

# **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

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

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

(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.

$$\hat{p} = \frac{22}{42} = ~~0.5238~~ .5238$$

- (a)  $H_0: p \leq .362$  (ie same or worse than last season)  
 $H_A: p > .362$  (ie improved over last season)

(b) test statistic  $z = \frac{.5238 - .362}{\sqrt{\frac{.362(1-.362)}{42}}}$   
 $= 2.182$

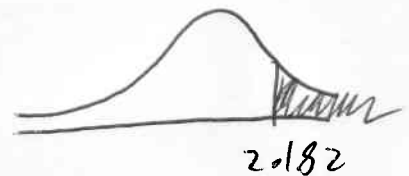
(c) since  $H_A$  is  $p > .362$

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

$$= 1 - P(Z < 2.18)$$

$$= 1 - .9854$$

$$= .0146$$



since this is below .05 we would reject  $H_0$  and accept  $H_A$ . ie she has improved her Free throw ability.

(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

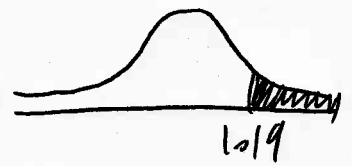
$$\hat{p} = \frac{11}{40} = 0.275$$

- (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 (i.e. make a profit)

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

Since alternative is  $p > .2$



$$\begin{aligned} \text{pvalue} &= P(Z > 1.19) \\ &= 1 - P(Z < 1.19) \\ &= 1 - .8830 \\ &= .1170 \end{aligned}$$

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  $p > .2$