minutes after take-off did the balloon reach a height of 1100 metres?

(ii) _____ minutes **[1]**

(iii) For how many minutes was the balloon flying above 1000 metres?

(iii) _____ minutes **[1]**

(h) Andy's mobile shows GPS coordinates.
GPS coordinates work in the same way as normal coordinates, for example the point A has GPS coordinates (1.33, 52.33).



(i) Write down the GPS coordinates of point B.

(h)(i) (_____ , _____) **[1]**

(ii) Mark and label the point C whose GPS coordinates are (1.31, 52.325)

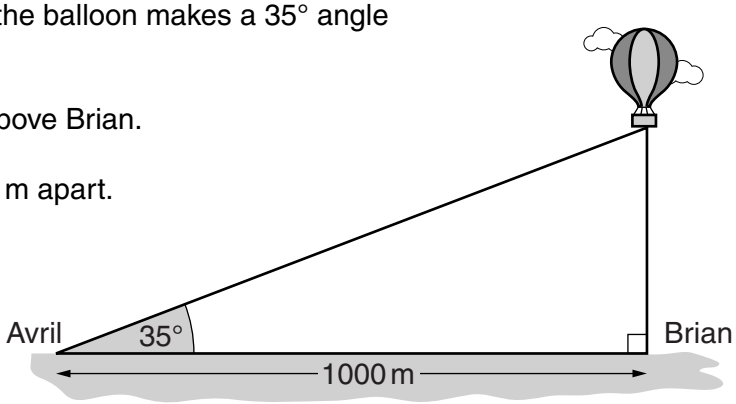
[1]

(i) Avril and Brian watch the balloon.

Where Avril is standing the balloon makes a 35° angle to the horizontal.

The balloon is directly above Brian.

Avril and Brian are 1000 m apart.

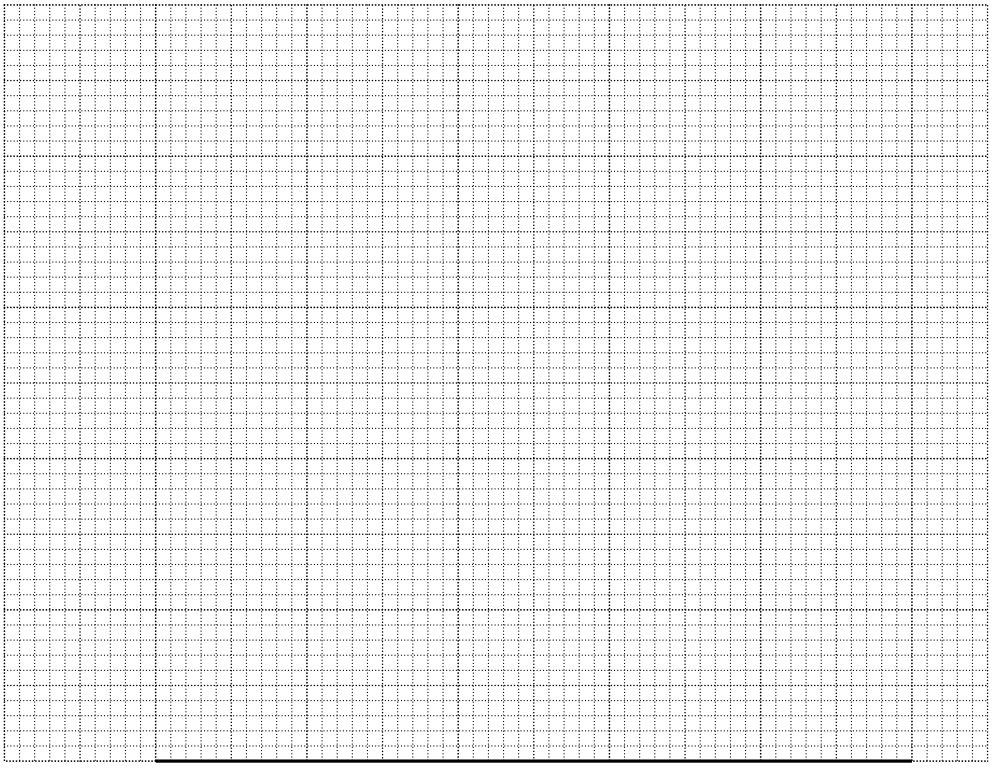


Not to scale

They want to find out the height of the balloon.

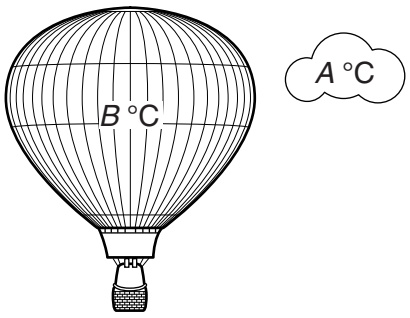
They draw a scale diagram of the triangle above.
They use a scale of 1 cm to represent 100 m.

Complete their scale drawing and find the height of the balloon.



(i) _____ m **[3]**

(j)



The temperature, B °C, of the air inside a balloon must be greater than the temperature, A °C outside the balloon.

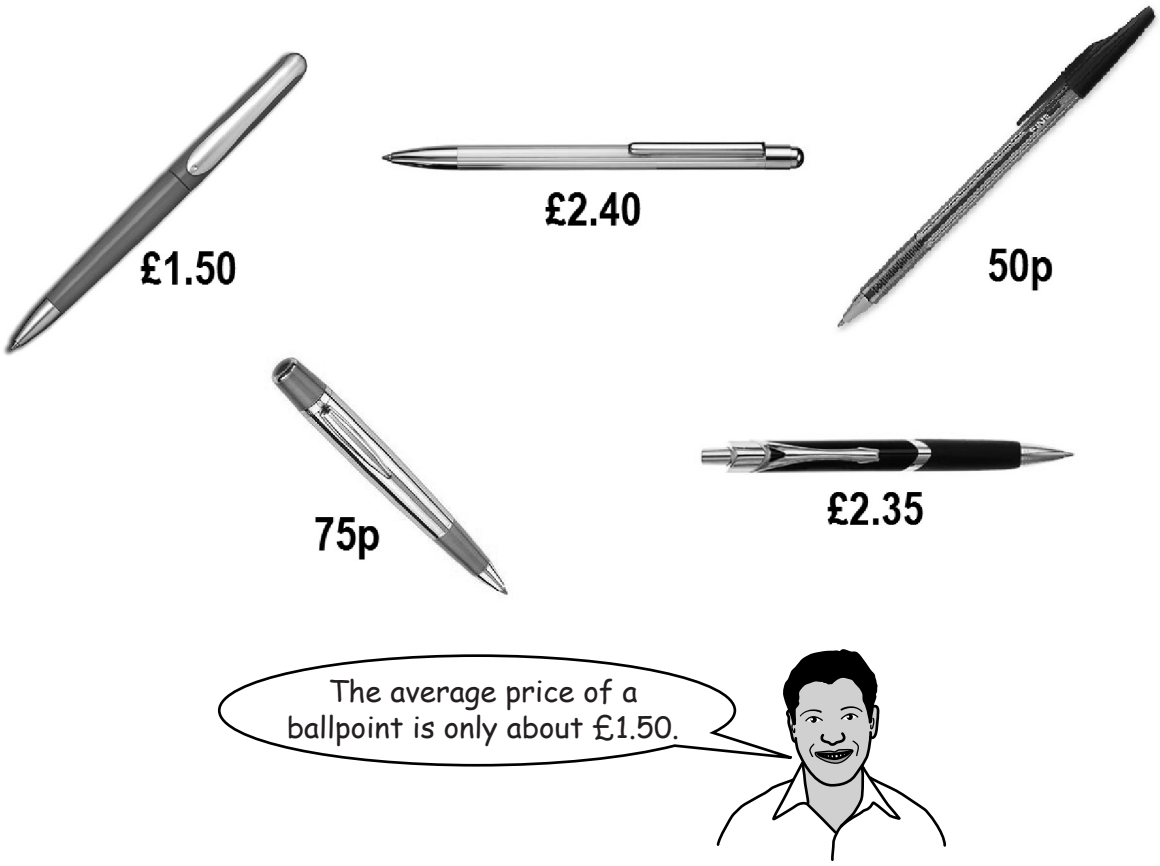
For a good flight the temperature inside the balloon must be at least 70 °C more than the temperature outside the balloon.

Write the rule for a good flight as an inequality involving A and B.

(j) _____ **[2]**

5 Ballpoint pens (ballpoints) are very popular.

(a) Here is a fair sample from a large store.



Use the sample to check Jo's statement.

_____

_____

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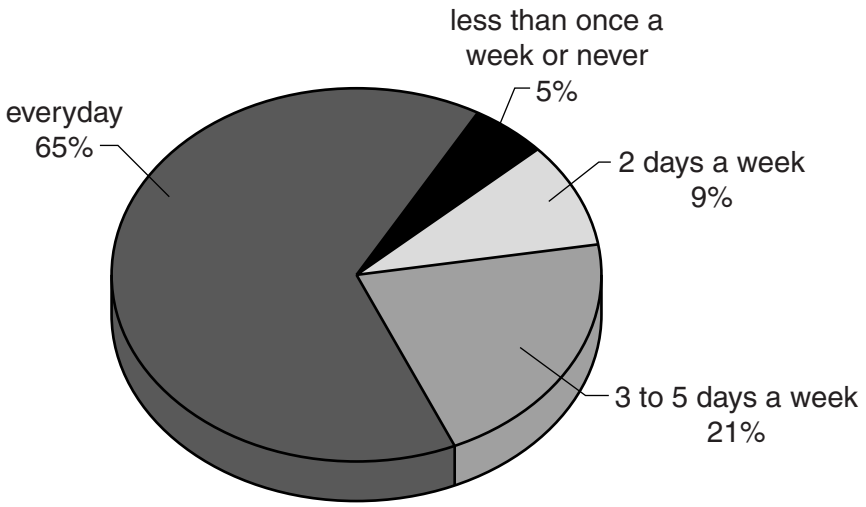
_____

_____ **[3]**

(b) Here are the results of an internet survey about ballpoints.

How often do you use a ballpoint?



(i) The number of people surveyed was 12600.

How many said they used ballpoints "less than once a week or never"?

(b)(i) _____ **[2]**

(ii) Here is a breakdown of the ages of the people asked.

21% aged fifty and over
32% in their forties
33% in their thirties
10% in their twenties.

The rest of the people asked were in their teens.
50.1% of the sample was female.

Using this information give two examples to show that the sample is not representative.

_____

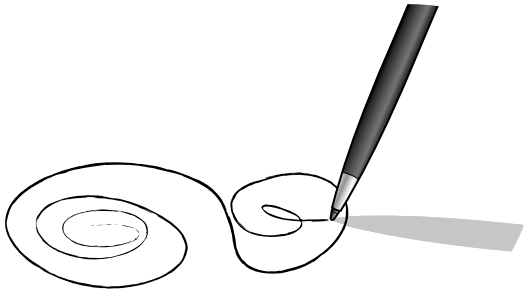
_____

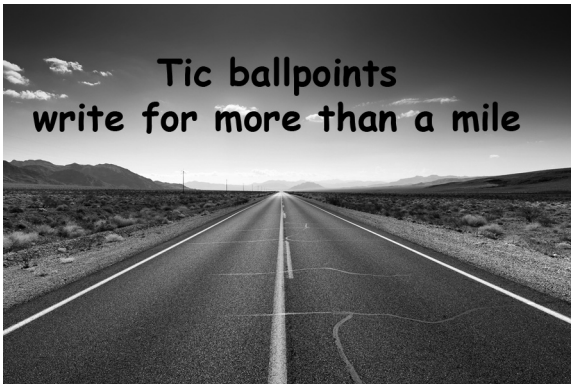
_____

_____

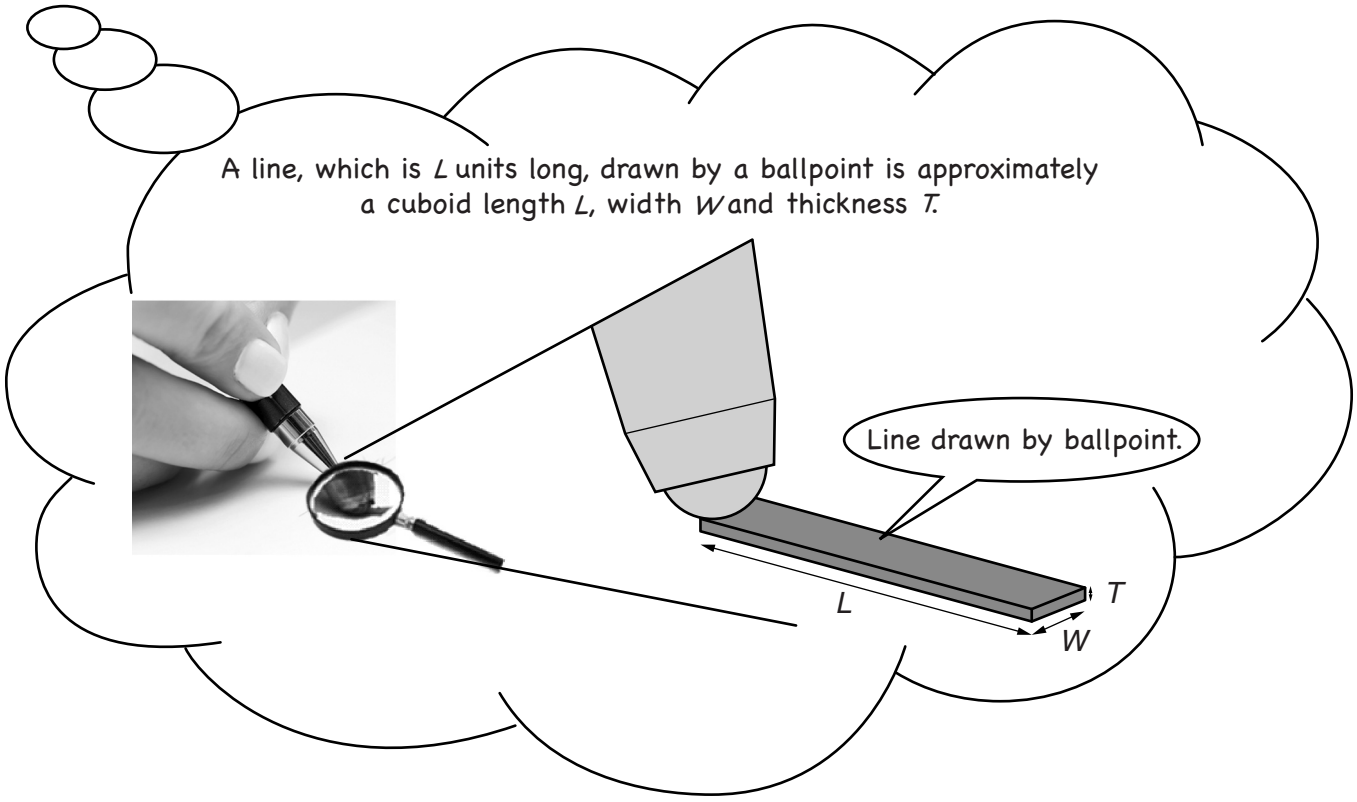
_____ **[2]**

(c)* Amy sees this advert ……





… and begins to wonder if this is true.



Amy jots down some more information that she will need in order to check the claim in the advert.

- The width of a line drawn by a ballpoint is about 0.1 mm
- The thickness of a ballpoint line is about 0.001 mm
- A mile is about 1600 m
- A full ballpoint holds about 200 mm^3 of ink

Work out whether the claim made by Tic is true.

_____

_____

_____

_____

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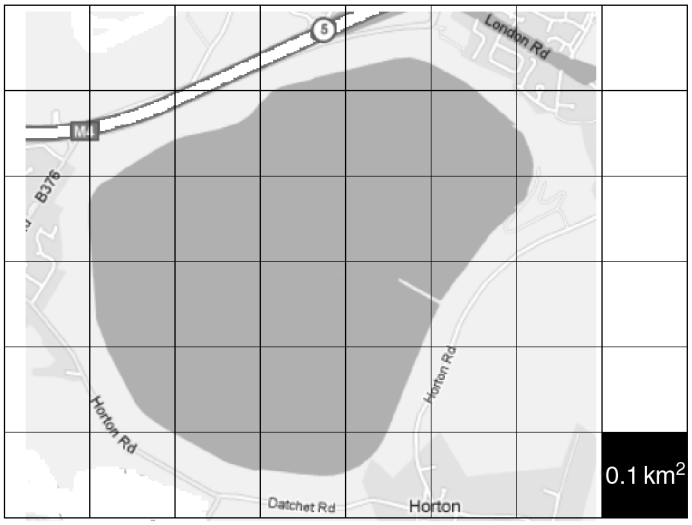
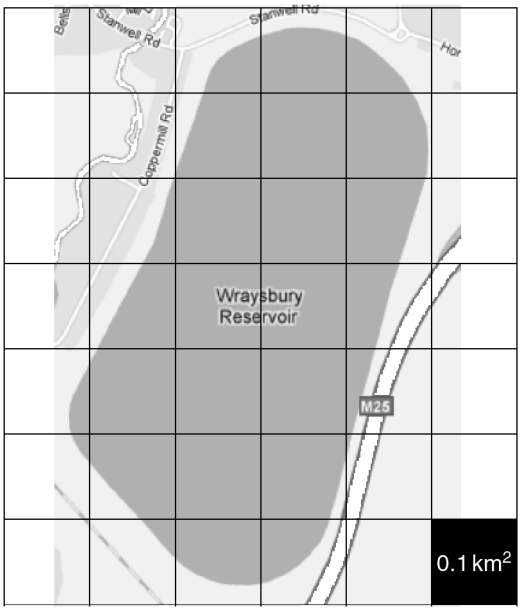
_____ **[4]**

6 **(a)** Here are scale drawings of three reservoirs near to London.
Each small square represents an area of 0.1 km^2.

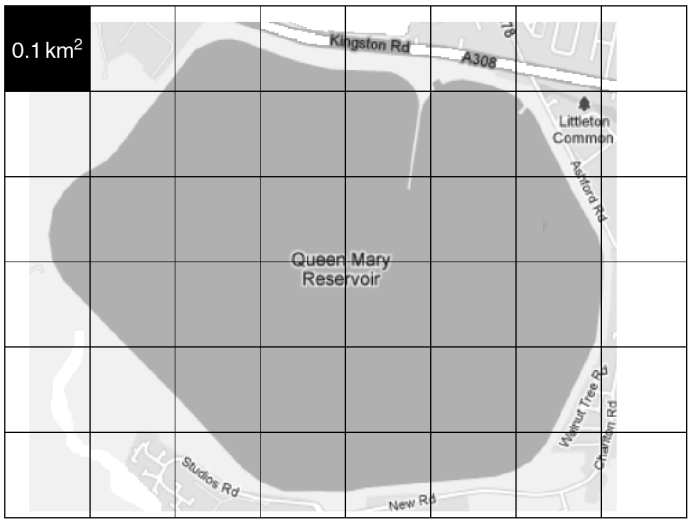
The Queen Mother Reservoir



Wraysbury Reservoir



Queen Mary Reservoir



Which reservoir has the largest area and what is its area?

(a) The largest reservoir is _____ with area _____ km^2 **[3]**

(b)* Most of London's reservoirs are used for water sports.

Choy likes windsurfing and belongs to a club. She has to hire the windsurfing board and rig and a wetsuit each visit.

This table shows what the club charges each visit.

	Midweek Day	Weekend Day
Board and Rig	£25	£35
Wetsuit	£5	£5

Choy goes windsurfing for a day every other weekend.
Hiring the equipment is expensive.

She sees this in a windsurfing magazine.

Over a year, will it be cheaper for Choy to buy the equipment or to hire it each visit?
You must support your answer with clear reasons and calculations.

_____

_____

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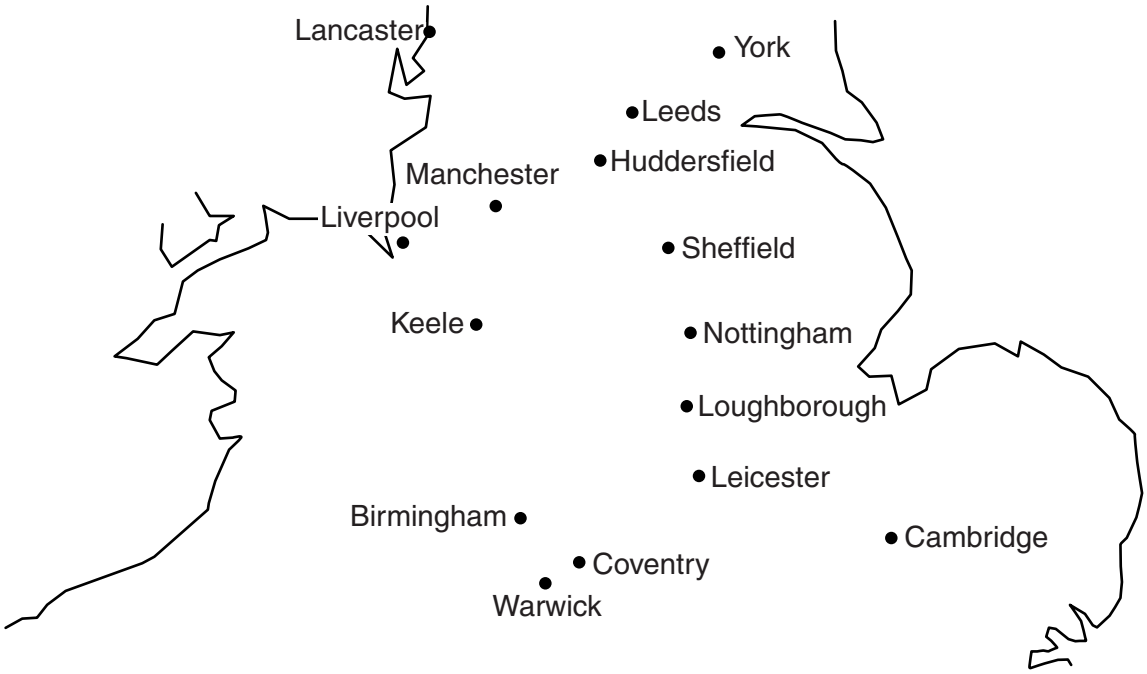
_____

_____ **[4]**

7 This map shows the location of some universities.



Scale: 1 cm represents 40 km

Jon's home is in Huddersfield.
He wanted to go to university.

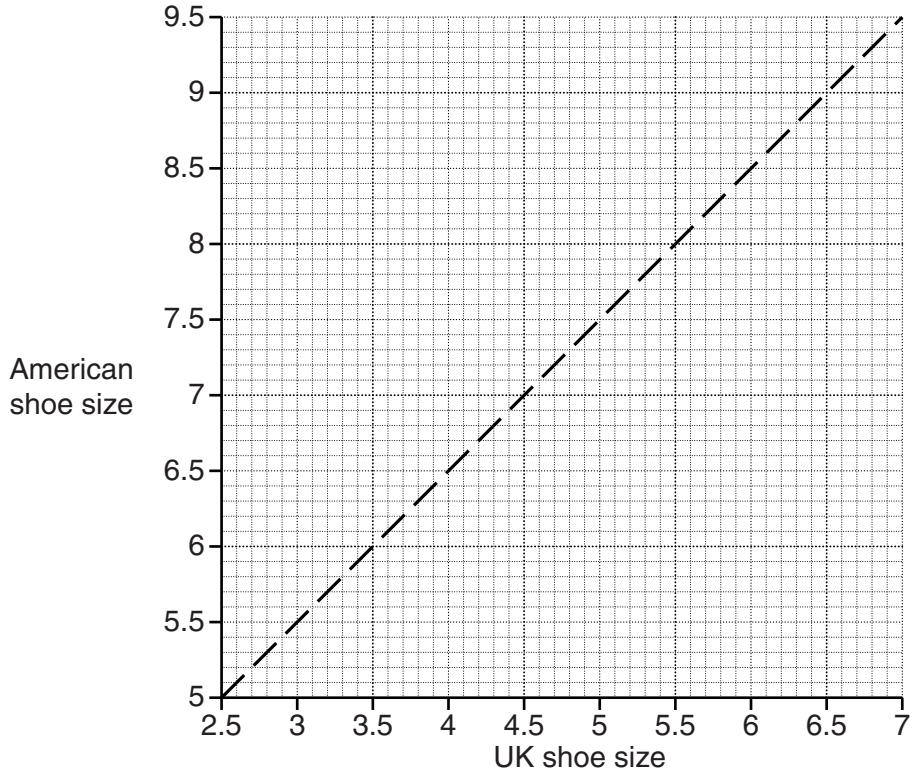
Jon wanted a university that was more than 100 km and less than 200 km from his home.
He also wanted to be closer to Birmingham than Liverpool.

On the map construct and shade the region in which Jon chose universities.
Use a ruler and a pair of compasses and show all your construction lines. **[5]**

8 The table shows UK, European and American equivalent sizes for women's shoes.

UK	2 ½	3	3 ½	4	4 ½	5	5 ½	6	6 ½	7
America	5	5 ½	6	6 ½	7	7 ½	8	8 ½	9	9 ½
Europe	35		36	37		38		39	40	41

(a) (i) This graph shows the conversion between UK and American shoe sizes.



The relationship between UK and American shoe sizes is linear.
Explain how you can tell this from the graph.

_____ **[1]**

(ii) Write a rule to convert UK shoe sizes to American shoe sizes.

(a)(ii) _____ **[1]**

(b) One way to convert European shoe sizes to UK shoe sizes is

Step 1: Subtract 32 from the European size

Step 2: Multiply by 0.8

Step 3: Round up to nearest half

What is the UK shoe size for European size 43?

(b) _____ **[2]**

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