Mark schemes

Q1.

(a) 27

B1

(b) Comparison 1 on median

eg length are about same as medians are similar.

Greenhouse cucumbers are longer on average / as they have a higher median.

B1

Comparison 2 on interquartile range or range

Greenhouse cucumbers are more consistent as range (or IQR) smaller.

Garden cucumbers are more varied as range (or IQR) larger.

B1

Use of relevant values from both box plots for at least one comment.

eg medians are 1cm different

Medians 28 and their 27

IQR 11 and 15

Range 26 and 33

Greenhouse cucumbers are more consistent with an IQR of 11 compared to 15

B1dep

[3]

Q2.

(a) (6) 22 50 60

cumulative frequency values

may be implied by points plotted

(± 0.5 square)

B1

Points plotted with upper class boundaries and cf values

(± 0.5 square)

ft their cumulative frequencies

must be increasing

B1ft

Smooth curve or polygon

(± 0.5 square)

ft their cumulative frequencies

must be increasing and not a single straight line

B1ft

Additional Guidance

Graphs may start from their first plotted point or from (40, 0)

If the points are plotted at mid-points, with a point at (45, 6), the graph may start at (35, 0) (± 0.5 square)

If the points are plotted at the lower bounds, with a point at (40, 6), the graph may start at (0, 0)

Graph starting at (0, 0), but otherwise correct

B1B1B0

Graph plotted at mid-points or lower class boundaries, but otherwise correct

B1B0B1

Graph ascends or descends after x = 80

B0 for 3rd mark

Bars drawn as well as correct graph

B1B1B0

Bars drawn without correct graph

max B1

(b) One correct mpg reading for their graph from cf of 15(.25) or 45(.75)

or

horizontal lines from 15(.25) and 45(.75) only to their graph

or

15(.25) and 45(.75) indicated as the cf values for the quartiles

± 0.5 square
ft their increasing graph
may be on table

M1

Correct value for their increasing graph

A1ft

[5]

Q3.

0.8 × 10 or 8
or 1.6 × 20 or 32
or 2.2 × 10 or 22
or 2 × 5 or 10

Any one fd × class width

M1

0.8 × 10 + 1.6 × 20 + 2.2 × 10
+ 2 × 5
or 8 + 32 + 22 + 10

oe

M1dep

72

A1

[3]

Q4.

(a) 15 or 16

Reading off at 30

M1

$\frac{45}{60}$ or $\frac{44}{60}$

oe

A1

(b) [69, 70]

B1

(c) No and comparative reason

eg No and median is 19 so lower
No and nobody scored higher than
77 on Quiz 2 but the maximum score
on Quiz 1 was 98
B1 for No and partial reason
eg No someone scored less than 10
No the top score was only 77

B2

Additional Guidance

The range is lower on Quiz 2

B0

[5]

Q5.

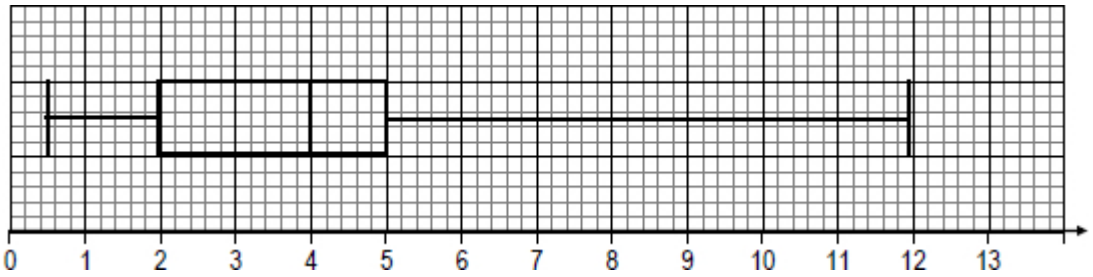
Fully correct box plot
Minimum = 0.5
LQ = 2
Median = 4
UQ = 5
Maximum = 12

B2 for box plot with 3 or 4 correct plots or 1 omission
B1 for at least 3 correct plots

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

B3

Additional Guidance



Any indication of correct plots

Whiskers may be omitted

Not a box plot scores a maximum of B1

½ 2, 3, 4, 12 plotted correctly in a box plot

B2

½, 2, 3, 4, 12 plotted correctly in a box plot with one point out of tolerance

B1

½ 2, 3, 4, 12 not in a box plot

B1

[3]

Q6.

(12) 44 69 80

Cumulative frequencies
May be implied by points plotted

Tolerance ± $\frac{1}{2}$ *square*

B1

Points plotted with upper class boundaries and cf values

ft their cumulative frequencies

Tolerance ± $\frac{1}{2}$ *square*

B1ft

Smooth curve or polygon through all their points

ft their cumulative frequencies
Must be increasing and not a single straight line

Tolerance ± $\frac{1}{2}$ *square*

B1ft

(b) **Alternative method 1**

56 or 72

Reads off a cf value for 50 min or 70 min

Tolerance ± $\frac{1}{2}$ *square*
ft their cumulative frequencies and an increasing graph

M1

15 or 16 or 17

ft their cumulative frequencies and an increasing graph

A1ft

Alternative method 2

$11 \times \frac{10}{30}$ or 3 or 4 or 3.66... or 3.67
or
$25 \times \frac{10}{20}$ or 12 or 13 or 12.5
oe

M1

15 or 16 or 17

A1

[5]

Q7.

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]

Q8.

Cumulative frequency 46 should be 48
oe

B1

Points should be plotted at end of class intervals
oe

B1

[2]

Q9.

(cf values)
8, 56, 100, 110 and 120
Allow one error but no omission
Allow inclusion of 0
May be implied by correct frequencies

M1

(frequencies)
8 (− 0) or 8
and
their 56 − their 8 or 48
and
their 100 − their 56 or 44
and
their 110 − their 100 or 10
and
their 120 − their 110 or 10

ft their cf values

Must have 5 frequencies

M1

(class widths)
20, 20, 40, 40 and 100

All correct

M1

(frequency densities)
0.4 and 2.4 and 1.1 and
0.25 and 0.1

ft their frequencies and their class widths

Must have 5 frequency densities

Must have first and second M1

A1ft

Suitable axes and scaling on grid

ft their frequency densities

B1ft

Bars of correct width and height

Must be fully correct

A1

Additional Guidance

Ignore any polygon drawn with a histogram

[6]

Q10.

28

B1

[1]

Q11.

Alternative method 1

25 × 11 or 275

M1

their 275 ÷ 22 or 12.5

M1dep

15 × 30 ÷ their 12.5

M1

36

A1

Alternative method 2

25 × 11 or 275

M1

15 × 30 ÷ their 275 or [1.6, 1.64]

M1dep

their [1.6, 1.64] × 22

M1

36

A1

Alternative method 3

11 squares
or
275 squares

M1

22 ÷ 11 or 2
or
22 ÷ 275 or 0.08

M1dep

their 2 × 18
or
their 0.08 × 450

M1

36

A1

Alternative method 4

$\frac{15}{25}$ or $\frac{30}{11}$

M1

$\frac{15}{25} \times \frac{30}{11}$ or $\frac{18}{11}$

oe fraction

M1dep

their $\frac{18}{11} \times 22$

M1

36

A1

Alternative method 5

$25 \times h = 22$ or $\frac{22}{25}$ or 0.88

oe

M1

0.88 ÷ 11 or 0.08

oe eg frequency density axis labelled with correct scale

M1dep

their 0.08 × 30 × 15

M1

36

A1

[4 marks]

Q12.

(a) Median at 37

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

B1

Quartiles at 24 and 56

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

B1

Ends at 0 and [107, 108) and correct boxplot presentation

B1

(b) Correct comment about average

eg the median age of the population will go up by 7 years, so average age will rise

B1

Correct comment about spread

eg the inter-quartile range will have increased by 8 years, so ages are more spread out

B1

[5]

Q13.

(a) **Alternative method 1**

30 ÷ 20 or 1.5

May be implied by correct labelling on vertical axis

M1

12 ÷ 15 or 0.8

M1

Draws block for $65 \leq x < 80$ with height 8 small squares

Mark intention

A1

Alternative method 2

12 ÷ (30 ÷ 6) or 12 ÷ 5 or 2.4

M1

their 2.4 ÷ 1.5 or 1.6

M1dep

Draws block for $65 \leq x < 80$ with height 8 small squares

Mark intention

A1

Alternative method 3

12 ÷ (30 ÷ 150) or 12 ÷ 0.2 or 60

M1

their 60 ÷ 7.5 or 8

M1dep

Draws block for $65 \leq x < 80$ with height 8 small squares

Mark intention

A1

Alternative method 4

1.5 × (30 ÷ 6) or 1.5 × 5 or 7.5

M1

12 ÷ their 7.5 or 1.6

M1dep

Draws block for $65 \leq x < 80$ with height 8 small squares

Mark intention

A1

Additional Guidance

Draws block for $65 \leq x < 80$ with height 8 small squares

3 marks

(b) 10 × 4.5 or 9 × 30 ÷ 6
or 225 ÷ (30 ÷ 6) or 45
or
10 × 3.6 or 7.2 × (30 ÷ 6)
or 180 ÷ (30 ÷ 6) or 36
or
25 × 2 or 10 × (30 ÷ 6)
or 250 ÷ (30 ÷ 6) or 50
or
34.6 × 30 ÷ 6
or
865 ÷ (30 ÷ 6)

oe

May be seen on histogram

M1

173

A1

[5]

Q14.

(a) 50

B1

(b) 64

B1

(c) 36

B1

[3]

Q15.

(a) Median at 18

tolerance ± ½ square

B1

LQ at 14

tolerance ± ½ square

B1

UQ at 26

tolerance ± ½ square

B1

Min at 5 and max at 30
and correct shape box including 3 lines for LQ, median and UQ

tolerance ± ½ square
Strand (ii)
End vertical lines are not required if end points are clear
SC1 for
(median =) 18
or (LQ =) 14
or (UQ =) 26

Q1

Additional Guidance

Note, for the SC1 (median =) 18, need to see 18, 8 circled on diagram is not enough, this also applies for the LQ and UQ values

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

(b) More points on average or median is higher.

B1

More consistent or IQR is less.

B1

Additional Guidance

Median
Jack scored more points on average because 21 is bigger than 18

B1

His median score is higher than Rob's

B1

Jack's median is located on a higher score

B1

Jack's average score (median) is higher

B1

He has a higher average amount of points	**B1**
Jack's average score is higher	**B1**
On average Jack scored higher points	**B1**
Jack's average score is higher by 3 points	**B1**
Jack's median score is higher by 3 points	**B1**
Higher median score	**B1**
The median is larger	**B1**
On average Jack scores 21 points a game and Rob scores 18	**B1**
Jack has all round better scores	**B0**
He had a higher midpoint so scored more often than Rob	**B0**
Jack was better	**B0**
Jack is higher	**B0**
Jack's score is higher	**B0**
Jack scores 21 points a game and Rob scores 18	**B0**

IQR

Jack scored more consistently because 12 is more than 8	**B1**
Jack's IQR is smaller so Jack is more CONCISE	**B1**
Jack has a smaller IQR (... than Rob)	**B1**
Jack has a lower IQR	**B1**
Jack's IQR is less spread out than Rob's	**B1**
The spread is less (Assume referring to Jack)	**B1**
Jack's box is smaller so he is more consistent	**B1**
Jack is more consistent	**B1**
His scores are closer together	**B1**
Jack's IQR is higher	**B0**
Jack has a consistent score	**B0**
Jack's range is more consistent	**B0**
Jack's UQ is higher than Rob's	**B0**
Jack's LQ is higher than Rob's	**B0**
Jack's LQ is 18 whilst Rob's is 12	**B0**

Median and IQR in one statement
Jack is higher on average and is more consistent

B1B1

If not explicitly stated assume referring to Jack

Numbers quoted must be correct

Jack's IQR is less spread out and higher than Rob's

Allow B1

Jack has a more consistent higher score

Allow B1

Use of mean or mode for average

B0

Use of range for IQR

B0

[6]

Q16.

(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]

Q17.

(a) Fully correct box plot with

minimum = 65

LQ = 70

median = 80

UQ = 85

maximum = 95

B1 for 3 correct

B2

Additional Guidance

Minimum and maximum values can be marked with a cross or a plus

(b) LQ = 75

Need not be plotted

B1

UQ = 90

Need not be plotted

B1

Minimum = 60 **or** maximum = 100

or median = [75,90]

Need not be plotted

B1

Minimum = 60 **and** maximum = 100 **and** median = [75,90] **and** correct box plot drawn

B1

Additional Guidance

Box plot takes precedence over any written answers

[6]

Q18.

(a) [64, 66]

B1

(b) [53, 55]

B1

[2]