

2.2 Solutions

A-level Statistics : Year 1 Partitioning Data

2.2.1 Answer to the Introductory Problem

- (i) The scores of 8% and 12% are well below the bulk of the data.
The score of 28% could also be considered an outlier.

- (ii) Lower Quartile, Q_1
30 items of data $\Rightarrow 30 / 4 = 7.5$
Not an integer so take the 8th item of data which is 42

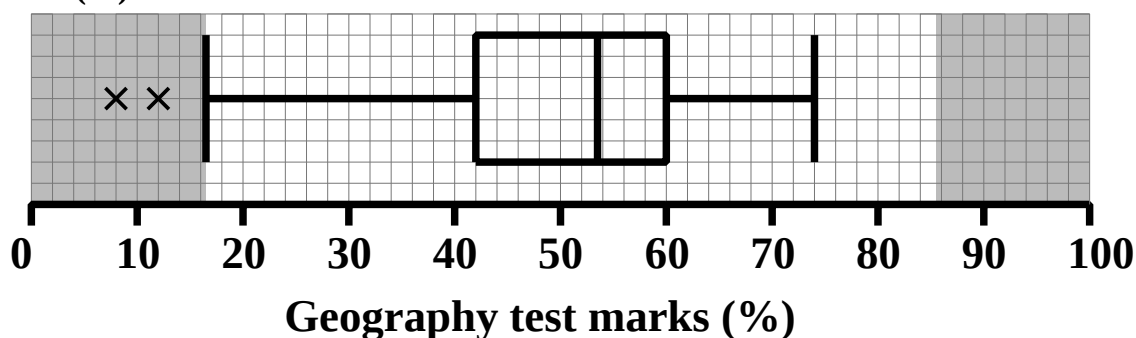
Median, Q_2
30 items of data $\Rightarrow 30 / 2 = 15$
Integer so take mean of 15th and 16th items of data which is 53.5

Upper Quartile, Q_3
30 items of data $\Rightarrow 3 \times 30 / 4 = 22.5$
Not an integer so take the 23rd item of data which is 59

- (iii) $IQR = Q_3 - Q_1 \Rightarrow IQR = 17$

- (iv) $Q_3 + 1.5 \times IQR \Rightarrow 59 + 1.5 \times 17 = 85.5$
 $Q_1 - 1.5 \times IQR \Rightarrow 42 - 1.5 \times 17 = 16.5$

- (v)



- (vi)
The distribution is negatively skewed
because
 $Q_3 - Q_2 < Q_2 - Q_1$

2.2.1 Answers to the Exercise

Answer 1

(a) Question is telling us that: $Q_1 = 12$ $Q_2 = 17$ $Q_3 = 28$ $\therefore$ IQR = 16

Cut off values are:

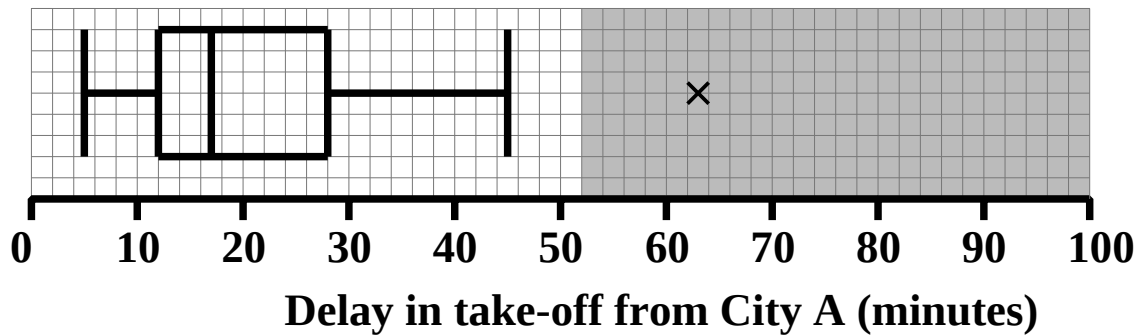
$$12 - 1.5 \times 16 = -12$$

no outliers at low end

$$28 + 1.5 \times 16 = 52$$

63 is a high end outlier

(b)

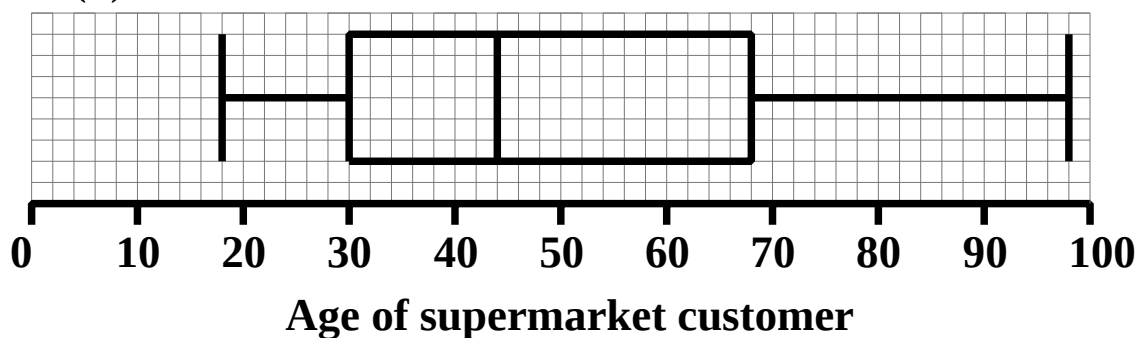


(c) (i) $Q_2 - Q_1 = 5$ (ii) $Q_3 - Q_2 = 11$
Distribution has positive skew because $Q_3 - Q_2 > Q_2 - Q_1$

(d) Many aircraft take off with only a short delay.
Most passengers are probably willing to accept such small delays.

Answer 2

(i)



(ii) IQR = $68 - 30$
IQR = 38

(iii) (a) $Q_2 - Q_1 = 44 - 30 = 14$

(b) $Q_3 - Q_2 = 68 - 44 = 24$

As $Q_3 - Q_2 > Q_2 - Q_1$ the skew is positive.

Answer 3

(i) LQ, Q_1 is 18

(ii) UQ, Q_3 is 56

(iii) IQR is 38

(iv) Median, Q_2 is 24

(v) $Q_2 - Q_1 = 24 - 18 = 6$

(vi) $Q_3 - Q_2 = 56 - 24 = 32$

Skewed (positively) because $Q_3 - Q_2 > Q_2 - Q_1$

Lots of younger people have TikTok accounts

Answer 4

(a) There are 19 pieces of data.

$\therefore$ Median is piece of data N° 10 (9.5 with ARU applied)

Median in a score of 33 out of 40.

(b) Lower quartile is piece of data N° 5 (4.75 with ARU applied)

$Q_1 = 24$

Upper quartile is piece of data N° 15 (14.25 with ARU applied)

$Q_3 = 40$

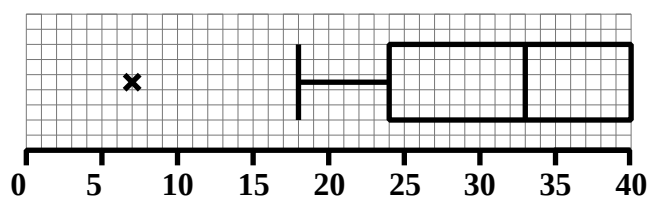
$\therefore$ The interquartile range is 16

(c) 'cut off' is given by $24 - 1.0 \times 16 = 8$

Only one employee scored less than 8 out of 40



(d)



A whisker that goes down to the 'cut off' at 8 is also acceptable

Answer 5

(i) Data in order is;

12.9	12.9	13.4	13.4	13.6	13.8	14.1	14.2	14.4
14.6	14.8	15.2	15.2	15.3	15.7	15.7	15.7	15.8
16.1	16.4	16.4	17.0	17.6				

(ii) Lower Quartile, Q_1

23 items of data $\Rightarrow 23 / 4 = 5.75$

Not an integer so take 6th item of data which is 13.8 seconds

(iii) Upper Quartile, Q_3

23 items of data $\Rightarrow 3 \times 23 / 4 = 17.25$

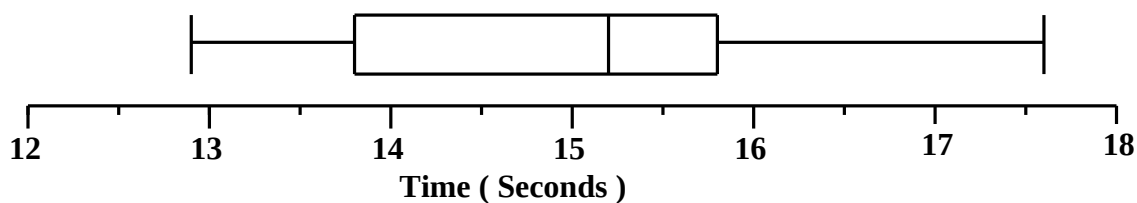
Not an integer so take 18th item of data which is 15.8 seconds.

(iv) Median, Q_2

23 items of data $\Rightarrow 23 / 2 = 11.5$

Not an integer so take 12th item of data which is 15.2 seconds

(v)



(vi) IQR = 2s