

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										



General Certificate of Secondary Education
Higher Tier
November 2014

Applications of Mathematics (Linked Pair)

93701H

H

Unit 1 Finance and Statistics

Wednesday 5 November 2014 9.00 am to 10.30 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a calculator • mathematical instruments. 	
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Time allowed

- 1 hour 30 minutes

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. Cross through any work that you do not want to be marked.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80
- The quality of your written communication is specifically assessed in Questions 2, 3 and 13
These questions are indicated with an asterisk (*).
- You may ask for more answer paper, tracing paper and graph paper.
These must be tagged securely to this answer book.
- You are expected to use a calculator where appropriate.

Advice

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

For Examiner's Use	
Examiner's Initials	
Pages	Mark
2 – 3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
14 – 15	
16 – 17	
18 – 19	
20 – 21	
22 – 23	
24	
TOTAL	



N 0 V 1 4 9 3 7 0 1 H 0 1

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

- 1 Emma counts the number of people travelling in 50 cars.
The spreadsheet shows her results.

	A	B	C
1	Number of people (x)	Frequency (f)	fx
2	1	18	18
3	2	14	28
4	3	6	18
5	4	9	36
6	5	3	15
7		Total =	115

- 1 (a) Write down the formula used in cell C7

[2 marks]

Answer

- 1 (b) Emma uses this formula = C7/50

Circle the statistical measure she is working out.

[1 mark]

Mean

Median

Mode

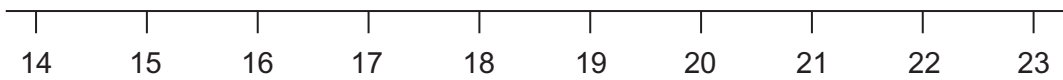
Range



2 One evening Anna, Dave and Tia were waiting for different buses.
Anna waited for 22 minutes.

***2 (a)** Dave waited for more than 15 minutes but for less time than Anna.
Show Dave's possible waiting times on the number line.

[2 marks]



2 (b) Tia waited for x minutes.
She waited longer than Anna but no more than 25 minutes.

Show her possible waiting times as an inequality.

[2 marks]

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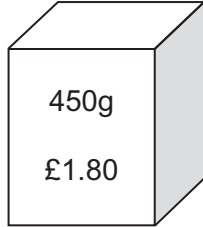
Answer

Turn over for the next question

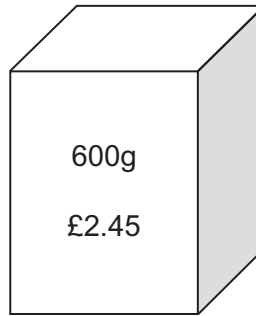


*3 A supermarket sells boxes of cereal in two sizes.

Regular



Large



Which box gives the better value for money?
You **must** show your working.

[3 marks]

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Answer



4 Jenny is comparing monthly costs when using different electricity companies.

'Sparks' electricity company

has a standing charge of £7.25

and

charges 21p for every unit of electricity used.

'Brightness' electricity company

has a standing charge of £9.95

and

charges 19p for every unit of electricity used.

Jenny works out that both companies would have charged the same amount last month.

Set up and solve an equation to work out how many units of electricity she used last month.

[4 marks]

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Answer

7

Turn over ►



5 A bottle of perfume has a recommended retail price of £57

Rachel goes on holiday.

The perfume is sold on the plane at 35% less than the recommended retail price.

She also sees the perfume on sale for 42.90 euros in a shop.

$$£1 = 1.10 \text{ euros}$$

Is the perfume cheaper on the plane or in the shop?

You **must** show your working.

[4 marks]

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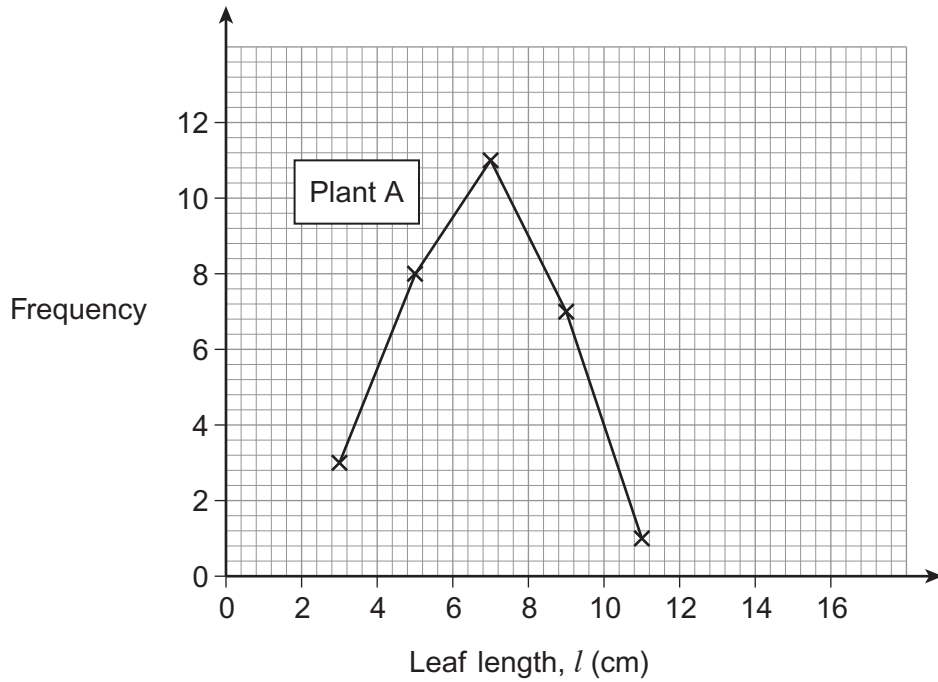
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Answer



6 Feli is given leaves from two plants in a science lesson. The frequency polygon shows the lengths, in cm, of 30 leaves from plant A.



The table shows the lengths of 30 leaves from plant B.

Leaf length, l (cm)	$6 \leq l < 8$	$8 \leq l < 10$	$10 \leq l < 12$	$12 \leq l < 14$	$14 \leq l < 16$
Frequency	4	8	10	5	3

6 (a) Draw a frequency polygon for the leaves from plant B on the same grid as for plant A. **[2 marks]**

6 (b) Feli finds a leaf on the classroom floor. The leaf has a length of 11 cm

Is the leaf more likely to be from plant A or plant B?
Give a reason for your answer.

[1 mark]

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- 7 A bag contains 500 counters.
Each counter has a shape on it.

Ali and Jake do some trials to estimate how many counters in the bag have a square.

A trial consists of

- taking a counter at random
- recording the shape on the counter
- putting the counter back in the bag.

The results of their trials are shown in the table.

	Number of trials	Number of counters that have a square
Ali	30	9
Jake	100	37

- 7 (a) Write down the relative frequency of Ali taking a counter that has a square.

[1 mark]

Answer

- 7 (b) Work out the relative frequency of Jake taking a counter that does **not** have a square.

[1 mark]

Answer



7 (c) Whose trials would give a more reliable estimate of the number of counters that have a square?
Give a reason for your answer.

[1 mark]

Answer

Reason

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7 (d) There are 500 counters in the bag.
Estimate the number of counters that have a square.

[1 mark]

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Answer

Turn over for the next question

4

Turn over ►



8 Vikki orders 500 kg of soil.
It is delivered in 16 small sacks and 8 large sacks.

A large sack holds three times as much soil as a small sack.

Work out the amount of soil each sack holds.

[4 marks]

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Small sack kg

Large sack kg



9 The table shows the masses of three planets.

	Mass (kg)
Mars	6.42×10^{23}
Earth	5.98×10^{24}
Jupiter	1.90×10^{27}

9 (a) How many times heavier is Jupiter than Earth?

[1 mark]

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Answer

9 (b) Work out the difference in mass between Earth and Mars.
Give your answer in standard form correct to 3 significant figures.

[2 marks]

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Answer kg

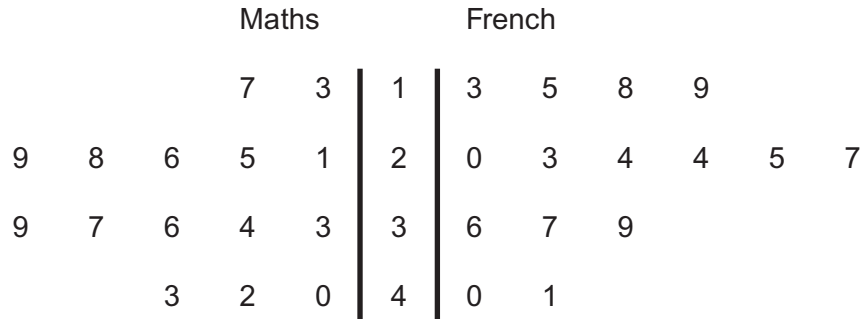
7

Turn over ►



10 The marks of a group of 15 students in Maths and French tests are shown in the back-to-back stem-and-leaf diagram.

Key 5 | 2 | 3 means 25 in Maths and 23 in French



10 (a) How many students scored less than 35 marks in the Maths test?

[1 mark]

Answer

10 (b) Show clearly that the median mark for Maths is higher than the median mark for French.

[2 marks]

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- 10 (c)** Another student takes both tests.
She scores 42 marks in each test.

How will the **range** of marks in Maths and French change when these new marks are included?

Tick a box.

[1 mark]

- only changes Maths
- only changes French
- changes both
- changes neither

- 10 (d)** Four students take a Music test.

The test is marked out of 50

The median mark is 41

The modal mark is 2 higher than the mean mark.

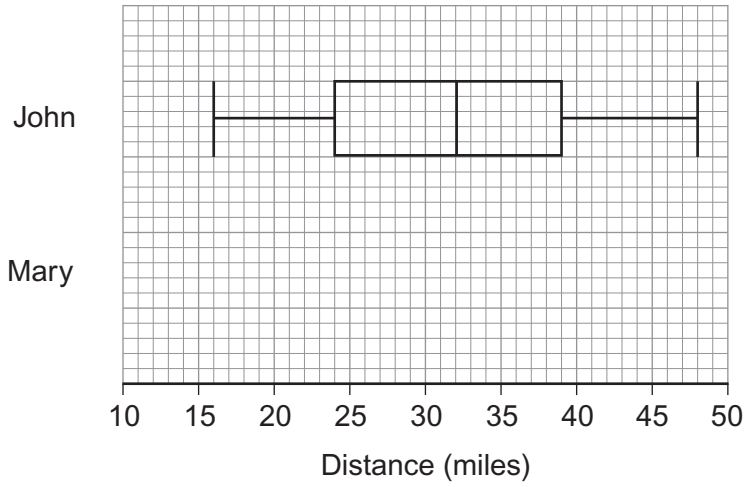
Work out a possible set of marks for the four students.

[3 marks]

Answer,,,



11 John and Mary are training for a cycle race. The box-and-whisker plot shows information about the distance John cycles each day.



11 (a) Write down the median distance John cycles each day. [1 mark]

Answer miles

11 (b) Work out the inter-quartile range of the distance John cycles each day. [2 marks]

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Answer miles



11 (c) The table shows information about the distance Mary cycles each day.

	Smallest	Lower quartile	Median	Upper quartile	Largest
Distance (miles)	16	27	34	38	48

On the grid opposite, draw a box-and-whisker plot to show this information.

[3 marks]

11 (d) Make **two** comparisons of the distances John and Mary cycle.

[2 marks]

Comparison 1

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Comparison 2

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Turn over for the next question

8

Turn over ►



12 Bottles of shower gel are on offer in three shops.
The bottles are usually the same price in each shop.

Shop A
Buy two get one
free

Shop B
Buy one get one
half price

Shop C
40% off

Which offer is the best value?
You **must** show your working.

[4 marks]

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Answer



14 Lisa sees two different accounts advertised at her local building society.

<p>Account 1</p> <p>Annual gross interest rate 2.75%</p> <p>Interest calculated and paid monthly</p>

<p>Account 2</p> <p>AER 2.8%</p>

Lisa wants to open the account with the highest AER(%)

She uses this formula to work out the AER for Account 1

$$AER = \left(\left(1 + \frac{r}{100n} \right)^n - 1 \right) \times 100$$

where $r = 2.75$ and n is the number of times that interest is paid per year.

Which account should Lisa open?
You **must** show your working.

[3 marks]

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Answer



15 A school has 185 students in Year 11
The head teacher chooses a sample of 30 Year 11 students, stratified by how they
travel to school.

Complete the table.

[3 marks]

	Walk	Bus	Car
Number of students	65	93	27
Number in sample			

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Turn over for the next question

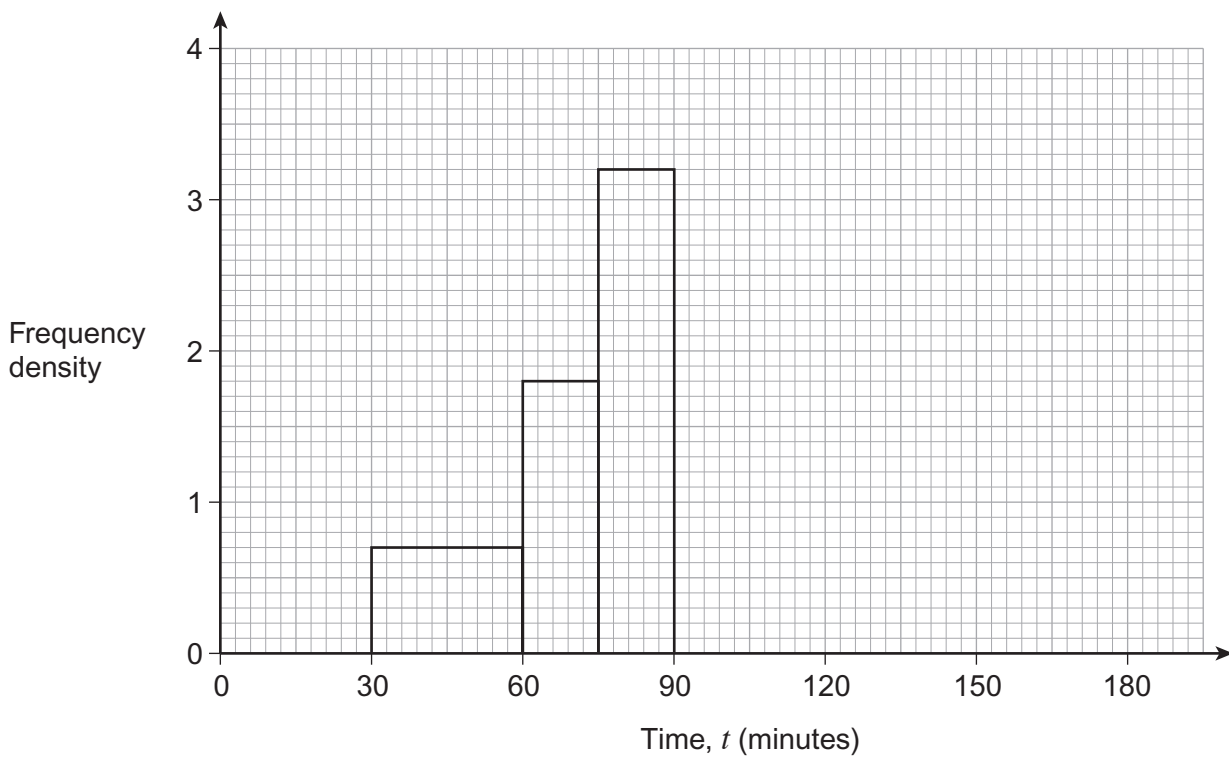
6

Turn over ►



16 The table and histogram show information about the time, t (minutes), that Ruth walks her dog each day.

Time, t (minutes)	Frequency
$30 \leq t < 60$	
$60 \leq t < 75$	
$75 \leq t < 90$	48
$90 \leq t < 120$	24
$120 \leq t < 180$	18



16 (a) Use the histogram to complete the table.

[3 marks]

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16 (b) Use the table to complete the histogram.

[2 marks]

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16 (c) Estimate the number of days she walked her dog for more than 130 minutes.

[2 marks]

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Answer

Turn over for the next question

7

Turn over ►



17 A garage owner starts a car rental business.
She buys small cars and medium sized cars.

Each small car costs £6000
Each medium car costs £8000
She wants to spend no more than £84 000

She buys at least 3 small cars.
She buys at least 2 medium cars.
She buys more small cars than medium cars.

Let the number of small cars be x .
Let the number of medium cars be y .

17 (a) Use the information about the costs of the cars to show that $3x + 4y \leq 42$ **[1 mark]**

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17 (b) Show, by shading on the grid opposite, the region containing the possible number of cars of each type that she buys. **[1 mark]**

17 (c) The profit per day made on renting each small car is £20, and on renting each medium car is £24
Work out the maximum profit per day and the number of cars of each type needed. **[3 marks]**

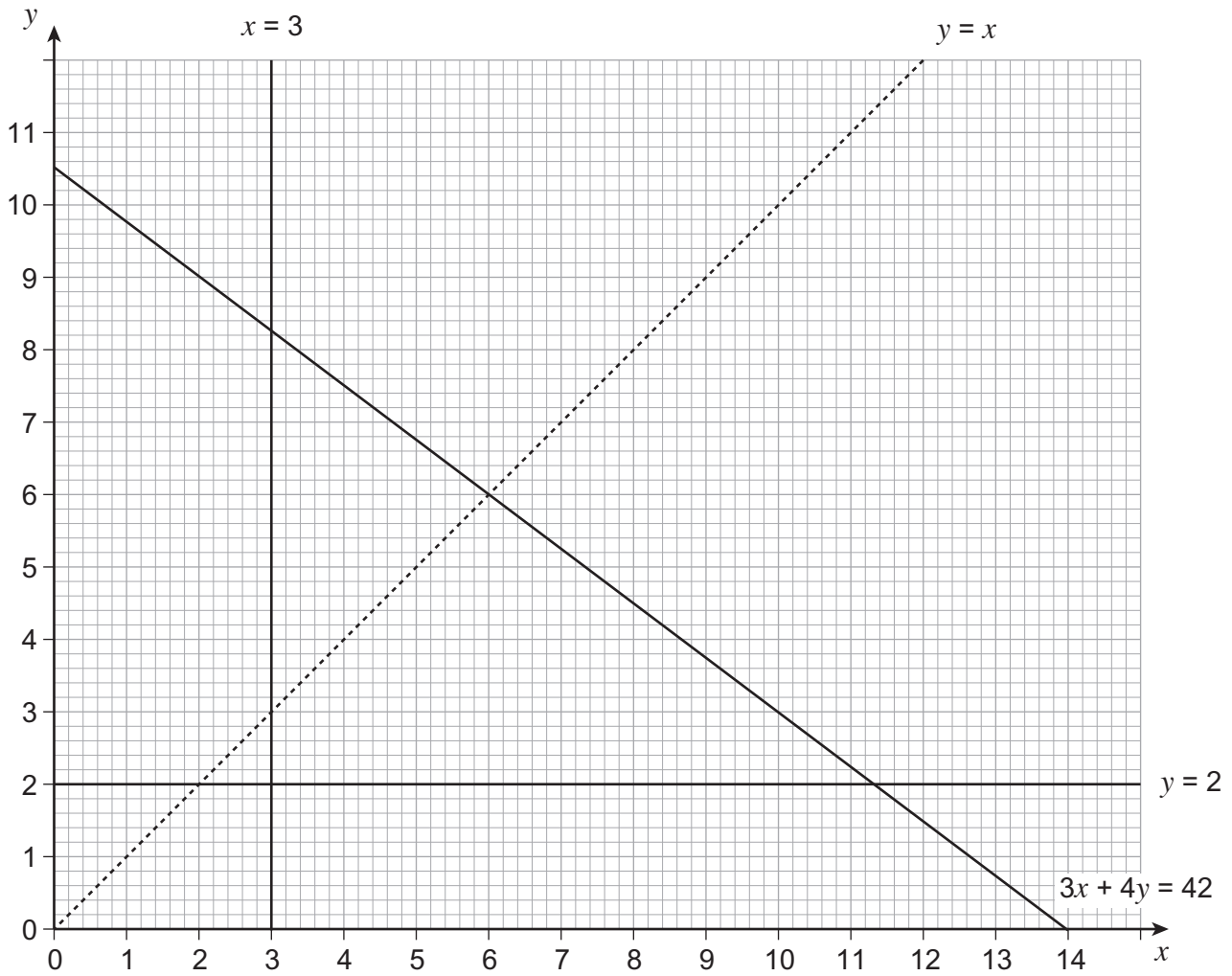
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Number of small cars

Number of medium cars

Maximum profit per day £





Turn over for the next question



18 Sam wants to spread fertiliser on his rectangular lawn.

His lawn is 18 metres long and 12 metres wide.

Each dimension is measured to the nearest metre.

For each square metre of lawn, his spreader uses 40 grams of fertiliser, to the nearest 10 grams.

Area of a rectangle = length \times width

Sam has **exactly** 10 kilograms of fertiliser.

Can Sam be sure that this is enough?

You **must** show your working.

[5 marks]

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END OF QUESTIONS

