Year 1 Applied Chapter 3: Representation of Data – Exam Questions (Answers)

1.

Width	1	1	4	2	3	5	3	12
Freq. Density	6	7	2	6	5.5	2	1.5	0.5

M1

0.5 ×12 or 6 A1

Total area is (1 × 6) + (1 × 7) + (4 × 2) + ..., = 70

$(90.5 - 78.5) \times \frac{1}{2} \times \frac{140}{\text{their } 70}$ M1

"70 seen anywhere" B1

Number of runners is 12 A1

2. (a) Time is a <u>continuous</u> variable

or data is in a <u>grouped</u> frequency table

B1

(b) Area is proportional to frequency <u>or</u> $A \propto f$ or $A = kf$ B1

(c) $3.6 \times 2 = 0.8 \times 9$ M1
dM

(d) (Total) = $\frac{24}{0.8}$, = **<u>30</u>** M1, A1

3. (a) 18-25 group, area = 7 × 5 = 35 B1

25-40 group, area = 15 × 1 = 15 B1

(b) (25 – 20) × 5 + (40 – 25) × 1 = 40 M1A1

(c) Mid points are 7.5, 12, 16, 21.5, 32.5 M1

Σf = 100 B1

$$\frac{\sum \mathrm{f}t}{\sum \mathrm{f}} = \frac{1891}{100} = 18.91$$ M1A1

d) $\sigma_t = \sqrt{\frac{41033}{100} - \bar{t}^2}$ $\sqrt{\frac{n}{n-1}\left(\frac{41033}{100} - \bar{t}^2\right)}$ M1

M1

$\sigma_t = \sqrt{52.74...} = 7.26$ A1

Clear attempt at $\frac{41033}{100} - \bar{t}^2$ or $\frac{n}{n-1}\left(\frac{41033}{100} - \bar{t}^2\right)$

Anything that rounds to 7.3 for A1.

(e) Q_2 = 18 or 18.1 if (n + 1) used B1

$Q_1 = 10 + \frac{15}{16} \times 4 = 13.75$ or 15.25 numerator gives 13.8125 M1A1

$Q_3 = 18 + \frac{25}{35} \times 7 = 23$ or 25.75 numerator gives 23.15 A1

4. (a) Indicates max / median / min / upper quartile / lower quartile (2 or more) B1

Indicates outliers (or equivalent description) B1

Illustrates skewness (or equivalent description e.g. shape) B1

Allows comparisons Indicates range / IQR / spread

(b) (i) 37 (minutes) B1

(ii) Upper quartile or Q_3 or third quartile or 75^{th} percentage or P_{75} B1

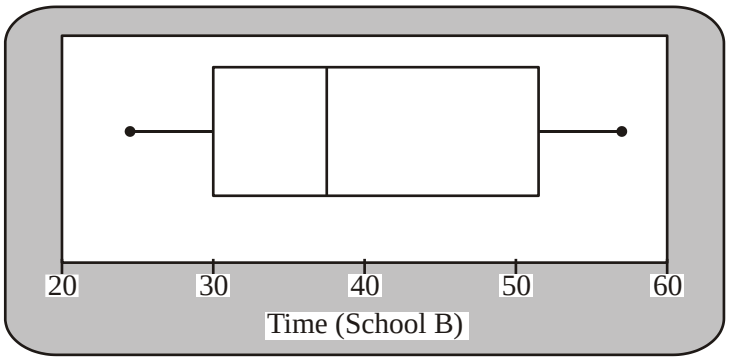
(c) outliers

How to calculate correctly

'Observation that are very different from the other observations and need to be treated with caution' B1

These two children probably walked / took a lot longer B1

(d)



Box & median & whiskers M1

Sensible scale B1

30, 37, 50 B1

25, 55 B1

(e) Children from school A generally took less time B1

50% of B ≤ 37 mins, 75% of A < 37 mins (similarly for 30) B1

Median / Q1 / Q3 / of A < median / Q1 / Q3 / of (1 or more) B1

A has outliers, (B does not) B1

Both positive skew

IQR of A < IQR of B, range of A > range of B

5. **(a)** $\Sigma x = 12075$

$\Sigma x^2 = 15\ 499\ 685$

$\bar{x} = \frac{12075}{15} = 805$ B1

sd = $\sqrt{\frac{15499685}{15} - 805^2} = 620.71491$ M1

621 (3 sf) A1

(NB Using $n - 1$ gives 642.50125…) (643)

(b) 99, 169, 299, 350, 475, 485, 550, 650, 689, 830, 999, 1015, 1050, 2100, 2315 M1

$Q_2 = 650$ A1

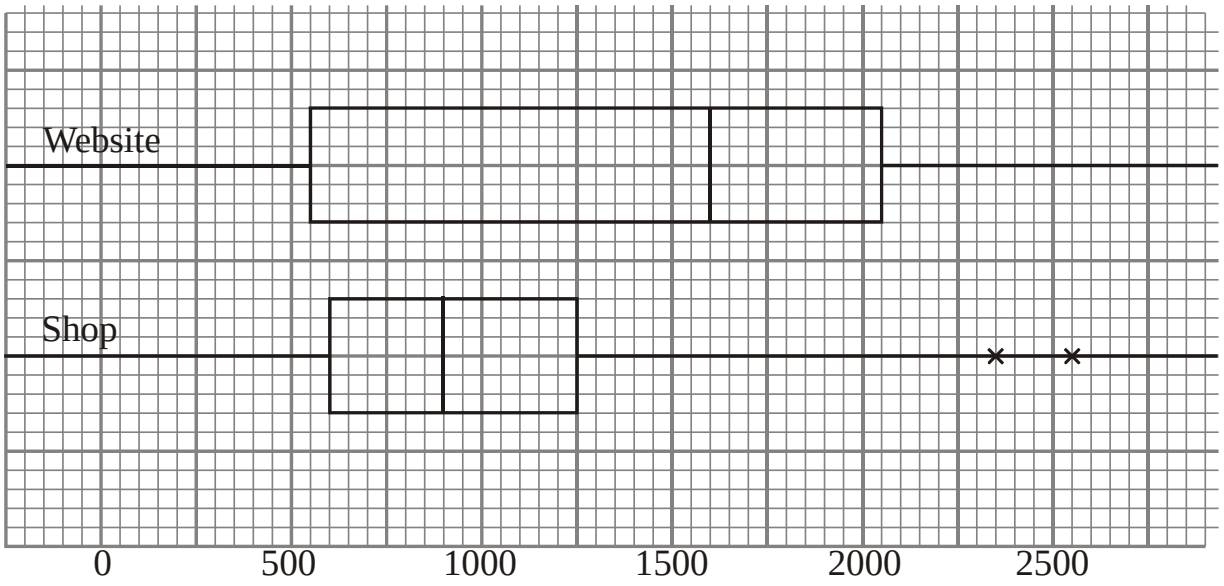
$IQR = Q_3 - Q_1 = 1015 - 350 = 665$ M1

cao 665 A1

(c) $Q_3 + 1.5(Q_3 - Q_1) = 1015 + 1.5 \times 665 = 2012.5$ M1

$Q_1 - 1.5(Q_3 - Q_1) = 350 - 1.5 \times 665 < 0$ M1

2100 and 2315 are outliers



Website B1

Shop Box-plot B1

Both outliers B1

(e) Median website > median shop

Website negative skew;

shop approx symmetrical

Ignoring outliers

Ranges approximately equal

Shop Q_3 < Website Q_3 $\Rightarrow$shop sales low value

Website sales more variable in value $IQR_W \geq IQR_S$

Any two sensible comments B1 B1

6. (a) 44, 100, 134, 153, 160 B1 cao

(b) *B1 ft for at least 4 of 5 points plotted correctly ± ½ sq at end of interval dep on sensible table (condone 1 addition error)*

B1 ft (dep on previous B1) for points joined by curve or line segments provided no gradient is negative – ignore any part of graph outside range of their points

(SC B1 if 4 or 5 pts plotted not at end but consistent within each interval and joined)

(c) 30 to 32

15 to 18

Median 30 – 32

IQR 40 – 24

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(d) B2 if fully correct

B1 for box with median or quartiles or whiskers correct