Presidential Approval Ratings

October 24, 2025
According to Gallup an estimated 41% of Americans approve of the way that President Trump is performing in his job (range 37%-47% during second term).

https://news.gallup.com/interactives/507569/presidential-job-approval-center.aspx

X = Number of adults in the sample that say they approve of D. Trump

Survey Methods
The Gallup polls are based on national telephone surveys of typically 1,000 adults conducted over three nights. Margin of sampling error is +/- 3 percentage points with a 95% level of confidence.
Source: www.gallup.com

Mean and Standard Deviation for the
Binomial Distribution

BINOMIAL MEAN AND STANDARD DEVIATION

If a count X has the binomial distribution $B(n, p)$, then

$$\mu_X = np$$

$$\sigma_X = \sqrt{np(1-p)}$$

MEAN AND STANDARD DEVIATION OF A SAMPLE PROPORTION

Let $\hat{p}$ be the sample proportion of successes in an **SRS** of size n drawn from a large population having population proportion p of successes. The mean and standard deviation of $\hat{p}$ are

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

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

Rules for Means (Expected Values)

Rule 1: If $Z = a + b X$ then $\mu_Z = a + b \mu_X$

Rule 2: If $Z = X + Y$ then $\mu_Z = \mu_X + \mu_Y$

Rule 3: If $Z = X - Y$ then $\mu_Z = \mu_X - \mu_Y$

Rules for Variances

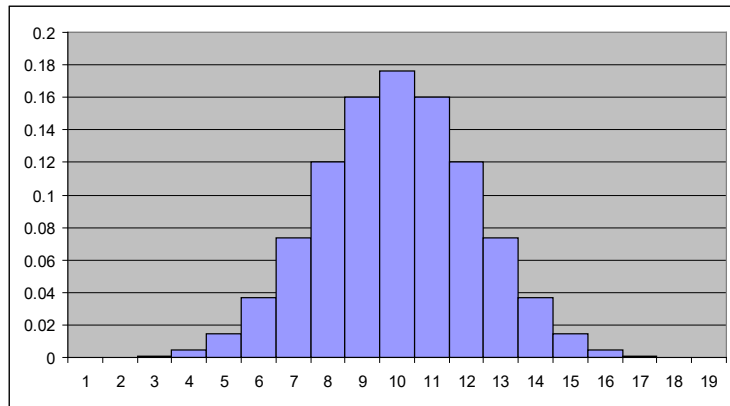**Rule 1**:   If $Z = a + b\,X$ then $\sigma_Z^2 = b^2\,\sigma_X^2$

Rule 2:   If $Z = X + Y$ then $\sigma_Z^2 = \sigma_X^2 + \sigma_Y^2$

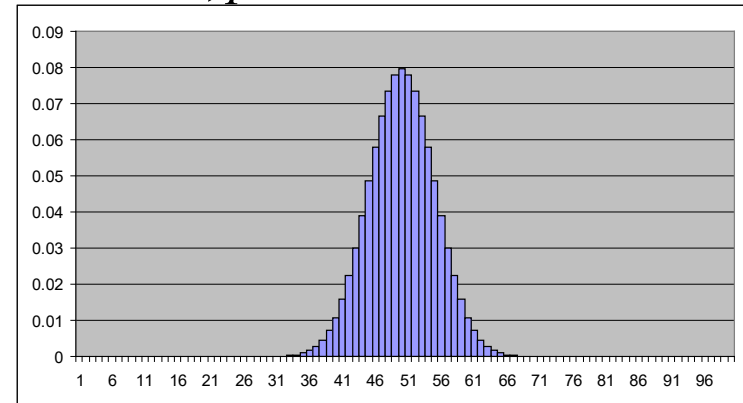**Rule 3**:   If $Z = X - Y$ then $\sigma_Z^2 = \sigma_X^2 + \sigma_Y^2$

NOTE: For Rules 2 and 3 we also must assume that X and Y are independent (all events associated with values of the two random variables are independent)
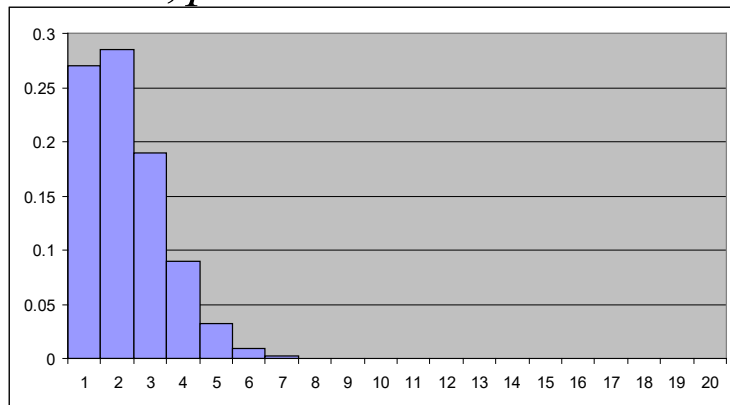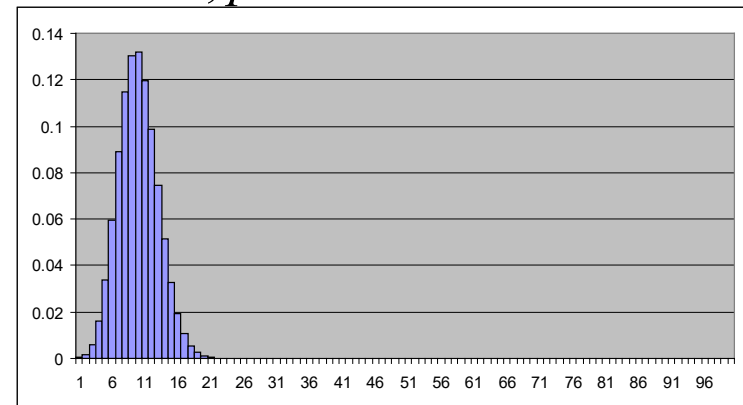
Binomial Distributions

n=20, p=0.5

n=100, p=0.5

n=20, p=0.1

n=100, p=0.1

Normal Approximation to the
Binomial Distribution

- Which Binomial Distributions look "normal"?
- It appears that it works when n is "large" and p is not too small.
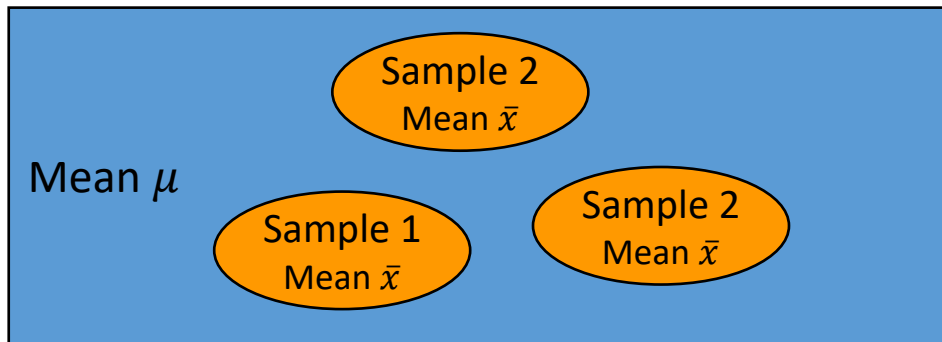- Commonly used criteria:

$$0 \leq np \pm 3\sqrt{np(1-p)} \leq n \qquad \text{or}$$

$$\boxed{np \geq 5 \text{ and } n(1-p) \geq 5}$$

Sampling Distributions

Population: The collection
of all subjects/cases of interest to our study

Sample: The collection of subjects/cases
actually used in our study

Mean μ

Sample 2
Mean $\bar{x}$

Sample 1
Mean $\bar{x}$

Sample 2
Mean $\bar{x}$

Note: There is only one population mean μ

$\bar{x}$ varies from sample to sample

Parameters and Statistics
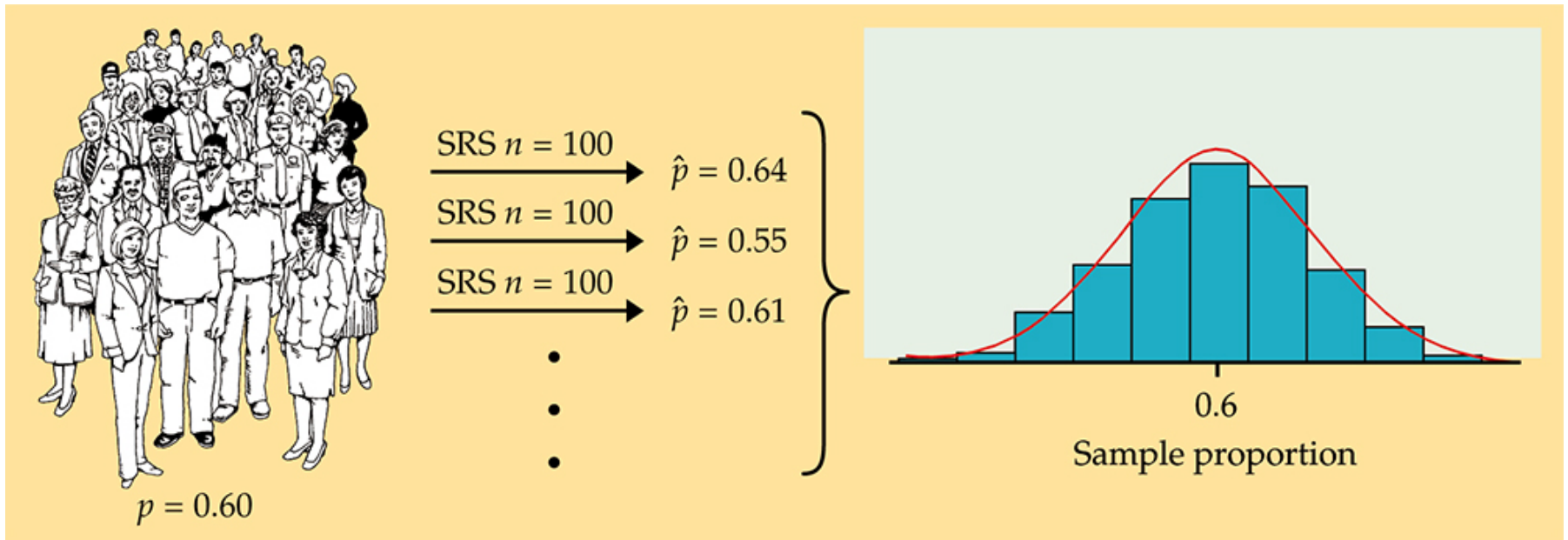
PARAMETERS AND STATISTICS

A **parameter** is a number that describes the **population.** A parameter is a fixed number, but in practice we do not know its value.

A **statistic** is a number that describes a **sample.** The value of a statistic is known when we have taken a sample, but it can change from sample to sample. We often use a statistic to estimate an unknown parameter.

Parameter or Statistic?

- The Bureau of Labor Statistics last month interviewed 60,000 members of the U.S. labor force, of whom **7.2%** were unemployed.

- A carload lot of ball bearings has mean diameter **2.5003 centimeters (cm).** This is within the specifications for acceptance of the lot by the purchaser. By chance, an inspector chooses 100 bearings from the lot that have mean diameter **2.5009 cm**. Because this is outside the specified limits, the lot is mistakenly rejected.

- A telemarketing firm in Los Angeles uses a device that dials residential telephone numbers in that city at random. Of the first 100 numbers dialed, **48%** are unlisted. This is not surprising because **52%** of all Los Angeles residential phones are unlisted.

- A researcher carries out a randomized comparative experiment with young rats to investigate the effects of a toxic compound in food. She feeds the control group a normal diet. The experimental group receives a diet with 2500 parts per million of the toxic material. After 8 weeks, the mean weight gain is **335 grams** for the control group and **289 grams** for the experimental group.
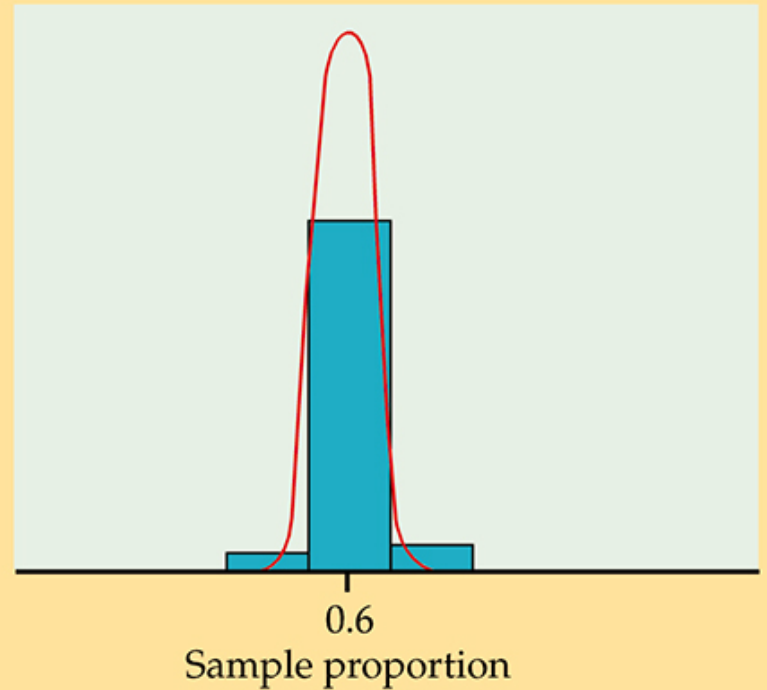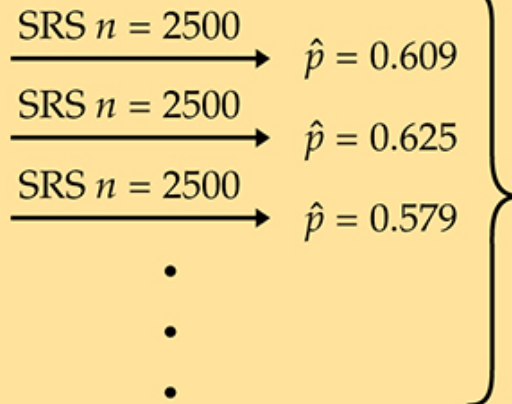
Parameters and Statistics

Parameters and Statistics

Samples vs. Populations

SAMPLE	POPULATION

- Frequency Distribution
- Rel. Frequency
- Sample Mean
- Sample Variance
- Sample Std. Dev.

Statistics

- Probability Distribution
- Probability
- Population Mean
- Population Variance
- Population Std. Dev.

Parameters

Statistics vs. Parameters

STATISTICS	PARAMETERS
▪ A *statistic* is a numerical measure that describes a sample.	▪ A *parameter* is a numerical measure that describes a population.
▪ A statistic is a *random variable*	▪ A parameter is a *constant*.
▪ The distribution of a statistic is called a *sampling distribution*	▪ Parameters can be estimated using statistics.