AQA

General Certificate of Secondary Education
Higher Tier
November 2012

Mathematics

43601H

Unit 1

H

Tuesday 6 November 2012   9.00 am to 10.00 am

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 spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

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 7 and 10. 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 book.

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

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

1   In a college canteen students can choose

a starter and a main course
or
a main course and a pudding.

Starter	Main Course	Pudding
Soup	Curry Burger Pasta	Jelly Fruit

1 (a)   One combination is soup and curry.

How many different combinations are there?

$(1 \times 3) + (3 \times 2) = 3 + 6 = 9$

Answer   9   *(2 marks)*

1 (b) All of the combinations are equally popular.

A student is chosen at random.

What is the probability that he has jelly?

$$P(J) = \frac{n(J)}{n(S.)} = \frac{3}{9} = \frac{1}{3}$$

probability space

Answer ......$\frac{1}{3}$........ *(1 mark)*

1 (c) The canteen serves 270 students one Monday.

How many jellies do they expect to serve?

$$E(J) = P(J) \times 270 = \frac{1}{3} \times 270 = 90$$

N.B: $E(J)$ = Expected no. of jellies

Answer ......90........ *(2 marks)*

Turn over for the next question

2 There are 100 balls in a bag.
The balls are red, blue, green or white.

The ratio of blue to red is 5 : 1
There are twice as many blue as green.

$\frac{1}{4}$ of the balls are green.

How many white balls are in the bag?

$B : R = 5 : 1 \implies R = \frac{1}{5} \times B$

$B = 2 \times G$

$G = \frac{1}{4} \times 100 = 25$

$\implies B = 2 \times 25 = 50$

$\implies R = \frac{1}{5} \times 50 = 10$

$\therefore W = 100 - (25 + 50 + 10) = 100 - 85 = 15$

Answer .... 15 ....   *(4 marks)*

3 The cars parked on a street are counted.
Here are the results for 13 days.

19	15	22	24	19	11	20
2	12	4	26	8	16	

3 (a) Show the data on an ordered stem-and-leaf diagram.
Remember to complete the key.

Key: 0 | 2 represents 2 cars

```
0 | 2  4  8
1 | 1  2  5  6  9  9
2 | 0  2  4  6
```

(3 marks)

3 (b) On day 14, the cars parked are counted.
The range for **all** 14 days is 25.

How many cars were parked on day 14?
Give the **two** possible answers.

Range = Max - Min => Max = Range + Min or
Min = Max - Range. So Max = 25 + 2 = 27 or Min = 26 - 25
= 1

Answer ....1........ or ....27........ *(2 marks)*

9

Turn over ▶

4   Paula records the times she takes to run 30 marathons.

Time , t (minutes)	Frequency (F)	Midpoint (M)	M x F
$200 < t \leq 240$	16	220	3520
$240 < t \leq 280$	4	260	1040
$280 < t \leq 320$	4	300	1200
$320 < t \leq 360$	0	340	0
$360 < t \leq 400$	2	380	760
$400 < t \leq 440$	0	420	0
$440 < t \leq 480$	2	460	920
$480 < t \leq 520$	2	500	1000

$\Sigma f = 30$ $\Sigma mf = 8440$

4 (a)   Write down the modal class.

Answer .... 200 .... $< t \leq$ .... 240 .... *(1 mark)*

4 (b)   Use midpoints to calculate an estimate of the mean time Paula takes.

Mean estimate $= \dfrac{\Sigma mf}{\Sigma f} = \dfrac{8440}{30} = 281$ minutes

(to the nearest minute)

Answer .... 281 .... minutes   *(3 marks)*

4 (c)   Paula runs each marathon in a faster time.

Which average better represents her current performance?
Tick a box.

Modal class [✓]   Mean [ ]

Explain your answer.

Her results show an improving trend with time so a much more reliable measure of her current performance would be a moving average of the last 3-6 marathons with the last moving average undoubtedly yielding a mean class of $200 < t \leqslant 240$

(1 mark)

Turn over for the next question

5

Turn over ▶

5 (a) A company receives 1250 orders in December.
It has a January sale.
It receives 1430 orders in January.

Work out the percentage increase in orders.

$$\frac{1430-1250}{1250} \times 100 = 14.4\%$$

$$OR \left(\frac{1430}{1250} - 1\right) \times 100 = 14.4\%$$

Answer .... 14.4 .... %   *(3 marks)*

5 (b) The company sends out a questionnaire to customers.
One of the questions is

"How long did your order take to arrive?"

Write a suitable response section for this question.

☐ 1 - 2 days

☐ 3 - 4 days

☐ 5 - 6 days

☐ 1 - 2 weeks

☐ Over 2 weeks

(2 marks)

6 The sections of a fair spinner are red, white or blue.

6 (a) The spinner is spun 40 times.

Red	White	Blue	Total
28	9	3	40

Write down the relative frequency of the spinner landing on red.

$$\frac{28}{40} = \frac{7}{10} = 0.7$$

Answer ....

(1 mark)

6 (b) The spinner has 10 equal sections.

Work out the most likely number of sections for each colour.

$0.7 \times 10 \qquad \frac{9}{40} \times 10 \qquad \frac{3}{40} \times 10$

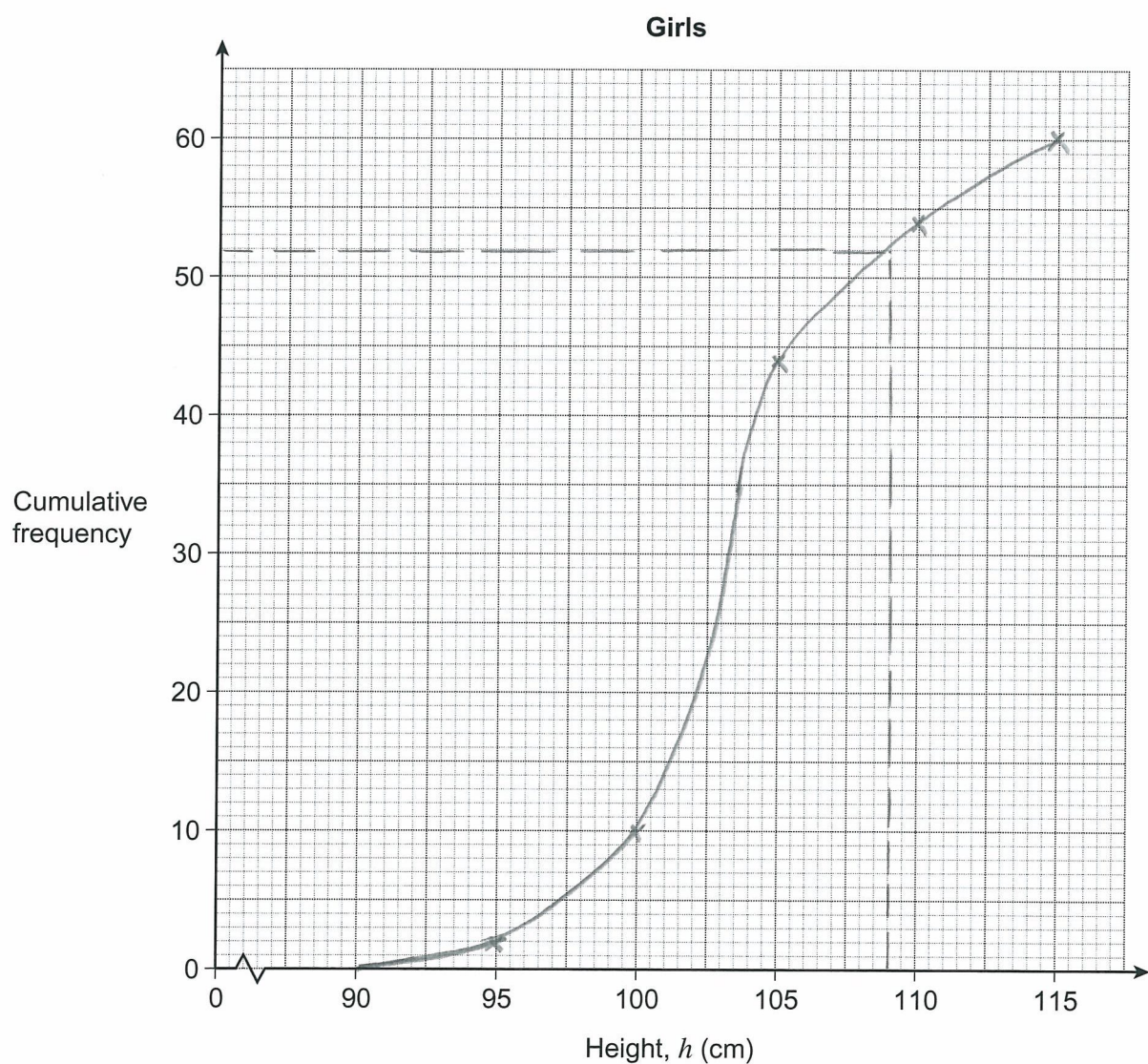| Red	White	Blue	Total
7	2	1	10

(2 marks)

Turn over for the next question

8

Turn over ▶

*7   The table shows information about the heights of 60 girls in a nursery school.

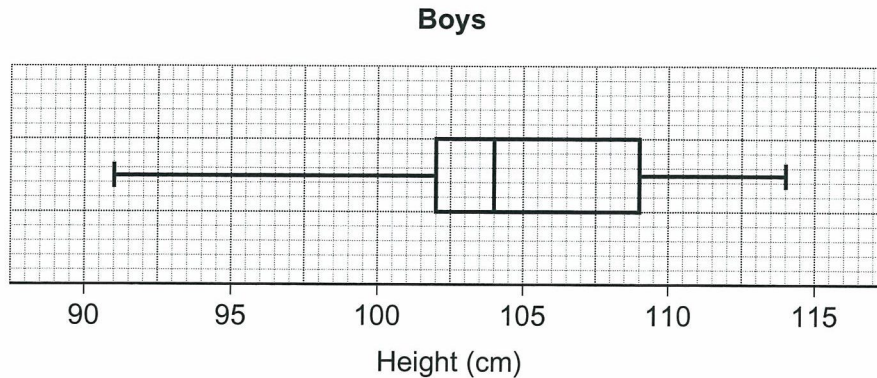| Height, h (cm)	Frequency	Cumulative frequency
$90 < h \leqslant 95$	2	2
$95 < h \leqslant 100$	8	10
$100 < h \leqslant 105$	34	44
$105 < h \leqslant 110$	10	54
$110 < h \leqslant 115$	6	60

7 (a)   Draw a cumulative frequency diagram for the data.

Girls

(3 marks)

7 (b)   The box plot shows information about the heights of 60 boys in the nursery school.

Boys

Height (cm)

The 60 girls and the 60 boys visit a park.
Only children whose heights are under 109 cm are allowed in the soft play area.

Estimate the total number of these children that are allowed in the soft play area.

Upper Quartile for boys is 109 cm.

75% of $60 = \frac{3}{4} \times 60 = 45$.

From C.F. graph, 52 girls are under 109 cm.

∴ Total no. allowed in the soft play area = $45 + 52 = 97$

Answer .... 97 .... (4 marks)
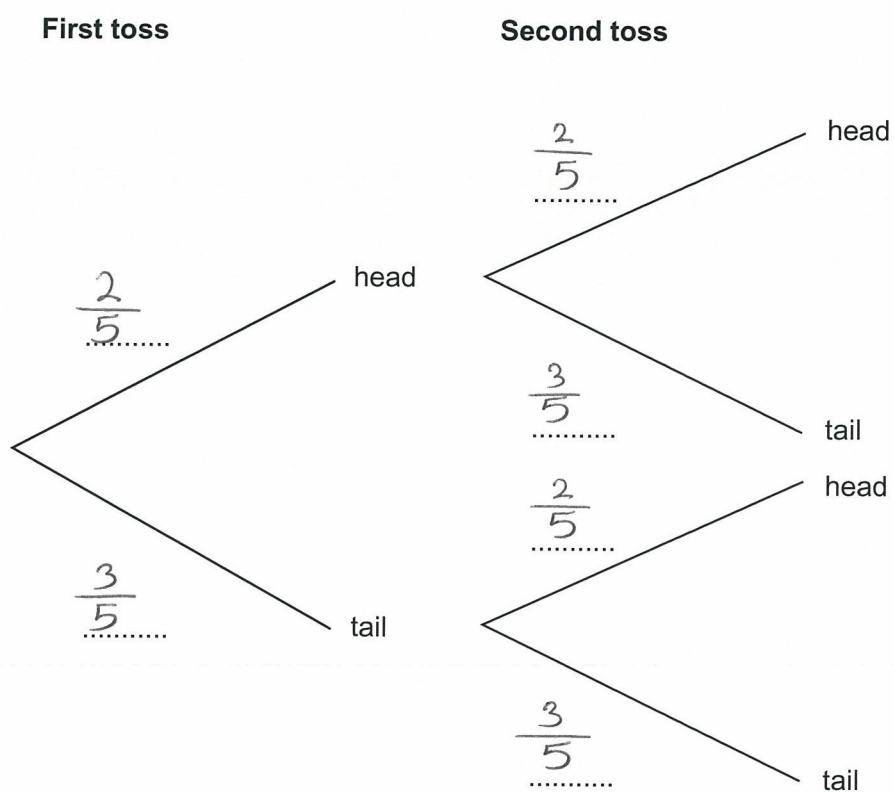
Turn over for the next question

7

Turn over ▶

8   The probability of a biased coin landing on heads is $\frac{2}{5}$

The coin is tossed twice.

Complete the tree diagram.

First toss   **Second toss**

$\frac{2}{5}$ head

$\frac{2}{5}$ .... head

$\frac{3}{5}$ .... tail

$\frac{3}{5}$ tail

$\frac{2}{5}$ .... head

$\frac{3}{5}$ .... tail

(3 marks)

9   Adam, Ben and Chris receive pocket money each week.

Adam and Ben receive pocket money in the ratio 10 : 9
Ben and Chris receive pocket money in the ratio 5 : 4

Work out the ratio for   Adam : Chris
Give your answer in its simplest form.

$A : B = 10 : 9$ and $B : C = 5 : 4$

$A = \dfrac{10B}{9}$ and $A : C = \dfrac{10}{9}(5) : 4$

$= \dfrac{50}{9} : 4 = 50 : 36$

$= 25 : 18$

Answer .... 25 : 18 ....   **(3 marks)**

*10   Here are two events.

A   A ticket wins the National Lottery.
B   A fair coin lands on heads five times in a row.

The probability of **A** happening is 7.15×10^{-8}.

How many more times likely is **B** than **A**?
Give your answer in standard form to 2 significant figures.

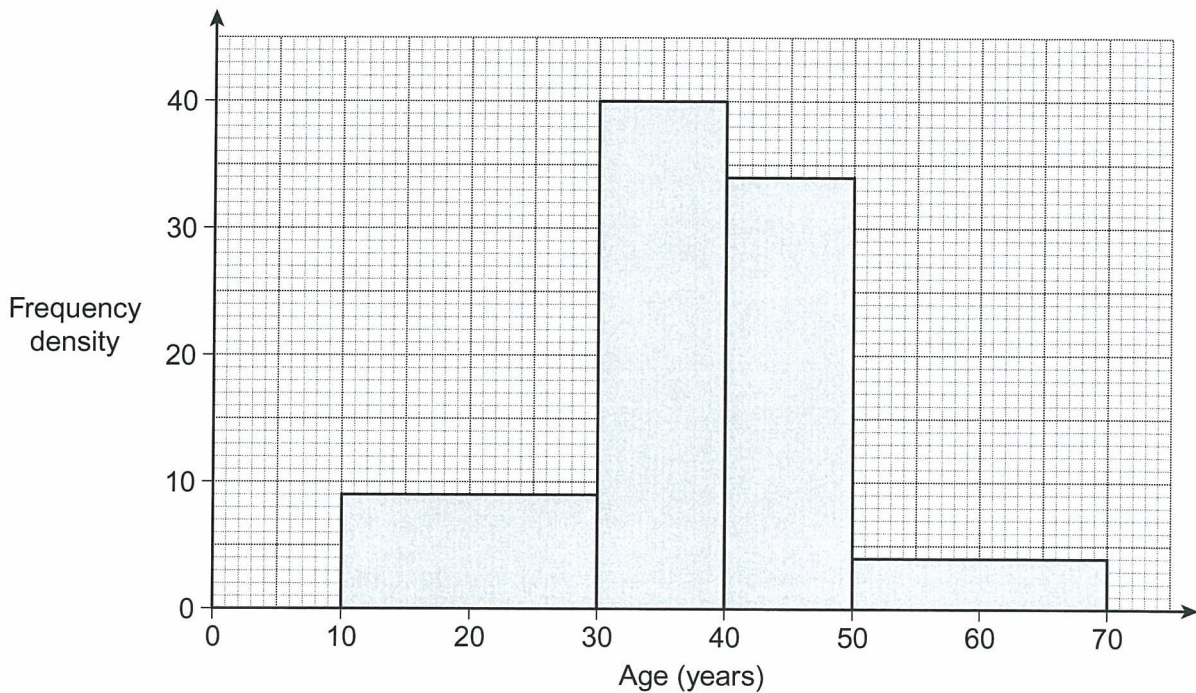$P(5 \text{ heads in a row}) = 0.5^5 = 0.03125$

or 3.125×10^{-2}

$\dfrac{3.125 \times 10^{-2}}{7.15 \times 10^{-8}} \approx 4.4 \times 10^{5}$ (2 s.f.).

Answer 4.4×10^{5} **(3 marks)**

Turn over ▶

11 The histogram shows information about 1000 members of a fan club.

Frequency density (y-axis)
Age (years) (x-axis)

11 (a) Calculate an estimate of the median age of the members of the fan club.

Age	F.D	Frequency (F.D × C.W)	Cumulative Freq
10-30	9	180	180
30-40	40	400	580
40-50	34	340	920
50-70	4	80	1000

Median Class. → 30-40

$$\text{Estimate for median} = \left(\frac{500-180}{400} \times 10\right) + 30 = 38$$

Answer .... 38 .... years (4 marks)

11 (b) A sample of 100 members, stratified by age, is asked about membership fees.

Complete the table.

Age, a (years)	Number sampled
$10 \leqslant a < 30$	18
$30 \leqslant a < 40$	40
$40 \leqslant a < 50$	34
$50 \leqslant a < 70$	8
	Total = 100

(3 marks)

Turn over for the next question

7

Turn over ▶

12 Matthew invests some money in a building society.

His money earns 5% compound interest every year.
He wants it to be worth at least £9000 at the end of 3 years.

What is the smallest amount he can invest?

$9000 \div 1.05^3 = 7,774.54$ (2 d.p. - must in any case be rounded up)

Answer £ ...... 7,774.54 ...... *(4 marks)*

END OF QUESTIONS

4