Centre Number						Candidate Number				
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For Examiner's Use	
Examiner's Initials	
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TOTAL	

General Certificate of Secondary Education
Higher Tier
June 2012

Mathematics 43601H

Unit 1

Tuesday 19 June 2012 1.30 pm to 2.30 pm

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 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 game players score points.
The table shows the number of points Alex scored in 50 games.

Number of points	Number of games
0	13
1	8
2	6
3	8
4	15
	Total = 50

1 (a) To win a game, you have to score 4 points.

What percentage of the 50 games did Alex win?

$\frac{15}{50} \times 100 = 30\%$

Answer 30 % *(2 marks)*

1 (b) Alex says he scored more than 100 points in total.

Show that he is correct.

Total no. of points = 13(0) + 8(1) + 6(2) + 8(3) + 15(4) = 104, which is greater than 100.

∴ Alex is correct.

(3 marks)

2 In a cafe, a customer orders one drink.

The probability that he orders tea is 0.42
The probability that he orders coffee is 0.3

Work out the probability that he orders **either** tea **or** coffee.

P(tea OR coffee) = P(tea) + P(coffee)

= 0.42 + 0.3 = 0.72

Answer 0.72 *(2 marks)*

3 Use your calculator to work out $\sqrt{30 + 80 \times \frac{1}{4}}$ as a decimal.

3 (a) Write down your full calculator display.

Answer 7.071067812 *(1 mark)*

3 (b) Give your answer to part (a) to 3 significant figures.

Answer 7.07 *(1 mark)*

Turn over for the next question

9

4 A student draws three scatter diagrams.
She draws a line of best fit on each one.

Diagram A

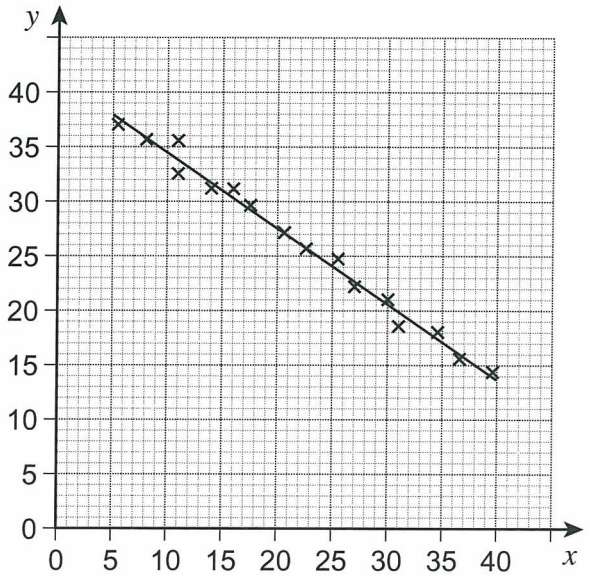


Diagram B

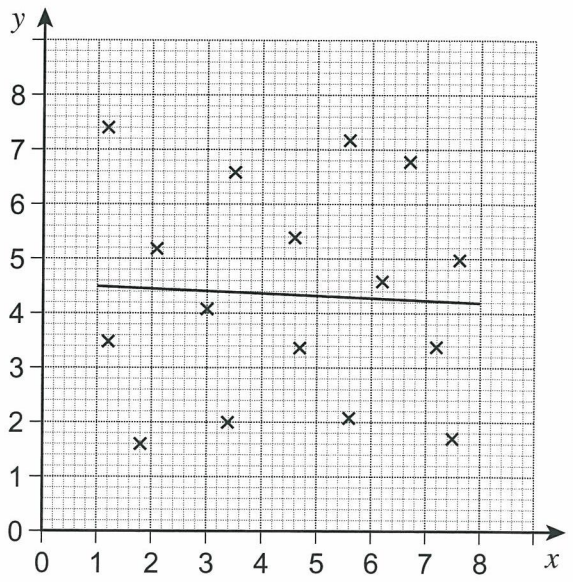
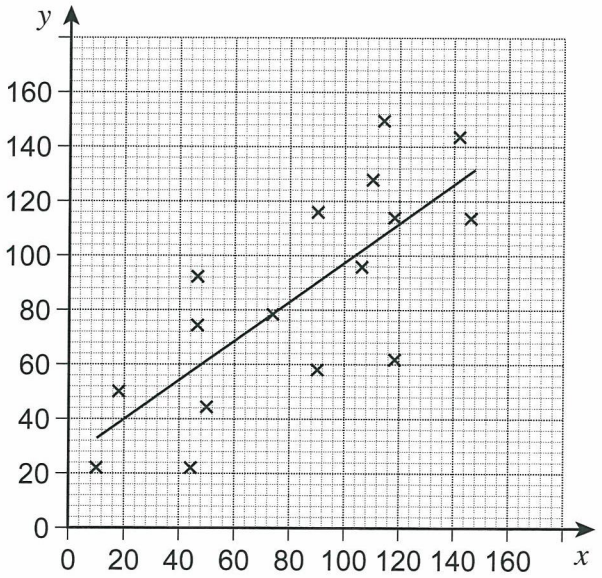


Diagram C



4 (a) Which diagram shows the strongest correlation?
Circle your answer.

(A) B C

(1 mark)

4 (b) Which line of best fit should **not** have been drawn?
Give a reason for your answer.

The line in diagram B should not have been drawn as the points are randomly distributed with no correlation.

(1 mark)

5 A toy is made from red bricks and yellow bricks.

Number of red bricks : number of yellow bricks = 5 : 2
There are 210 **more** red bricks than yellow bricks.

How many red bricks are in the toy?

Let R = no. of red bricks and Y = no. of yellow bricks. Then

$R = Y + 210$ and $R : Y = Y + 210 : Y = 5 : 2$

$\Rightarrow \frac{Y}{Y+210} = \frac{2}{5} \Rightarrow 5Y = 2Y + 420 \Rightarrow Y = \frac{420}{3} = 140$

$\therefore R = 140 + 210 = 350$

Answer 350 *(3 marks)*

5

6 A new road is planned.
There are two possible routes, A and B.

160 people are asked which route they prefer.

6 (a) Name a suitable data collection method to use.

Answer Questionnaire *(1 mark)*

6 (b) Write a suitable question with a response section.

Question Which of the following two routes would you say you prefer?

Response Section

☐ Route A

☐ Route B

☐ Don't know | Undecided.

(2 marks)

6 (c) 27.5% of the 160 people prefer route A.

How many people is this?

$\frac{27.5}{100} \times 160 = 0.275 \times 160$

$= 44$

Answer 44 *(2 marks)*

***7** Fair spinner A has five equal sections labelled 1, 2, 3, 4, 5.
Fair spinner B has five equal sections labelled 6, 7, 8, 9, 10.

Each spinner is spun once and the numbers are added.

Work out the probability that the total is 12 or more.

Probability space grid for Spinner A + Spinner B :

B \ A	1	2	3	4	5
6	7	8	9	10	11
7	8	9	10	11	(12)
8	9	10	11	(12)	(13)
9	10	11	(12)	(13)	(14)
10	11	(12)	(13)	(14)	(15)

P(total ≥ 12) = P(2&10 OR 3&9 OR 3&10 OR 4&8 OR 4&9 OR 4&10 OR 5&7 OR 5&8 OR 5&9 OR 5&10) = $\frac{10}{25} = \frac{2}{5}$ or 0.4

Answer $\frac{2}{5}$ *(5 marks)*

Turn over for the next question

10

8 (a) Millie records her reaction time with and without glasses.

Reaction time with glasses

Time, t (seconds)	Frequency	Midpoint x Freq. ($m \times f$)
$0.1 \leqslant t < 0.2$	31	4.65
$0.2 \leqslant t < 0.3$	42	10.5
$0.3 \leqslant t < 0.4$	19	6.65
$0.4 \leqslant t < 0.5$	8	3.6
$\Sigma f \rightarrow$	**Total = 100**	25.4 $\leftarrow \Sigma(m \times f)$

Calculate an estimate of the mean reaction time **with** glasses.

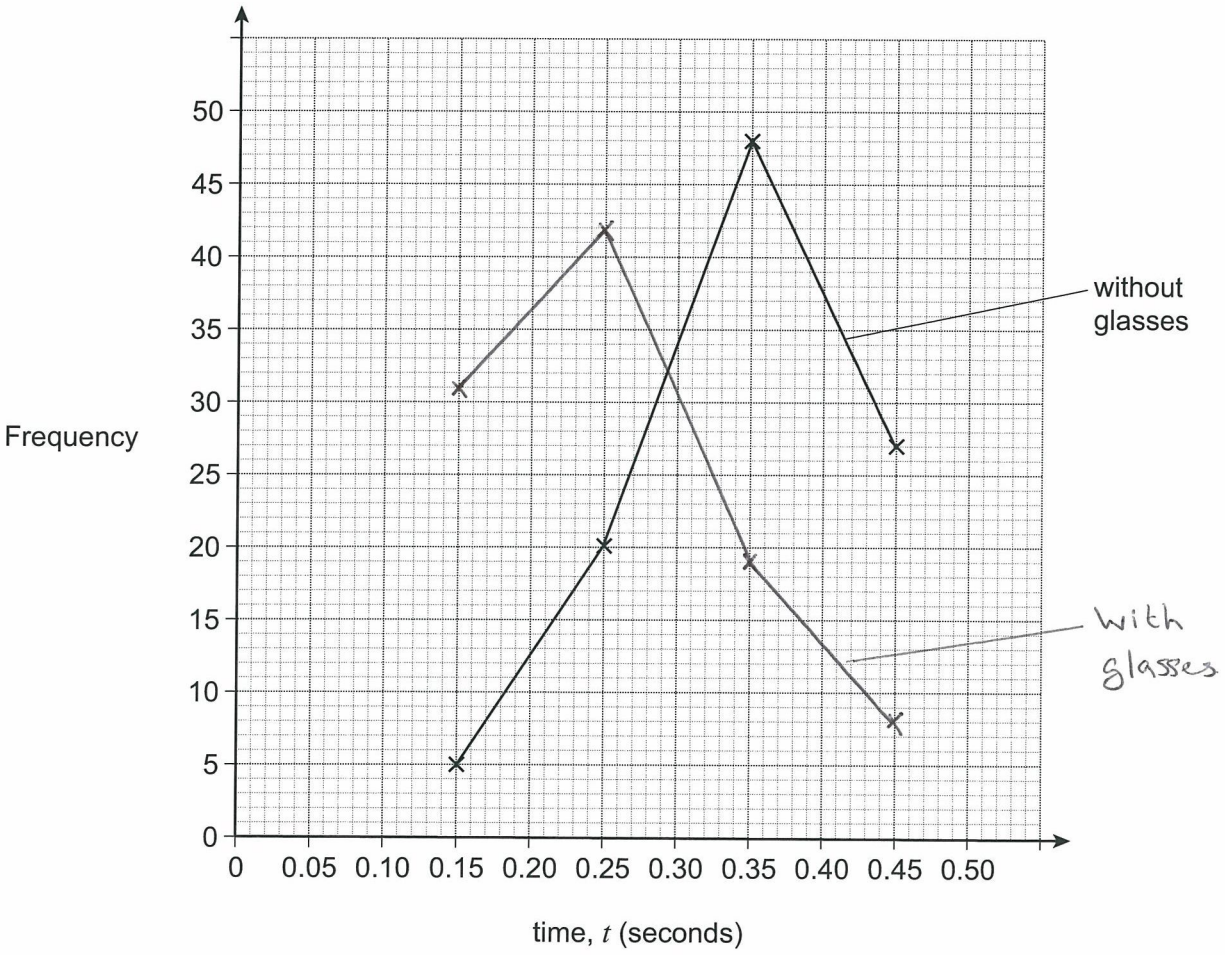
Mean estimate $= \frac{\Sigma(m \times f)}{\Sigma f} = \frac{25.4}{100} = 0.254$ s

Answer ..... 0.254 ..... seconds *(4 marks)*

8 (b) The grid shows a frequency polygon for her reaction time **without** glasses.

On the same grid draw a frequency polygon for her reaction time **with** glasses.

Reaction time



(2 marks)

8 (c) An estimate of the mean reaction time **without** glasses is 0.347 seconds.

Make **two** comparisons between reaction time with and without glasses.

Comparison 1 Reaction time without glasses was greater on average (i.e. slower) than with glasses.

Comparison 2 The modal class for reaction times with glasses was $0.2 \leq t < 0.3$ compared with $0.3 \leq t < 0.4$ for without glasses.

(2 marks)

8

Turn over ▶

9 Each day a baker makes 60 cakes to sell.
Any cakes **not** sold are thrown away.

The profit on each cake sold is 40 p.
The loss on each cake **not** sold is 10 p.

The number of cakes sold on each of five days is shown.

Day	Mon	Tue	Wed	Thu	Fri
Number of cakes sold	44	38	48	55	60

The baker says,

"If I had only made 50 cakes each day,
the overall profit would have been more."

Is he correct?
You **must** show your working.

60 cakes. Profit = 44(40) - 16(10) + 38(40) - 22(10)
+ 48(40) - 12(10) + 55(40) - 5(10) + 60(40)
= 9,250p = £92.50

50 cakes. Profit = 44(40) - 6(10) + 38(40)
- 12(10) + 48(40) - 2(10) + 50(40) + 50(40)
= 9,000p = £90.00

∴ The baker is incorrect.

(5 marks)

***10** A grocer has 100 boxes of strawberries.

10 (a) He weighs 10 of the boxes.

Which **three** words describe the data he collects?
Circle your answers.

(continuous) discrete (sample) (primary) secondary

(2 marks)

10 (b) Name a suitable sampling method to obtain 10 boxes to represent the 100 boxes.

Briefly describe how to carry out your method.

Method Random sample or systematic sample (i.e. random sample with system)

Description For a random sample, assign numbers 1 to 100 to each box and use a random number generator to randomly select the 10 boxes.

(3 marks)

Turn over for the next question

10

11 The attendance at a hockey match is 1000.
This number is given to 2 significant figures.

Work out the difference between the maximum and minimum possible attendance.

Lower bound = 995. Upper bound = 1050 (for continuous variable) or 1049 for variables such as attendance which can only take discrete integer values. 1049 - 995 = 54

Answer 54 *(2 marks)*

12 The stem-and-leaf diagram shows the number of visitors to a castle over 19 days.

Key: 7 | 0 represents 70 visitors

6	0	4	8				
7	0	2	5	6	7	8	9
8	1	2	3	4	6	7	9
9	2	4					

Each visitor is charged £6.

For the 19 days, work out the interquartile range of the total amount charged per day.

Upper Quartile = 15th data point $\left(\frac{3}{4}(19+1)\right)$
= 86 visitors or £516
Lower Quartile = 5th data point $\left(\frac{1}{4}(19+1)\right)$
= 72 visitors or £432
Interquartile Range = U.Q. − L.Q = 516 − 432
= £84

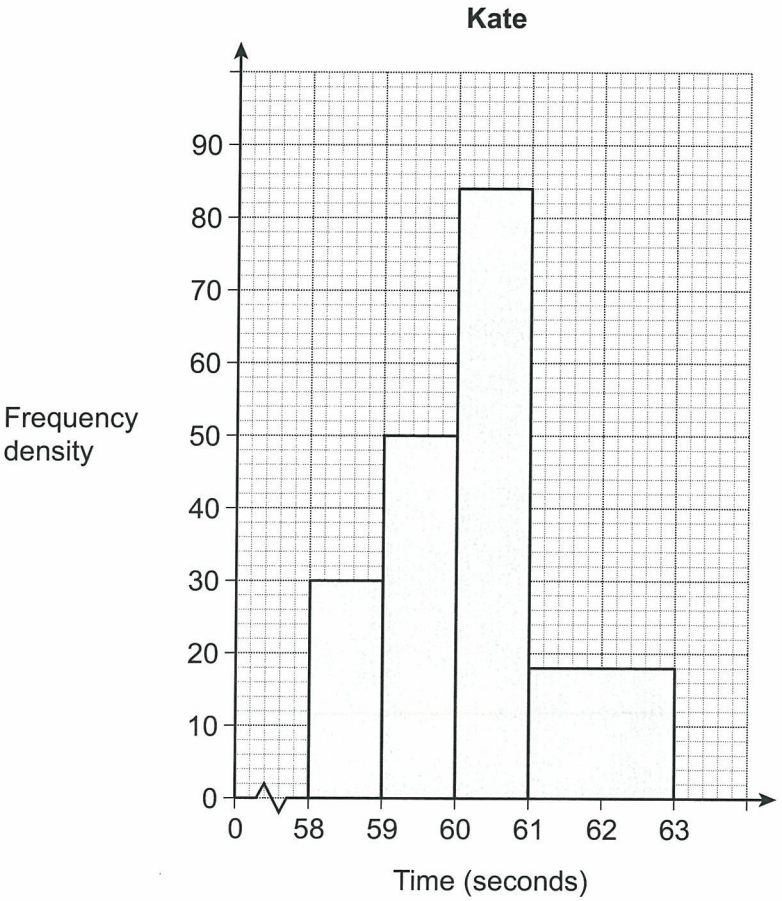
Answer £ 84 *(4 marks)*

Turn over for the next question

6

13 Kate and David are a team in a contest.
They will each have **one** chance to estimate a minute.

13 (a) Kate has 200 practice attempts.



Based on her practice attempts,

show that the probability that she can estimate a minute to within one second is 0.67

$P(59 \leq t \leq 61) = \dfrac{F_{59\text{-}60} + F_{60\text{-}61}}{200} = \dfrac{(1 \times 50) + (1 \times 84)}{200}$

$= \dfrac{134}{200} = \dfrac{67}{100}$

(2 marks)

N.B: Frequency Density (F.D.) = $\dfrac{\text{Frequency (F)}}{\text{Class Width (CW)}}$

& $F = F.D. \times C.W.$

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13 (b) David also has 200 practice attempts.
He estimates a minute to within one second 84 times.

They win the contest if **either** of them estimates a minute to within one second.

Based on their practice attempts, work out the probability that they win.

Let K denote Kate estimating a minute to within one second and $\bar{K}$ her failure to do so.

Also, let D denote David estimating a minute to within one second and $\bar{D}$ his failure to do so.

$P(K) = \frac{134}{200} = \frac{67}{100}$ & $P(D) = \frac{84}{200} = \frac{21}{50}$

$P(\bar{K}) = 1 - \frac{67}{100} = \frac{33}{100}$ $P(\bar{D}) = \frac{29}{50}$

$P(\text{Winning contest}) = P(K\bar{D} \text{ OR } \bar{K}D \text{ OR } KD)$

$= \frac{67}{100}\left(\frac{29}{50}\right) + \frac{33}{100}\left(\frac{21}{50}\right) + \frac{67}{100}\left(\frac{21}{50}\right) = \frac{4043}{5000}$

or 0.8086.

ALTERNATIVELY, $P(\text{Winning contest}) =$

$1 - P(\bar{K}\bar{D}) = 1 - \frac{33}{100}\left(\frac{29}{50}\right) = \frac{4043}{5000}$ or

0.8086 as before.

Answer 0.8086 *(4 marks)*

END OF QUESTIONS

6

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