Version 1.0

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
2 – 3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
TOTAL	

General Certificate of Secondary Education
Higher Tier

Mathematics 43601H

Unit 1 Higher Tier

Specimen Paper 2012 Specification

H

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

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 space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 54.
- The quality of your written communication is specifically assessed in questions 2 and 12.
  These questions are indicated with an asterisk (✳)
- You may ask for more answer paper and graph paper.
  These must be tagged securely to this answer booklet.

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

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

1 Clive works for the local council.
One of his jobs is to check that taxi companies charge reasonable fares.
Each week he checks 10 taxi journeys with local companies.
He records the fare and the distance of each journey.

1 (a) Clive expects there to be strong positive correlation between the length of the journey and the fare charged.

Explain why he might expect this.

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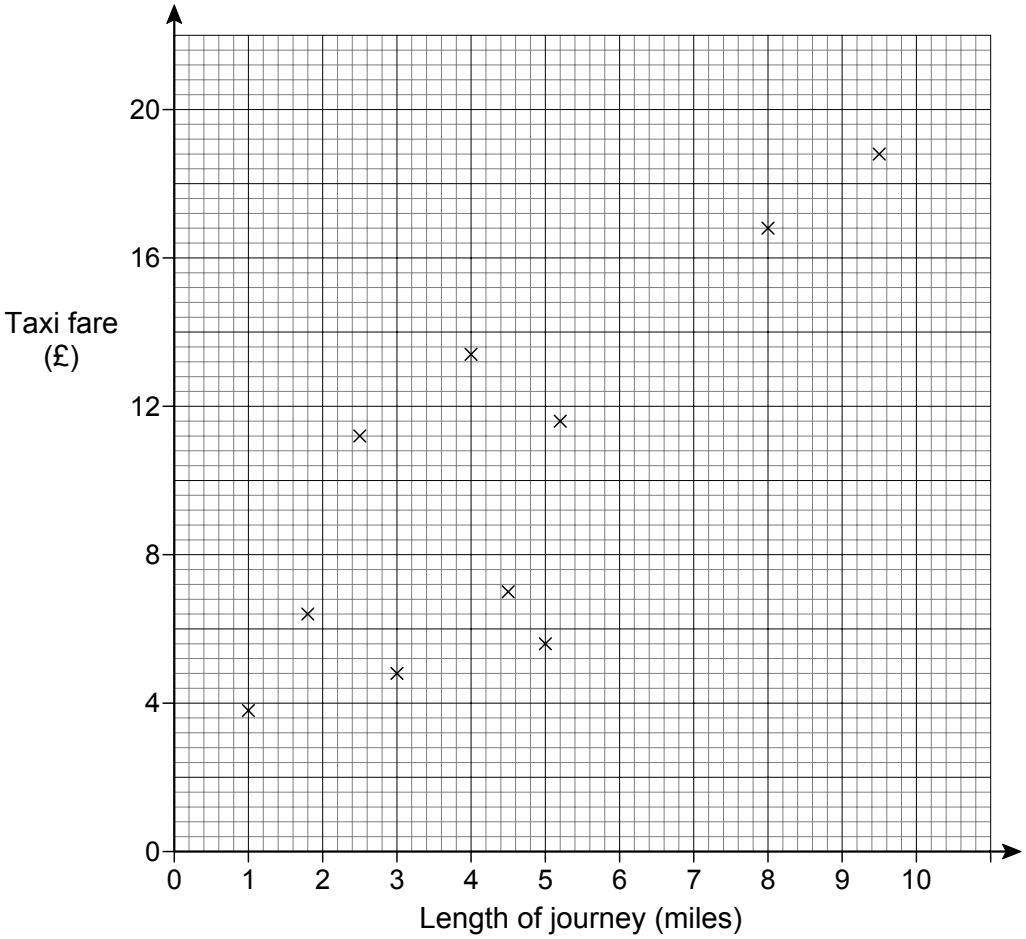
(1 mark)

1 (b) The scatter diagram shows the results for a week in January 2009.



Does the data support Clive's view about the expected correlation between the length of journey and the fare?

Give a reason for your answer.

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..... *(1 mark)*

Do not write outside the box

✶**2** 10 boys and 10 girls are each given 20 mental arithmetic questions.
Here are the number of correct answers for each boy.

12 18 12 19 9 20 11 9 18 12

The range of the girls' scores is 12

The mean of the girls' scores is 14.5

Use the data to investigate the hypothesis

'Boys are better at mental arithmetic than girls'

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(5 marks)

7

3 A doctor wants to encourage her patients to take more exercise.
The doctor has approximately 500 patients.

She decides to do a survey about what exercise her patients take.

3 (a) The doctor decides to use one of three methods to do the survey.

Method 1	Give the survey to the first 50 patients seen in a week
Method 2	Choose 50 patients at random
Method 3	Choose 26 patients, picking one whose surname begins with each letter of the alphabet

Give a reason why method 3 is **not** suitable.

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(1 mark)

3 (b) Which of the other two methods for doing the survey will give the most reliable results?

Give a reason for your choice.

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(1 mark)

4 Ronan is designing a game.
He has two sets of discs laid face down on a table.

The first set of five discs are labelled 1, 3, 5, 7, 9
The second set of four discs are labelled 2, 4, 6, 8

Players turn over one disc, at random, from each set and add the numbers together.

Ronan uses the game to raise money for charity.
Each player pays 20 p to play the game.
If a player gets a total of exactly 13 they win a bar of chocolate.
It costs Ronan 50 p for each bar of chocolate.

If 100 people play the game, show that Ronan should expect to raise £ 12.50 for charity.

You may find the grid below useful.

	1	3	5	7	9
2	3				
4					
6					
8					

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(4 marks)

6

Turn over ▶

5 (a) The National Curriculum levels in Mathematics for 30 students in year 9 were recorded.

Level	Number of students	
3	0	
4	4	
5	4	
6	9	
7	8	
8	5	

Calculate the mean level.

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Answer ..... *(3 marks)*

5 (b) The 30 students study both French and Spanish.

Their National Curriculum levels in these subjects are shown in the table.

		Level in Spanish						
		1	**2**	**3**	**4**	**5**	**6**	**Total**
Level in French	**1**	0	0	0	0	0	0	0
	2	1	0	0	0	0	0	1
	3	2	1	1	0	0	0	4
	4	0	3	4	1	0	0	8
	5	0	1	2	3	2	0	8
	6	0	0	3	3	2	1	9
	Total	3	5	10	7	4	1	30

5 (b) (i) What is the median level for French?

Show clearly how you obtain your answer.

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Answer ..... *(2 marks)*

Do not write outside the box

5 (b) (ii) The teacher claims that the students are better at French than at Spanish.

How can you tell from the table that this is true?

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(1 mark)

6 x, y and z are standard form numbers.

$x = 2.5 \times 10^5$ $y = 3.8 \times 10^4$ $z = 1.9 \times 10^6$

6 (a) Calculate $x - y$

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Answer ..... *(1 mark)*

6 (b) Calculate x^2

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Answer ..... *(1 mark)*

6 (c) Calculate $\frac{xy}{z}$

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Answer ..... *(1 mark)*

9

7 Salima sees an advert for a summer holiday.

Summer Sun
Fantastic deals with Sunbreaks Holidays

Dates	7 nights	14 nights
1 April - 30 April	£315	£575
1 May - 6 July	£220	£400

- Prices are per person.

Salima books a 7-night holiday in April for two adults.

The travel agent adds a percentage surcharge to the cost of the holiday for booking fees.

Salima's final bill is £642.60

What was the percentage surcharge?

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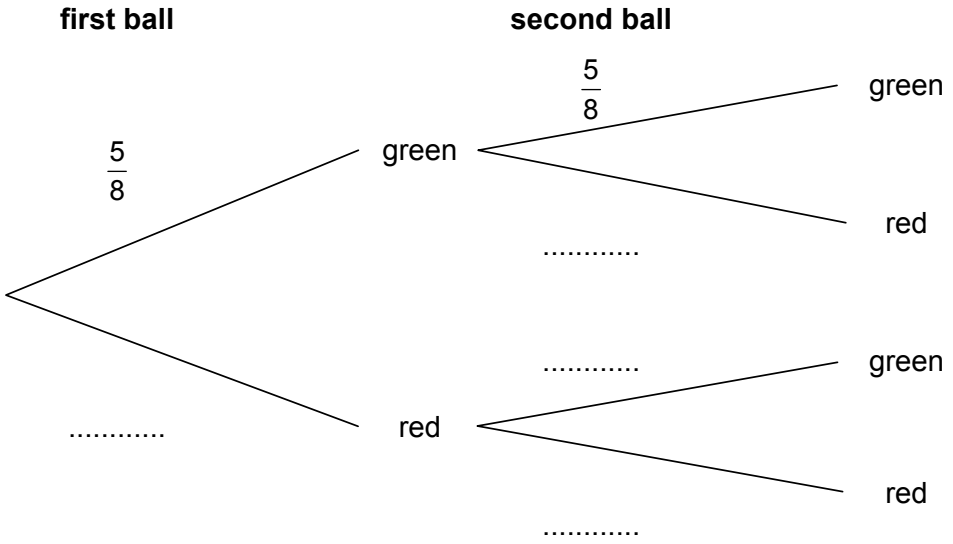
Answer ..... % *(3 marks)*

8 A bag contains 5 green and 3 red balls.

A ball is taken from the bag at random and replaced.

Another ball is then taken from the bag at random.

8 (a) Complete the tree diagram.



(1 mark)

8 (b) What is the probability that both balls are red?

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Answer ..... *(2 marks)*

8 (c) Some more green balls are added to the 5 green and 3 red balls in the bag.

A ball is taken from the bag at random and replaced.

Another ball is then taken from the bag at random.

The probability that both balls are red is now $\frac{1}{25}$.

How many green balls were added to the bag?

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Answer ..... *(3 marks)*

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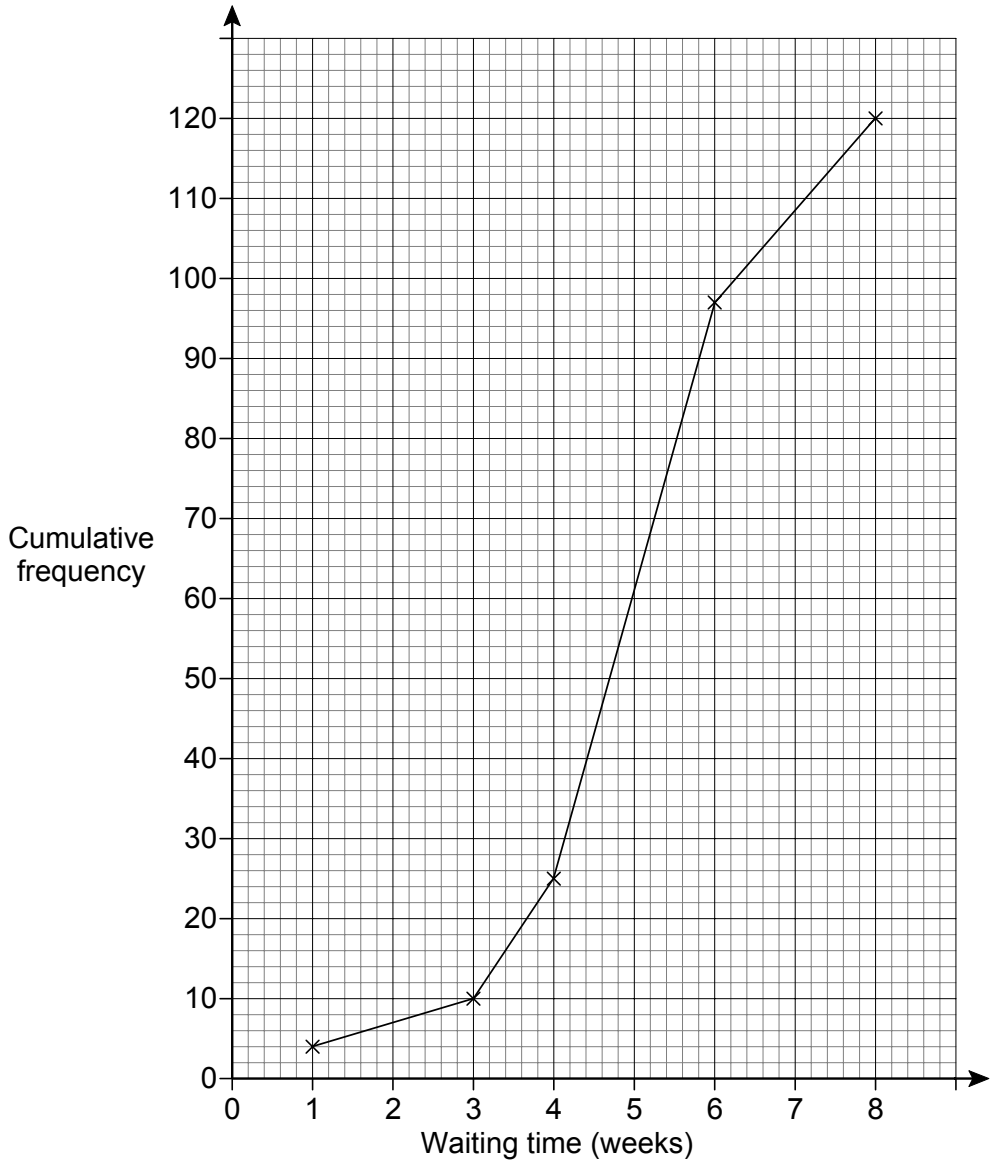
9 The cumulative frequency diagram shows the waiting times for 120 patients needing an operation at a hospital.



9 (a) The hospital claims that 75% of patients wait less than 40 days for the operation.

Comment on this claim.

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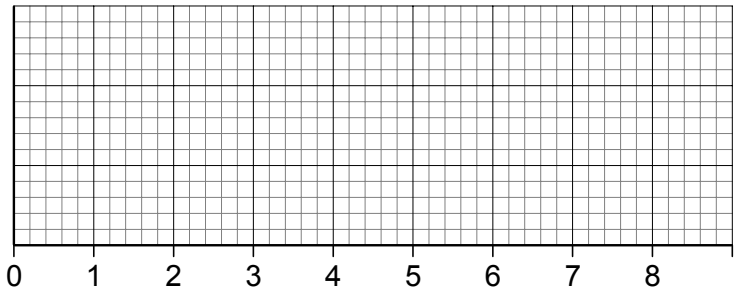
(3 marks)

9 (b) The least waiting time was 1 week.
The range of waiting times was 7 weeks.

Use this information and the cumulative frequency diagram to draw a box plot for the waiting times



(3 marks)

9 (c) At a different hospital 746 patients had the same operation.
This table shows the age and gender of the patients.

	Age		
	Under 18	**18 – 65**	**Over 65**
Male	84	342	50
Female	39	194	37

The hospital wants to take a stratified sample of 80 patients.

Complete the table below to show how many people from each group should be sampled.

	Age		
	Under 18	**18 – 65**	**Over 65**
Male			
Female			

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(3 marks)

9

10 The table shows the weight of the first 100 parcels posted over the counter at a Post Office.

Weight, w (grams)	**Frequency**	
$0 < w \leq 500$	34	
$500 < w \leq 1000$	28	
$1000 < w \leq 2000$	22	
$2000 < w \leq 4000$	16	

10 (a) Draw a fully labelled histogram to show the weights of the 100 parcels.

(3 marks)

Do not write outside the box

10 (b) Estimate the probability that the first two parcels posted that week were both over 500 grams in weight.

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Answer ..... *(3 marks)*

Turn over for the next question

6

11 The radius of the Earth and the radius of Jupiter are in the approximate ratio 1 : 11
The mass of the Earth and the mass of Jupiter are in the approximate ratio 1 : 320

You will need the following information.

- The Earth and Jupiter are spherical
- The volume of a sphere of radius r is $\frac{4}{3}\pi r^3$

11 (a) Show that the approximate ratio of the volume of the Earth to the volume of Jupiter is 1 : 1331

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(1 mark)

11 (b) You are given density $= \frac{\text{mass}}{\text{volume}}$

Work out the approximate ratio of the average density of the Earth to the average density of Jupiter in the form 1 : n

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Answer 1 : ..... *(2 marks)*

✳**12** A coffee machine dispenses 130 millilitres of black coffee into cups with a capacity of 175 millilitres.

These values are accurate to 3 significant figures.

Milk is supplied in small cartons which contain 21 millilitres, accurate to the nearest millilitre.

Beryl likes milky coffee and always puts 2 cartons of milk in her coffee.

Will Beryl's cup ever overflow?

You **must** show your working.

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(5 marks)

END OF QUESTIONS

8

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED