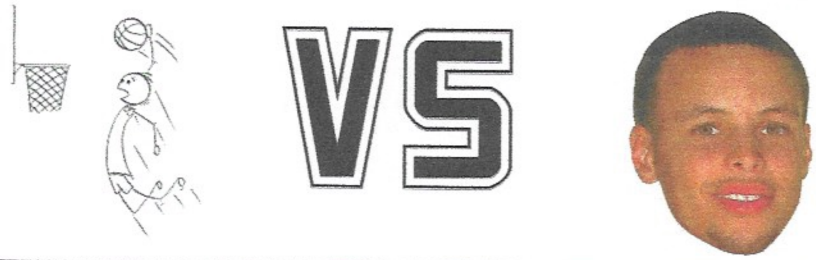
Name: ______________________________ Hour: _____ Date: ______

Are you sure Mr. Bohn isn't a good free throw shooter?



In our introduction to significance tests, we used simulation to estimate a P-value to decide whether or not Mr. Bohn was exaggerating about his free throw percentage. Today, we will use a formula to find a *P*-value.

I

→ Population of interest...
→ Parameter we wish...

1. We're going to carry out the significance test from lesson 9.1 again. Begin by writing the hypotheses.

   $H_0: p = .80$

   $H_a: p < .80$

II

2. a. ~~Each class found a different P-value because each dotplot was different~~. Would it be appropriate to use a Normal distribution to model the sampling distribution of $\hat{p}$? Justify your answer.

   $n \cdot p \overset{?}{\geq} 10 \quad n(1-p) \overset{?}{\geq} 10$

   $50(.80) \overset{?}{\geq} 10 \checkmark \quad 50(1-.80) \overset{?}{\geq} 10 \checkmark$

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

   b. Are there any other conditions we should check?

   SRS...

   Population at least 10x sample size...

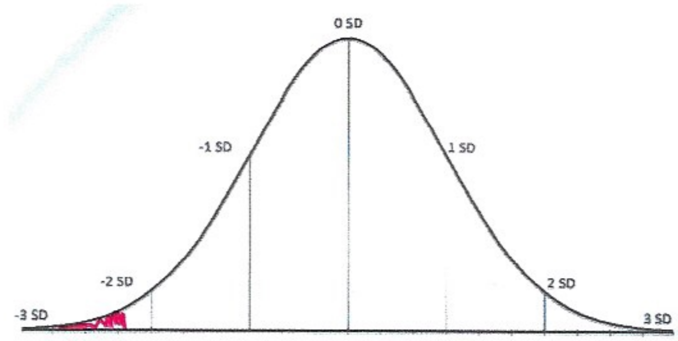
3. Now that conditions have been met, find the mean and standard deviation of the sampling distribution of $\hat{p}$.

   $\mu_{\hat{p}} = p = .80 \qquad \sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{.8(.2)}{50}} = .05657$

4. Use the mean and standard deviation you found to label the Normal curve.

5. How many standard deviations below the mean (*z*-score) is $\hat{p} = 0.64$? Label it on the normal curve.

   $z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{.64 - .8}{.05657} = -2.82$



6. Find the probability of an 80% shooter making 32/50 ($\hat{p} = 0.64$) or less.

   $.0024$

7. What conclusion can we make?

   If Ho were true we'd get sample results this low or lower .0024 of the time. Mr. Bohn is exagerating!

STATS MEDIC

Name: ____________________ Hour: _____ Date: _____

Significance Test for *p*

Important ideas:

LT#1 Conditions:

① Random:

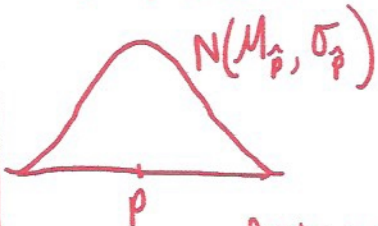
② 10%. $n < \frac{1}{10}N$

③ Normal: Large Counts

$n \cdot p \geq 10$

$n(1-p) \geq 10$

LT#2 Standardized Test Statistic (z-score) & P-value



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

$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} \rightarrow$ P-value

P-value < 5% → Statistically sig & have convincing evidence in the...

Check Your Understanding

Sharon claims that 90% of students can identify the smell of a skunk. She carries out a study to test this theory. She selects a random sample of 100 students and asks them each to take a whiff from a bag that is filled with skunk smell. She finds that 84 are able to correctly identify the smell as that of a skunk. She would like to know if these data provide convincing evidence that less than 90% of students can identify the smell of a skunk. Use $\alpha = 0.05$

a. State appropriate hypotheses for performing a significance test. Be sure to define the parameter of interest.

$p \rightarrow$ true proportion of students who can identify the smell of a skunk.

$H_0: p = 0.90$

$H_a: p < 0.90$

b. Explain why the sample result gives some evidence for the alternative hypothesis.

$\hat{p} = 84/100 = 0.84$ which is less than .90.

c. Check if the conditions for performing the significance test are met.

Random: "Random Sample of 100 students." ✓

10%: $100 < \frac{1}{10}$(All students) ✓

Normal: $100 \times .90 \geq 10$ ✓ $100 \times .10 \geq 10$ ✓

d. Calculate the standardized test statistic and *P*-value.

$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = -2 \rightarrow 0.0228$

e. What conclusion should Sharon make?

Because 0.0228 < .05, we have convincing evidence that less than 90% of students can identify the smell of a skunk.

Assignment #9.2a

(32) We are told that we have a random sample but we can only generalize to the population of interest with a SRS. The population of this "large rural high school" is likely larger than 60 x 10 so our sampling is approximately independent and we can use the formula for standard deviation.

$n \cdot p \overset{?}{\geq} 10 \quad n(1-p) \overset{?}{\geq} 10$ So the sampling

$60(.8) \overset{?}{\geq} 10 \quad 60(1-.8) \overset{?}{\geq} 10$ distribution of $\hat{p}$ is

approximately normal and our calculations will be accurate

(36) a) $z = 1.19$ p-value $= .1170$ 

(38) p-value is .0375

a) for $\alpha = .05$ we fail to reject but for $\alpha = .01$ we reject to

b for two-sided alternative, p-value is .0750

Fail to reject at $\alpha = .05$ or $\alpha = .01$