

# AP Statistics: Checking for Normalcy

1. The data listed here are the weights of 27 packages of ground beef in a supermarket meat display. Find the mean and standard deviation of the data set. Find the percentage of measurements in the intervals  $\bar{x} \pm s$ ,  $\bar{x} \pm 2s$  and  $\bar{x} \pm 3s$ . Show all work, including the number of data points in each interval, the interval, written in the form (lower, upper), and the percentages. How do the percentages obtained compare with those given by the empirical rule?

*MEAN, STANDARD DEVIATION*

$$\begin{aligned}\mu &= 1.05\bar{2} \\ \sigma &= 0.163\end{aligned}\tag{1}$$

*INTERVALS*

$$\begin{aligned}\bar{x} \pm s &:: (0.889, 1.215) :: 20 \text{ points} :: 74\% \\ \bar{x} \pm 2s &:: (0.726, 1.378) :: 25 \text{ points} :: 93\% \\ \bar{x} \pm 3s &:: (0.563, 1.541) :: 27 \text{ points} :: 100\%\end{aligned}\tag{2}$$

*REASONING*

The Empirical states that the ideal percentages for standard deviation ranges in a normal distribution is 68% – 95% – 99.7. The percentages I got are very close to these values, so I can conclude that the weights of the ground beef in the supermarket meat display are normally distributed.

2. To estimate the amount of lumber in a tract of timber, an owner decided to count the number of trees with diameters exceeding 12 inches in randomly selected 50-by-50 foot squares. Seventy 50-by-50 foot squares were chosen via a simple random sample of all squares in the tract, and the selected trees were counted in each tract.

*SAMPLE MEAN*

$$\mu = 7.729\tag{3}$$

*STANDARD DEVIATION, INTERVALS, CALCULATIONS*

$$S = 1.985\tag{4}$$

$$\begin{aligned}\bar{x} \pm s &:: (5.744, 9.714) :: 71.4\% \\ \bar{x} \pm 2s &:: (3.759, 11.699) :: 95.7\% \\ \bar{x} \pm 3s &:: (1.774, 13.684) :: 100\%\end{aligned}\tag{5}$$

Compared with the percentages given by the empirical rule 68% – 95% – 99.7%, these percentages are quite close. Therefore, the tree diameters are normally distributed.

3. The randNorm function in the graphing calculator was used to generate the following numbers with a mean of 75 and standard deviation of 5. Use the empirical rule, a histogram, and a normal quantile plot to determine if this data could have come from a normal distribution. Explain clearly how each of these tools provide evidence for your conclusion.

For the histogram, we can see that it is bell-shaped and somewhat symmetric around mean. For the normal quantile plot, we can see that it is a somewhat diagonal straight line. Therefore, the distribution is normal. The percents I found are 71.4%, 95.7%, and 100%. These are very close to the percents specified in the empirical rule, so we can conclude that the distribution is normal.

4. You have the following data set of ages of students in a community college chemistry class. Create a normal probability plot to determine whether these age data are normally distributed.

The normal probability plot has a increasing concave down curve, with the rate of change decreasing as you move to the right. It is still quite close to being a straight diagonal line, so the age data is normally distributed.