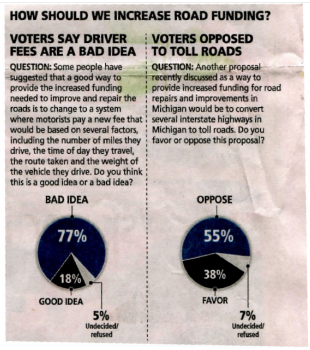
Thursday, June 4, 2020

Sample Proportions and Margin of Error

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 by used to ask a SAMPLE of all the people.



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 - smallest Std Dev.

Which sample was most likely the smallest?

Sample A - largest Std Dev.

Results of the driver fee survey:

In favor of raising fees = 108

Against raising fees = 462

Total in survey = 570

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

$$\frac{\text{\# in favor}}{\text{Total \# in survey}} = \frac{108}{570} \times 100 = 18.95\%$$

This is called the Sample Proportion

Sample Proportion:

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

Sample Proportion:

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

Sampe Proportion = $\frac{159}{500}$ x 100 = 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% ± 3.5%

Margin of Error: Usually given as ±%.

Will lead to a range of values that most likely contains the actual population proportion.

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

43% ± 4%
- 43 + 4 = 47%
- 43 - 4 = 39%

Jones can expect to get somewhere between 39% and 47% of the overall number of votes.

Using the information from the previous problem, if there are 50,000 registered voters, find the range of acutal number of votes Jones can expect to receive.

There are a few ways to answer this question, here is one method:

Step 1: Use the 43% from the survey to find # of votes predicted by the survey.

(0.43)(50,000) = 21,500 votes

Step 2: Turn the 4% margin of error into # of votes.

(0.04)(50,000) = ±2000

Step 3: Apply the results of step 2 to the answer from step1:

21,500 ± 2000 → Jones should expect to get from 19,500 to 23,500 votes

Here is another method to answer the question:

Step 1: Apply the margin of error as a percent to the sample proportion.

43% ± 4% → 39% to 47%

Step 2: Apply this range of percents to the population (total # of voters).

(0.39)(50,000) = 19,500 (0.47)(50,000) = 23,500

Jones should expect to get from 19,500 to 23,500 votes

Margin of Error Formula:

$\pm\frac{1}{\sqrt{n}}$ n = sample size

Convert this to a percent by x100.

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?

$\pm\frac{1}{\sqrt{n}}$ n = 275 → $\frac{1}{\sqrt{n}} = \frac{1}{\sqrt{275}} = 0.0603$

$0.0603 \times 100 \approx \pm 6\%$ margin of error

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 ±4% estimate the number of voters in the poll to the nearest whole number.

Margin of Error = ±4%

$$\frac{1}{\sqrt{n}} = 0.04$$

$$\left(\frac{1}{\sqrt{n}}\right)^2 = (0.04)^2$$

$$\frac{1}{n} = 0.0016$$

$$\frac{1}{n} = \frac{0.0016}{1}$$

n = 625 people in the poll

You can now finish problems 9 & 10 from Practice #30

This practice will be due on Sunday, June 7 by 10:00 pm