Topic 2 Part 1 *[195 marks]*

1a. *[1 mark]*

Markscheme

43 (mm) *(A1)* *(C1)*

[1 mark]

Examiners report

[N/A]

1b. *[1 mark]*

Markscheme

10 (mm) *(A1)* *(C1)*

[1 mark]

Examiners report

[N/A]

1c. *[2 marks]*

Markscheme

$48 - 20$ *(A1)*

$= 28$ *(A1)* *(C2)*

Note: Award *(A1)* for identifying correct quartiles, *(A1)* for correct subtraction of the quartiles.

[2 marks]

Examiners report

[N/A]

1d. *[2 marks]*

Markscheme

(i)   20 (days) *(A1)*

(ii)   60 (days) *(A1)* *(C2)*

[2 marks]

Examiners report

[N/A]

2a.   *[1 mark]*

Markscheme

3   *(A1)   (C1)*
[1 mark]

Examiners report

[N/A]

2b.   *[2 marks]*

Markscheme

4   *(M1)(A1)   (C2)*

Note: Award *(M1)* for ordered list of numbers seen.

[2 marks]

Examiners report

[N/A]

2c.   *[1 mark]*

Markscheme

5.5   *(A1)   (C1)*
[1 mark]

Examiners report

[N/A]

2d.   *[2 marks]*

Markscheme

5.5 – 3   *(M1)*

Note: Award *(M1)* for 3 and their 5.5 seen.

= 2.5   *(A1)(ft)   (C2)*

Note: Follow through from their answer to part (c).

[2 marks]

Examiners report

[N/A]

3a.   *[1 mark]*

Markscheme

10   *(A1)   (C1)*
[1 mark]

3b.

Markscheme

$s\left(\text{km h}^{-1}\right)$	$0 < s \le 50$	$50 < s \le 70$	$70 < s \le 80$	$80 < s \le 90$	$90 < s \le 100$
Frequency	10	20	34	12	4

(A1)(ft)   *(C1)*

Note: Follow through from their answer to part (a).

[1 mark]

3c.

Markscheme

60   *(A1)*   *(C1)*

[1 mark]

3d.

Markscheme

(i)

$67.5 \left(\text{km h}^{-1}\right)$ *(A2)*(ft)

Notes: Award *(M1)* for an attempt to use the formula for the mean with at least two midpoint values consistent with their answer to part (c). Follow through from their table in part (b).

(ii)

$18.6 (18.6413\ldots)$ *(A1)*(ft)   *(C3)*

Note: Follow through from their table in part (b).

[3 marks]

4a. *[3 marks]*

4b. *[1 mark]*

4c. *[2 marks]*

5a. *[1 mark]*

5b. *[2 marks]*

5c.

Markscheme

(i) $\dfrac{1\times4+2\times7+3\times12\dots}{60}$ *(M1)*

Notes: Award *(M1)* for an attempt to substitute into the "mean of a set of data" formula, **with at least three correct terms** in the numerator.

Denominator must be 60.

Follow through from part (b)(i), only if work is seen.

$= 4.03\,(4.03333\dots)$ *(A1)*

Notes: Award at most *(M1)(A0)* for an answer of 4 but only if working seen.

(ii) $1.54\,(1.53803\dots)$ *(A1)*   *(C3)*

Examiners report

[N/A]

6a.

Markscheme

$2\ \ 3\ \ 3\ \ 4\ \ 4\ \ 5\ \ 5\ \ 5\ \ 6\ \ 7$ *(M1)*

Note: Award *(M1)* for correct ordered set.

$(\text{Median} =)\ 4.5$ *(A1)*   *(C2)*

Examiners report

Part (a) was generally well done although some candidates seemed to be confused between the mean and median.

6b.

Markscheme

$5 - 3$ *(M1)*

Note: Award *(M1)* for correct quartiles seen.

$= 2$ *(A1)*   *(C2)*

Examiners report

In part (b) it was not unusual to see an upper quartile of 5.5 (resulting from (5+6)/2).

6c.

$\dfrac{7}{10}$ $(0.7,\ 70\%)$

7a.   *[1 mark]*

Markscheme

4   *(A1)(C1)*

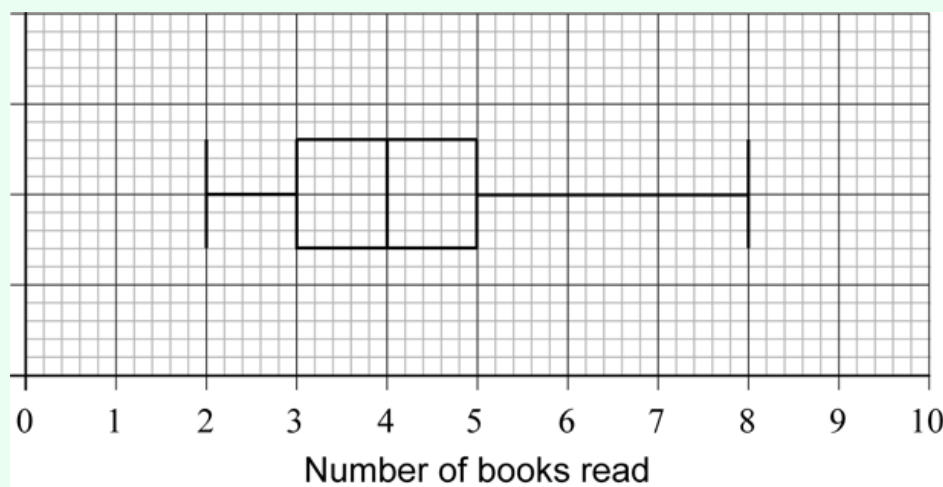7b.   *[3 marks]*

Markscheme

(A1)(ft)(A1)(A1)   *(C3)*

Notes: Award *(A1)(ft)* for correct median, *(A1)* for correct quartiles and box, *(A1)* for endpoints 2 and 8 joined by a straight line that does not cross the box. Follow through from their median from part (a).

7c.   *[2 marks]*

Markscheme

40×0.25 *(M1)*

Notes: Award *(M1)* for $40 \times 25\%$ **OR** $40 - 40 \times 75\%$.

10   *(A1)*   *(C2)*

8a. *[1 mark]*

Markscheme

$10 \, (\mathrm{km \, h^{-1}})$ *(A1)*

Examiners report

For the great majority, this was a straightforward and accessible question. There were many, however, who had no appreciation of medians, percentiles and quartiles – all straightforward concepts. Most were able to read from the graph, using correctly the scales; only the weakest misinterpreting these. Calculation of the mean and standard deviation are expected to be completed using the graphic display calculator (GDC) – formulae are no longer required and the covariance will **not** be given in questions. Many candidates, however, were unable to calculate the mean and standard deviation of a (grouped) frequency distribution, instead treating the data as raw; comments on the G2 forms from schools indicated that some teachers were also unable to do this and advice must be sought.

8b. *[2 marks]*

Markscheme

36 *(G2)*

Examiners report

For the great majority, this was a straightforward and accessible question. There were many, however, who had no appreciation of medians, percentiles and quartiles – all straightforward concepts. Most were able to read from the graph, using correctly the scales; only the weakest misinterpreting these. Calculation of the mean and standard deviation are expected to be completed using the graphic display calculator (GDC) – formulae are no longer required and the covariance will **not** be given in questions. Many candidates, however, were unable to calculate the mean and standard deviation of a (grouped) frequency distribution, instead treating the data as raw; comments on the G2 forms from schools indicated that some teachers were also unable to do this and advice must be sought.

8c. *[1 mark]*

Markscheme

41.5 *(G1)*

Examiners report

For the great majority, this was a straightforward and accessible question. There were many, however, who had no appreciation of medians, percentiles and quartiles – all straightforward concepts. Most were able to read from the graph, using correctly the scales; only the weakest misinterpreting these. Calculation of the mean and standard deviation are expected to be completed using the graphic display calculator (GDC) – formulae are no longer required and the covariance will **not** be given in questions. Many candidates, however, were unable to calculate the mean and standard deviation of a (grouped) frequency distribution, instead treating the data as raw; comments on the G2 forms from schools indicated that some teachers were also unable to do this and advice must be sought.

8d. *[2 marks]*

Markscheme

$41.5 - 32.5$ *(M1)*

$= 9 \, (\pm 1)$ *(A1)(ft)(G2)*

Notes: Award *(M1)* for quartiles seen. Follow through from part (c).

8e. *[2 marks]*

Markscheme

$120 - 110$ **(M1)**

$= 10$ **(A1)(G2)**

Note: Award **(M1)** for 110 seen.

8f. *[2 marks]*

Markscheme

$p = 4$ $q = 10$ **(A1)(ft)(A1)(ft)**

Note: Follow through from part (e).

8g. *[2 marks]*

Markscheme

(i) $30 < s \leqslant 40$ **(A1)**

(ii)
35 **(A1)(ft)**

Note: Follow through from part (g)(i).

8h.   [3 marks]

Markscheme

(i) $36.8 \, (\text{km}\,\text{h}^{-1}) \; (36.8333)$ **(G2)(ft)**

Notes: Follow through from part (f).

(ii) $8.85 \; (8.84904\ldots)$ **(G1)(ft)**

Note: Follow through from part (f), irrespective of working seen.

Examiners report

For the great majority, this was a straightforward and accessible question. There were many, however, who had no appreciation of medians, percentiles and quartiles – all straightforward concepts. Most were able to read from the graph, using correctly the scales; only the weakest misinterpreting these. Calculation of the mean and standard deviation are expected to be completed using the graphic display calculator (GDC) – formulae are no longer required and the covariance will **not** be given in questions. Many candidates, however, were unable to calculate the mean and standard deviation of a (grouped) frequency distribution, instead treating the data as raw; comments on the G2 forms from schools indicated that some teachers were also unable to do this and advice must be sought.

8i.   [2 marks]

Markscheme

$\frac{26}{120} \times 100$ **(M1)**

Note: Award **(M1)** for $\frac{26}{120} \times 100$ seen.

$= 21.7 \, (\%) \; \left(21.6666\ldots, \; 21\frac{2}{3}, \; \frac{65}{3}\right)$ **(A1)(G2)**

Examiners report

For the great majority, this was a straightforward and accessible question. There were many, however, who had no appreciation of medians, percentiles and quartiles – all straightforward concepts. Most were able to read from the graph, using correctly the scales; only the weakest misinterpreting these. Calculation of the mean and standard deviation are expected to be completed using the graphic display calculator (GDC) – formulae are no longer required and the covariance will **not** be given in questions. Many candidates, however, were unable to calculate the mean and standard deviation of a (grouped) frequency distribution, instead treating the data as raw; comments on the G2 forms from schools indicated that some teachers were also unable to do this and advice must be sought.

9a.

Markscheme

(i) 6.76 (cm)   **(G2)**

Notes: Award **(M1)** for an attempt to use the formula for the mean with a least two rows from the table.

(ii) 1.14 (cm) $(1.14122\ldots$ (cm))   **(G1)**

Examiners report

[N/A]

9b.

Markscheme

$\mathrm{P}(\text{diameter} < 6.5) = 0.338$ (0.338461) **(M1)(A1)**

Notes: Award **(M1)** for attempting to use the normal distribution to find the probability **or** for correct region indicated on labelled diagram. Award **(A1)** for correct probability.

$33.8(\%)$ **(A1)(ft)(G3)**

Notes: Award **(A1)(ft)** for converting their probability into a percentage.

Examiners report

[N/A]

9c.

Markscheme

$\mathrm{P}(\text{diameter} \geqslant a) = 0.05$ **(M1)**

Note: Award **(M1)** for attempting to use the normal distribution to find the probability **or** for correct region indicated on labelled diagram.

$a = 8.97$ (cm) $(8.97382\ldots)$ **(A1)(G2)**

Examiners report

[N/A]

9d.

Markscheme

$100 - (5 + 33.8461\ldots)$ **(M1)**

Note: Award **(M1)** for subtracting "
$5+$ their part (b)" from 100 **or (M1)** for attempting to use the normal distribution to find the probability
$\mathrm{P}\left(6.5 \leqslant \text{diameter} < \text{their part (c)}\right)$ **or** for correct region indicated on labelled diagram.

$= 61.2(\%)$ $(61.1538\ldots(\%))$ **(A1)(ft)(G2)**

Notes: Follow through from their answer to part (b). Percentage symbol is not required. Accept $61.1(\%)$ ($61.1209\ldots(\%)$) if 8.97 used.

9e.

[2 marks]

Markscheme

$100\,000 \times 0.05$ *(M1)*

Note: Award *(M1)* for multiplying by 0.05 (or 5%).

$= 5000$ *(A1)(G2)*

10a.

[2 marks]

Markscheme

(i) 8   *(A1)*

(ii) 48   *(A1)*(ft)   *(C2)*

Note: Follow through from their t, even if no workings seen as long as $w < 50$.

10b.

[4 marks]

Markscheme

Statement	True	False
Every household owns at least 1 bicycle.		✓
The median number of bicycles per household is 3.	✓	
The 25th percentile is 1 bicycle per household.		✓
There are 10 households with at most 1 bicycle.	✓	

(A1)(A1)(A1)(A1)   *(C4)*

11a.

[1 mark]

Markscheme

54 (cm)   *(A1)*   *(C1)*

11b.   *[1 mark]*

Markscheme

58   *(A1)*   *(C1)*

11c.   *[2 marks]*

Markscheme

58, 45   *(A1)*

Note: Award *(A1)* for 45 seen.

$58 - 45$

$= 13$ *(A1)(ft)*   *(C2)*

Note: Follow through from part (b).

11d.   *[2 marks]*

Markscheme

$80 - 14$ *(M1)*

Note: Award *(M1)* for 14 seen.

$= 66$ *(A1)*   *(C2)*

12a.   *[1 mark]*

Markscheme

42 kg   *(A1)*   *(C1)*

Note: The units are required.

12b.

Markscheme

58 − 33   *(A1)*

Note: Award *(A1)* for correct maximum and minimum seen.

= 25   *(A1)*   *(C2)*

12c.

Markscheme

$\frac{1}{4}(0.25, 25\%)$ *(A1)*   *(C1)*

12d.

Markscheme

Mean weight is **more** than the median weight.   *(A1)*

The upper half of the distribution is wider (more dispersed) **or** data is positively (or right) skewed **or** equivalent reason.   *(R1)*

OR

$\left(\text{The mean is calculated } \bar{x} = \frac{35.5 \times 15 + 40 \times 15 + 54 \times 15}{60}\right)$

$\bar{x} = 43.875 \,(kg)$ *(R1)*   *(C2)*

Note: Do not award *(A1)(R0)*.

13a. *[2 marks]*

13b. *[2 marks]*

13c. *[2 marks]*

14a. *[1 mark]*

[1 mark]

Markscheme

12.5   *(A1)*

[1 mark]

Examiners report

[N/A]

[2 marks]

Markscheme

$\frac{3\times 2.5+5\times 7.5+\ldots+10\times 27.5}{60}$ *(M1)*

Note: Award *(M1)* for an attempt to substitute their mid-interval values (consistent with their answer to part (b)) into the formula for the mean.

Award *(M1)* where a table is constructed with their (consistent) mid-interval values listed along with the frequencies.

$= \frac{1075}{60}$ $\left(\frac{215}{12}, 17.9, 17.9166\ldots\right)$ *(A1)(ft)(G2)*

Note: Follow through from their answer to part (b).

[2 marks]

Examiners report

[N/A]

[2 marks]

Markscheme

$a = 34$, $b = 60$ *(A1)(A1)*

[2 marks]

Examiners report

[N/A]

[4 marks]

Markscheme

(i)

$\leqslant 21.25$ minutes   *(A1)*

Note: Accept
21.25.
    Accept any answer between
21 and
21.5.
    (Accept 21.5, but do not accept 21.)

(ii)

5   *(A1)*

Note: Accept
< 6. Do not accept
6.
    Answer must be an integer.

(iii)

$60 - 45$ *(M1)*
$= 15$ *(A1)(G2)*

Notes: Award *(M1)* for subtraction from
60. Accept
15 ± 1.
    Answer must be an integer.

[4 marks]

Examiners report

[N/A]

[1 mark]

Markscheme

discrete   *(A1)   (C1)*
[1 mark]

Examiners report

Most candidates could state whether the data was discrete or continuous and find the mode however the calculations to find the mean, median and standard deviation appeared problematic for some candidates. A significant number of candidates gave the mode as 37 rather than 0. Many did not appear to use their graph and some obtained the incorrect value of 1.47 from their graphic display calculator.

[1 mark]

Markscheme

0   *(A1)   (C1)*
[1 mark]

15c. [4 marks]

Markscheme

(i)

1.47

(1.46666...)   *(A2)*

Note: Award *(M1)* for

$\frac{176}{120}$ seen.

   Accept

1 or

2 as a final answer if

1.4666... or

1.47 seen.

(ii)

1.5   *(A1)*

(iii)

1.25

(1.25122...)   *(A1)*   *(C4)*

[4 marks]

Examiners report

Most candidates could state whether the data was discrete or continuous and find the mode however the calculations to find the mean, median and standard deviation appeared problematic for some candidates. A significant number of candidates gave the mode as 37 rather than 0. Many did not appear to use their graph and some obtained the incorrect value of 1.47 from their graphic display calculator.

16a. [2 marks]

Markscheme

$Q_2 = 119$ km   *(M1)(A1)*   *(C2)*

Note: Award *(M1)* for indication on graph of correct position of median.

[2 marks]

Examiners report

Many candidates gained full marks on this question although a significant number could not find the interquartile range.

Markscheme

$Q_1 = 114$ and $Q_3 = 123$ *(A1)*

Note: Award *(A1)* for correct quartiles seen.

9   *(A1)*   *(C2)*
[2 marks]

Examiners report

Many candidates gained full marks on this question although a significant number could not find the interquartile range.

Markscheme

$240 - 220$ *(M1)*

Note: Award *(M1)* for
220 seen.

$= 20$ *(A1)*   *(C2)*
[2 marks]

Examiners report

Many candidates gained full marks on this question although a significant number could not find the interquartile range.

$Q_1 = 114$ and $Q_3 = 123$ *(A1)*

Note: Award *(A1)* for correct quartiles seen.

9   *(A1)*   *(C2)*

Markscheme
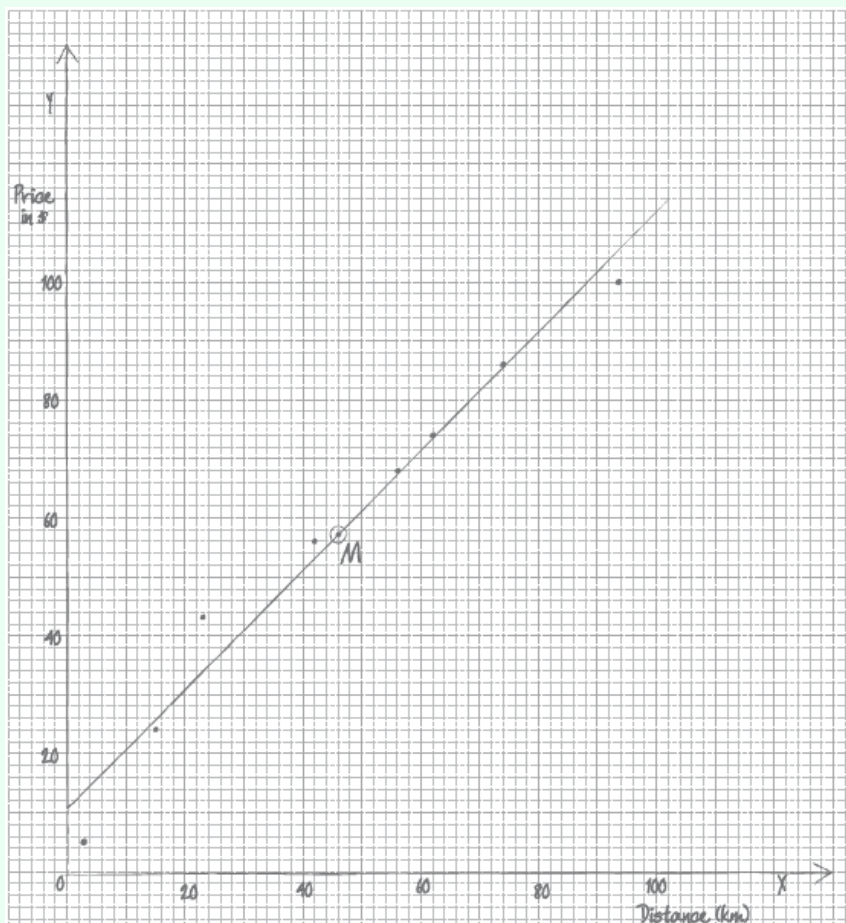
(A4)

Notes: Award *(A1)* for correct scale and labels (accept

x and

y).

Award *(A3)* for

7 or

8 points plotted correctly.

Award *(A2)* for

5 or

6 points plotted correctly.

Award *(A1)* for

3 or

4 points plotted correctly.

Award at most *(A1)(A2)* if points are joined up.

If axes are reversed, award at most *(A0)(A3)*.

If graph paper is not used, award at most *(A1)(A0)*.

[4 marks]

17b.   *[2 marks]*

Markscheme

(i)

$(\bar{x} =)\ 46$ **(G1)**

(ii)

$(\bar{y} =)\ 57$ **(G1)**

[2 marks]

Examiners report

This question was very well attempted by a significant majority of candidates. Many good and accurate attempts at plotting a scatter diagram were seen in part (a). However, a minority of candidates chose not to use graph paper but instead used their answer book. These candidates achieved, at most, one mark for that part question. Many correct answers were seen in parts (b) and (d) reflecting good use of the graphic display calculator. Whilst many candidates realized that the line of regression passes through the point M, a significant number of candidates seemed to draw their line 'by eye' rather than using the equation found in part (d) and, as a consequence for many, their straight line (or projected line) did not fall within the required tolerances for the second mark. Many candidates understood the requirements for part (f) and full marks were seen on a majority of scripts. Those candidates, however, who used their graph instead scored, at most, two marks here. Many candidates seemed to be well-drilled in giving a suitable reason in part (f) and 'within the data range' or a 'strong correlation' were frequently seen. Percentage error caused very few problems for candidates and many correct answers were seen in part (h).

17c.   *[1 mark]*

Markscheme

$M(46, 57)$ plotted and labelled on the scatter diagram   **(A1)(ft)**

Notes: Follow through from their part (b).

   Accept

$(\bar{x},\ \bar{y})$ as the label.

[1 mark]

17d. [3 marks]

Markscheme

(i)

0.986

(0.986322...)   *(G1)*

(ii)

$y = 1.01x + 10.3$

$(y = 1.01431\ldots x + 10.3412\ldots)$ *(G1)(G1)*

Notes: Award *(G1)* for

$1.01x$, *(G1)* for

10.3.

Award *(G1)(G0)* if not written in the form of an equation.

OR

$(y - 57) = 1.01(x - 46)$

$(y - 57 = 1.01431...(x - 46))$ *(G1)(G1)*(ft)

Note: Award *(G1)* for

1.01, *(G1)* for their

57 and

46.

[3 marks]

Markscheme

straight line drawn on the scatter diagram   *(A1)*(ft)*(A1)*(ft)

Notes: The line must be straight for either of the two marks to be awarded.

   Award *(A1)*(ft) passing through their

M plotted in (c).

   Award *(A1)*(ft) for correct

y-intercept (between

9 and

12).

   Follow through from their

y-intercept found in part (d).

   If part (d) is used, award *(A1)*(ft) for their intercept

(±1).

[2 marks]

Examiners report

This question was very well attempted by a significant majority of candidates. Many good and accurate attempts at plotting a scatter diagram were seen in part (a). However, a minority of candidates chose not to use graph paper but instead used their answer book. These candidates achieved, at most, one mark for that part question. Many correct answers were seen in parts (b) and (d) reflecting good use of the graphic display calculator. Whilst many candidates realized that the line of regression passes through the point M, a significant number of candidates seemed to draw their line 'by eye' rather than using the equation found in part (d) and, as a consequence for many, their straight line (or projected line) did not fall within the required tolerances for the second mark. Many candidates understood the requirements for part (f) and full marks were seen on a majority of scripts. Those candidates, however, who used their graph instead scored, at most, two marks here. Many candidates seemed to be well-drilled in giving a suitable reason in part (f) and 'within the data range' or a 'strong correlation' were frequently seen. Percentage error caused very few problems for candidates and many correct answers were seen in part (h).

Markscheme

$y = 1.01431... \times 76 + 10.3412...$ *(M1)*

Note: Award *(M1)* for substitution of
76 into their regression line.

$= 87.4295...$ *(A1)(ft)*

Note: Follow through from part (d). If 3 sf values are used the value is
87.06.

$87   *(A1)(ft)(G2)*

Notes: The final *(A1)* is awarded for their answer given correct to the nearest dollar.
    Method, followed by the answer of
87 earns *(M1)(G2)*. It is not necessary to see the interim step.
    Where the candidate uses their graph instead of the equation, and arrives at an answer other than
87, award, at most, *(G1)(ft)*.
    If the candidate uses their graph and arrives at the required answer of
87, award *(G2)(ft)*.

[3 marks]

Examiners report

This question was very well attempted by a significant majority of candidates. Many good and accurate attempts at plotting a scatter diagram were seen in part (a). However, a minority of candidates chose not to use graph paper but instead used their answer book. These candidates achieved, at most, one mark for that part question. Many correct answers were seen in parts (b) and (d) reflecting good use of the graphic display calculator. Whilst many candidates realized that the line of regression passes through the point *M*, a significant number of candidates seemed to draw their line 'by eye' rather than using the equation found in part (d) and, as a consequence for many, their straight line (or projected line) did not fall within the required tolerances for the second mark. Many candidates understood the requirements for part (f) and full marks were seen on a majority of scripts. Those candidates, however, who used their graph instead scored, at most, two marks here. Many candidates seemed to be well-drilled in giving a suitable reason in part (f) and 'within the data range' or a 'strong correlation' were frequently seen. Percentage error caused very few problems for candidates and many correct answers were seen in part (h).

Markscheme

76 is within the range of distances given in the data **OR** the correlation coefficient is close to
1.   *(R1)*

Notes: Award *(R1)* if **either** condition is given.
    Sufficient to indicate that
76 is 'within the data range' and the correlation is 'strong'.
    Allow
r^2 close to
1.
    Do **not** accept "within the range of prices".

[1 mark]

17h. *[2 marks]*

Markscheme

Percentage error $= \frac{87-80}{80} \times 100$ *(M1)*

Note: Award *(M1)* for correct substitution into formula.

8.75% *(A1)(ft)(G2)*

Notes: Follow through from their answer to part (f).

Accept either the rounded or unrounded answer to part (f).

If no integer value seen in part (f), follow through from their unrounded answer to part (f).

Answer must be positive.

[2 marks]

Examiners report

This question was very well attempted by a significant majority of candidates. Many good and accurate attempts at plotting a scatter diagram were seen in part (a). However, a minority of candidates chose not to use graph paper but instead used their answer book. These candidates achieved, at most, one mark for that part question. Many correct answers were seen in parts (b) and (d) reflecting good use of the graphic display calculator. Whilst many candidates realized that the line of regression passes through the point *M*, a significant number of candidates seemed to draw their line 'by eye' rather than using the equation found in part (d) and, as a consequence for many, their straight line (or projected line) did not fall within the required tolerances for the second mark. Many candidates understood the requirements for part (f) and full marks were seen on a majority of scripts. Those candidates, however, who used their graph instead scored, at most, two marks here. Many candidates seemed to be well-drilled in giving a suitable reason in part (f) and 'within the data range' or a 'strong correlation' were frequently seen. Percentage error caused very few problems for candidates and many correct answers were seen in part (h).

18a. *[1 mark]*

Markscheme

continuous *(A1)*

[1 mark]

Examiners report

[N/A]

18b. *[4 marks]*

Markscheme
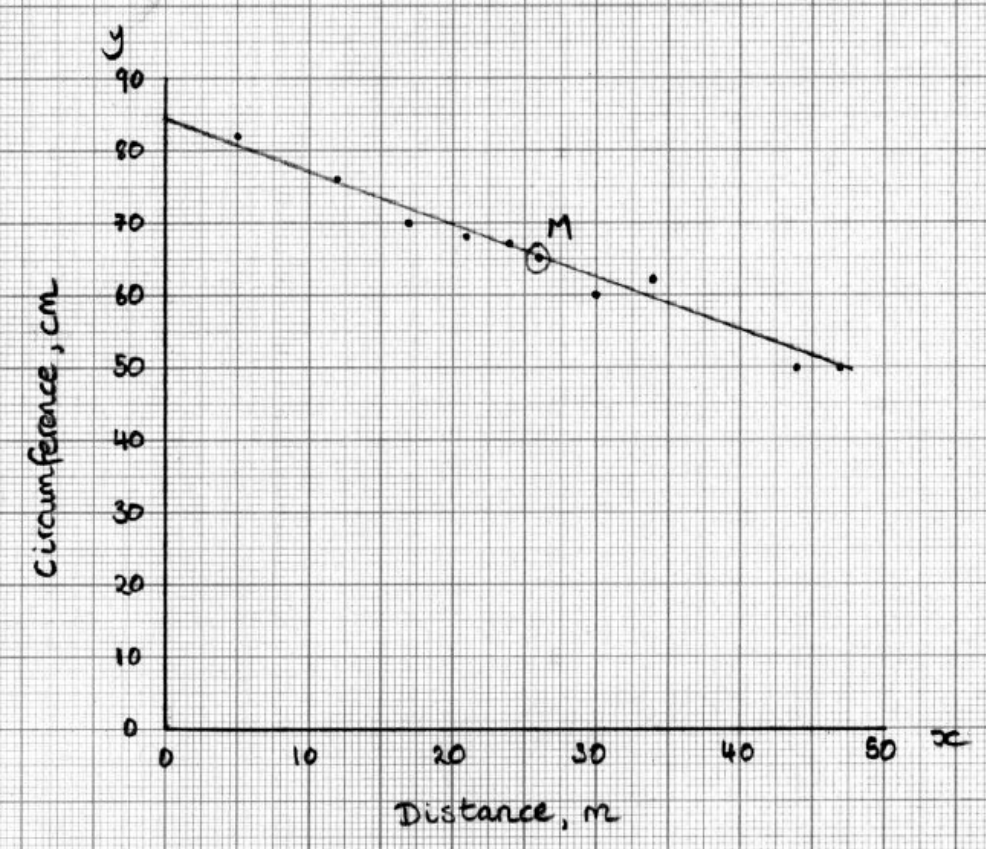
(A1)(A1)(A1)(A1)

Notes: Award *(A1)* for labelled axes and correct scales; if axes are reversed award *(A0)* and follow through for their points. Award *(A1)* for at least 3 correct points, *(A2)* for at least 6 correct points, *(A3)* for all 9 correct points. If scales are too small or graph paper has not been used, accuracy cannot be determined; award *(A0)*. Do not penalize if extra points are seen.

[4 marks]

Examiners report

[N/A]

18c. *[2 marks]*

Markscheme

(i)   26 (m)   *(A1)*

(ii)   65 (cm)   *(A1)*

[2 marks]

Examiners report

[N/A]

18d. *[2 marks]*

Markscheme

point

M labelled, in correct position   *(A1)(A1)*(ft)

Notes: Award *(A1)*(ft) for point plotted in correct position, *(A1)* for point labelled
M or
$(\bar{x}, \bar{y})$. Follow through from their answers to part (c).

[2 marks]

Examiners report

[N/A]

18e. *[4 marks]*

Markscheme

(i)
$-0.988 \; (-0.988432\ldots)$ *(G2)*

Note: Award *(G2)* for
-0.99. Award *(G1)* for
-0.990.
     Award *(A1)(A0)* if minus sign is omitted.

(ii)
$y = -0.756x + 84.7$
$(y = -0.756281\ldots x + 84.6633\ldots)$ *(G2)*

Notes: Award *(A1)* for
$-0.756x$, *(A1)* for
84.7. If the answer is not given as an equation, award a maximum of *(A1)(A0)*.

[4 marks]

Examiners report

[N/A]

18f. *[2 marks]*

Markscheme

regression **line** through their

M   *(A1)((ft)*

regression **line** through their

$(0, 85)$ (accept

$85 \pm 1)$ *(A1)(ft)*

Notes: Follow through from part (d). Award a maximum of *(A1)(A0)* if the line is not straight. Do not penalize if either the line does not meet the *y*-axis or extends into quadrants other than the first.

   If

M is not plotted or labelled, then follow through from part (c).

   Follow through from their *y*-intercept in part (e)(ii).

[2 marks]

Examiners report

[N/A]

18g. *[2 marks]*

Markscheme

$-0.756281(40) + 84.6633$ *(M1)*

$= 54.4$ (cm) $(54.4120\ldots)$ *(A1)(ft)(G2)*

Notes: Accept

54.5 (

54.46) for use of 3 sf. Accept

54.3 from use of

-0.76 and

84.7.

   Follow through from their equation in part (e)(ii) **irrespective of working shown**; the final answer seen must be consistent with that equation for the final *(A1)* to be awarded.

   Do not accept answers taken from the graph.

[2 marks]

Examiners report

[N/A]

19a. *[2 marks]*

Markscheme

(ii) and (iv) are discrete.   *(A1)(A1)*

Award (A1)(A0) for both correct and one incorrect.

Award (A1)(A0) for one correct and two incorrect.

Otherwise, (A0)(A0).   *(C2)*

[2 marks]

19b. [3 marks]

Markscheme

(i) Median = 10   *(A1)*

(ii) Q_3 = 12   *(A1)*

(iii) Min value = 1 (±0.2)   *(A1)*   *(C3)*

[3 marks]

19c. [1 mark]

Markscheme

Any three different **integers** whose mean is 10 *e.g.* 9, 10, 11.   *(A1)*   *(C1)*

[1 mark]

20a. [2 marks]

Markscheme

Total = 2 + 3 + 5 + 7 + 11 + 5 + 6 + 9 + 2 + 1   *(M1)*

(M1) is for a sum of frequencies.

= 51   *(A1)(G2)*

[2 marks]

Markscheme

Unit penalty (UP) is applicable where indicated in the left hand column.

(i) modal interval is 60 – 70

Award (A0) for 65   **(A1)**

(ii) median is length of fish no. 26,   **(M1)(A1)**

also 60 – 70   **(G2)**

Can award (A1)(ft) or (G2)(ft) for 65 if (A0) was awarded for 65 in part (i).

(iii) mean is

$$\frac{2\times 25+3\times 35+5\times 45+7\times 55+...}{51}$$ **(M1)**

(UP) = 69.5 cm (3sf)   **(A1)(ft)(G1)**

Note: (M1) is for a sum of (frequencies multiplied by midpoint values) divided by candidate's answer from part (a). Accept mid-points 25.5, 35.5 etc or 24.5, 34.5 etc, leading to answers 70.0 or 69.0 (3sf) respectively. Answers of 69.0, 69.5 or 70.0 (3sf) with no working can be awarded (G1).

[5 marks]

Examiners report

a) b), c) There was much confusion about how to present the intervals. Often the mid-point only was seen. (eg. 65 instead of 60-70). Understanding of mode, median and mean was usually good but too many candidates wasted time calculating standard deviation by hand and got it wrong. In c(ii) 'greater than three' caused no problems but 'above the mean' was often ignored.

Markscheme

Unit penalty (UP) is applicable where indicated in the left hand column.

(UP) (i) standard deviation is 21.8 cm   **(G1)**

For any other answer without working, award (G0). If working is present then (G0)(AP) is possible.

(ii)
$69.5 + 3 \times 21.8 = 134.9 > 120$ **(M1)**

no fish   **(A1)(ft)(G1)**

For 'no fish' without working, award (G1) regardless of answer to (c)(i). Follow through from (c)(i) only if method is shown.

[3 marks]

Examiners report

a) b), c) There was much confusion about how to present the intervals. Often the mid-point only was seen. (eg. 65 instead of 60-70). Understanding of mode, median and mean was usually good but too many candidates wasted time calculating standard deviation by hand and got it wrong. In c(ii) 'greater than three' caused no problems but 'above the mean' was often ignored.

20d. [2 marks]

Markscheme

5 fish are less than 40 cm in length, *(M1)*

Award (M1) for any of

$\frac{5}{51}$, $\frac{46}{51}$, 0.098 or 9.8%, 0.902, 90.2% or 5.1 seen.

hence no fine. *(A1)(ft)*

Note: There is no G mark here and (M0)(A1) is never allowed. The follow-through is from answer in part (a).

[2 marks]

Examiners report

d) This was often well done, even if earlier parts were poorly done.

20e. [2 marks]

Markscheme

(i) and (iii) are correct. *(A1)(A1)*

[2 marks]

Examiners report

e) Rather mixed performance here. It was hard to identify any consistency in the errors made.

Too much time was spent on this question. It was only worth two marks and candidates ought to have realised that it relied on a general pictorial understanding of the concepts, possibly supplemented by a little elementary arithmetic only, to compare (iii) and (vi). With good understanding, many of the options could be ruled out in a few seconds.

21a. [2 marks]

Markscheme

Time (minutes)	Number of telephone calls
$0 < t \leq 5$	12
$5 < t \leq 10$	4
$10 < t \leq 15$	6
$15 < t \leq 20$	8

(A2)   *(C2)*

Note: Award *(A2)* for four correct entries, *(A1)* for three correct entries, *(A0)* otherwise.

Examiners report

[N/A]

21b. [1 mark]

Markscheme

$0 < t \leqslant 5$ *(A1)*   *(C1)*

21c.

Markscheme

12.5   *(A1)   (C1)*

21d.

Markscheme

$\frac{275}{30}$ *(M1)*

Note: Award *(M1)* for division with 275 seen.

$= 9.17$ (
9.16666...)   *(A1)*(ft)   *(C2)*

Note: Follow through from their parts (a) and (c), irrespective of whether working is shown.

22a.

Markscheme

(i) Mean = (5.96 + 5.95 + 6.02 + 5.95 + 5.99) / 5 = 5.974 (5.97)   *(A1)*

(ii)
$\%$ error $= \frac{error}{actualvalue} \times 100\%$

$= \frac{6 - 5.974}{5.974} \times 100\% = 0.435\%$ *(M1)(A1)*(ft)

(M1) for correctly substituted formula.

Allow 0.503% as follow through from 5.97

Note: An answer of 0.433% is incorrect.   (C3)

[3 marks]

Examiners report

a) Almost all candidates calculated the mean correctly but less than half were able to find the % error, many dividing by 6. This was despite the boldening of 'approximate' in the question.

22b.

Markscheme

number is 29.45728613

(i) Nearest integer = 29   *(A1)*

(ii) Standard form = 2.95×10^1 (*accept* 2.9×10^1)   *(A1)(**ft**)(A1)*

Award (A1) for each correct term

Award (A1)(A0) for 2.95×10 (C3)

[3 marks]

Examiners report

b) Main errors were giving the answer correct to 1 significant figure (30) or 1 decimal place. Some candidates just counted the number of figures on the calculator to determine the index for the standard form, giving 10^9 instead of 10^1.

23a.

Markscheme

1.6×10^{-19},
9.8×10^{-18},
π,
3.5,
0.006073×10^6,
60730,
6.073×10^5 *(A4)*

Award (A1) for
π before 3.5

Award (A1) for
1.6×10^{-19} before
9.8×10^{-18}

Award (A1) for the three numbers containing 6073 in the correct order.

Award (A1) for the pair with negative indices placed before 3.5 and
π and the remaining three numbers placed after (independently of the other three marks).

Award (A3) for numbers given in correct decreasing order.

Award (A2) for decreasing order with at most 1 error   (C4)

[3 marks]

Examiners report

This was the best-answered question on the paper with most candidates achieving 5 or 6 marks. The main errors were finding the mean instead of the median in part (b) and giving numbers with negative indices as irrational numbers for part (c). Some candidates gave the list in reverse order (which lost them one mark).

23b.

23c.   *[1 mark]*

Markscheme

π is irrational.   *(A1)*   *(C1)*

[1 mark]

Examiners report

This was the best-answered question on the paper with most candidates achieving 5 or 6 marks. The main errors were finding the mean instead of the median in part (b) and giving numbers with negative indices as irrational numbers for part (c). Some candidates gave the list in reverse order (which lost them one mark).

24a.   *[2 marks]*

Markscheme

$(6, 13)$ *(A1)(A1)*   *(C2)*

Examiners report

[N/A]

24b.   *[2 marks]*
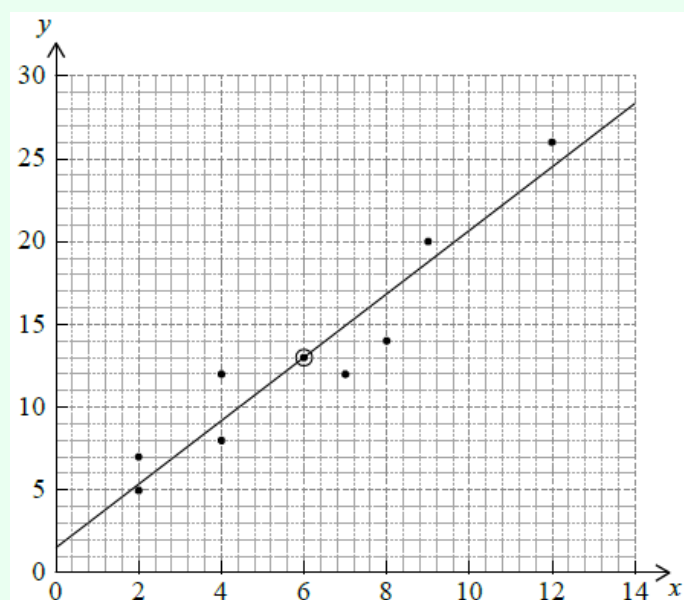
Markscheme

0.952 (
$0.95202\ldots$)   *(A2)*   *(C2)*

Note: Award *(A0)* for
0.9.

Examiners report

[N/A]

Markscheme

(A1)
y intercept at
$y = 1.8$ (*accept between 1 and 2*)
(A1)(ft) line passes through their mean point   *(A1)(A1)(ft)*   *(C2)*

Examiners report

[N/A]