

NOTES: STANDARD DEVIATION

DAY 4

Textbook Chapter 11.1, 11.3

OBJECTIVE: Today you will learn about standard deviation and the normal curve!

There are three ways that we can measure how spread out the data in a data set is.

1. Range
2. Quartiles
3. Standard Deviation

Who did the best? 5 problem sets were assigned this quarter.

Joe received the following scores: 12, 18, 18, 19, 18.

Another student, Charlotte, received these scores: 20, 19, 19, 20, 7.

Who did better on their problem sets? How can we tell?

Joe, since his scores were more consistent!

Let's find the standard deviation of the Problem Set scores to tell us who was the most **CONSISTENT**.

Without doing the calculation, determine which of the following two sets of data have the smaller standard deviation. Explain.

Data set #1:	8	10	11	14	17	19	23
Data set #2:	32	31	33	33	35	37	38

↳ this data set has numbers closer together.

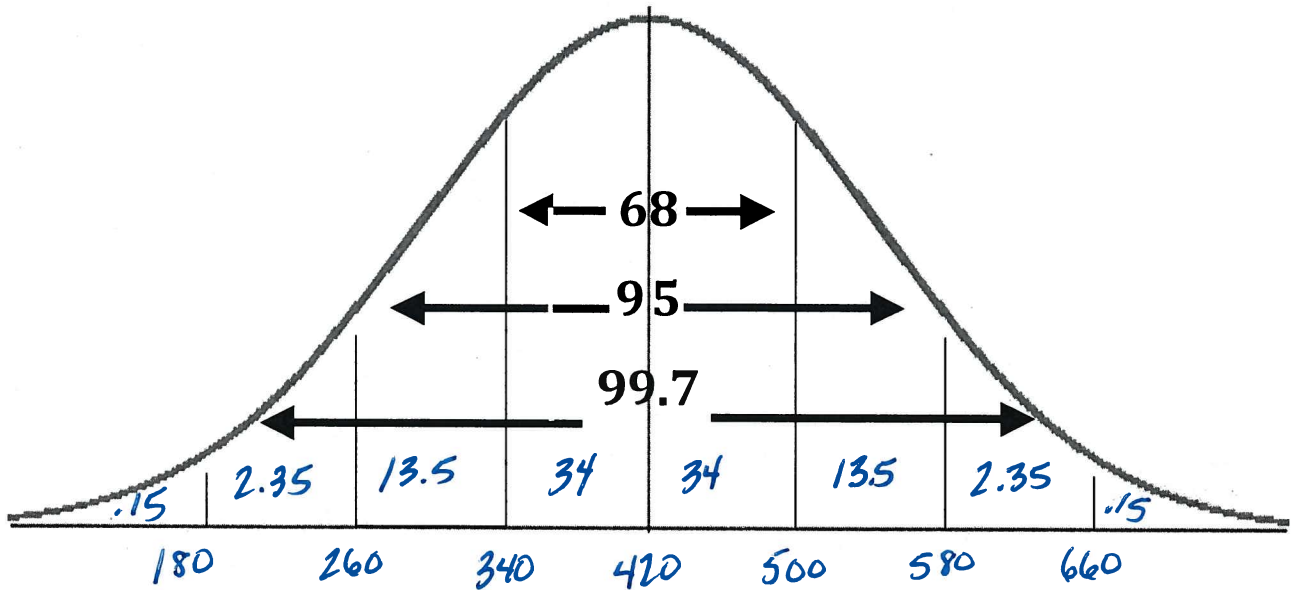
Now with a calculator, calculate the standard deviation for both. Did you make the correct decision above?

Data Set #1: 4.98

Data Set #2: 2.42

Properties of the Normal Curve:

- The mean, median and mode are all equivalent
- Area under the curve (total probability) is 1, or 100%
 - Curve is symmetrical



EMPIRICAL RULE

Monthly food expenditures for 750 families of four in a large city average \$420 with a standard deviation of \$80. Assuming that the monthly food expenditures are normally distributed:

a. What percentage is between \$260 and \$340?

13.5%

b. How many of these expenditures is between \$260 and \$340?

$$750 \times 13.5\%$$

$$750 \times 0.135$$

101.25

c. How many are less than \$260 or greater than \$580?

5% or $750(0.05) = 37.5$ people

d. If a family spends \$525 on food each month, determine the percentile for their monthly food expenditures.

normalcdf(0, 525, 420, 80) = 0.9053 = 90.53%

e. How much must a family spend in order to be in the top 30% of monthly food expenditures.

invNorm(0.3, 420, 80) = \$378.05

2nd VARS 2

2nd VARS 3

$$\bar{x} = 12.4$$

$$\sigma = 0.2$$

PRACTICE: EMPIRICAL RULE

DAY 4

A machine fills 12 ounce Potato Chip bags. It places chips in the bags. Not all bags weigh exactly 12 ounces. The weight of the chips placed is normally distributed with a mean of 12.4 ounces and with a standard deviation of 0.2 ounces.

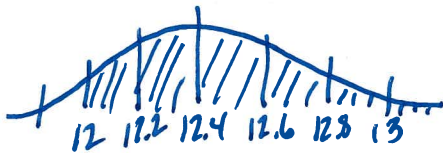
The company has asked you to determine the following probabilities to aid in consumer relations concerning the weight of the bags purchased.

- a. If you purchase a bag filled by this dispenser what is the likelihood it has less than 12 ounces?



$$2.5\%$$

- b. If you purchase a bag filled by this dispenser what is the likelihood it has more than 12 ounces?



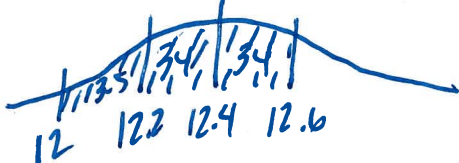
$$13.5 + 34 + 50 = 97.5\%$$

- c. If you purchase a bag filled by this dispenser what is the likelihood it has less than 12.6 ounces?



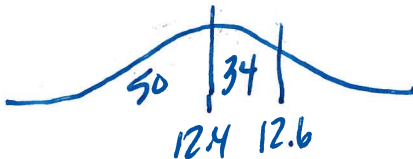
$$50 + 34 = 84\%$$

- d. If you purchase a bag filled by this dispenser what is the likelihood it has between 12 and 12.6 ounces?



$$13.5 + 34 + 34 = 81.5\%$$

- e. What weight of the bag is represented by the 84th percentile? Explain your answer.



12.6 oz, since 84% of bags weigh less than 12.6 oz.

- f. How many bags had a weight between 12 and 12.6 ounces?

From question d, 81.5% has a weight between 12 and 12.6 oz.

So, $400 \times 0.815 = 326$ bags

Practice Using your Calculator

1. The 1998 average monthly temperatures for a town are given below:

33 35 40 42 47 52 54 57 64 66 67 72

a) Find the mean 52.42

b) Find the standard deviation 12.62

2. Students in Mr. Johnson's class took a test on statistics. The test scores are as follows:

97, 88, 91, 60, 86, 72, 88, 76, 66, 60, 50, 61, 88, 73, 72, and 97

a) Find the mean 76.56

b) Find the standard deviation 14.12

c) Make a box and whisker plot