[Brief Answers]

CLASS OF 2020 Name: _____ Hour: _____ Date: _____ CLASS OF 2021

Which grade is more likely to go to Prom?

At many high schools, Prom is an annual dance that only Juniors and Seniors can purchase tickets for. The student council at a large high school is wondering if Juniors or Seniors are more likely to attend Prom. They take a random sample of 50 Juniors and find that 28 are planning on attending Prom. They select a random sample of 45 Seniors and 29 are planning on attending. Construct and interpret a 95% confidence interval for the difference in proportions of Juniors and Seniors who are planning on attending Prom.

1. What is the **point estimate** for…

   the proportion of Juniors planning on attending prom? $\hat{p}_J$ = .56

   the proportion of Seniors planning on attending prom? $\hat{p}_S$ = .64

   the difference in the proportion of Jrs and Srs planning on attending prom? $\hat{p}_J - \hat{p}_S$ = −.08

2. Check the conditions needed in order to construct a confidence interval.

   Random: SRS from each population of interest

   10%: Each population must be at least 10 × sample size

   Large Counts: $n_J\hat{p}_J \geq 10$ $n_J(1-\hat{p}_J) \geq 10$ $n_S\hat{p}_S \geq 10$ $n_S(1-\hat{p}_S) \geq 0$

3. Construct and interpret a 95% confidence interval for the difference in proportions of Juniors and Seniors who are planning on attending prom.

   General Formula: est ± MOE

   Specific Formula: $\hat{p}_J - \hat{p}_S \pm z^* \sqrt{\frac{\hat{p}_J(1-\hat{p}_J)}{n_J} + \frac{\hat{p}_S(1-\hat{p}_S)}{n_S}}$

   Work: $-.08 \pm 1.960 \sqrt{\frac{(.56)(.44)}{50} + \frac{(.64)(.36)}{45}}$

   Conclude: (−.2765, .1165)

4. Does the interval provide convincing evidence that Juniors have a lower proportion planning on going to prom or is it plausible that there is no difference between the two classes? Explain.

Name: _____ Hour: _____ Date: _____

Constructing a Confidence Interval for $p_1 - p_2$

Important ideas:

[Complete Inference Toolbox for 2 proportions]

Check Your Understanding

In a social study, a simple random sample of 150 teachers were selected and an independent simple random sample of 100 nurses were selected. Each person was asked if they currently have a second job. The results showed that 48 of the 150 teachers and 21 of the 100 nurses had a second job. Construct and interpret a 95% confidence interval for the difference in the proportion of all teachers and nurses that have a second job.

STATE: Parameter:

I The populations of interest are teachers and nurses. The parameter we wish to make a claim about is the difference ($p_t - p_n$) is proportions of teachers and nurses who have a second job.

Confidence level:

II. Because we wish to make a claim about a difference in proportions we will construct a 2-proportion z-interval. We have SRSs from each population of interest so our results will generalize to each population of interest. There are more than 10 · 150 teachers and 10 · 100 nurses so our sampling is approximately independent so we can use the formula for standard deviation

PLAN:

Name of procedure:

Check conditions:

$n_t(\hat{p}_t) \stackrel{?}{\geq} 10 \quad n_t(1-\hat{p}_t) \stackrel{?}{\geq} 10 \quad n_n(\hat{p}_n) \stackrel{?}{\geq} 10 \quad n_n(1-\hat{p}_n) \stackrel{?}{\geq} 10$

$150\left(\frac{48}{150}\right) \stackrel{?}{\geq} 10 \quad 150\left(\frac{102}{150}\right) \stackrel{?}{\geq} 10 \quad 100\left(\frac{21}{100}\right) \stackrel{?}{\geq} 10 \quad 100\left(\frac{79}{100}\right) \stackrel{?}{\geq} 10$ ✓ ✓ ✓ ✓

DO:

So the sampling distribution of the difference in $\hat{p}$s is approximately normal so our calculations should be accurate.

General Formula:

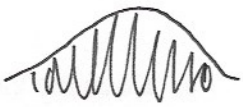
Specific Formula:

III est. ± mae

$$\hat{p}_t - \hat{p}_n \pm 1.960\sqrt{\frac{\hat{p}_t(1-\hat{p}_t)}{n_t} + \frac{\hat{p}_n(1-\hat{p}_n)}{n_n}}$$

Answer:

$$\frac{48}{150} - \frac{21}{100} \pm 1.960\sqrt{\frac{\frac{48}{150}\left(\frac{102}{150}\right)}{150} + \frac{\left(\frac{21}{100}\times\frac{79}{100}\right)}{100}}$$



CONCLUDE:

(.0007, .2193)

IV. We are 95% confident that the true difference (teachers − nurses) in proportion of teachers and nurses who have a second job is between .0007 and .2193

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