Topic Test: OxfordAQA International GCSE Mathematics Extension

Statistics

Name: _____

Class: _____

Date: _____

Time: **79 minutes**

Marks: **72 marks**

Comments:

1 Each of these items of data is qualitative, discrete or continuous.

Tick the correct box for each item.

	Qualitative	Discrete	Continuous
Height of a tree	☐	☐	☐
Colour of a flower	☐	☐	☐
Number of sweets in a bag	☐	☐	☐
Favourite sport	☐	☐	☐

(Total 3 marks)

2 The table shows the number of hours Sarah works each week for 26 weeks.

Number of hours, h	Frequency
$0 \leq h < 2$	3
$2 \leq h < 4$	4
$4 \leq h < 6$	9
$6 \leq h < 8$	6
$8 \leq h < 12$	4

(a) Work out an estimate of the mean number of hours.

Answer _____ hours

(3)

(b) Give a reason why your answer to part (a) is an estimate.

_____

_____

(1)

(Total 4 marks)

3 Aasim played in 19 basketball matches.

The stem-and-leaf diagram shows the number of points he scored in each match.

Key: 2 | 6 represents 26 points

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

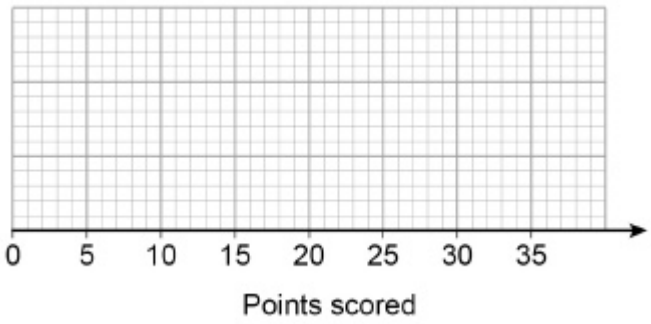
Draw a box plot to represent the data.

_____

_____

_____

_____



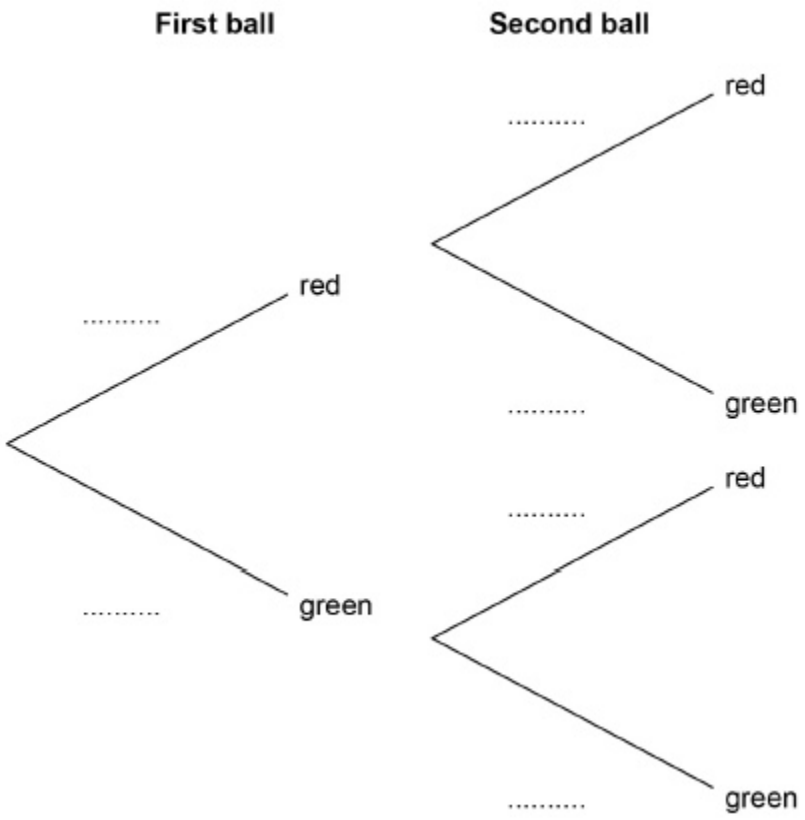
(Total 4 marks)

4 In a bag there are 80 balls.

50 are red and 30 are green.

Two balls are taken at random.

(a) Complete the tree diagram.



(3)

(b) Work out the probability that both balls are red.

Answer _____

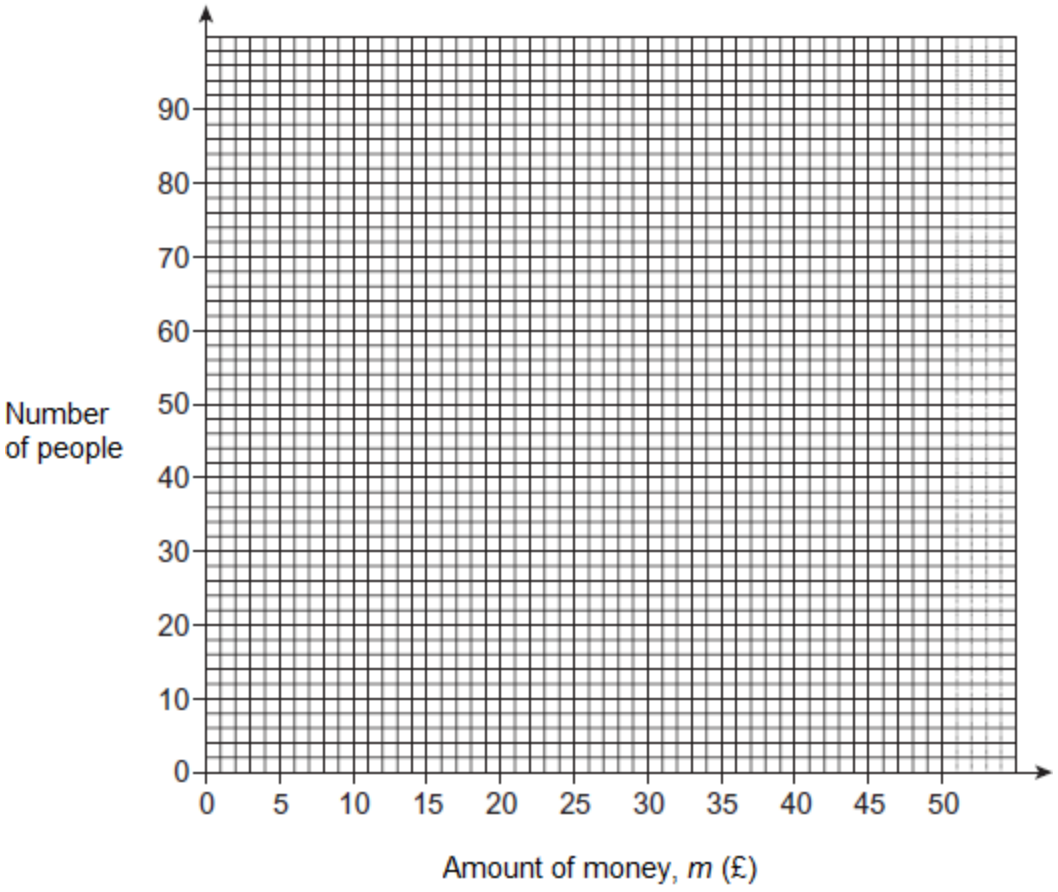
(2)

(Total 5 marks)

5 The table shows information about the amount of money people spent at a market.

Amount of money, m (£)	Number of people
$0 < m \leq 10$	40
$10 < m \leq 20$	70
$20 < m \leq 30$	86
$30 < m \leq 40$	78
$50 < m \leq 50$	54

Draw a frequency polygon to show this information.



(Total 2 marks)

6 Five **whole** numbers are written in order.

4 7 x y 11

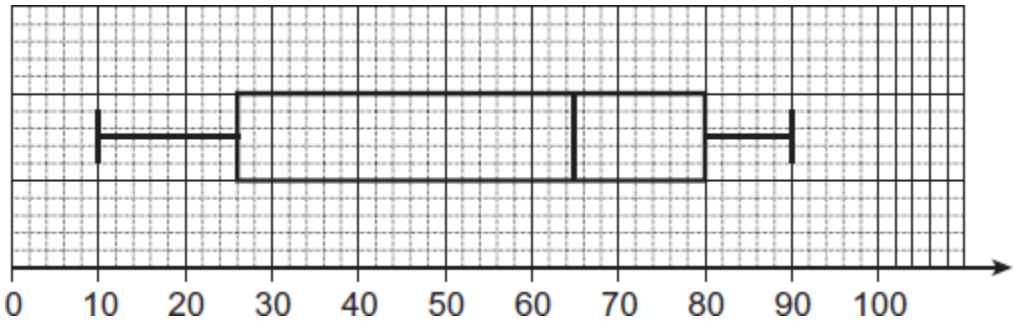
The mean and median of the five numbers are the same.

Work out the values of x and y.

$x =$ _____ $y =$ _____

(Total 3 marks)

7 The diagram shows a box plot.



(a) Write down the median.

Answer _____

(1)

(b) Work out the interquartile range.

Answer _____

(1)

(Total 2 marks)

8 One day, 800 people were asked how they travelled to work.

The relative frequency that a person cycled to work was 0.18

How many people did **not** cycle to work?

_____

_____

Answer _____

(Total 2 marks)

9 A factory makes batteries.

One week, batteries are tested in five batches of 500

The table shows some information about the batteries tested that week.

Total number of batteries tested	500	1000	1500	2000	2500
Relative frequency of faulty batteries			0.018	0.017	0.016

(a) 7 of the first 500 batteries were faulty.

12 of the next 500 batteries were faulty.

Complete the table.

_____

_____

_____

(2)

(b) Next week, the factory will make 60 000 batteries.

Work out the best estimate of the number that will be faulty.

_____

_____

_____

Answer _____

(2)

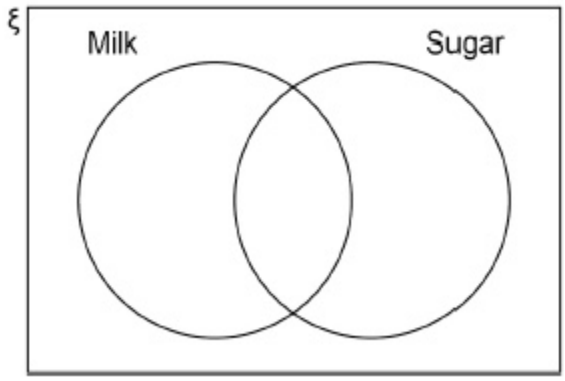
(Total 4 marks)

10 50 people are drinking coffee.

31 have milk.

28 have sugar.

19 have milk but no sugar.



One person is chosen at random.

Work out the probability that the person has **no** milk and **no** sugar.

You may use the Venn diagram to help you.

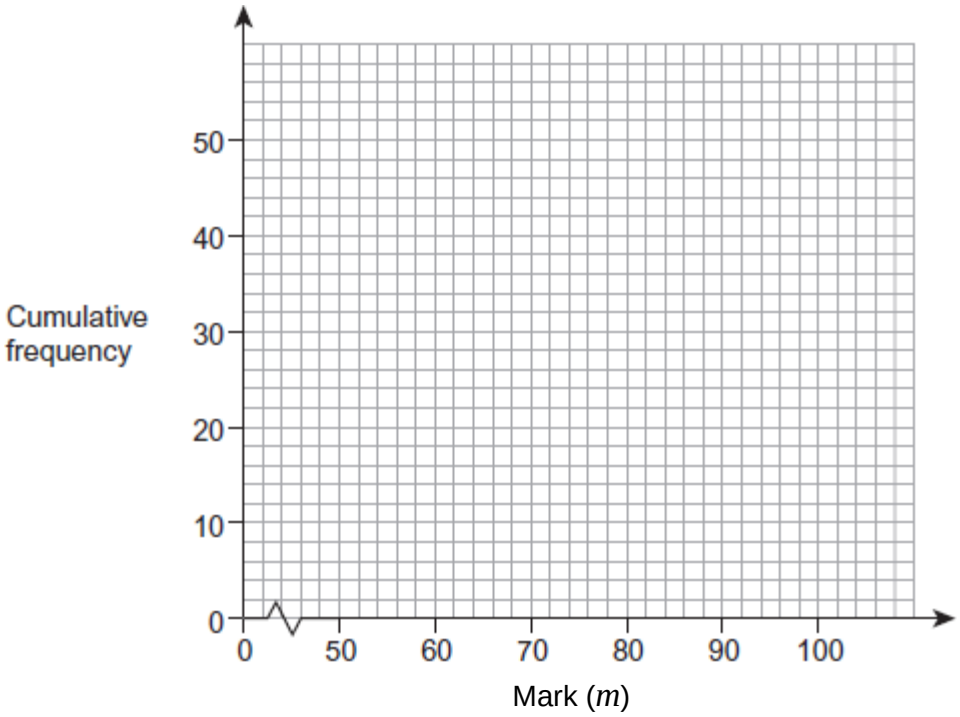
Answer _____

(Total 3 marks)

11 The table shows the marks of 50 students in a test.

Mark (m)	Number of students	
$50 < m \leq 60$	2	
$60 < m \leq 70$	3	
$70 < m \leq 80$	20	
$80 < m \leq 90$	16	
$90 < m \leq 100$	9	

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



(3)

(b) Students who scored between 72 and 85 marks are chosen for extra lessons.

Estimate the number of students chosen.

Answer _____

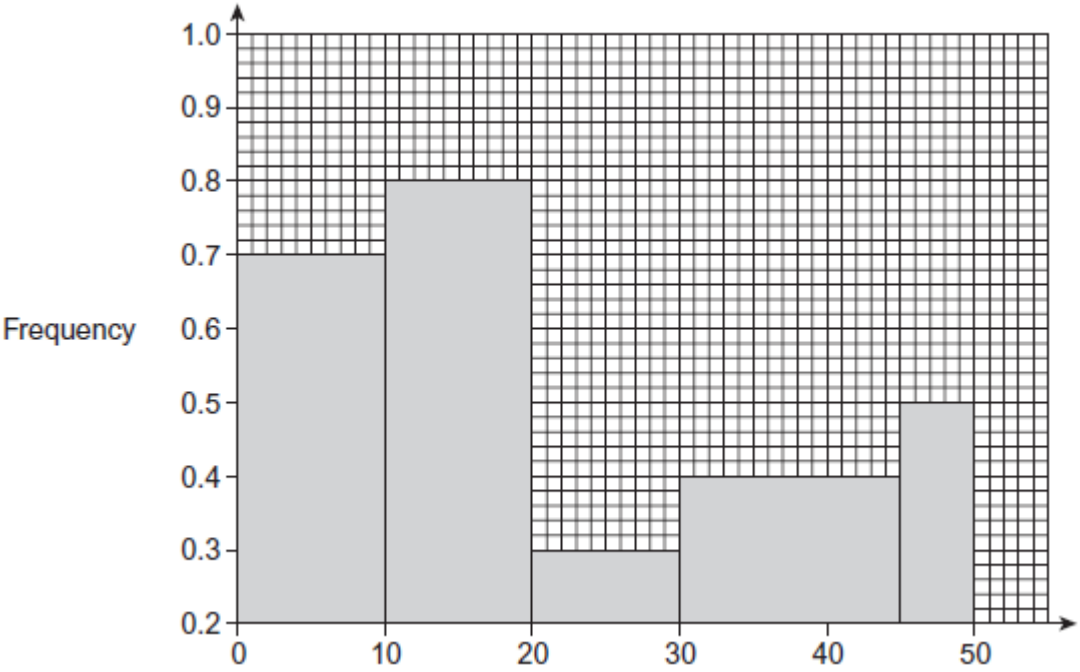
(3)

(Total 6 marks)

12 Jon uses this data about the heights of plants (h) to draw the histogram below.

Height, h (cm)	$0 < h \leq 10$	$10 < h \leq 20$	$20 < h \leq 30$	$30 < h \leq 45$	$45 < h \leq 50$
Frequency	7	8	3	6	5

Heights of plants



Write down **three different** types of mistake that he has made.

Mistake 1 _____

Mistake 2 _____

Mistake 3 _____

(Total 3 marks)

13 A drawer contains six socks.

Four are red and two are green.

Two socks are taken at random without replacement.

Work out the probability that the socks are the **same** colour.

Answer _____

(Total 4 marks)

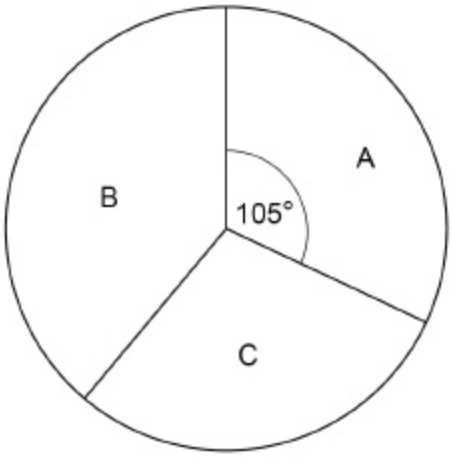
14 In a survey, people chose A, B or C.

420 people chose A.

number who chose B : number who chose C = 3 : 2

Not drawn accurately

Survey results



Work out the number of people who chose B.

Answer _____

(Total 5 marks)

15 Ten different names are put into a computer.
One of the names is Jaspal.

(a) On Monday, the computer chooses two names at random.
The computer is set so that the same name **can** be chosen twice.

Show that the probability that Jaspal is chosen at least once is $\frac{19}{100}$

(3)

(b) On Tuesday, the computer chooses two names at random.
The computer is set so that the same name **cannot** be chosen twice.

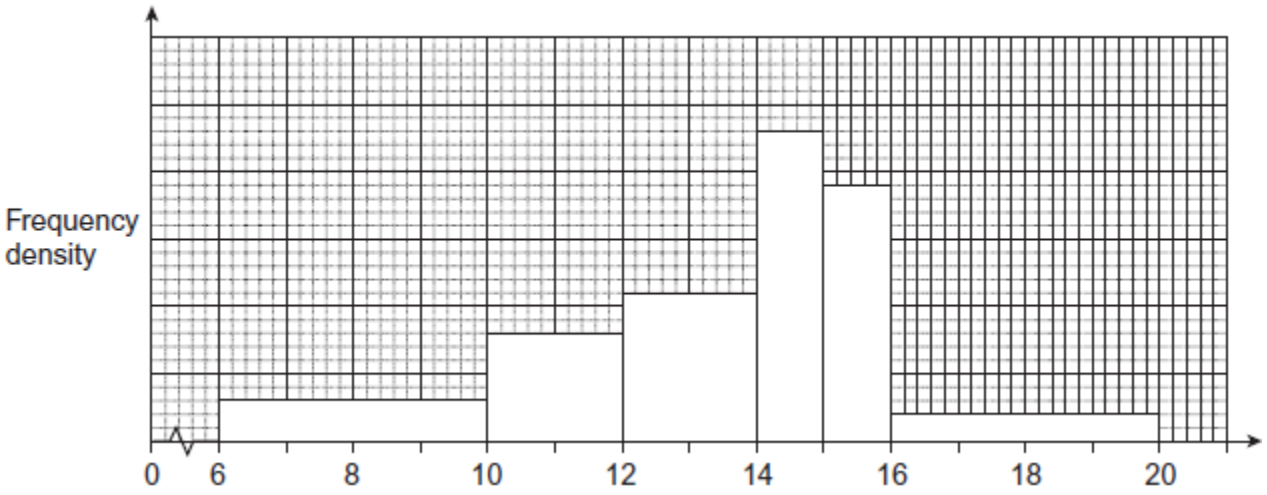
Work out the probability that Jaspal is chosen now.

Answer _____

(3)

(Total 6 marks)

16 The histogram represents the birth masses of 500 mice.



Work out the number of mice with birth masses below 10 grams.

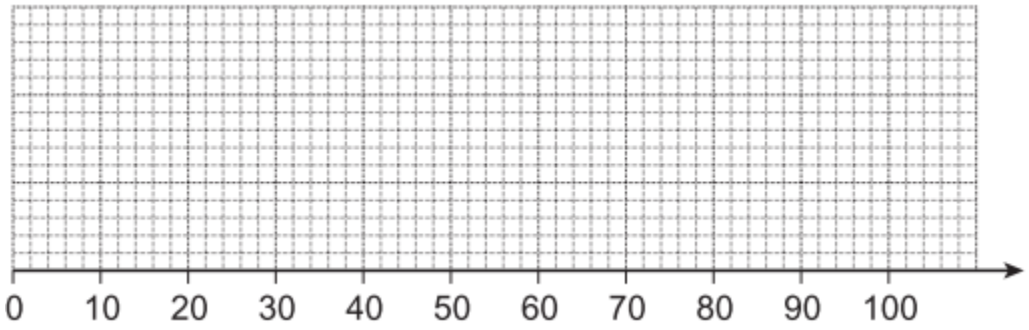
Answer _____

(Total 4 marks)

17 (a) Here is some information about the points scored in a quiz.

Minimum	Lower quartile	Median	Upper quartile	Maximum
15	20	50	80	90

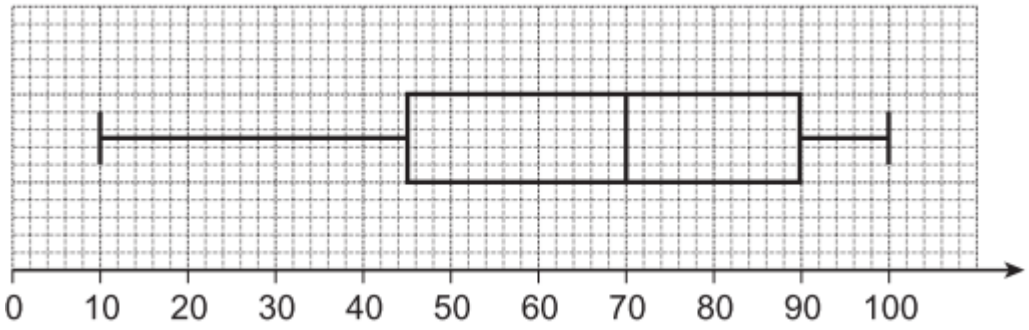
Show this information on a box plot.



Points scored

(2)

(b) This box plot represents the marks gained by students in an exam.



Marks

Nobody gained exactly 45, 70 or 90 marks.
120 students gained **less than** 90 marks.

How many students gained **more than** 70 marks?

Answer _____

(3)

(Total 5 marks)

18 Robin is firing arrows at a target.

The probability that he hits the target on his x^{th} attempt is $\frac{x+2}{x+3}$

For example Probability (hit on his 5^{th} attempt) = $\frac{7}{8}$

(a) Work out the probability that he hits the target with both his 1^{st} and 2^{nd} attempts.

Answer _____

(3)

(b) Work out the probability that he hits the target **exactly** once on his first two attempts.

Answer _____

(4)

(Total 7 marks)

Mark schemes

1

Continuous

Qualitative

Discrete

Qualitative

B2 3 correct rows
B1 2 correct rows

B3

[3]

2

(a) (1 × 3) + (3 × 4) + (5 × 9) + (7 × 6) + (10 × 4)

or 3 + 12 + 45 + 42 + 40

or 142

allow one error

M1

their 142 ÷ (3 + 4 + 9 + 6 + 4)

M1dep

5.46(…) or 5.5 or 5h 28 mins or 5h 30mins

allow 5 with correct method seen

A1

(b) Suitable reason
e.g.
Raw data not known

Midpoints used to represent class

Data is/are grouped not individual values

B1

[4]

3

Median at 19

B1

LQ at 12

B1

UQ at 28

B1

Min at 3 and max at 35

and

correct shape box including 3 lines for LQ, median and UQ

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

end vertical lines are not required if end points are clear

SC1 Median = 19 or LQ = 12 or UQ = 28 stated

B1

Additional Guidance

e.g. number circled on diagram is not enough for SC1 (must see the value written)

Condone whisker line drawn horizontally through the box, but not along the top or along the bottom of the box

[4]

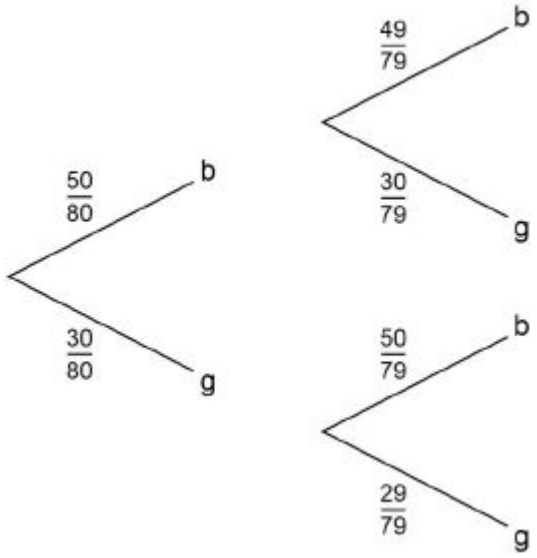
4 (a) Correct probabilities against each branch on first pair of arms

B1

Correct probabilities against each branch on a second pair of arms

B1

Correct probability on each branch



B1

Additional Guidance

Decimals to 2dp or better

Accept equivalent fractions/percentages

(b) $\frac{50}{80}\times\frac{49}{79}$

oe

ft their probabilities from (a) (each probability must be <1)

M1

0.388 or 0.39

or $\frac{245}{632}$ or $\frac{2450}{6320}$

oe

ft their probabilities from (a)

A1ft

Additional Guidance

Ignore incorrect simplification or conversion to a decimal or percentage after correct fraction seen

[5]

5 Plotted at midpoints

± $\frac{1}{2}$ *square*

B1

Correct heights (40, 70, 86, 78, 54) and joined with straight lines

± $\frac{1}{2}$ *square*

SC1 4 out of 5 completely correct points and joined with straight lines

SC1 Correct histogram drawn at heights 40, 70, 86, 78, 54.

B1

[2]

6 8 and 10

B2 for any whole number combination that satisfies the median equal to the mean.
There are an infinite number.
Common ones are
(1, 12), (2, 11), (3, 10), (4, 9), (5, 8), (2, 6), (6, 7), (9, 14), (10, 18), (11, 22)
(11 + n, 22 + 4n), (15, 18), (16, 17), (any pair greater than 11 that total 33).
B1 for any decimal combination that satisfies the median equal to the mean.
There are an infinite number.
Common ones are
(7.5, 8), (8.5,12), (8.5 + n, 12 + 4n).

B3

Alternative Method 1

$22 + x + y = 5x$ *oe*

M1

$4x - y = 22$ *oe*

M1

8 and 10

A1

Alternative Method 2

Chooses values for x and y (which may be the same) where both are between 7 and 11 inclusive and calculates mean correctly or compares total to $5x$.
e.g. 8 and 9 chosen, Mean = 39 ÷ 5 = 7.8 or total = 39 ≠ 40
NB an attempt at another pair of values implies rejection of first pair

M1

Chooses two further values for x and y where both are between 7 and 11 inclusive and calculates mean correctly or compares total to $5x$.
e.g. 9 and 10 chosen, Mean = 41 ÷ 5 = 8.2 or total = 41 > 40

M1

8 and 10

A1

[3]

7 (a) [64, 66]

B1

(b) [53, 55]

B1

[2]

8 800 − 0.18 × 800 or 144

or (1 − 0.18) × 800

or 0.82 × 800

oe

M1

656

A1

[2]

9 (a) 0.014 in the first cell

oe

B1

0.019 in the second cell

oe

B1

(b) 0.016 × 60 000

or 0.017 × 60 000 or 1020

or 0.018 × 60 000 or 1080

or their 0.019 × 60 000 or 1140

or their 0.014 × 60 000 or 840

or their 0.0168 × 60 000

or 1008

oe

allow their mean relative frequency used for M1

M1

960

A1

[4]

10 31 − 19 or 12

12 may be seen in M ∩ S

M1

31 + 28 − their 12 or 47

50 − (31 + 28 − their 12) or 3

47 may be seen as total of their M ∪ S

3 may be seen in M′ ∩ S′

oe

M1dep

$\frac{3}{50}$ or 0.06 or 6%

A1

Additional Guidance

Ignore incorrect cancelling or change of form once correct probability seen

Venn diagram correctly completed with at least 12, 19, 16, 3 will score at least M2

[3]

11 (a) Fully correct cumulative frequency diagram using UCBs and 2, 5, 25, 41, 50

Ignore (50, 0)

Ignore before 1st point and after last point

B2 for one error

eg Consistent plotting at mid class intervals with line joining points

Consistent plotting at lower bounds with line joining points

One error on cumulative frequency values

eg 2, 6, 26, 42, 51

eg 2, 5, 25, 51, 60

Points not joined

B1 for 2, 5, 25, 41, 50

B1 for bar chart indicating correct heights with no lines

B3

(b) **Using correct cumulative frequency graph**

[6, 9] or [31, 34]

Using incorrect cumulative frequency graph

Reading at 72 or reading at 85 ± ½ square tolerance

M1

[6, 9] and [31, 34]

Reading at 72 and reading at 85 ± ½ square tolerance

M1

[22, 28]

ft from their graph readings at 72 and 85

A1ft

Alternative Method

Using the table or dividing up frequency bars

$\frac{4}{5} \times 20$ or 16 or $\frac{1}{2} \times 16$ or 8

M1

$\frac{4}{5} \times 20$ or 16 and $\frac{1}{2} \times 16$ or 8

M1

24

A1

[6]

12 (Vertical scale) does not start at 0

or incorrect height bars

or vertical scale is incorrect

or Area not proportional to frequency

B1

Last bar (should be at height 1)

B1

Label on vertical scale incorrect

e.g. should be frequency density

Any order

B1

[3]

13 $\frac{4}{6}$ and $\frac{3}{5}$ or $\frac{2}{6}$ and $\frac{1}{5}$

oe may be on tree diagram

M1

$\frac{4}{6}\times\frac{3}{5}$ or $\frac{2}{6}\times\frac{1}{5}$

may be on tree diagram

M1

$\frac{4}{6}\times\frac{3}{5}$ and $\frac{2}{6}\times\frac{1}{5}$

M1

$\frac{14}{30}$ or $\frac{7}{15}$ or 0.46 or 0.467

oe

A1

[4]

14 **Alternative method 1**

420 ÷ 105 × 360 or 1440
360 − 105 or 255

oe

M1

their 1440 − 420 or 1020
420 ÷ 105 × their 255 or 1020

oe

M1dep

their 1020 ÷ (3 + 2) or 204

M1dep

their 204 × 3

M1dep

612

SC3 864 SC2 288

A1

Alternative method 2

360 − 105 or 255

M1

their 255 ÷ (3 + 2) or 51

M1dep

their 51 × 3 or 153

M1dep

420 ÷ 105 × their 153

oe

M1dep

612

SC3 864 SC2 288

A1

Alternative method 3

420 ÷ 105 × 360 or 1440

oe

M1

their 1440 − 420 − x or 1020 − x

oe

any letter for the number who chose B

M1dep

$$\frac{x}{\text{their } (1020 - x)} = \frac{3}{2}$$

oe

M1dep

$5x = 3060$

oe forms an equation of the form $ax = b$

M1dep

612

SC3 864 SC2 288

A1

[5]

15 (a) $\frac{1}{10}\times\frac{9}{10}$ or $\frac{9}{10}\times\frac{1}{10}$ or $\frac{1}{10}\times\frac{1}{10}$

oe

M1

$\frac{1}{10}\times\frac{9}{10}+\frac{9}{10}\times\frac{1}{10}+\frac{1}{10}\times\frac{1}{10}$

oe

M1 dep

$\frac{9}{100}+\frac{9}{100}+\frac{1}{100}$ or $\frac{18}{100}+\frac{9}{100}$

oe

A1

Alternative method 1

$\frac{9}{10}\times\frac{9}{10}$

oe

M1

$1-\frac{9}{10}\times\frac{9}{10}$

oe

M1 dep

$1-\frac{81}{100}$

oe

A1

Alternative method 2

Use of sample space diagram

M1

Indication of correct pairs

M1 dep

$\frac{19}{100}$ or 19 out of 100

A1

(b) $\frac{1}{10}\left(\times\frac{9}{9}\right)$ or $\frac{9}{10}\times\frac{1}{9}$

oe

M1

$\frac{1}{10}\left(\times\frac{9}{9}\right)+\frac{9}{10}\times\frac{1}{9}$

oe

M1 dep

$\frac{18}{90}$

oe

A1

Alternative method 1

$\frac{9}{10}\times\frac{8}{9}$

oe

M1

$1-\frac{9}{10}\times\frac{8}{9}$

oe

M1 dep

$\frac{18}{90}$

oe

A1

Alternative method 2

Use of sample space diagram

M1

Indication of correct pairs

M1 dep

$\frac{18}{90}$ or $\frac{9}{45}$

oe

A1

[6]

16 Evidence that any bar area has been calculated eg applying a scale to side and multiplying by width. These should be multiples of 12, 16, 22, 23, 19 and 8 but as 23 and 19 can be read from graph, do not award for these values unless an area calculation seen

***NB** each little square is one mouse but if this is assumed and the total area is not shown to be 500 then only this M1 can be awarded.*

M1

Total area calculated. Sum of above is 100.

***NB** The bars cover 20 'big' squares, so if this is stated this is M1, A1*

A1

Area scaled to 500 or a calculation done such as 12 × 500 ÷ 100

Scale of 25, 50 for 'big' squares as fd.

M1

60

This must come from valid working, so answer of 60 alone or 60 from, say, 3 × 20 is M1.

*ft their first bar total × 500 ÷ their total **and** rounded or truncated to an integer.*

A1ft

Alternative Method

20 'big' squares stated as area of all bars

M1

500 ÷ 20 (= 25)

A1

Their 25 × 2.4

M1

60

A1ft

[4]

17 (a) Correct box drawn and median and quartiles at 20, 50, 80

± $\frac{1}{2}$ *square*

B1

IQR box formed and whiskers correctly joined to 15 and 90

± $\frac{1}{2}$ *square*

B1

(b) 120 is $\frac{3}{4}$ or 40 is $\frac{1}{4}$ seen or implied

May be implied by M1 scored

Condone lower quartile = 40 or $Q_1 = 40$

B1

120 ÷ 3 × 4 (÷ 2) or 160 seen *oe*

or 120 − 40

$\frac{2}{3}$ × *120 or 40 × 2*

M1

80

SC2 median linked with 80 in working

A1

[5]

18 (a) $\frac{3}{4}$ or $\frac{4}{5}$ seen

oe decimal or percentage

M1

$\frac{3}{4} \times \frac{4}{5}$

oe decimal or percentage

M1dep

$\frac{3}{5}$ or $\frac{12}{20}$

oe
0.6 or 60%

A1

(b) $\frac{3}{4} \times \frac{1}{5}$ or $\frac{3}{20}$

Hit then miss

M1

$\frac{1}{4} \times \frac{4}{5}$ or $\frac{4}{20}$ or $\frac{1}{5}$

Miss then hit

M1

$\frac{3}{20} + \frac{4}{20}$

dependent on both previous marks

M1dep

$\frac{7}{20}$

oe
0.35 or 35%

A1

Alternative method

$\frac{1}{4} \times \frac{1}{5}$ or $\frac{1}{20}$

Miss then miss

M1

$\frac{1}{20}$ + their $\frac{12}{20}$

ft from their (a)

M1

$1 - \frac{1}{20}$ – their $\frac{12}{20}$

oe

M1dep

$\frac{7}{20}$

oe

0.35 or 35%

A1

[7]