Tuesday, January 29, 2019

- **Warm-up**
  - A home alarm system has detectors covering *n* zones of the house. Suppose the probability is 0.7 that a detector sounds an alarm when an intruder passes through its zone, and this probability is the same for each detector. The alarms operate independently. An intruder enters the house and passes through all the zones.
    - What is the probability that at least one alarm sounds if $n = 3$?
    - What is the probability that at least one alarm sounds if $n = 6$?
    - How large must *n* be in order to have the probability of at least one alarm sounding be about 0.99?
- **Reaching for beads**

$p = 0.7$ $P(0) = (.3)^3 = 0.027$

- **What is the probability that at least one alarm sounds if *n* = 3?**

not 0

binomialcdf(3, 0.7, 1, 3) = 0.973

(n, p, lbound, ubound)

- **What is the probability that at least one alarm sounds if *n* = 6?**

n = 6 → 0.999

- **How large must *n* be in order to have the probability of at least one alarm sounding be about 0.99?**

n = 4 → 0.9919

mean → μ
standard deviation → σ
proportions → p (lower case)

almost always an estimate

Parameter

A number that describes some characteristic of the population. In statistical practice, the value of a parameter is usually not known because we cannot examine the entire population

Objectives

Content: I will examine random events and analyze the data from them.
Social: I will participate in the class activity well.
Language: I will explain my reasoning in a clear manner and listen to others.

mean -> $\bar{x}$
standard deviation -> s_x
proportions -> $\hat{p}$

Statistic

— know (not an estimate)

A number that describes some characteristic of a sample. The value of a statistic can be computed directly from the sample data. We often use a statistic to estimate an unknown parameter.

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Sampling distribution

The distribution of values taken by the statistic in all possible samples of the same size from the same population

sample size must be consistent

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The Candy Machine…

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Question to Ponder:

How does the sampling distribution change when n (the number in the sample) changes?

http://bit.ly/Resees

Central Limit Theorem

Draw an SRS of size *n* with mean μ and finite standard deviation σ. The central limit theorem (CLT) says that when *n* is large, the sampling distribution of the sample mean $\bar{x}$ is approximately Normal.

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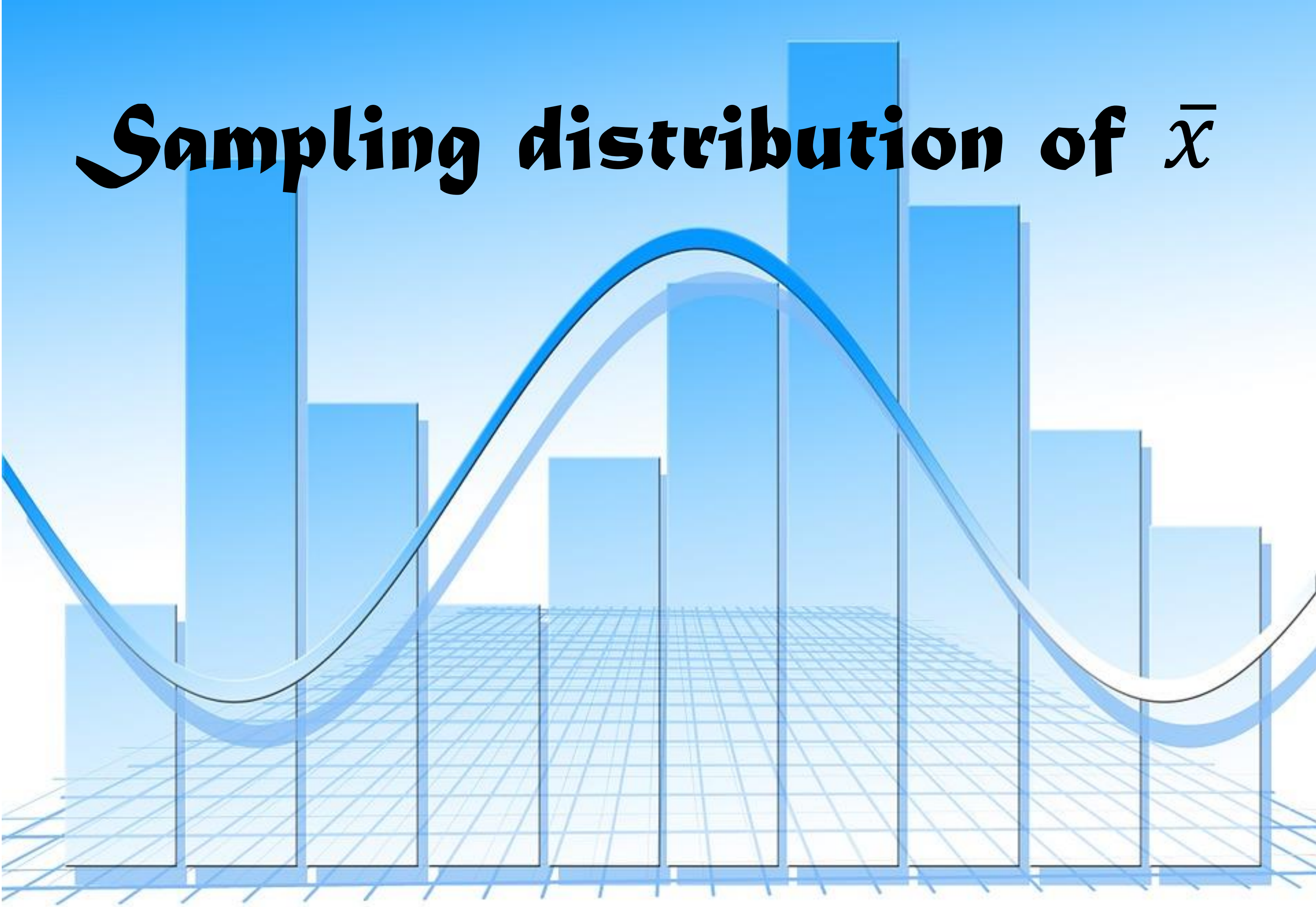
Sampling distribution of $\bar{x}$



http://bit.ly/PlingDist

The Fundamental Theorem of Statistics

- **The sampling distribution of *any* mean becomes more nearly Normal as the sample size grows.**
  - **All we need is for the observations to be independent and collected with randomization.**
  - **We don't even care about the shape of the population distribution!**
- **The Fundamental Theorem of Statistics is called the Central Limit Theorem (CLT).**

The Central Limit Theorem (CLT)

The mean of a random sample is a random variable whose sampling distribution can be approximated by a Normal model. The larger the sample, the better the approximation will be.

Homework

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