

## CONFIDENCE INTERVALS for SURVEYS and POLLS

$p$  = population proportion having a given characteristic

$\bar{p}$  = sample proportion having a given characteristic

### Example 1

Find  $\bar{p}$ .

a) 10 out of 25 doctors recommend daily exercise

$$10 \div 25 = .4 = 40\%$$

b) 24 out of 250 students favor name change

$$24 \div 250 = .096 = 9.6\%$$

$\bar{p}$  varies from sample to sample; depends on sample size ( $n$ )

**Statistic Theorem** states three things are true about the values of  $\bar{p}$ :

1. Values of  $\bar{p}$  are normally distributed

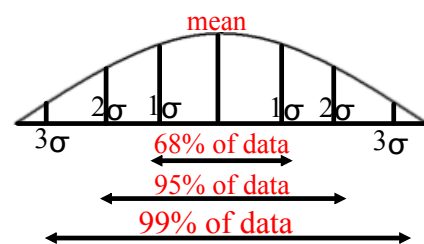
2. The mean of this distribution is  $p$

3. Standard deviation for this distribution =  $\sqrt{\frac{p \cdot (1-p)}{n}}$

### NORMAL DISTRIBUTION RULE

The 68% - 95% - 99% rule applies; which means 95% of the time  $\bar{p}$  is within 2 standard deviations of its mean ( $p$ ).

We are using  $\bar{p}$  to estimate  $p$ ... so we say, "95% of the time  $p$  is within 2 S.D. of  $\bar{p}$ "



**95% CONFIDENCE INTERVAL of p**

$$\bar{p} - 2(\text{standard deviation}) < p < \bar{p} + 2(\text{st. dev.})$$

**99% CONFIDENCE INTERVAL of p**

$$\bar{p} - 3(\text{standard deviation}) < p < \bar{p} + 3(\text{st. dev.})$$

**Example 2**

If  $\bar{p} = 0.4$  and  $n = 24$ , find the standard deviation of  $\bar{p}$ .

$$\sigma = \sqrt{\frac{\bar{p}(1-\bar{p})}{n}} = \sqrt{\frac{(.4)(1-.4)}{24}} = \boxed{.1}$$

**Example 3**

Using the information from example 2, also find a 95% and a 99% confidence interval for p from *example 2*.

$$\begin{array}{l} \bar{p} = .4 \\ \sigma = .1 \end{array} \quad \begin{array}{l} 95\% \\ .4 - 2(.1) < p < .4 + 2(.1) \\ \boxed{.2 < p < .6} \end{array} \quad \begin{array}{l} 99\% \\ .4 - 3(.1) < p < .4 + 3(.1) \\ \boxed{.1 < p < .7} \end{array}$$

\*99% is a bigger interval than 95%, more room for error

**Example 4**

Of 400 households surveyed, 144 reported watching Channel 8 news at least twice a week. Find a 99% confidence interval for p, the unknown proportion of households that watch the Channel 8 news at least twice a week.

$$\begin{array}{l} \bar{p} = \frac{144}{400} = .36 \\ SD = \sqrt{\frac{.36(1-.36)}{400}} = .024 \end{array} \quad \begin{array}{l} .36 - 3(.024) < p < .36 + 3(.024) \\ .288 < p < .432 \\ \boxed{28.8\% \text{ to } 43.2\% \text{ of households watch Ch 8 news}} \end{array}$$

## 17.6 HOMEWORK

**P678 # 1-7 ALL, 9, 11, 17, 18**

} collecting

## CHAPTER REVIEW OUT OF THE BOOK (NO WORKSHEET)

**P681 # 2-8 ALL**

← not  
collecting  
answers online