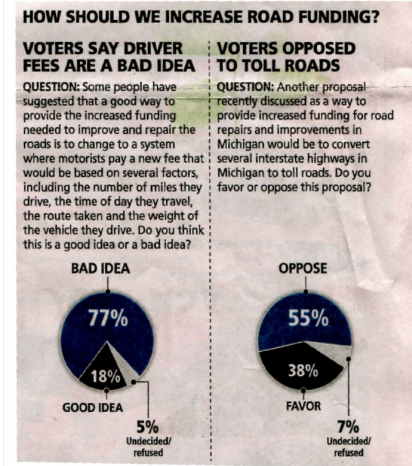


The governor wanted to know what percent of the people in Michigan were in favor of raising driver fees in order to produce enough money to fix the roads. How would he go about finding this out.

It's too costly and time consuming to try and actually ask everybody. A survey would then be used to ask a **SAMPLE** of all the people.



Section 12-5: Working With Samples

Population:

All of a certain item (The Whole Group)

Sample:

Part of the population.

Random Sample:

When all the members of the population are equally likely to be chosen.

Law of Large Numbers:

The variation in a set of data decreases as the sample size increases.

In general, the larger the data set the smaller the standard deviation.

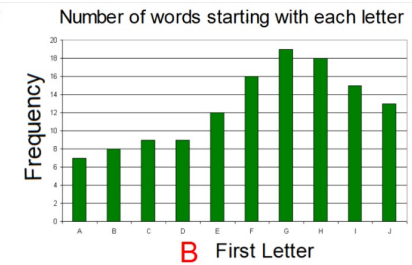
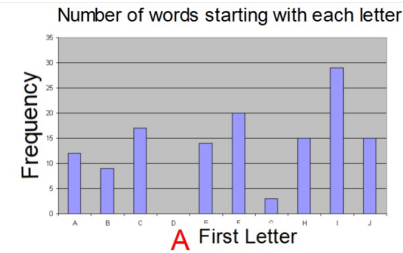
Sample	Score	Stand Dev
A	4.4	1.4
B	4.6	0.6
C	4.6	1.2

Which sample was most likely the greatest in size?

Sample B because it has the least variation.

Which sample was most likely the smallest?

Sample A because it has the most variation.



The two charts show the number of words found in two a sample passage from two different books. Which sample was most likely the largest?

Sample B because its graph has less variation.

Biased Sample:

When part of the population is overrepresented or underrepresented.

This may occur because of how a sample was taken or how a question is worded.

Why are the following methods or questions biased?

How could they be changed so that they are not biased?

1. You ask every fifth person leaving a Detroit Tigers baseball game which team they think is the best in baseball.

You are overrepresenting Tigers fans.

To be unbiased you could ask fans from cities across the country and even in cities without teams.

2. Question on a survey:

Do you think that people should be allowed to continue killing deer?

This wording could influence people's response.

An unbiased question could be: "Should people be allowed to continue hunting?"

Why are the following methods or questions biased?

How could they be changed so that they are not biased?

3. Do you want to eat a hamburger or the usual boring vegetable sandwich?

This wording could influence people's response.

An unbiased question could be: "Do you want to eat a hamburger or vegetable sandwich?)

4. Should the underpaid and overworked city workers get a pay raise?

This wording could influence people's response.

An unbiased question could be: "Should city workers get a pay raise?)

Why are the following methods or questions biased?

How could they be changed so that they are not biased?

5. What is your current age?

10 or less

10 to 20

20 to 30

30 to 40

40 to 50

50 or greater

← this interval is larger than the others
so it could be overrepresented

Results of the driver fee survey:

In favor of raising fees = 108

Against raising fees = 462

What percent of people favor raising driver fees to fix the roads?

$$\frac{108}{570} = 18.9\%$$

This is called the Sample Proportion

Sample Proportion:

The ratio of: $\frac{\text{\# times an event occurs}}{\text{Sample Size}}$

Sample Proportion:

Example:

In a sample of 500 TV viewers, 159 watch the 11:00pm news. Find the sample proportion.

$$\frac{159}{500} \Rightarrow 31.8\%$$

According to a CNN/Time poll, among likely voters, Murkowski and Miller each take 37 percent while Democrat Scott McAdams is pulling 23 percent with a 3.5 percent margin of error.

this means that the 37% could be off by as much as 3.5% either smaller or larger: $37\% \pm 3.5\%$

Margin of Error:

A range of values that most likely contains the actual population proportion.

Usually given as $\pm\%$.

A poll leading up the election shows that Jones is favored by 43% of the people. The poll has a margin of error of $\pm 4\%$. What is the range of voters that can be expected to vote for Jones?

$$43\% \pm 4\% \rightarrow$$

39% to 47%

A poll in a local election shows that Berg is leading Pomeroy by 58% to 45%. The margin of error is 5%.

What range of percentage of votes can Berg expect to receive?

53% to 63%

What range of percentage of votes can Pomeroy expect to receive?

40% to 50%

Should Berg be confident of winning?

Yes, Berg's lowest percent is still higher than Pomeroy's highest percent.

The same poll a month ago showed the pair in a statistical dead heat, with Berg edging Pomeroy by three points, with a 4.5 percent margin of error

Berg 59 \pm 4.5 \Rightarrow 54.5 to 63.5
Pomeroy 56 \pm 4.5 \Rightarrow 51.5 to 60.5

Now it's possible that Pomeroy could win because Berg's lowest percent is below Pomeroy's highest percent. When the margin of error is applied and it turns out that either candidate could win, it's called a Statistical Dead Heat.

Margin of Error Formula:

$$\pm \frac{1}{\sqrt{n}}$$

n = sample size

Convert this to a percent by x100.

Margin of Error: $\pm \frac{1}{\sqrt{n}}$

SOURCE: Exclusive poll done for the Free Press/WXYZ-TV (Channel 7) and our statewide media polling partners. The survey was done May 17-20 by Lansing-based EPIC-MRA. It was a 600-voter sample, using 20% cell phones, with an error margin of +/- 4 percentage points.

Find the margin of error rounded to the nearest whole percent.

$$\pm \frac{1}{\sqrt{600}} \times 100 = \pm 4\%$$

A random sample of 275 people shows that 44% are not satisfied with the job the governor is doing so far. What is the margin of error of this survey? $\frac{1}{\sqrt{275}} \times 100 = \pm 6\%$

What is the interval that is most likely to contain the **population proportion** for the percent of people that are not satisfied?

$$44\% \pm 6\% = 38\% \text{ to } 50\%$$

What happens to the margin of error as the sample size increases?

Margin of error should decrease with a larger sample size

$$\pm \frac{1}{\sqrt{n}}$$

As sample size decreases?

Margin of error should increase with a smaller sample size.

What sample size would give the most accurate results?

The entire population - - EVERYBODY!

A poll take before an election shows that 52% of registered voters are in favor of the Proposal. If the survey has a margin of error of $\pm 4\%$ estimate the number of voters in the poll to the nearest whole number.

$$\frac{1}{\sqrt{n}} = \frac{.04}{1}$$

Cross multiply to get:

$$(.04)(\sqrt{n}) = 1$$

divide by .04

$$\sqrt{n} = \frac{1}{.04}$$

square both sides

$$n = 625$$

In a survey of 528 high school juniors 325 already had career plans after high school. Round to a tenth.

1. Find the sample proportion. $\frac{325}{528} \times 100 = 61.6\%$

2. Find the margin of error $\frac{1}{\sqrt{528}} \times 100 = \pm 4.4\%$

3. Find the interval that most likely contains the actual percentage (**population proportion**) of juniors who have actually decided on their future career plans.
 $61.6 \pm 4.4 = 57.2\% \text{ to } 66\%$

4. If there are actually 250,000 juniors, find the interval for the actual number of juniors who have made this decision.

$$(.572)(250,000) \text{ to } (.66)(250,000) = 143,000 \text{ to } 165,000 \text{ juniors}$$

A sample of 50 yogurt containers is taken off the production line and tested. 3 are found to have traces of E-coli.

1. Find the sample proportion. $\frac{3}{50} \times 100 = 6\%$

2. Find the margin of error. $\frac{1}{\sqrt{50}} \times 100 = \pm 14\%$

3. If the manufacturer produces 3200 containers of yogurt a day how many of those will probably have traces of E-coli?

$$6 \pm 14 \rightarrow 0\% \text{ to } 20\%$$

↑
6% - 14% would be a negative percent but that wouldn't be possible in this situation.