

HIGHER STATISTICS AND PROBABILITY

(Predicted topics)

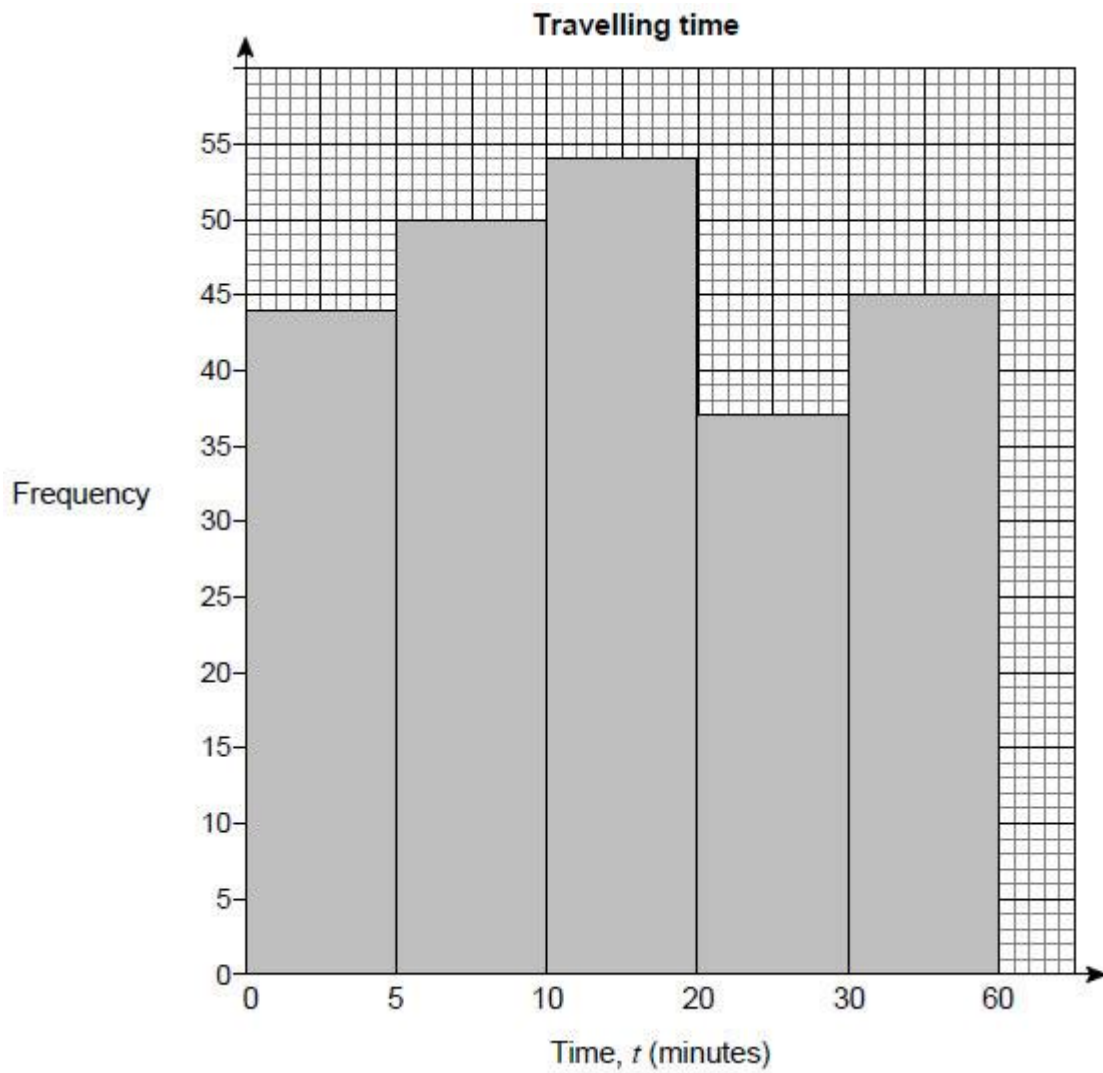
Q1.

Joe asked 230 students how long it took them to travel to school.

The results are shown in the table.

Travelling time, t (minutes)	Number of students
$0 < t \leq 5$	44
$5 < t \leq 10$	50
$10 < t \leq 20$	54
$20 < t \leq 30$	37
$30 < t \leq 60$	45

This is Joe's attempt to draw a histogram to show the data.



Make **two** criticisms of his histogram.

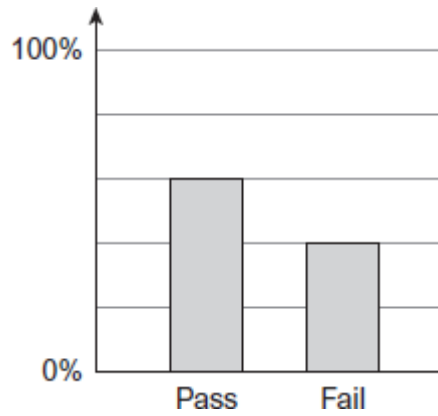
Criticism 1 _____

Criticism 2 _____

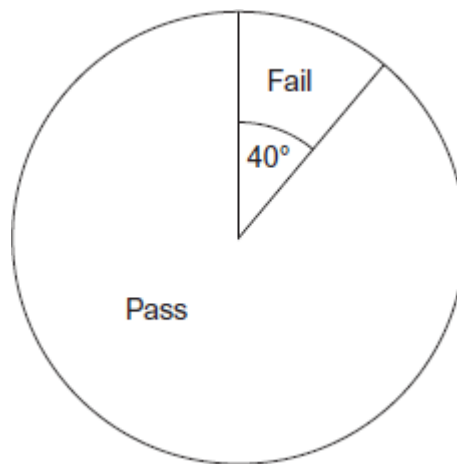
(Total 2 marks)

Q2.

Some students take a cycling test.
The percentage bar chart shows the results.



The students who fail the test take it a second time.
The pie chart shows the results.



Two students fail the second test.

How many students pass the test first time?

Answer _____

(Total 5 marks)

Q3.

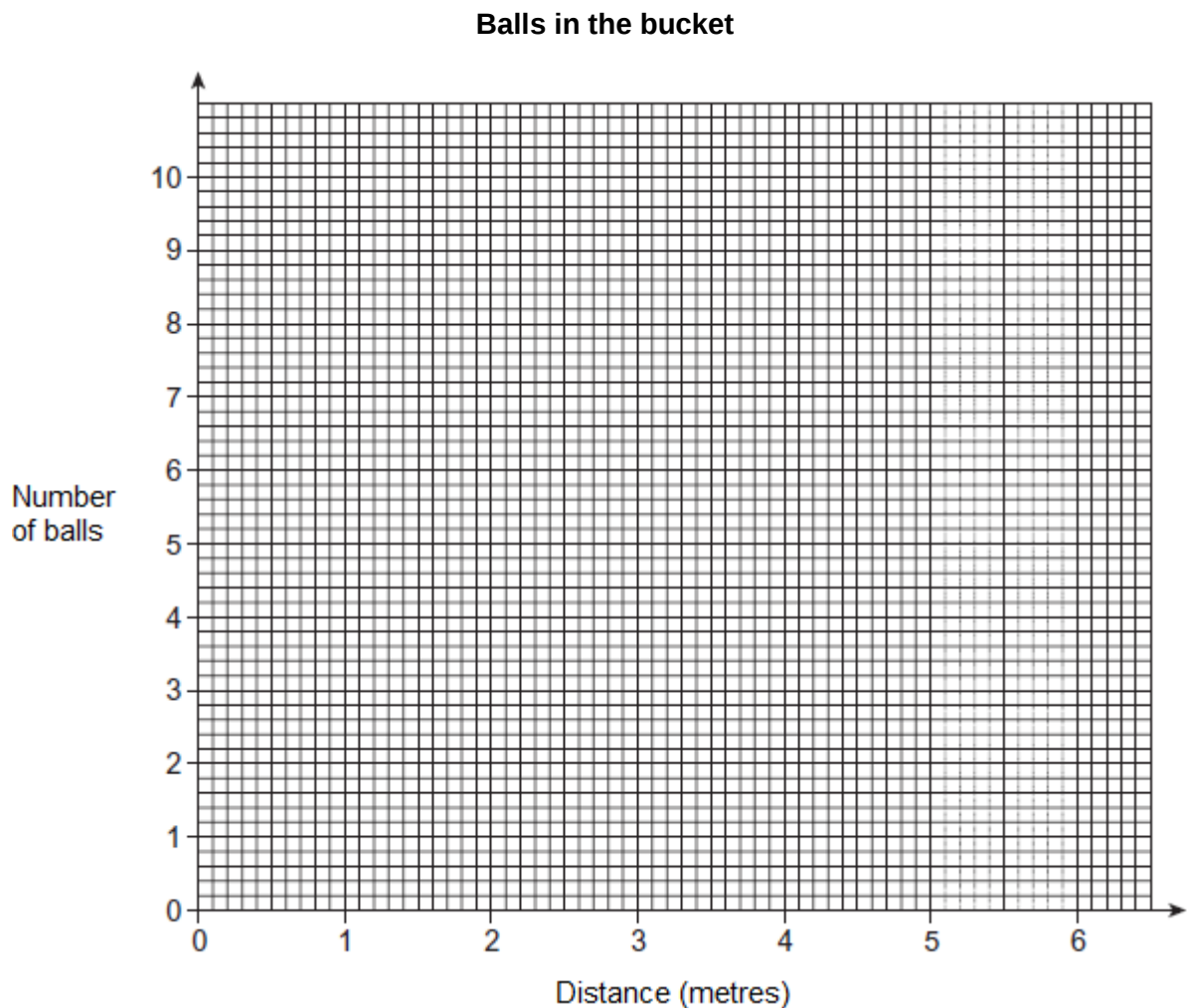
Matthew tried to throw balls into a bucket from different distances.
He threw 10 balls from each distance.

His results are shown in the table.

Distance (metres)	2.0	2.5	3.2	4.1	4.5	5.3	6.0
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Number of balls in the bucket	9	7	8	6	2	4	1
--	---	---	---	---	---	---	---

- (a) Plot these results as a scatter graph.



(2)

- (b) Draw a line of best fit on your scatter graph.

(1)

- (c) What type of correlation is shown?

Answer _____

(1)

- (d) Matthew is organising a game at the school fayre.

Each player will be given 10 attempts to throw a ball into a bucket.
He wants the average number in the bucket to be 5.

Use your line of best fit to decide how far the bucket should be from each player.

Answer _____ metres

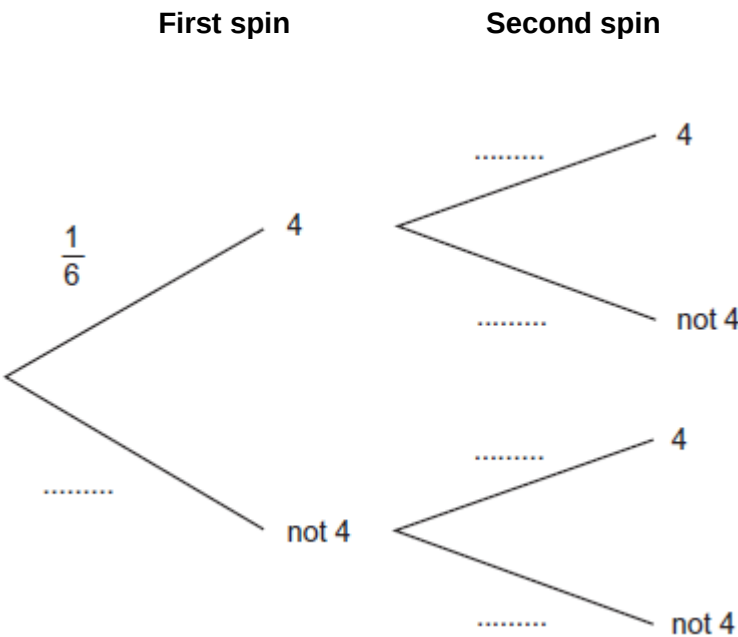
(2)

Q4.

An ordinary fair dice is rolled.



- (a) Complete the tree diagram for the dice landing on 4



(1)

- (b) Work out the probability of the dice landing on 4 both times.

Answer _____

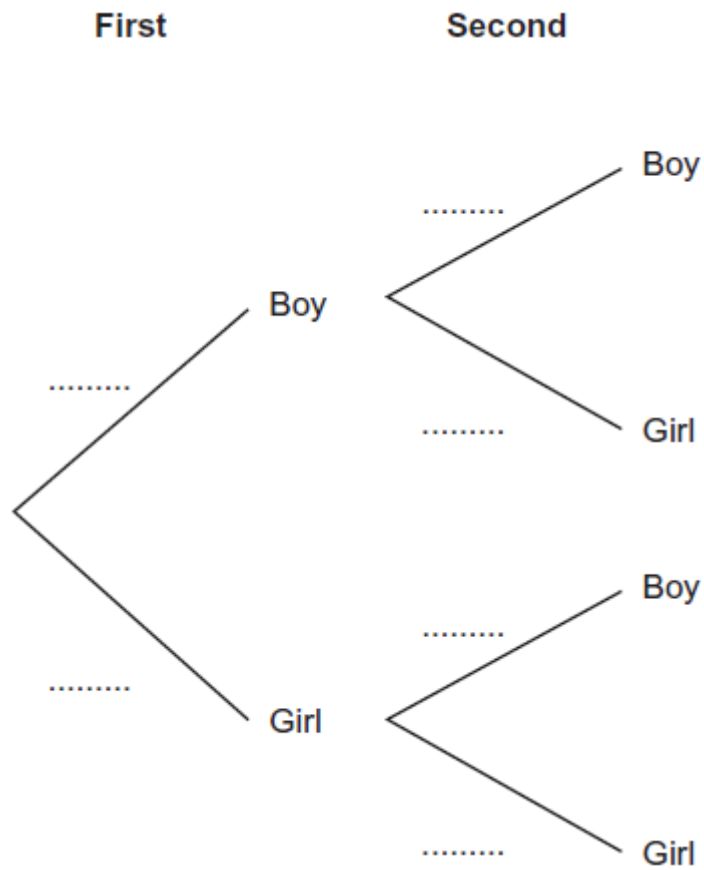
(2)

(Total 3 marks)

Q5.

A team has 7 boys and 3 girls.
Stevie chooses two of the team at random.

- (a) Complete the probability tree diagram.



(3)

(b) Work out the probability that he chooses one boy and one girl.

Answer _____

(3)

(Total 6 marks)

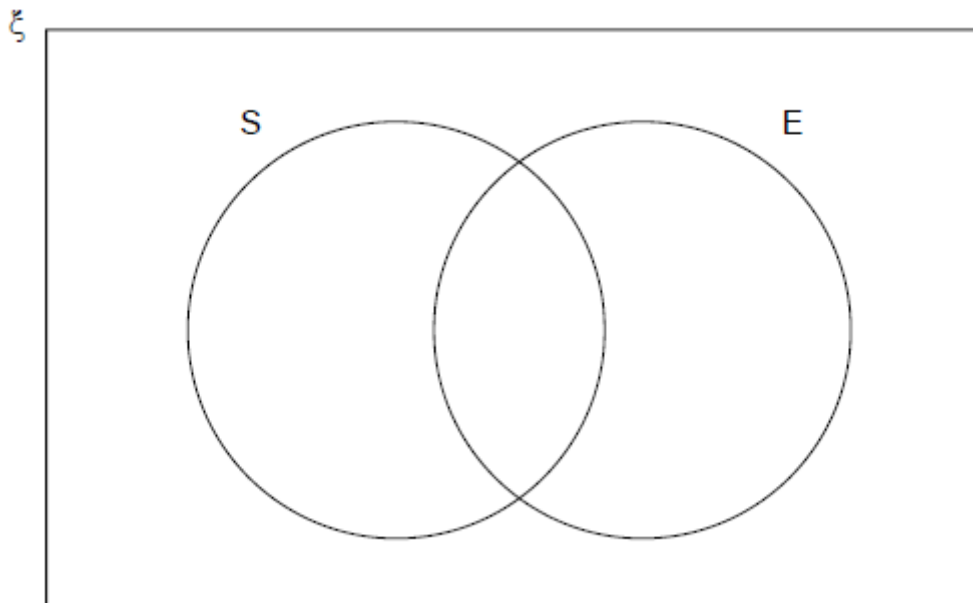
Q6.

$\xi = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$

S = square numbers

E = even numbers

(a) Complete the Venn diagram.



(3)

- (b) One of the numbers is chosen at random.

Write down $P(S \cap E)$

Answer _____

(1)

(Total 4 marks)

Q7.

80 patients gave information about how long they waited to see the doctor.

Time, T , (minutes)	Frequency		
$0 \leq T < 10$	5		
$10 \leq T < 20$	22		
$20 \leq T < 30$	28		
$30 \leq T < 40$	21		
$40 \leq T < 50$	4		

- (a) Work out an estimate of the mean time that the patients waited.

Answer _____ minutes

(4)

(b) The doctor says, “70% of our patients wait less than 30 minutes to be seen.”

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

Answer _____

(3)
(Total 7 marks)

Q8.

In a game a team scores

- 2 points for a win
- 1 point for a draw
- 0 points for a loss.

A team plays four games.

There are six combinations of results that score **at least 5** points.

Complete the table to show these combinations.

Number of wins	Number of draws	Number of losses	Total score
4	0	0	8
3	1	0	7

(Total 3 marks)

Q9.

Bag A contains 3 red balls and 7 blue balls.

Bag B contains 8 red balls and 2 blue balls.



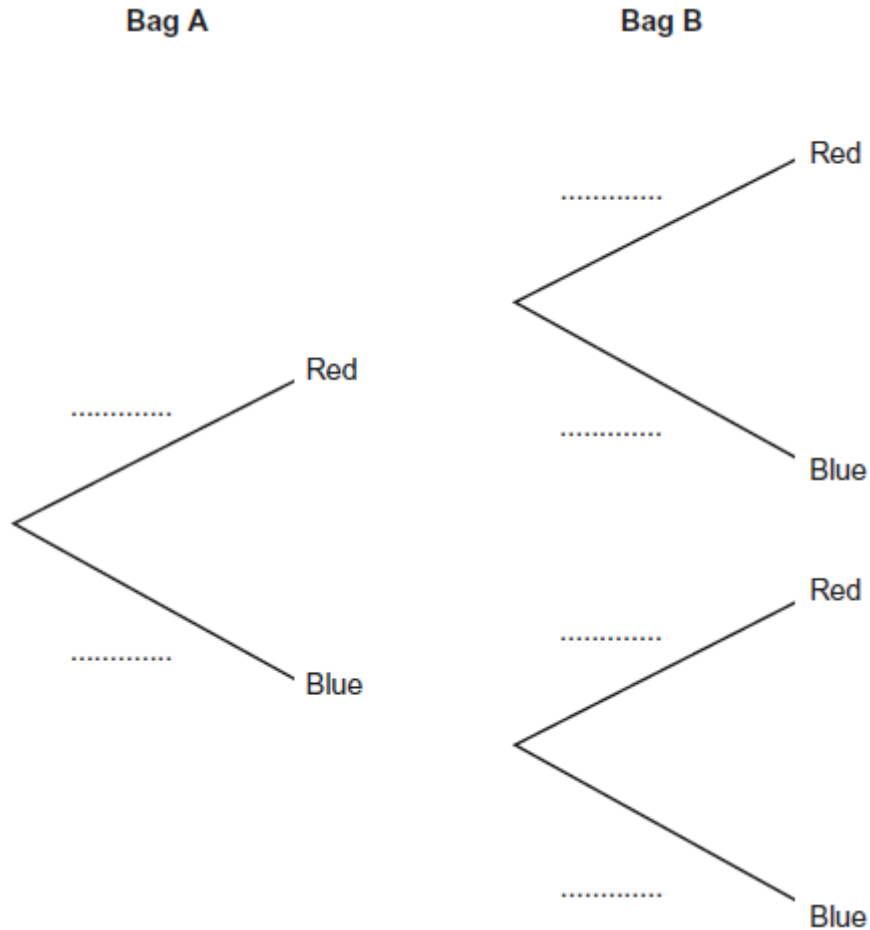
Bag A



Bag B

A ball is picked at random from each bag.

- (a) Complete the tree diagram to show all the probabilities.



(3)

- (b) Work out the probability of picking a **red** ball from Bag A and a **blue** ball from Bag B.

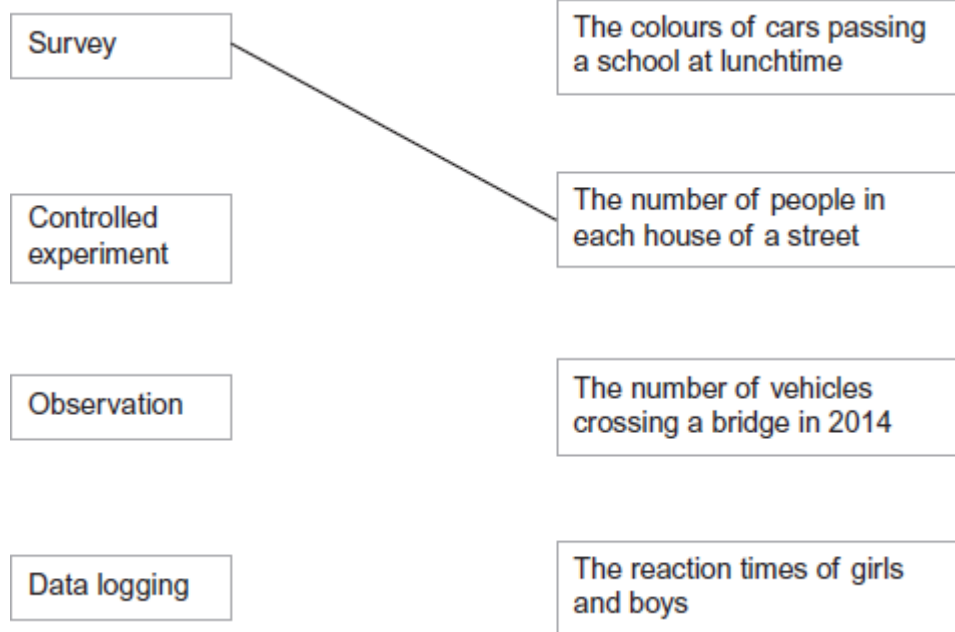
Answer _____

(2)

(Total 5 marks)

Q10.

- (a) Match each data collection method to **one** set of data.



(2)

- (b) Jess wants to know the number of people who live in her street. She carries out a survey.

Which **two** words describe the data she collects?
Circle your answers.

Primary

Secondary

Discrete

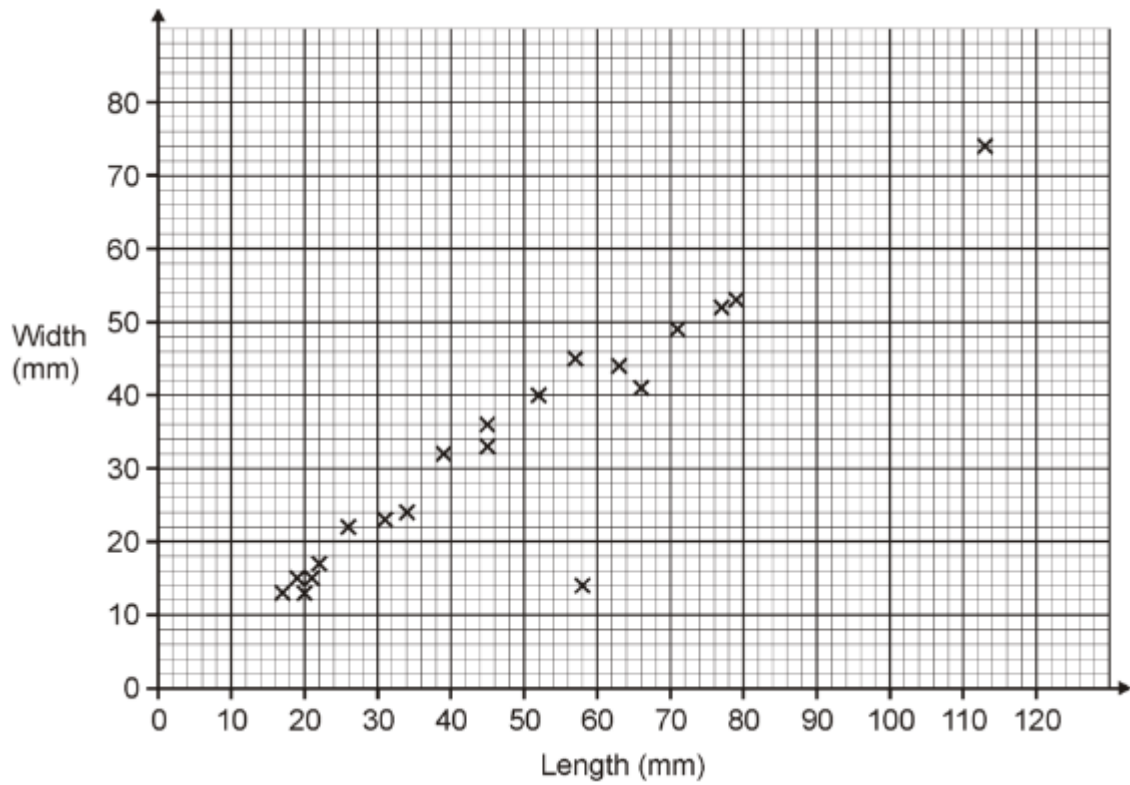
Continuous

(2)

(Total 4 marks)

Q11.

The scatter graph shows the lengths and widths of 20 birds' eggs.



- (a) One of the eggs has a length of 52 mm.

What is its width?

Answer _____ mm

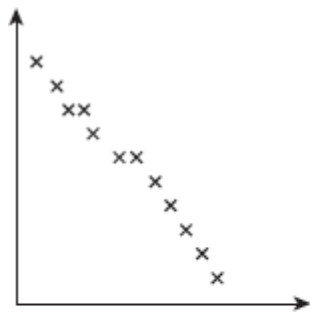
(1)

- (b) All the points except one show strong correlation.

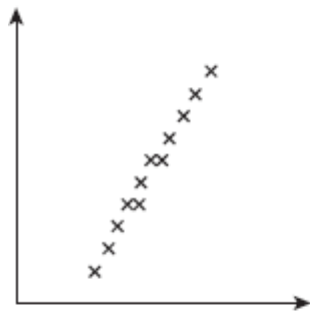
Circle the point that does **not** fit this pattern.

(1)

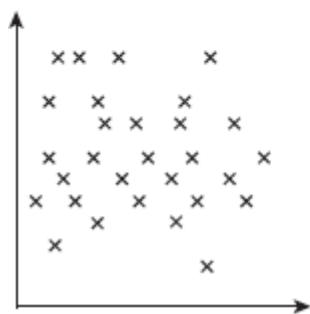
- (c) Match each scatter graph with a description.
The first one has been done for you.



• Strong positive correlation



• Weak positive correlation



• Little or no correlation

• Weak negative correlation

• Strong negative correlation

(2)

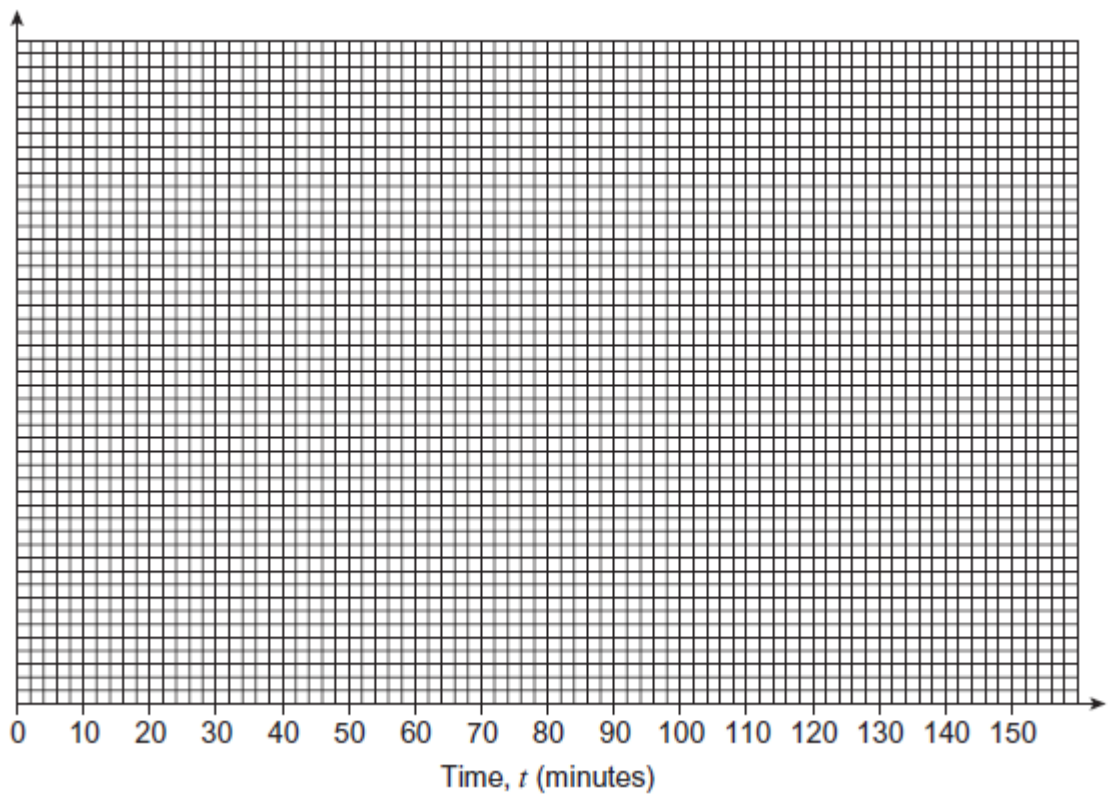
(Total 4 marks)

Q12.

The table shows information about the time, t (minutes), 100 people spend visiting a castle.

Time, t (minutes)	Frequency
$0 < t \leq 40$	12
$40 < t \leq 60$	36
$60 < t \leq 80$	24
$80 < t \leq 150$	28

(a) Draw a histogram to represent this information.



(3)

- (b) The table shows information about the time, t (minutes), 80 people spend visiting a stately home.

Time, t (minutes)	Frequency
$0 < t \leq 40$	15
$40 < t \leq 60$	25
$60 < t \leq 80$	22
$80 < t \leq 150$	18

Naz says,

“The median time at the castle is almost 2 minutes more than the median time at the stately home.”

Is he correct?

You **must** show your working.

(5)
(Total 8 marks)

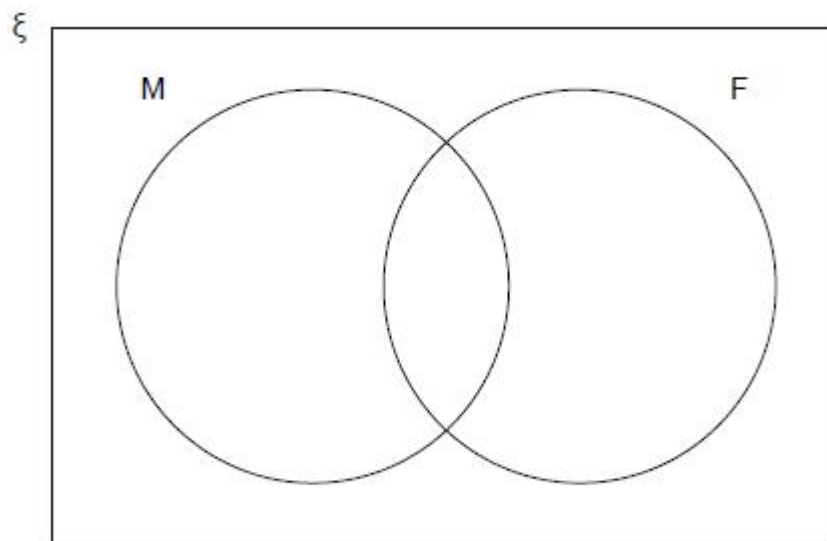
Q13.

A whole number from 1 to 15 inclusive is picked at random.

ξ = Whole numbers from 1 to 15 inclusive

M = Multiples of 3

F = Factors of 24



Using the Venn diagram, work out which of these probabilities is greater

P (the number is a multiple of 3 given it is a factor of 24)

or

P (the number is a factor of 24 given it is a multiple of 3)

You **must** show your working.

Answer _____

(Total 5 marks)

Q14.

Jess wants to know the number of people who live in her street
She carries out a survey.

Which **two** words describe the data she collects?
Circle your answers.

Primary

Secondary

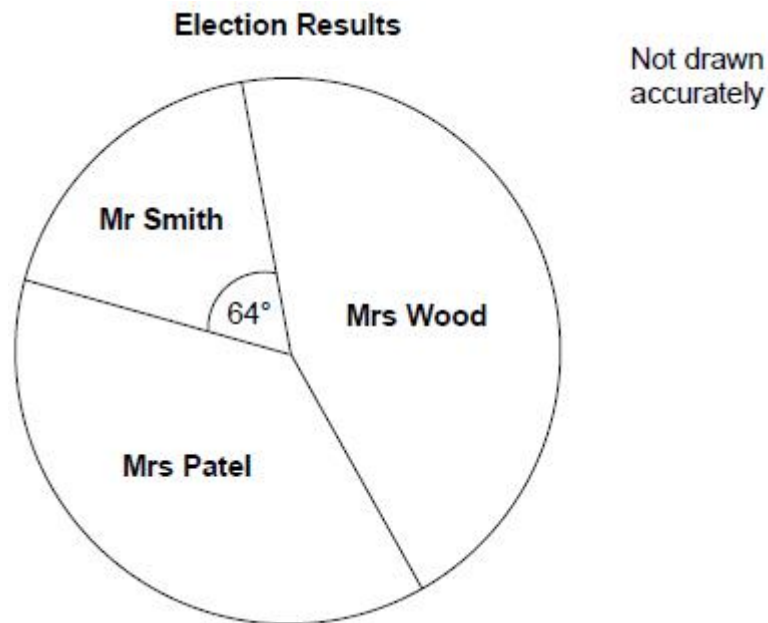
Discrete

Continuous

(Total 3 marks)

Q15.

The pie chart shows some information about the share of votes for candidates in an election.



The angle for Mrs Wood would be 24° more than the angle for Mrs Patel.
There were 5220 votes in total.

Work out the number of votes for Mrs Patel.

Answer _____

(Total 4 marks)

Q16.

A bag contains 12 discs.

7 are red

3 are blue

2 are yellow.

Two discs are taken from the bag at random, without replacement.

Work out the probability that the two discs are the same colour.

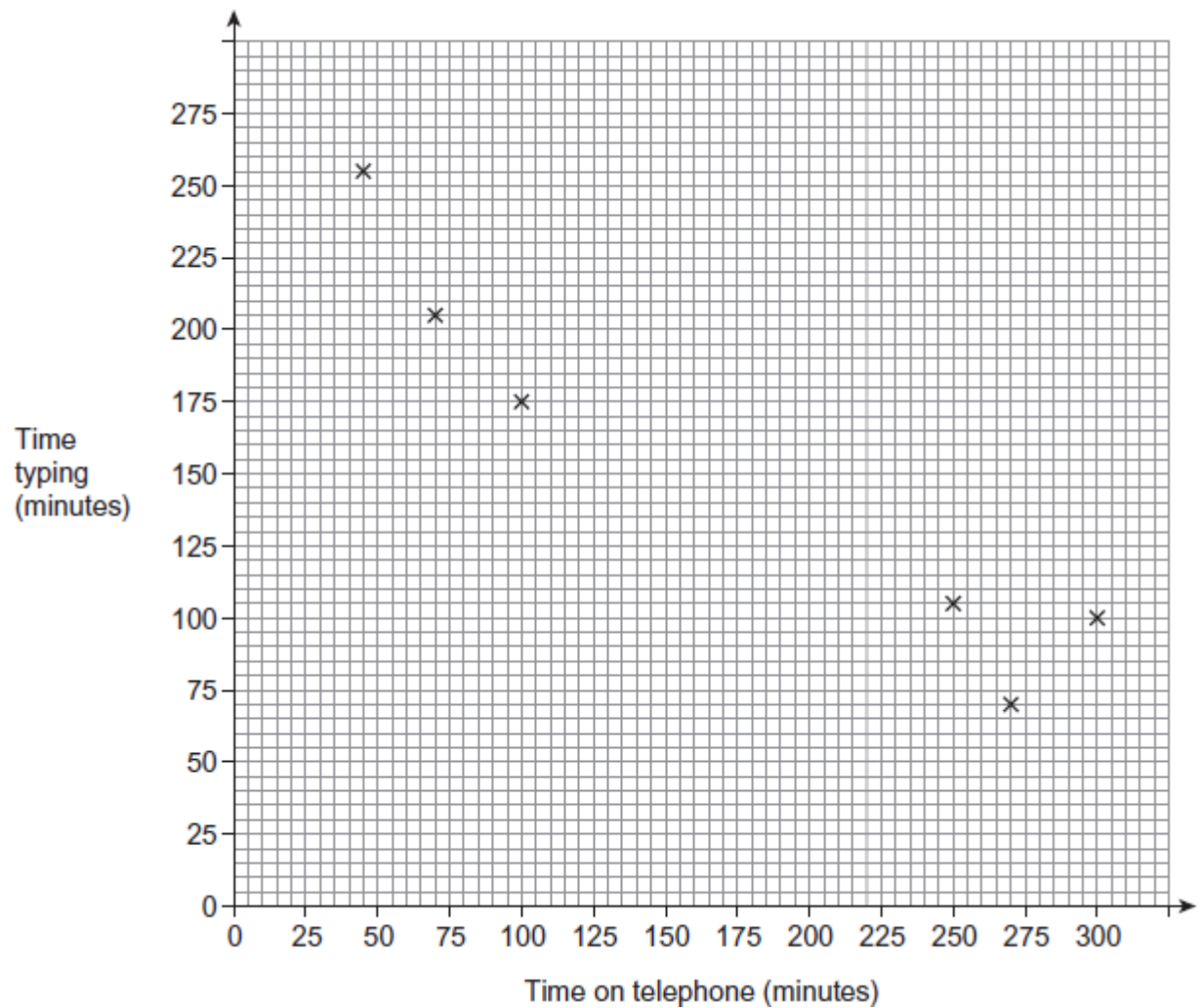
Answer _____

(Total 4 marks)

Q17.

A secretary types letters and answers the telephone.

The times spent on six days are shown on the scatter graph.



- (a) The table shows the times spent on the next four days.

Time on telephone (minutes)	275	150	125	180
Time typing (minutes)	125	190	225	175

Show these times on the scatter graph.

(2)

- (b) Draw a line of best fit.

(1)

- (c) On another day she spent 200 minutes on the telephone.

Use your line of best fit to estimate the time she spent typing that day.

Answer _____ minutes

(1)

(Total 4 marks)

Q18.

The probability that Gina goes to the gym on Saturday is 0.9
 The probability that Dave goes to the gym on Saturday is 0.6
 These probabilities are **independent**.

- (a) Calculate the probability that **both** Gina and Dave go to the gym on Saturday.

Answer _____

(1)

- (b) If Gina goes to the gym on Saturday the probability that she goes on Sunday is 0.2
If Gina does **not** go to the gym on Saturday the probability that she goes on Sunday is 0.7

Calculate the probability that Gina goes to the gym on exactly **one** of the two days.

Answer _____

(4)

(Total 5 marks)

Q19.

Four numbers have a mean of 10
The median is 8

Two of the numbers are 1 and 5

Work out the other two numbers.

Answer _____ and _____

(Total 3 marks)

Q20.

These expressions represent four numbers.
 The value of the median of the expressions is 12.

x $2x$ $6x$ $11x$

Work out the value of the mean of the expressions.

Answer _____

(Total 5 marks)

Q21.

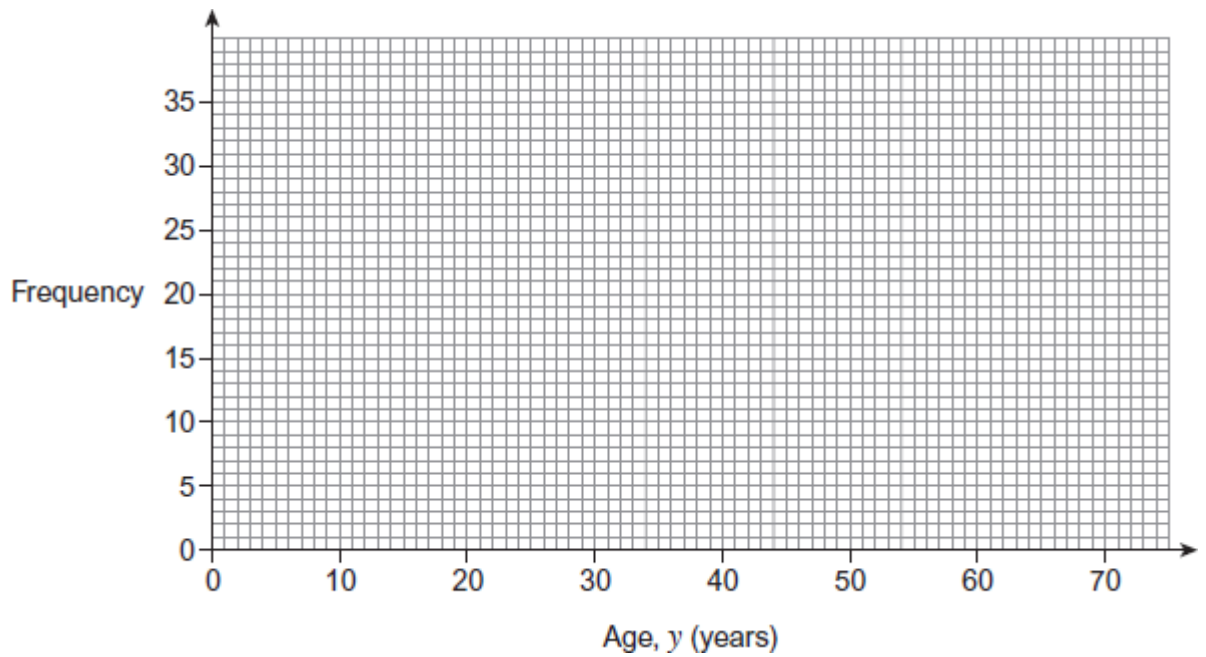
A chess club has both male and female members.

(a) The table shows the age distribution of the male club members.

Age, y (years)	Frequency
$10 \leq y < 20$	5
$20 \leq y < 30$	9
$30 \leq y < 40$	16
$40 \leq y < 50$	34
$50 \leq y < 60$	28
$60 \leq y < 70$	19

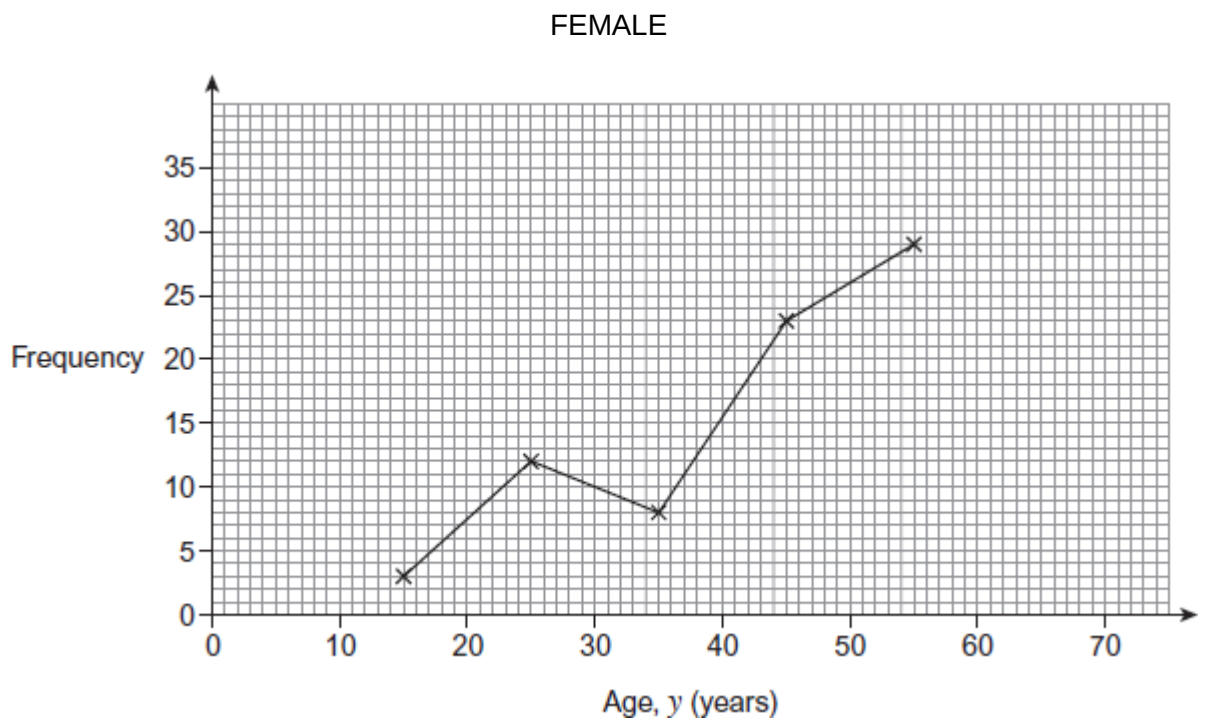
Draw a frequency polygon for these data.

MALE



(2)

- (b) The frequency polygon below shows the age distribution of the female club members.



Write down **two** comparisons between the age distributions of the male and female club members.

Comparison 1 _____

Comparison 2 _____

(2)
(Total 4 marks)

Q22.

Ella has these coins.



Jayden has these coins.



Ella takes one of her coins at random and gives it to Jayden.
Jayden adds it to his coins.

Then Jayden takes one of his coins at random and gives it to Ella.

What is the probability that Ella and Jayden now have the same amount of money as each other?

You **must** show your working.

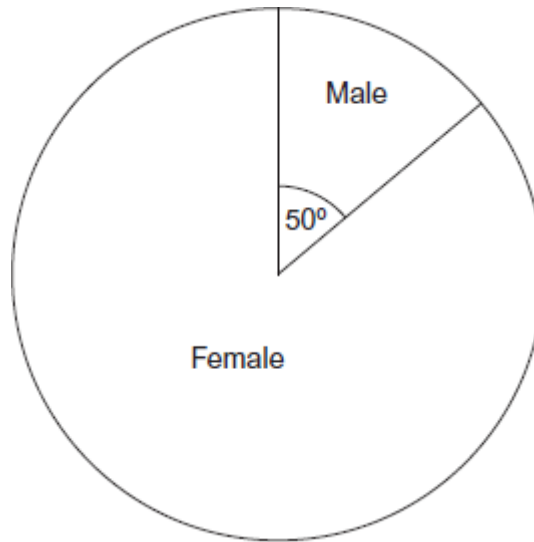
Answer _____

(Total 4 marks)

Q23.

The pie chart shows the proportion of male and female teachers in 15 074 schools.

Primary school teachers



The mean number of teachers per school is 13.7

Work out the total number of **female** teachers in these schools.
Give your answer to 2 significant figures.

Answer _____

(Total 5 marks)

Q24.

- (a) Garage A sold 4960 vehicles.

The garage takes a sample of customers, stratified by type of vehicle sold.
Some information about the sample is shown.

	Car	People carrier	Van	Total
Number sold	2520			4960
Number in sample	126	44		

Complete the table.

(3)

- (b) Garage B sold 3790 vehicles, to 3 significant figures.

Write down the minimum and maximum possible number sold by Garage B.

Minimum _____

Maximum _____

(2)

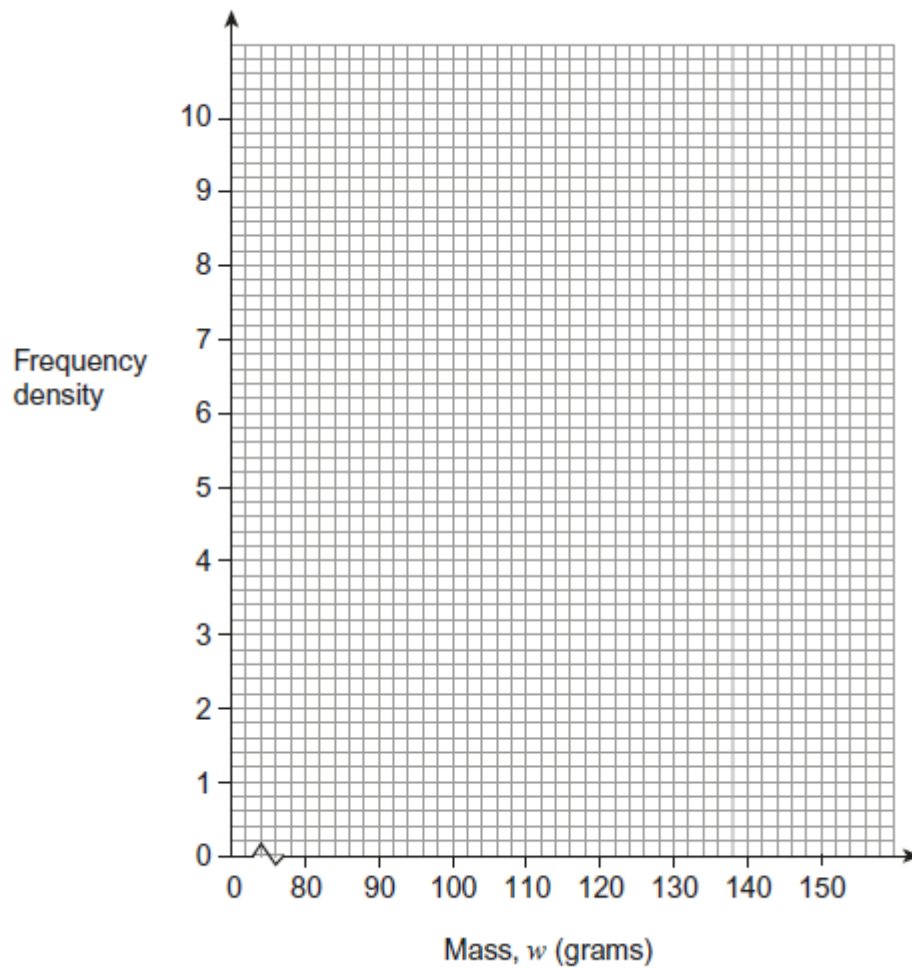
Q25.

The table shows information about the masses of 400 hamsters.

Mass, w (grams)	Frequency
$80 < w \leq 100$	100
$100 < w \leq 115$	150
$115 < w \leq 125$	90
$125 < w \leq 150$	60

Draw a histogram for the data.
You may use the table to help you.

Mass, w (grams)	Frequency		
$80 < w \leq 100$	100		
$100 < w \leq 115$	150		
$115 < w \leq 125$	90		
$125 < w \leq 150$	60		



(Total 4 marks)

Q26.

This table shows information about the weights of 200 rabbits.

Weight, w (grams)	Frequency	Midpoint	
$60 < w \leq 70$	101	65	
$70 < w \leq 80$	64	75	
$80 < w \leq 90$	25	85	
$90 < w \leq 100$	10	95	
	Total = 200		

(a) Tick whether each statement is true or false.

True **False**

You can use the table to calculate the exact median.

☐
☐



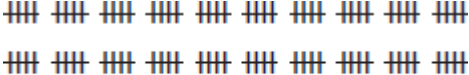
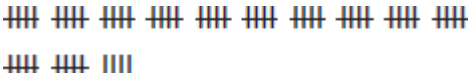
(b) Calculate an estimate of the mean weight of the 200 rabbits.

Answer grams

(c) Here are the weights, in grams, of 10 more rabbits.

Complete the table with:

- tallies for these 10 rabbits
- the frequencies for all 210 rabbits.

Weight, w (grams)	Tally	Frequency
$60 < w \leq 70$		
$70 < w \leq 80$		
$80 < w \leq 90$		
$90 < w \leq 100$		
		Total = 210

(d) Which **two** of these diagrams could you use to represent this grouped data? Circle your answers.

histogram

(Total 7 marks)

Q27.

The speed of 50 vehicles was measured travelling along a road.

Speed, s (mph)	Number of cars
$0 < s \leq 40$	2
$40 < s \leq 60$	11
$60 < s \leq 75$	24
$75 < s \leq 90$	9
$90 < s$	4

- (a) Every driver travelling at more than 70 mph is fined £60
On average, 8400 drivers use the road each day.

Estimate the total amount of money raised from fines on the road each day.

Answer £.....

(3)

- (b) Mia says,
“4% of vehicles on the road travel at 40 mph or less.”

Explain why she might be wrong.

(1)

(Total 4 marks)

Q28.

The table shows information about the pay per hour of 40 people.

Pay per hour, x (£)	Frequency		
-----------------------	-----------	--	--

$5 < x \leq 15$	14		
$15 < x \leq 25$	12		
$25 < x \leq 35$	11		
$35 < x \leq 45$	2		
$45 < x \leq 55$	1		
Total = 40			

(a) Which group contains the median pay per hour?

Circle your answer.

$5 < x \leq 15$ $15 < x \leq 25$ $25 < x \leq 35$ $35 < x \leq 45$ $45 < x \leq 55$

(1)

(b) Work out an estimate of the mean pay per hour.

Answer £ _____

(4)

(Total 5 marks)

Q29.

The table shows information about the marks of 30 students in a test.

Mark	Frequency
14	2
15	10
16	2
17	3
18	13
Total = 30	

Students who scored less than the mean mark have to retake the test.

How many students have to retake the test?

You **must** show your working.

Answer _____

Q30.

One of the frequencies is missing.

Work out the missing frequency.

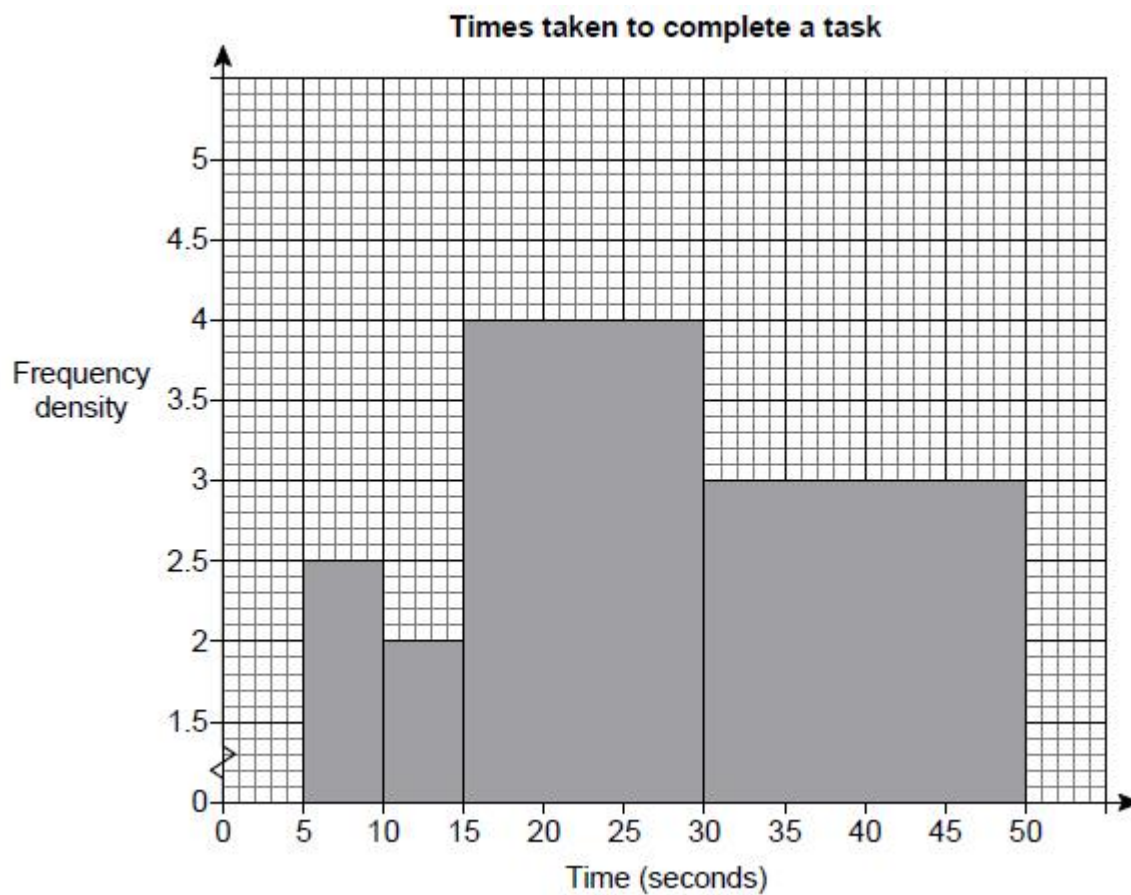
[illegible]

Answer _____

(Total 5 marks)

Q31.

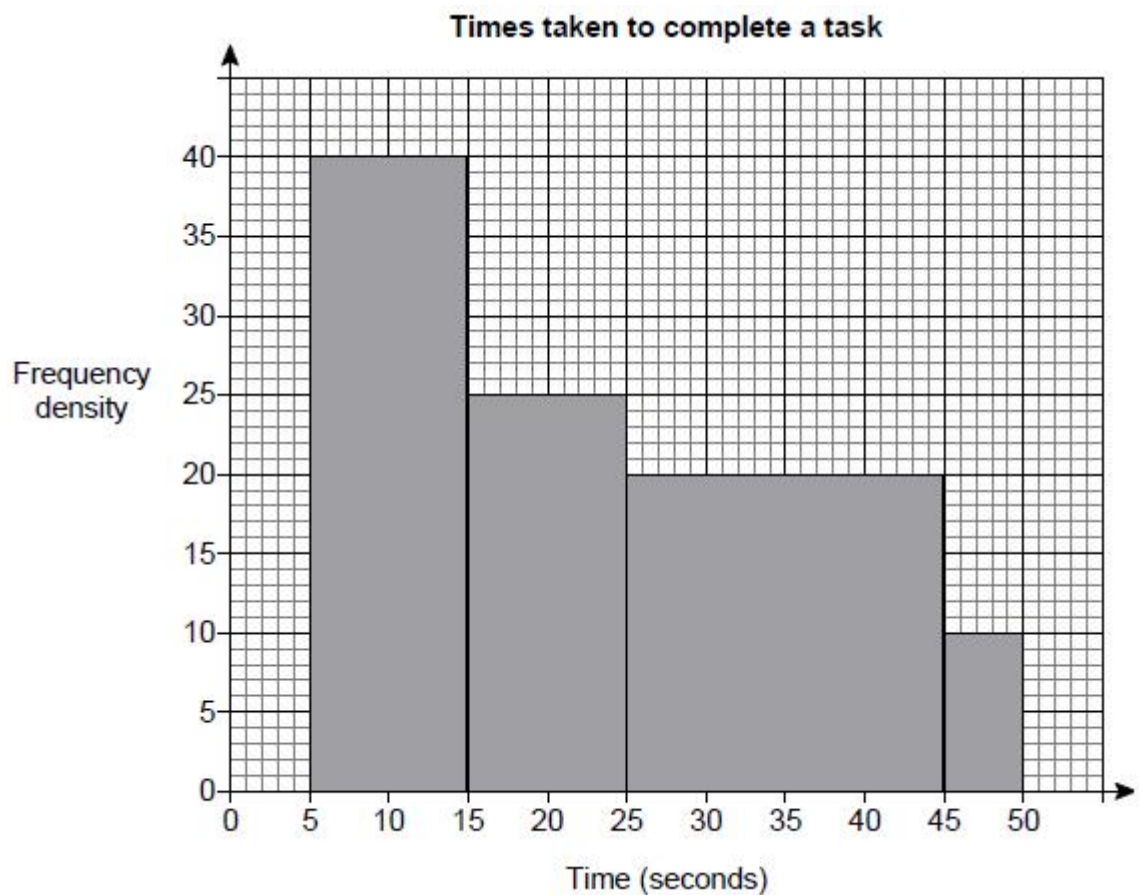
- (a) Amy drew this histogram to show the times taken to complete a task.



Give **one** reason why it is misleading.

(1)

- (b) Here is another histogram showing the times taken to complete another task.



Estimate the percentage of people who took less than 30 seconds.

Answer _____ %

(5)

(Total 6 marks)

Q32.

The following data is about the same types of plants.

Some of the plants are treated with plant food.

	Mean height (cm)	Interquartile range (cm)
Untreated	30.2	12.3
Treated	35.1	10.7

Compare the untreated plants and treated plants.

Comparison 1

Comparison 2

(Total 2 marks)

Mark schemes

Q1.

Bars should not be of equal width or horizontal scale is incorrect

oe

B1

Vertical axis should be frequency density
or heights of bars incorrect

oe

B1

[2]

Q2.

$$\frac{40}{360} \rightarrow 2 \text{ or } 1 \text{ student} = 20^\circ$$

Oe

Not $20\% = 1 \text{ student}$

M1

$$2 \times 9 \text{ or } 360 \div 20 \text{ or } 18$$

Calculating number failing first time

M1

$$\text{their } 18 \div 40 \times 100 \text{ or } 45$$

$$\text{or } 40\% = \text{their } 18 \text{ or } 20\% = 9$$

M1

$$0.6 \times \text{their } 45$$

$$\text{Or } 18 + 9$$

M1

$$27$$

A1

[5]

Q3.

(a) Any four correct plots

$$\pm \frac{1}{2} \text{ square}$$

M1

All seven correct plots

$$\pm \frac{1}{2} \text{ square}$$

A1

(b) Continuous line within limits

*Straight line, negative gradient, at least 3 large squares wide
that passes / would pass through gate at (2, 8) and (2, 11)
and gate at (5, 1) and (5, 5)*

B1

- (c) Negative (correlation)

Strand (i) Correct vocabulary

Must use the word 'negative'

Ignore extra words eg strong, weak, ...

Q1

- (d) Reads across from 5 on the vertical axis

Must have a straight line of best fit

M1

Answer appropriate to their straight line of best fit with negative gradient

ft their line of best fit $\pm \frac{1}{2}$ square
SC1 Answer [3.9, 4.3]

A1 ft

[6]

Q4.

- (a) $\frac{1}{6}$

$$\frac{5}{6}$$

On every pair of branches

oe

Allow 0.16... or 0.17

Allow 0.83...

B1

- (b) $\frac{1}{6} \times \frac{1}{6}$

or $\frac{1}{6} \times$ their $\frac{1}{6}$

oe

Allow 0.16... or 0.17

ft their $\frac{1}{6}$ provided [0, 1]

M1

$$\frac{1}{36}$$

oe

Allow 0.027...

Allow 0.03 if working shown

Ignore fw if attempting to convert

$\frac{1}{36}$ to a decimal, otherwise, do not ignore fw,

eg $\frac{1}{36} \times 2$

A1ft

[3]

Q5.

(a) Fully correct

$$\frac{6}{9}$$

$$\frac{7}{10}$$

$$\frac{3}{9}$$

$$\frac{7}{9}$$

$$\frac{3}{10}$$

$$\frac{2}{9}$$

oe

B2 all pairs of probabilities add to 1 with one right hand side pair correct

or

four correct probabilities in correct positions

B1 two correct probabilities in correct positions

Accept decimals or percentages rounded or truncated to 2 significant figures or better

B3

(b) their $\frac{7}{10}$ × their $\frac{3}{9}$ or

their $\frac{3}{10}$ × their $\frac{7}{9}$ or

$\frac{21}{90}$ or $\frac{7}{30}$ oe

Multiplies along one of the two relevant branches using their probabilities ($0 < p < 1$)

M1

their $\frac{7}{10}$ × their $\frac{3}{9}$ × 2 or

their $\frac{3}{10}$ × their $\frac{7}{9}$ × 2 or

their $\frac{7}{10}$ × their $\frac{3}{9}$ + their $\frac{3}{10}$ × their $\frac{7}{9}$

Doubles their product of a correct branch

or

adds the products of the two relevant branches using their probabilities

M1dep

$$\frac{42}{90} \text{ or } \frac{21}{45} \text{ or } \frac{7}{15} \text{ or}$$

$$0.4\dot{6} \text{ or } 0.47$$

ft their tree diagram if B2 scored in part (a)

oe

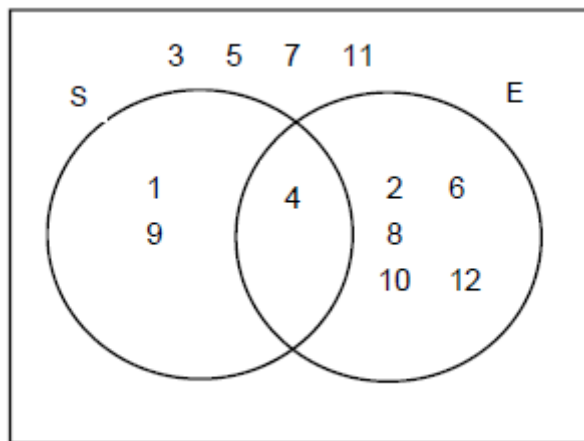
$$\text{SC2 } \frac{21}{50} \text{ oe} \quad \text{SC1 } \frac{21}{100} \text{ oe}$$

A1ft

[6]

Q6.

(a)



B2 Any 2 or 3 of the 4 sections correct

B1 Any 1 of the 4 sections correct

B3

(b) $\frac{1}{12}$

oe

ft their Venn diagram

B1ft

[4]

Q7.

- (a) Midpoints seen or implied
5, 15, 25, 35, 45

B1

their $\sum fx$

This mark is for the sum of their midpoints $\times$ frequencies but condone one error

$$5 \times 5 + 15 \times 22 + 25 \times 28 + 35 \times 21 + 45 \times 4$$

$$\text{or } 25 + 330 + 700 + 735 + 180$$

$$\text{or } 1970$$

$$5 \times 5 = 25$$

$$15 \times 22 = 330$$

$$25 \times 28 = 700$$

$$35 \times 21 = 735$$

$$45 \times 4 = 180$$

M1

their $\sum fx \div 80$

their 1970 $\div 80$

M1dep

24.6(...)

Accept 25 with working shown

A1

(b) $5 + 22 + 28$ or 55

21 + 4 or 25

M1

$$\frac{5+22+28}{80}$$

$$\times 100$$

$$\frac{21+4}{80}$$

$$\times 100$$

M1

68(...)(%) or 69 and No

31.(...)(%) and no

A1

Alternative Method

$5 + 22 + 28$ or 55

21 + 4 or 25

M1

$$\frac{70}{100}$$

$$\times 80 \text{ or } 56$$

$$\frac{30}{100}$$

$$\times 80 \text{ or } 24$$

M1

55 and 56 and No

or 56 is in the 30 – 40 group so No

24 and 25 and No

A1

[7]

Q8.

All four correct combinations **and** scores (in any order)

W	D	L	Score
4	0	0	8
3	1	0	7
3	0	1	6

2	2	0	6
2	1	1	5
1	3	0	5

B2 for any 2 or 3 correct combinations (condone missing or incorrect scores)

B1 for any 1 correct combination (condone missing or incorrect score)

Rows may be in any order

B3

Additional Guidance

Accept blank as zero

Must have correct scores for B3

Beware 2, 1, 0 = 5 (doesn't add up to 4 games)

[3]

Q9.

(a) 0.3 or $\frac{3}{10}$

and

0.7 or $\frac{7}{10}$

1st pair of branches fully correct

B1

0.8 or $\frac{8}{10}$ or $\frac{4}{5}$

2nd and 3rd pairs of branches fully correct

and

0.2 or $\frac{2}{10}$ or $\frac{1}{5}$

B1 for 2nd or 3rd pairs of branches fully correct

B2

(b) 0.3×0.2

or $\frac{3}{10} \times \frac{2}{10}$

or $\frac{3}{10} \times \frac{1}{5}$

or 3×2 or 6 and 10×10 or 100

oe

May be seen in part (a) but must be chosen

M1

0.06

or $\frac{6}{100}$

or $\frac{3}{50}$ or 6%

ft their diagram

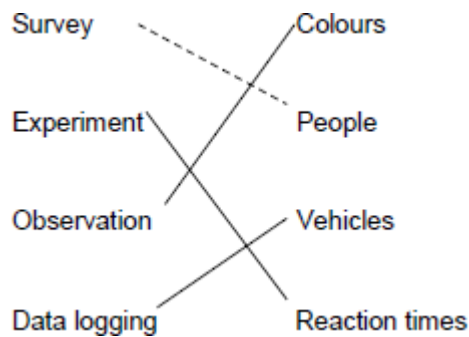
May be seen in part (a) but must be chosen

A1ft

[5]

Q10.

(a)



B1 Any one or two correctly linked

B2

(b) Primary selected **and** Secondary **not** selected

B1

Discrete selected **and** Continuous **not** selected

B1

Additional Guidance

1, 3 B2

1, 4 B1

1, 3, 4 B1

1, 2, 3 B1

2, 3 B1

[4]

Q11.

(a) 40

B1

(b) Circles the outlier (58, 14)

B1

- (c) Links middle graph to strong positive correlation

Links bottom graph to little or no correlation

B1 for each

B2

[4]

Q12.

- (a) Attempt at frequency densities

0.3, 1.8, 1.2, 0.4 at least two with different widths correct

M1

Heights correct

Within class or on boundaries

A1

Widths correct

A1

- (b) $80 \div 2$ or 40th person or $100 \div 2$
Or 50

Accept 40.5 or 50.5

M1

Median for stately home = 60

A1

Median for castle $50 - 48 (= 2)$

Accept 50.5 used in place of 50

M1

$$\frac{2}{24} \times 20$$

Attempt at location of median in 60 to 80 class

M1

Yes, 1.66(6...) over 60

or

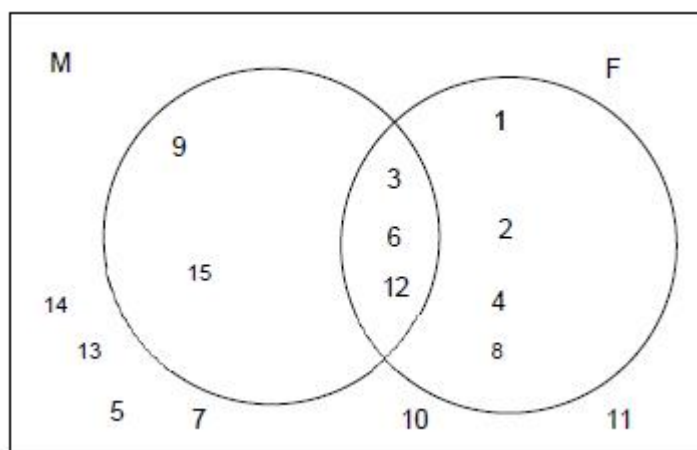
Yes, 61.6 is 2 more than 60

A1ft

[8]

Q13.

ξ



B1 for two correct regions
Condone omission of numbers in $(M \cup F)'$

B2

$$P(\text{Multiple 3 / Factor 24}) = \frac{3}{7}$$

M1

$$P(\text{Factor 24 / Multiple 3}) = \frac{3}{5}$$

M1

$$\frac{3}{7} > \frac{3}{5} \text{ or } 0.6 > 0.4(28\ldots)$$

or

$$P(\text{multiple of 3...}) > P(\text{multiple of 7...})$$

oe

A1

Additional Guidance

If Venn diagram not used, working must be clear

[5]

Q14.

Primary selected **and** Secondary **not** selected

B1

Discrete selected **and** Continuous **not** selected

B1

Additional Guidance

1, 3

B2

1, 4

B1

1, 3, 4

B1

1, 2, 3

B1

2, 3

B1

[3]

Q15.

Alternative method 1

$$64 + x + x + 24 = 360$$

oe

M1

$$2x = 360 - 24 - 64$$

or $x = 136$

M1

their $\frac{136}{360} \times 5220$
oe

M1

1972

A1

Alternative method 2

360 – 64 or 296

M1

$\frac{296 - 24}{2}$ or 136
oe

M1

their $\frac{136}{360} \times 5220$
oe

M1

1972

A1

[4]

Q16.

$\frac{7}{12} \times \frac{6}{11}$ or $\frac{3}{12} \times \frac{2}{11}$
or $\frac{2}{12} \times \frac{1}{11}$
oe

M1

$\frac{7}{12} \times \frac{6}{11}$ and $\frac{3}{12} \times \frac{2}{11}$
and $\frac{2}{12} \times \frac{1}{11}$
oe

This mark implies M1 M1

M1

$$\frac{7}{12} \times \frac{6}{11} + \frac{3}{12} \times \frac{2}{11} + \frac{2}{12} \times \frac{1}{11}$$

M1

$$\frac{25}{66} \text{ or } \frac{50}{132}$$

oe fraction

Accept 0.37(8...) or 0.38

A1

[4]

Q17.

- (a) All four points plotted correctly
(275, 125), (150, 190), (125, 225), (180, 175)

B1 for two or three correct plots

B2

- (b) Appropriate line of best fit

A straight line at least 4 squares wide which goes through, or would go through, the two gates (125, 175 – 225) and (275, 75 – 125)

B1

- (c) Correct reading from their graph

ft their negative, straight line of best fit

If B0 awarded in (b), accept answer in range [145, 150]

B1ft

Additional Guidance

Allow $\pm\frac{1}{2}$ square tolerance but condone rounding up to the next 5 or down to the previous 5

[4]

Q18.

- (a) 0.54

oe

B1

- (b) 0.9 and $1 - 0.2$ or 0.8

or

$1 - 0.9$ or 0.1 and 0.7

Pairs must be linked

eg on a tree diagram

M1

$0.9 \times (1 - 0.2)$ or 0.72

or

$(1 - 0.9) \times 0.7$ or 0.07

May be seen on a tree diagram

M1

$0.9 \times (1 - 0.2)$ or 0.72

and

$(1 - 0.9) \times 0.7$ or 0.07

May be seen on a tree diagram

M1

0.79

oe

A1

[5]

Q19.

11 chosen with no other number less than 11 chosen

B1

4×10 or 40

M1

23

SC1 for 2 numbers with a total of 34

A1

[3]

Q20.

(Median =) $\frac{2x+6x}{2}$

or $4x (= 12)$ seen

oe

M1

$x = 3$

oe

A1

3, 6, 18 and 33 seen

or their $3 + 2(\text{their } 3) + 6(\text{their } 3) + 11(\text{their } 3)$

or their 3, 6, 18 and 33 seen

or (Mean =) $\frac{x+2x+6x+11x}{4}$

Allow one error

M1

$\frac{3+6+18+33}{4}$ or $\frac{20x}{4}$ or $5x$

or their $5x$

or $(\text{their } 3 + 2(\text{their } 3) + 6(\text{their } 3) + 11(\text{their } 3)) \div 4$

M1dep

15

ft $5 \times \text{their } x \text{ value}$

A1ft

[5]

Q21.

(a) Plotted at mid class intervals

$\pm \frac{1}{2} sq$

B1

Heights correct and joined with straight line

Ignore ends

$\pm \frac{1}{2} sq$

SC1 for one point omitted but all the rest fully correct

B1

- (b) Two valid comparisons about average, spread, distribution of ages.

Examples

using means ($m = 46.5$, $f = 43.4$) suggests male older

using median (male 47.6, female 46.5) suggests male older

on average the female club members were older (female mode 50-60, male mode 40-50)

there is a wider age range/more variation in age for the male club members

the oldest male is older than the oldest female/males have some over 60 but females don't/only the males go over 60

both distributions have more older members/both distributions have fewer younger members

the number of male members decline from about 50 whereas for females the number keeps on increasing

B2

[4]

Q22.

Indication that they need to swap 20p and 10p

B1

$$\frac{1}{5} \text{ or } \frac{2}{4}$$

oe

M1

$$\frac{1}{5} \times \frac{2}{4}$$

oe Condone $\frac{1}{5} \times \frac{2}{3}$

M1 dep

$$\frac{2}{20}$$

oe eg $\frac{1}{10}$

SC3 $\frac{2}{15}$ oe

A1

[4]

Q23.

360 – 50 or 310(°)

Allow [86, 86.2](%) or [0.86, 0.862]

M1

15074 × 13.7 or [206 513, 206 514]

oe

M1

their $310 \div 360 \times$ their 206 513. ... or

their $86 \div 100 \times$ their 206 513. ...

oe

dep on second M

M1dep

[177 571, 178 025]

*May be implied by correct method and 177 000 or
178 000 or 180 000*

A1

180 000

ft any answer > 2sf correctly rounded

B1ft

Alternative method 1

$360 - 50$ or $310(^{\circ})$

Allow [86, 86.2](%) or [0.86, 0.862]

M1

their $310 \div 360 \times 13.7$ or

their $86 \div 100 \times 13.7$ or

[11.78, 11.81]

oe

M1

$15074 \times$ their [11.78, 11.81]

oe

dep on second M

M1dep

[177 571, 178 025]

*May be implied by correct method and 177 000 or
178 000 or 180 000*

A1

180 000

ft any answer > 2sf correctly rounded

B1ft

Alternative method 2

$360 - 50$ or $310(^{\circ})$

Allow [86, 86.2](%) or [0.86, 0.862]

M1

their $310 \div 360 \times 15074$ or

their $86 \div 100 \times 15074$ or

12980. ... or [12 963, 12 994]

M1

$13.7 \times$ their 12 980. ...

M1dep

[177 571, 178 025]

*May be implied by correct method and 177 000 or
178 000 or 180 000*

A1

180 000

ft any answer > 2sf correctly rounded

B1ft

Alternative method 3

15074×13.7 or [206 513, 206 514]

M1

$50 \div 360 \times \text{their } 206\,513. \dots$ or

28 682. ... or [28 498, 28 912]

oe

Condone [0.138, 0.14] for $50 \div 360$

M1

their 206 513.8 – their 28 682. ...

oe

M1dep

[177 571, 178 025]

*May be implied by correct method and 177 000 or
178 000 or 180 000*

A1

180 000

ft any answer > 2sf correctly rounded

B1ft

Alternative method 4

15074×13.7 or [206 513, 206 514]

M1

$50 \div 360 \times 13.7$ or [1.89, 1.92]

oe

Condone [0.138, 0.14] for $50 \div 360$

M1

their 206 513.8 – $15\,074 \times \text{their } 1.9\dots$

oe

M1dep

[177 571, 178 025]

*May be implied by correct method and 177 000 or
178 000 or 180 000*

A1

180 000

ft any answer > 2sf correctly rounded

B1ft

Alternative method 5

$$15074 \times 13.7 \quad \text{or} \quad [206\,513, 206\,514]$$

M1

$$50 \div 360 \times 15074 \quad \text{or}$$

$$2093. \dots \quad \text{or} \quad [2080, 2110.4]$$

oe

Condone [0.138, 0.14] for $50 \div 360$

M1

$$\text{their } 206\,513.8 - 13.7 \times \text{their } 2093. \dots$$

oe

M1dep

$$[177\,571, 178\,025]$$

May be implied by correct method and 177 000 or 178 000 or 180 000

A1

$$180\,000$$

ft any answer > 2sf correctly rounded

B1ft

[5]

Q24.

(a) $2520 \div 126 \quad \text{or} \quad 20 \quad \text{or}$

$$126 \div 2520 \quad \text{or} \quad 0.05$$

oe

M1

$$44 \times \text{their } 20 \quad \text{or} \quad 44 \div \text{their } 0.05 \quad \text{or}$$

$$4960 \div \text{their } 20 \quad \text{or} \quad 4960 \times \text{their } 0.05$$

$$\text{or } 880 \quad \text{or} \quad 248$$

oe

M2 $44 \div 126 \times 2520 \quad \text{or}$
 $4960 \div 2520 \times 126$

M1dep

2520	880	1560	4960
126	44	78	248

A1

(b) (minimum) 3785

B1

(maximum) 3794

SC1 *correct answers interchanged*

B1

[5]

Q25.

$$100 \div 20 \quad \text{or} \quad 5$$

or $150 \div 15$ or 10
 or $90 \div 10$ or 9
 or $60 \div 25$ or 2.4

oe

May be implied from the diagram

M1

5 and 10 and 9 and 2.4

Allow one error

May be implied from the diagram

A1

At least one fully correct bar

tolerance $\pm \frac{1}{2}$ square

B1

Fully correct histogram with correct bar heights

tolerance $\pm \frac{1}{2}$ square

B1

[4]

Q26.

(a)

	✓
	✓

B1

(b) 101×65 or 6565 or

64×75 or 4800 or

25×85 or 2125 or

10×95 or 950 or 14 440

Attempt at $\bar{f}x$ using one correct midpoint

3610 implies M1M0A0

M1

(their 6565 + their 4800 + their 2125 + their 950) $\div$ 200

Condone missing brackets eg 13494.75 implies M1M1A0

M1dep

72.2

SC2 77.2 or 67.2

Accept 70 or 72 with fully correct working

A1

(c)

	101

	66
	29
	14

*B1 all frequencies correct
or
all tallies correct
or
two rows correct*

B2

(d) frequency polygon and histogram

B1

[7]

Q27.

(a) **Alternative method 1**

$$4 + 9 + [1, 12] \text{ or } [14, 25]$$

or

$$\frac{5}{15} \times 24 \text{ or } 8$$

M1

$$8400 \times \frac{21}{50} \text{ or } 3528$$

oe

M1dep

$$211\,680$$

A1

Alternative method 2

$$\frac{8400}{50} \times 4 \text{ or } 672$$

and

$$\frac{8400}{50} \times 9 \text{ or } 1512$$

and

$$\frac{8400}{50} \times [1, 12] \text{ or } [168, 2016]$$

M1

$$\frac{8400}{50} \times 4 + \frac{8400}{50} \times 9 +$$

$$\frac{8400}{50} \times \frac{5}{15} \times 24$$

or 3528

oe

M1dep

- (b) Any appropriate explanation

eg1 this is only a sample

eg2 it may not reflect the whole population

eg3 it may be different on another day

eg4 it may be different at another time

B1

[4]

Q28.

- (a) $15 < x \leq 25$

B1

- (b) Mid values seen

10, 20, 30, 40 and 50

or 10.005, 20.005, 30.005, 40.005, 50.005

or 10.01, 20.01, 30.01, 40.01, 50.01

B1

$$10 \times 14 (+) 20 \times 12 (+) 30 \times 11$$

$$(+ 40 \times 2 (+) 50 (\times 1)$$

$$\text{or } 140 (+) 240 (+) 330 (+) 80 (+) 50$$

$$\text{or } 840$$

Accept use of mid values 10.005, 20.005

etc or 10.01, 20.01 etc

Allow one error

eg one mid value incorrect

or one calculation incorrect

M1

$$\text{their } 840 \div 40$$

M1dep

$$21 \text{ or } 21.01$$

Accept 21.005

SC2 for 16 or 16.005 or 16.01

or 21.5(0) or 21.505 or 21.51

or 26 or 26.005 or 26.01

or 791.25

A1

Additional Guidance

21 and then states answer is in $15 < x \leq 25$ class is fw and can be ignored

4 marks

$$140 + 240 + 330 + 80 + 50 \div 40 = 21 \text{ (recovered)}$$

4 marks

$$\frac{140 + 240 + 330 + 80 + 50}{40} = 791.25$$

B1M1M1A0

$$140 + 240 + 330 + 80 + 50 \div 40 = 791.25$$

B1M1

Answer 791.25 implies at least B1M1
840

B1M1

$$840 \div 5 = 168$$

B1M1M0

140, 240, 330, 80, 50

B1M1

168 with no working

M0

Note: Two or more midpoints incorrect

B0M0

[5]

Q29.

$2 \times 14 + 10 \times 15 + 2 \times 16 + 3 \times 17 + 13 \times 18$
or $28 + 150 + 32 + 51 + 234$
or 495

Allow one error or omission

M1

$$(2 \times 14 + 10 \times 15 + 2 \times 16 + 3 \times 17 + 13 \times 18) \div 30 \text{ or } 16.5$$

Condone bracket error

M1dep

14

Full method required

A1

[3]

Q30.

16×2 or 32 or
 $7 \times x$ or $7x$ or
 20×12 or 240 or
 10×17 or 170 or
 $16 + x + 20 + 10$ or $46 + x$
oe

M1

$$16 \times 2 + 7 \times x + 20 \times 12 + 10 \times 17$$

or

$$16 \times 2 + 7x + 240 + 170 \text{ or } 442 + 7x$$

oe

Must be the sum of 4 products

Award if correct expression seen, even if in an incorrect equation

M1

$$\text{their } (32 + 7x + 240 + 170) =$$

$$8.5 \times \text{their } (16 + x + 20 + 10)$$

or

$$\text{their } (442 + 7x) =$$

$$8.5 \times \text{their } (46 + x)$$

oe equation

ft their sum of at least 3 products, one of which must be $7 \times x$

ft sum of at least 3 frequencies, one of which must be x

M1

their $442 - \text{their } (8.5 \times 46) =$
 $8.5x - 7x$

oe equation
dep on 3rd M1
Expands and rearranges their equation
Allow one sign or expansion error

M1dep

34

Answer 34 with no incorrect working gains 5 marks

A1

[5]

Q31.

(a) Valid reason

eg Broken axis
Scale not continuous from zero
Heights of bars not in correct proportion

B1

(b) **Alternative method 1**

10×40 or 400
or 10×25 or 250
or 20×20 or 400
or 5×10 or 50

M1

$400 + 250 + 400 + 50$ or 1100

Allow one error

M1dep

their $400 + \text{their } 250 + \frac{1}{4} \times \text{their } 400$
or 750

M1

their $750 \div \text{their } 1100 (\times 100)$

M1dep

68.(...)

A1

Alternative method 2

16 or 10 or 4 or 12 or 2

M1

$16 + 10 + 4 (+ 12 + 2)$

Allow one error

M1dep

30 or 44

M1

(their 30/their 44) $\times$ 100

M1dep

68.(...)

A1

[6]

Q32.

Comment comparing mean

eg On average treated plants are taller

B1

Comment comparing IQR

eg Less variation in treated plants

Treated plants more consistent (height)

B1

[2]