Statistics / Module 6 - Measures of Position

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Topic 1: Percentage of data below a specified value

Problem 1: In a data set {10, 20, 30, 40, 50}, find the percentage of data values below 30.
Answer: Values below 30: {10, 20} (2 values). Total values: 5. Percentage = (2/5) × 100 = 40%.

Problem 2: For the data set {5, 15, 25, 35, 45, 55}, calculate the percentage of data below 40.
Answer: Values below 40: {5, 15, 25, 35} (4 values). Total values: 6. Percentage = (4/6) × 100 ≈ 66.67%.

Topic 2: Interpreting percentile ranks

Problem 1: A student's score is in the 75th percentile of a test. Interpret what this means.
Answer: The student's score is higher than 75% of the scores in the test distribution, meaning it is in the top 25% of scores.

A national chain of department stores ranks its 1,250,000 salespeople by the monetary value of their sales. Charmaine's sales are at the 62nd percentile. Greg's sales are at the 76th percentile.

(If necessary, consult a list of formulas.)

(a) Which of the following must be true about Charmaine's and Greg's sales?
62   76
✗ Charmaine's sales were higher in value than Greg's sales.
● Both Charmaine and Greg had sales higher in value than the median.
The value of Greg's sales were $1400 more than Charmaine's.
The values of both Charmaine's and Greg's sales were in the bottom half of all of the salespeople.

(b) Which of the following must be true about Charmaine's sales?
higher
○ Charmaine had sales lower in value than about 62% of the salespeople.
○ The value of Charmaine's sales were about 62% of the chain's total.
● Charmaine had sales higher in value than about 62% of the salespeople.
○ The value of Charmaine's sales were about 38% of the chain's total.

Median = 50th percentile

Problem 2: A runner's time is in the 90th percentile. Explain the percentile rank.
Answer: The runner's time is faster than 90% of all runners' times, placing them in the top 10% of the distribution.

Topic 3: Five-number summary and interquartile range

Problem 1: For the data set {3, 7, 8, 9, 12, 15, 18}, find the five-number summary and interquartile range (IQR).
Answer: Ordered set: {3, 7, 8, 9, 12, 15, 18}. Five-number summary: Minimum = 3, Q1 = 7, Median = 9, Q3 = 15, Maximum = 18. IQR = Q3 - Q1 = 15 - 7 = 8.

Problem 2: Calculate the five-number summary and IQR for {4, 6, 10, 12, 14, 16, 20, 22}.
Answer: Ordered set: {4, 6, 10, 12, 14, 16, 20, 22}. Minimum = 4, Q1 = (6 + 10)/2 = 8, Median = (12 + 14)/2 = 13, Q3 = (16 + 20)/2 = 18, Maximum = 22. IQR = 18 - 8 = 10.
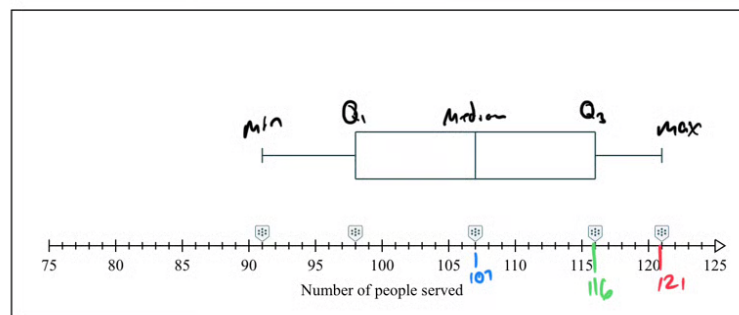
Topic 4: Introduction to finding outliers in a data set

Problem 1: Using the data set {3, 7, 8, 9, 12, 15, 30}, determine if there are any outliers.

Problem 2: For {5, 6, 7, 8, 9, 10, 20}, identify any outliers

Topic 5: Interpreting a box-and-whisker plot

Each day, for several weeks, a food bank recorded the number of people it served. The box-and-w

Use the box-and-whisker plot to answer the following.

(a) What is the median number of people served?
☐ 107

(b) What is the largest number of people served?
☐ 121

(c) What is the third quartile (Q_3) of the numbers of people served?
☐ 116

Topic 6: Constructing a box-and-whisker plot

Problem 1: Construct a box-and-whisker plot for 61, 56, 53, 40, 66, 67, 66, 61, 44, 41, 44, 35, 57, 52, 51, 56, 85, 20

Topic 7: Using box-and-whisker plots to compare data sets

The noon temperatures (in Fahrenheit) for two cities were recorded over a given month.

The box-and-whisker plots below (sometimes called boxplots) summarize the noon temperature Use the box-and-whisker plots to answer the questions.
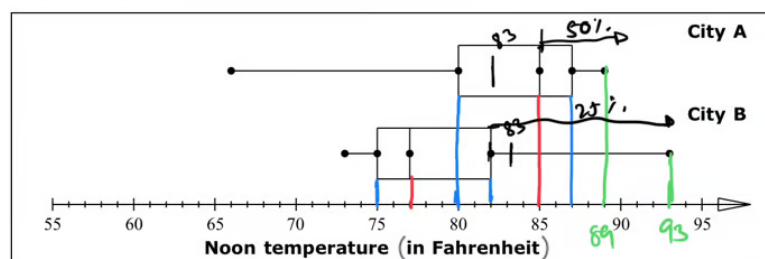
(a) Which city had noon temperatures with a larger interquartile range (IQR)?

| Select ⌄ | SAME | Bigger box |

(b) Which city had the highest noon temperature?

| Select ⌄ | City B |

(c) Which city had a larger median noon temperature?

| Select ⌄ | City A |

(d) Which city had more noon temperatures above 83 °F?

| Select ⌄ | City A |