

Bellwork: Calculate the mean and standard deviation of the data below.

| Wait Time in Minutes | | |
|----------------------|-----|-----|
| 6.4 | 9.3 | 3.9 |
| 4.3 | 6.4 | 4.8 |
| 6.7 | 3.7 | 5.4 |
| 4.0 | 3.3 | 5.9 |
| 4.5 | 8.1 | 2.6 |
| 2.9 | 4.4 | 3.1 |
| 6.0 | 5.5 | 5.9 |
| 3.6 | 8.0 | 3.7 |
| 7.7 | 8.1 | 9.4 |
| 9.9 | 9.4 | 2.6 |

$$\bar{x} = 5.65$$

$$s_x = 2.24$$

3b) what % are greater than 81 in

$$\mu = 79 \text{ in}$$

$$\sigma = 3.89 \text{ in}$$

$$\text{normalcdf}(81, 200, 79, 3.89)$$

$$= .304 = 30.4\%$$

Homework 9.6 Solutions

1.
 - a. 200 to 800
 - b. approximately 6.7%
 - c. approximately 83.5%

2.
 - a. 13.25 to 19.75
 - b. approximately 2.3%
 - c. approximately 4.5%

3.
 - a. 71.22 inches to 86.78 inches
 - b. approximately 30.6%
 - c. approximately 24.2%
 - d) 3.6%

Lesson 9.7 Objectives

I can find the mean and standard deviation given a set of data

I can define and calculate the margin of error of a sample

Vocabulary

$$\frac{60}{100}$$

$$\frac{30}{100}$$

The **margin of error** accounts for the variation in results if the study or simulation were to be conducted multiple times under the same conditions. It does account for the random selection of individuals but it does not account for bias.

A **confidence interval** provides a range of plausible values for a population parameter. It can be found by using the sample statistic and the margin of error for the confidence level desired, i.e.

sample statistic \pm margin of error.

$$\frac{60}{100} \pm \frac{30}{100} = \frac{30}{100} - \frac{90}{100}$$

The **confidence level** determines how likely it is that the actual population parameter falls on the confidence interval that was calculated using the sample statistic and the margin of error.

95%

$$.30 - .90$$

50%

$$.50 - .70$$

A margin of error is not a mistake; rather it refers to the expected range of variation in a survey or simulation if it were to be conducted multiple times under the same procedures. The margin of error is based on the sample size and the confidence level desired. The interval that includes the margin of error is called the **confidence interval** and is usually computed at a 95% **confidence level**. A confidence level of 95% means that you can be 95% certain that the actual population parameter falls within the confidence interval.

Calculating Margin of Error

The following formulas can be used to approximate the margin of error with a 95% confidence level:

1. If you are given a sample proportion, then the margin of error can be approximated by:

$$\text{margin of error} = 2 \cdot \sqrt{\frac{\rho(1-\rho)}{n}}$$

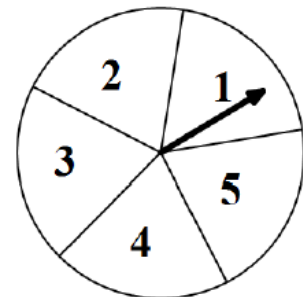
where ρ is the sample proportion and n is the sample size.

2. If you are given sample mean and standard deviation, then the margin of error can be

approximated by: $\text{margin of error} = 2 \cdot \frac{s}{\sqrt{n}}$, where s is the sample standard deviation and n is the sample size.

A spinner like the one shown at the right was spun 30 times and the number it landed on was recorded as shown below.

| | | | | |
|----|----|----|----|----|
| .2 | .2 | .2 | .2 | .2 |
| 1 | 2 | 3 | 4 | 5 |
| | | | | |



For each situation, find the sample proportion, the margin of error for a 95% confidence level, the 95% confidence interval for the population proportion, and determine if the theoretical proportion would be within the confidence interval found.

- a. the probability of the spinner landing on 2
- b. ~~the probability of the spinner landing on 3~~
- c. the probability of the spinner landing on 5

$P = 9/30 = .3$
 $m.e. = 2 \cdot \sqrt{\frac{.3(1-.3)}{30}} = .167$

$C.I. = .3 \pm .167$

$.133 - .467$

yes, .2 is in the interval

$P = 4/30 \approx .133$

$m.e. = 2 \cdot \sqrt{\frac{4/30(1-4/30)}{30}} = .124$

$C.I. = .133 \pm .124$

$.009 - .257$

yes, .2 is in the interval

How to Calculate Mean and Standard Deviation of a data set

Enter data into list: STAT→1: Edit

Run program: STAT→CALC → 1:1-Var Stats

\bar{x} = sample mean

S_x = sample stnd dev

A fast food restaurant manager wanted to determine the wait times for customers in line. He timed the customers chosen at random.

a) $\bar{x} = 5.7$
 $S = 2.2$

b) $m.e. = 2 \cdot \frac{S}{\sqrt{n}}$
 $2 \cdot \frac{2.2}{\sqrt{30}} = 0.8$

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| 9.9 | 9.4 | 2.6 |

c) 5.7 ± 0.8

C.I. = $4.9 - 6.5$ min

d) We are 95% confident the REAL avg wait time is between 4.9 & 6.5 minutes.

- Find the mean and standard deviation for the sample. (Round to the nearest tenth)
- Approximate the margin of error for a 95% confidence level and round to the nearest tenth.
- Find the 95% confidence interval.
- Interpret the meaning of the interval in terms of wait times for customers.

