

ORMS 3310 Chapter 3 Practice Problems

Use the following data for questions 1 through 3.

The quality control manager of a steel manufacturer is interested in comparing two different processes for fabricating steel. The number of defects per lot is listed for six lots produced with process 1 and four lots produced with process 2.

Process 1 $s = 6.442$
14 6 12 4 21 6

Process 2 $mean = 13$
19 5 10 18

1. Calculate the sample standard deviation for Process 2?
2. Calculate the sample mean for Process 1?
3. The manager has asked you (the professional statistician) to determine which process for producing steel is better (*Hint: Use the coefficient of variation*)?

4. The Dow Jones Travel Index reported what business travelers pay for hotel rooms per night in major U.S. Cities. The average hotel rates for 20 cities are as follows:

City	Rate per Night	City	Rate per Night
Atlanta	163	Minneapolis	125
Boston	177	New Orleans	167
Chicago	166	New York	245
Cleveland	126	Orlando	146
Dallas	123	Phoenix	139
Denver	120	Pittsburgh	134
Detroit	144	San Francisco	167
Houston	173	Seattle	162
Los Angeles	160	St. Louis	145
Miami	192	Washington D.C.	207

- Calculate the mean hotel room rate?
- Calculate the median hotel room rate?
- What is the mode?
- Calculate the first quartile?
- Calculate the third quartile?
- Calculate the 36th percentile?

6. Car rental rates per day for a sample of seven Eastern U.S. Cities are as follows.

City	Daily Rate
Boston	\$43
Atlanta	35
Miami	34
New York	58
Orlando	30
Pittsburgh	30
Washington, D.C.	36

- a. Calculate the mean car rental rate?
- b. Calculate the range of the car rental rates?
- c. Calculate the values for the first quartile and the third quartile?
- d. Calculate the interquartile range?
- e. Calculate the variance for the car rental rates?
- f. Calculate the standard deviation for the car rental rates?
- g. Calculate the coefficient of variation for the car rental rates?
- h. A similar sample of seven Western U.S. Cities showed a sample mean car rental rate of \$38 per day. The variance and standard deviation were 12.3 and 3.5, respectively. Discuss any difference between car rental rates in Eastern and Western U.S. Cities.

10. Consider a sample mean of 500 and a standard deviation of 100. Calculate the z-scores for the following data values: 520, 650, 500, 450, and 280?
11. The high costs in the California real estate market have caused families who cannot afford to buy bigger homes to consider backyard sheds as an alternative form of housing expansion. The mean price of a customized wooden structure is \$3100. Assume that the standard deviation is \$1200.
- Calculate the z-score for a backyard structure costing \$2300?
 - Calculate the z-score for a backyard structure costing \$4900?
 - Interpret the z-score in parts (a) and (b). Comment on whether either should be considered an outlier.
 - A recent article describes a \$13,000 shed. Should this structure be considered an outlier?

ANSWERS:

1. 6.6833
2. 10.5
3. $CV_1 = 61.3524\%$
 $CV_2 = 51.4101\%$
The process with less variation is better. Therefore process 2 is better.
4.
 - a. 159.05
 - b. 161
 - c. 167
 - d. 136.5
 - e. 170
 - f. 145
5.
 - a. 422
 - b. 380
 - c. 690
 - d. Using the mean of 422, cell phone subscribers are using $422/750 = 56\%$ of the capacity of their plans. Part (c) shows that 85% of the subscribers are using 690 or less. In general, cell phone users are not coming close to using the 750 minute capacity of their plans.
6.
 - a. 38
 - b. 28
 - c. First quartile = 30
Third quartile = 43
 - d. IQR = 13
 - e. 97
 - f. 9.8489
 - g. 25.9180%
 - h. The mean car rental rate per day is \$38 for both Eastern and Western cities. However, Eastern cities show a greater variation in rates per day. This greater variation is most likely due to the inclusion of the most expensive city (New York) in the Eastern city sample.
7. Range = 10, interquartile range = 5, variance = 16, standard deviation = 4, coefficient of variation = 26.6667%
8. Range = 22, variance = 124, standard deviation = 11.1355, coefficient of variation = 6.1864%
9. z-score for 10 = -0.76 z-score for 20 = 1.13 z-score for 12 = -0.38
10. z-score for 520 = 0.20 z-score for 650 = 1.50 z-score for 500 = 0
z-score for 450 = -0.50 z-score for 280 = -2.20
11.
 - a. -0.67
 - b. 1.5
 - c. \$2300 is 0.67 standard deviation below the mean. \$4900 is 1.50 standard deviation above the mean. Neither is an outlier.
 - d. The z-score for \$13,000 is 8.25. Therefore, this cost is an outlier.