



AP Statistics

Chapter 7: Sampling Distributions

Day 1

HW: p. 428, #1-7 odd, p. 439-440, #29



Population vs Sample

The population is a complete set of items of interest.

A sample is a part of a population used to represent the population.



Parameter vs Statistic

The population mean μ and population standard deviation σ are examples of population parameters.

"x-bar"

The sample mean \bar{x} and the sample standard deviation s are examples of statistics.



Parameter vs Statistic

Statistics are used to make inferences about the population parameters.

While the population parameter is a fixed quantity, statistics vary depending on the particular sample chosen.

Probability Distribution vs Sampling Distribution

Recall that a **probability distribution** is all possible outcomes of a random variable and their associated probabilities.

A **sampling distribution** is the probability distribution of a sample statistic when a sample is drawn from a population.

The sampling distribution is **unbiased** if its mean is equal to the associated population parameter.

Sample Proportion

The value of the sample proportion \hat{p} is

$$\hat{p} = \frac{X}{n} = \frac{\text{number of success in the sample}}{n}$$

"p-hat"

Example

What proportion of U.S. teens know that 1492 was the year in which Columbus "discovered" America?

A gallop poll found that 210 out of a random sample of 501 American teens ages 13 to 17 knew this historical date.

What is the sample proportion?

$$\hat{p} = \frac{210}{501} = .42$$

Sample Proportion

\hat{p} has the following characteristics:

- The mean of the sample proportion \hat{p} is $\mu_{\hat{p}} = p$.
- The standard deviation of the sample proportion \hat{p} is

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

IMPORTANT NOTE ABOUT USING THIS STANDARD DEVIATION FORMULA

In order to use this formula, the following conditions must be met **AND YOU MUST ALWAYS SHOW THAT THE CONDITIONS ARE MET ON THE AP EXAM!!!**

- The 10% condition is met.

$$n \leq \frac{1}{10} N$$

- Check that the normal condition is met.

$$np \geq 10 \quad \text{and} \quad n(1 - p) \geq 10$$

Example

About 75% of young adult Internet users (ages 18 to 29) watch online videos. Suppose that a sample survey contacts an SRS of 1000 young adult Internet users and calculates the proportion \hat{p} in this sample who watch online video.

- What are the mean and standard deviation of the sampling distribution \hat{p} ?

$$\mu_{\hat{p}} = .75$$

$$\sigma_{\hat{p}} = \sqrt{\frac{(.75)(.25)}{1000}} = .0137$$

Example

About 75% of young adult Internet users (ages 18 to 29) watch online videos. Suppose that a sample survey contacts an SRS of 1000 young adult Internet users and calculates the proportion \hat{p} in this sample who watch online video.

- Check that both sampling conditions have been met.

10% condition:

$$1000 \leq \frac{1}{10} N$$

$$10000 \leq N$$

We can assume that there are at least 10,000 young adults that use the internet to watch videos.

Normal Distribution

$$np \geq 10$$

$$1000(.75) \geq 10$$

$$750 \geq 10$$

$$n(1-p) \geq 10$$

$$1000(.25) \geq 10$$

$$250 \geq 10$$