MATH 124 Spring 2005

Lecture: 21 A
Date: May 10, 2005

Skills you should acquire from this lecture:

- Confidence intervals and Hypothesis testing for the population proportion problem solving skills.
- Problems 8.4, 8.21, 8.9, 8.12

Problems related to single proportion

8.4, 8.21, 8.9, 8.12

Problem 8.4

Let p = proportion of job applicants at this company who lied

(a) $\hat{p} = \frac{15}{84} = 0.1786$

$$SE(\hat{p}) = \sqrt{\frac{.1786(1-.1786)}{84}} = 0.0418 \text{ (4dp)}$$

(b) A 95% CI for p is

$$0.1786 \pm 1.96\sqrt{\frac{.1786(1-.1786)}{84}}$$

$$\Rightarrow 0.1786 \pm 1.96(.0418)$$

$$\Rightarrow 0.1786 \pm .0819$$

$$\Rightarrow (.0967, .2605)$$

Problem 8.21

Let p = her current probability of making a free throw using her new technique.

$$\hat{p} = \frac{22}{42} = .5238$$

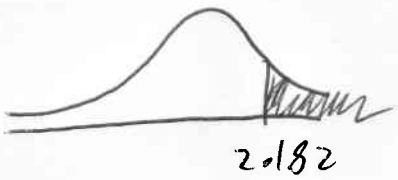
(a) H_0: $p \leq .362$ (i.e. same or worse than last season)

H_A: $p > .362$ (i.e. improved over last season)

(b) test statistic $z = \dfrac{.5238 - .362}{\sqrt{\dfrac{.362(1-.362)}{42}}}$

$= 2.182$

(c) Since H_A is $p > .362$



$P\text{value} = P(z > 2.182)$

$= 1 - P(z < 2.18)$

$= 1 - .9854$

$= .0146$

Since this is below .05 we would reject H_0 and accept H_A. i.e. she has improved her free throwability.

(d) A 90% CI For p is

$$.5238 \pm 1.645\sqrt{\frac{.5238(1-.5238)}{42}}$$

$$\Rightarrow 0.5238 \pm .0.4268$$

$$\Rightarrow (.3970, .6506)$$

since .362 is not in the confidence interval we would conclude she has improved her free throw success rate.

(e) We are assuming that the Freethrows are a SRS of her possible freethrows (not really true) and that the number of observations is large enough so that $\hat{p}$ is approximately distributed Normally.

Problem 8.9

Let p = proportion of months orders which shipped on time

$$\hat{p} = \frac{185}{200} = 0.925$$

A 95% CI for p is given by

$$.925 \pm 1.96\sqrt{\frac{.925(1-.925)}{200}}$$

$$\Rightarrow .925 \pm .037$$

$$\Rightarrow (.888, .962)$$

Problem 8.12

Let p = proportion of buyers willing to buy upgrade

$$\hat{p} = \frac{11}{40} = 0.275$$

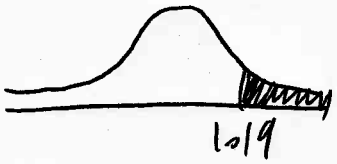
(a) $H_0: p \leq 0.2$ (20% or less would buy upgrade)

$H_A: p > .2$ (more than 20% would buy the upgrade)

use the one-sided alternative because we are only interested in being able to sell to 20% or more of customers (ie make a profit)

(b) test statistic is $z = \frac{.275-.2}{\sqrt{\frac{.2(1-.2)}{40}}} = 1.19$

since alternative is $p > .2$



$$\text{Pvalue} = P(Z > 1.19)$$
$$= 1 - P(Z < 1.19)$$
$$= 1 - .8830$$
$$= .1170$$

(c) Since Pvalue is $> .05$ cannot reject H_0.
therefore should not proceed with plans to market this upgrade (at least based upon this data) since have not shown that $p > .2$