

9.2 Answers

A-level Statistics : Year 1 Partitioning Data

Answer 1

$$\begin{aligned}x_{\mu} &= \frac{60.8 + 20}{1.4} \\&= \frac{404}{7} \\&= 57.71 \text{ (mean)}\end{aligned}$$

$$\begin{aligned}x_{\sigma} &= \frac{6.60}{1.4} \\&= \frac{33}{7} \\&= 4.71 \text{ (standard deviation)}\end{aligned}$$

Answer 2

$$\begin{aligned}\text{standard deviation} &= \sqrt{\frac{\sum x^2}{\sum f} - \left(\frac{\sum x}{\sum f}\right)^2} \\&= \sqrt{\frac{985.88}{8} - \left(\frac{86.8}{8}\right)^2} \\&= 2.347\,871\,376\dots \\&= 2.35 \text{ mm}\end{aligned}$$

Answer 3

- (a) Convenience sampling, opportunity sampling
- (b) Charlie would need more than ten minutes to gather data on 40 people.
He could still stand by the door for a longer period and do Quota sampling.
Ask 8 people every ten minutes between, say, 08:30 and 09:20
- (c) Taruni is carrying out a Census
- (d) $Q_3 = 58$ and $Q_1 = 26$ so IQR is 32 minutes
- (e)

$$\begin{aligned}\text{mean} &= \frac{4133}{95} \\&= 43.505\,263\,16\dots \\&= 43.5 \text{ minutes}\end{aligned}$$

$$\begin{aligned}\text{standard deviation} &= \sqrt{\frac{202\,294}{95} - \left(\frac{4133}{95}\right)^2} \\&= 15.38514231\dots \\&= 15.4 \text{ minutes}\end{aligned}$$

- (f) From the box and whisker plot it can be seen that there are a couple of large value outliers and these will distort the values of the mean and the standard deviation. Therefore, the median and interquartile range will better reflect the average and spread of the majority of the data.
- (g) The median will need to be decreased because two values that were above the previous median of 40 are now below it.
Similarly, the upper quartile will need to be decreased because two values that were above the previous upper quartile of 58 are now below it.
All else on the box plot remains the same.

Answer 4

See the notes following the following answer about what the Examiners were expecting in answer to this question.

Windspeed, w (knots)	Frequency f	Mid-interval value, x	fx	x^2	fx^2
$5.5 \leq w < 6.5$	2	6	12	36	72
$6.5 \leq w < 7.5$	3	7	21	49	147
$7.5 \leq w < 8.5$	2	8	16	64	128
$8.5 \leq w < 9.5$	2	9	18	81	162
$9.5 \leq w < 10.5$	0	10	0	100	0
$10.5 \leq w < 11.5$	3	11	33	121	363
$11.5 \leq w < 12.5$	1	12	12	144	144
$12.5 \leq w < 13.5$	2	13	26	169	338
$13.5 \leq w < 14.5$	1	14	14	196	196
$14.5 \leq w < 15.5$	0	15	0	225	0
$15.5 \leq w < 16.5$	2	16	32	256	512
	18		184		2062

(a)

$$\begin{aligned}
 \text{mean} &= \frac{184}{18} \\
 &= 10.222... \\
 &= 10.2
 \end{aligned}$$

(b)

$$\begin{aligned}
 \text{standard deviation} &= \sqrt{\frac{2062}{18} - \left(\frac{184}{18}\right)^2} \\
 &= 3.172... \text{ knots}
 \end{aligned}$$

Note : The examiners report for this question says,
“Another skill students are required to have under the new specifications is to be able to calculate standard statistics on their calculators.
In this case we expected students to enter the data into their calculators and write down the mean (part a) and standard deviation (part (b)).
It was clear many students are not familiar with this requirement and we often saw several lines of working to derive these results which unfortunately, under the new specifications cannot receive any marks”