Summary Statistics for a Quantitative Variable Quiz

1. Roger claims that the two statistics most likely to change greatly when an outlier is added to a small data set are the mean and the median. Is Roger's claim correct?

(A) Yes, both the mean and median are likely to change greatly.

(B) No, only the mean is likely to change greatly.

(C) No, only the median is likely to change greatly.

(D) No, neither the mean nor the median are likely to change greatly.

(E) There is not enough information to determine if the mean or the median is likely to change greatly.

Answer B

Correct. The mean is not resistant to outliers, so it is likely to change. The median is resistant to outliers, so the addition of the outlier will not greatly (if at all) change the median's value.

2. A golfer recorded the following scores for each of four rounds of golf: 86, 81, 87, 82. The mean of the scores is 84. What is the sum of the squared deviations of the scores from the mean?

(A) $\sum(x-\bar{x})=(86-84)+(81-84)+(87-84)+(82-84)$

(B) $\sum|x-\bar{x}|=|86-84|+|81-84|+|87-84|+|82-84|$

(C) $2\sum|x-\bar{x}|=2[|86-84|+|81-84|+|87-84|+|82-84|]$

(D) $\sum(x-\bar{x})^2=(86-84)^2+(81-84)^2+(87-84)^2+(82-84)^2$

(E) $[\sum|x-\bar{x}|]^2=[|86-84|+|81-84|+|87-84|+|82-84|]^2$

Answer D

Correct. The formula for finding the variance of a sample is $s^2=\frac{\Sigma(x-\bar{x})^2}{n-1}$, where $\Sigma(x-\bar{x})^2$ is the sum of the squared deviations from the mean. For the golf scores,
$\Sigma(x-\bar{x})^2=(86-84)^2+(81-84)^2+(87-84)^2+(82-84)^2=4+9+9+4=26.$

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3. The following list shows the selling prices of 8 houses in a certain town.

House	Price	House	Price
A	\$302,100	E	\$275,800
B	\$275,800	F	\$295,000
C	\$305,400	G	\$281,900
D	\$250,600	H	\$284,700

What is the median selling price of the houses in the list?

(A) \$263,200

(B) \$283,300

(C) \$288,450

(D) \$290,600

(E) \$293,400

Answer B

Correct. To find the median of the list of data, first order the data from least to greatest: 250,600; 275,800; 275,800; 281,900; 284,700; 295,000; 302,100; 305,400. Since there are 8 values, an even number, the median is the average of the 2 values in the middle of the ordered list: $\frac{281{,}900+284{,}700}{2}=\frac{566{,}600}{2}=\$283{,}300$. The median selling price of the houses is \$283,300.

4. A statistician at a metal manufacturing plant is sampling the thickness of metal plates. If an outlier occurs within a particular sample, the statistician must check the configuration of the machine. The distribution of metal thickness has mean 23.5 millimeters (mm) and standard deviation 1.4 mm. Based on the two-standard deviations rule for outliers, of the following, which is the greatest thickness that would require the statistician to check the configuration of the machine?

(A) 19.3 mm

(B) 20.6 mm

(C) 22.1 mm

(D) 23.5 mm

(E) 24.9 mm

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Answer B

Correct. This value is an outlier, because it is located more than 2 standard deviations below the mean. Of the five values that are listed in the options, this value is the greatest value that is an outlier.

5. At a photography contest, entries are scored on a scale from 1 to 100. At a recent contest with 1,000 entries, a score of 68 was at the 77th percentile of the distribution of all the scores. Which of the following is the best description of the 77th percentile of the distribution?

(A) There were 770 entries with a score less than or equal to 68. ✓

(B) There were at least 230 entries with a score of 77.

(C) There were 23% of the entries with a score less than or equal to 68.

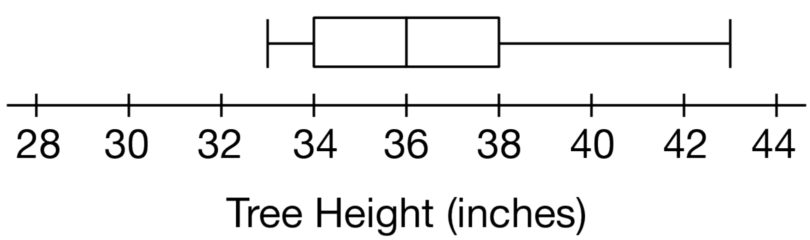
(D) There were 77% of the entries with a score equal to 68.

(E) There were at least 77% of the entries with a score greater than 68.

Answer A

Correct. This is a correct interpretation of the 77th percentile of the distribution. 77% of the scores were less than or equal to 68, and 77% of 1,000 scores is 770 scores.

6. The following boxplot summarizes the heights of a sample of 100 trees growing on a tree farm.



Emily claims that a tree height of 43 inches is an outlier for the distribution. Based on the $1.5 \times \text{IQR}$ rule for outliers, is there evidence to support the claim?

(A) Yes, because $(\text{max} - \text{Q3})$ is greater than $(\text{Q1} - \text{min})$.

(B) Yes, because 43 is greater than $(\text{Q3} + \text{IQR})$.

(C) Yes, because 43 is greater than $(\text{Q1} - 1.5 \times \text{IQR})$.

(D) No, because 43 is not greater than $(\text{Q3} + 1.5 \times \text{IQR})$. ✓

(E) No, because 43 is greater than $(\text{Q1} - 1.5 \times \text{IQR})$.

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Answer D

Correct. The IQR is $(\mathrm{Q}3-\mathrm{Q}1)$, which is 38 minus 34 or 4. An upper outlier exists if it is greater than $(\mathrm{Q}3+1.5\times\mathrm{IQR})$, but the value 43 is not greater than $38+1.5(4)=44$.