

Margin of Error



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Fill – in the charts on your paper

Margin of Error:

The interval in which the mean of the population is likely to be

FORMULA: $ME = 1.96\left(\frac{s}{\sqrt{n}}\right)$

ME = Margin of Error
n = # of terms (sample size)
s = Standard Deviation

Confidence Interval: we can say w/ 95% confidence

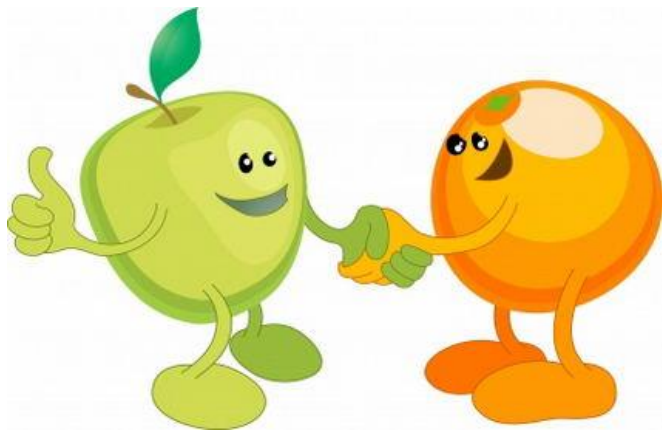
$\bar{x} \pm ME$ that the mean lies between the 2 #'s

FORMULA: $\bar{x} - ME \leq \mu \leq \bar{x} + ME$

FORMULA:

$$\bar{x} - ME \leq \mu \leq \bar{x} + ME$$

Where \bar{x} is the sample mean and μ is the population mean; the range is the confidence interval



Example 1

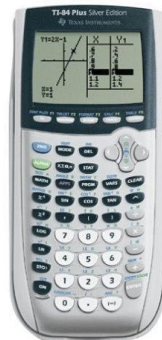
(Practice the GC steps to get the Answers)

A grocery store manager wanted to determine the wait times for customers in the express lines. She timed customers chosen at random.

(Use the chart of values in your packet.)

a) What is the mean and standard deviation of the sample? Round to the nearest hundredth.

Waiting Time (minutes)				
3.3	5.1	5.2	6.7	7.3
7.5	4.6	6.2	5.5	3.6
3.4	3.5	8.2	4.2	3.8
4.7	4.6	4.7	4.5	9.7
5.4	5.9	6.7	6.5	8.2
3.1	3.2	8.2	2.5	4.8



Graphing Calculator Steps

- [STAT] select 1:Edit
- Type the chart values into L1. After each number, hit the [ENTER] key to go to the next line. (Make sure the last value says L(30) on your calculator screen.
- [STAT] → CALC (at the top of the screen)
→ 1-var-stats → press [ENTER] twice.
- The symbol S_x stands for sample standard deviation and the symbol σ stands for population standard deviation. Pay attention to what kind of data you are working with and make sure you select the correct one! In some cases, you are working with population data and will select σ .

You should get:

$$\bar{x} = 5.36 \quad s_x = 1.83$$

1b

At a 95% confidence level, what is the approximate margin of error? Round to the nearest hundredth of a minute.



$$ME = 1.96 \frac{s}{\sqrt{n}}$$

$$ME = 1.96 \frac{1.83}{\sqrt{30}} = 0.65$$

1c and d

What is the confidence interval for a 95% confidence level?



What is the meaning of the interval in terms of wait times for customers?

$$\bar{x} - ME \leq \mu \leq \bar{x} + ME$$

$$4.71 \leq \mu \leq 6.01$$

95% confident that the mean of the grocery store customer's wait time is between 4.71 and 6.01.

Sample Populations

Sample Proportion: \hat{p}

This is read as “p hat”

$$= \frac{\text{desired \#}}{\text{total \#}}$$

95% Confidence Interval for
a Population Proportion:

$$\hat{p} \pm ME$$

Margin of Error for a
Sample Population:

$$ME = 1.96 \sqrt{\frac{\hat{p}(1 - \hat{p})}{n}}$$

Where \hat{p} is the Sample Population

And n is the

in the Sample Sample Size)



Example 2a



Find the sample proportion, the margin of error, and the 95% confidence interval for the population proportion.

$$\hat{p} = 280/530 = 0.5283$$

$$ME = 1.96 \sqrt{\frac{0.5283(1 - 0.5283)}{530}} = 0.043$$

- a) In a survey of 530 randomly selected high school students, 280 preferred watching football to watching basketball.

95% Confidence Interval:

$$0.53 \pm 0.04 = 0.49 \text{ to } 0.87$$



Example 2b



Find the sample proportion, the margin of error, and the 95% confidence interval for the population proportion.

$$\hat{p} = 342/500 = 0.684$$

b) In a simple random sample of 500 people, 342 reported using social networking.

$$ME = 1.96 \sqrt{\frac{0.684(1 - 0.684)}{500}} = 0.04$$

95% Confidence Interval:

$$0.684 \pm 0.04 =$$

$$0.644 \text{ to } 0.724$$

Seatmate Practice Problems

(Work with your seatmate partners to get the following answers.

After about 15 – 20 minutes, two People need to volunteer to put # 3 on the board and two different people need to put # 4 on the board.)



For Examples 3-4, find the 95% confidence interval for the population mean or population proportion, and interpret the confidence interval in context.

3. A consumer research group tested the battery life of 36 randomly chosen batteries to establish the likely battery life for the population of the same type of battery.

4. In a poll of 720 likely voters, 358 indicate they plan to vote for Candidate A.

Ans → 0.46 to 0.54

Ans → $67.4 \leq \mu \leq 73.6$

For the remaining time in class,
work on HW 5, so that you will not have any HW over
the weekend!!!
Please make sure that you have the Review Material
printed for Tuesday's class.

