

6.4**Select and Draw Conclusions from Samples**Georgia
Performance
Standard(s)

MM3D3

Your Notes

- Goal** • Study different sampling methods for collecting data.

VOCABULARY

Population - entire group for sampling

Sample - Subset of population

Unbiased sample - when you represent the population

Biased sample - Not representative of the population

Margin of error : How much error occurs in your sample

M.O.E.

Example 1 *Classify samples*

School Lunch A teacher wants to survey everyone at her school about the quality of the school lunches. Identify the type of sample described and tell if the sample is biased.

- The teacher surveys every 7th student that goes through the lunch line.
- From a random name lottery, the teacher chooses 150 students and teachers to survey.

Solution

- The teacher uses a Survey to select students, so the sample is a Systematic sample. This sample is biased because the teacher surveys the students, but not the teachers.
- The teacher chooses from a random lottery, so the sample is a Random sample. This sample is unbiased because both students and teachers are surveyed.

- ✓ **Checkpoint** Identify the type of sample described, and tell whether the sample is biased.

1. A local politician wants to survey his constituents. He mails surveys to the constituents that are members of his political party and uses only the surveys that are returned.

Self-selected: biased

MARGIN OF ERROR FORMULA

When a random sample of size n is taken from a large population, the margin of error is approximated by:

$$\text{Margin of error} = \pm \frac{1}{\sqrt{n}}$$

This means that if the percent of the sample responding a certain way is p (expressed as a decimal), then the percent of the population that would respond the same way is likely to be between $p - \text{MOE}$ and $p + \text{MOE}$.

Example 2 Find a margin of error

Newspaper Survey In a survey of 1432 people, 26% said that they read the newspaper every day. (a) What is the margin of error for the survey? (b) Give an interval that is likely to contain the exact percent of all people who read the newspaper every day.

a. Margin of error = $\pm \frac{1}{\sqrt{n}} = \pm \frac{1}{\sqrt{1432}} \approx .0264$

The margin of error for the survey is about 2.6 %.

b. To find the interval, add and subtract 2.6 %.

$$26\% - \underline{2.6}\% = \underline{23.4}\%$$

$$26\% + \underline{2.6}\% = \underline{28.6}\%$$

It is likely that the exact percent of all people who read the newspaper every day is between 23.4 % and 28.6 %.

✔ **Checkpoint** Complete the following exercise.

2. In Example 2, suppose the sample size is 3236 people. What is the margin of error for the survey?

$$\begin{aligned} \text{MOE} &= \pm \frac{1}{\sqrt{n}} \\ &= \pm \frac{1}{\sqrt{3236}} \\ &= \pm .0175 \end{aligned}$$

$$\text{MOE} = \pm 1.8\%$$

Example 3 Find a sample size

Community Survey A group of students survey the local community about their favorite beverages. How many people were surveyed if the margin of error is $\pm 7\%$?

Solution

Use the margin of error formula.

$$\text{Margin of error} = \pm \frac{1}{\sqrt{n}}$$

$$(.07)^2 = \left(\pm \frac{1}{\sqrt{n}}\right)^2$$

$$\frac{.0049}{n} = \frac{1}{n}$$

$$n \approx 204.08$$

About 204 people were surveyed.

$$7\% = .07$$

$$n \cdot .0049 = \frac{1}{n} \cdot n$$

$$\frac{.0049n}{.0049} = \frac{1}{.0049}$$

✔ **Checkpoint** Complete the following exercise.

3. In a poll about movie channels its customers prefer to watch, a cable company wants the margin of error to be $\pm 3\%$. How many customers would need to be surveyed?

$$\begin{aligned} (.03)^2 &= \left(\frac{1}{n}\right)^2 \\ .0009 &= \frac{1}{n} \\ .0009n &= 1 \\ n &= 1,111 \end{aligned}$$

Non-calc

- Samples & Why
- Observational
vs.
experimental
& Why

Calc

- mean
- St. dev. (σ_x)
- Variance $(\sigma_x)^2$
- 5 # Summary
 - min
 - Q_1
 - median
 - Q_3
 - max
- Range
- IQR
- Outliers Low = $Q_1 - 1.5(IQR)$
High $Q_3 + 1.5(IQR)$

Box & Whisker