BONUS In-Class Assignment

Business Statistics

November 25th 2009

1- According to the U.S. government at least 66% of Americans believe that there is too much violence on television. A telephone poll is conducted sampling 1000 Americans to test this claim, 743 people answer that they believe there is too much violence on television. Test at 2.5% significance whether or not the U.S. government's claim is true.

2- Wawson College claims that the average age of day-time students is 16.7 years. The standard deviation for age of Wawson College day-time students is 1.4 years. The college samples 100 day-time students and finds an average age of 17.1 years. Test Wawson College's claim at 5% significance.

3- According to the SPCM, children spend on average at least 231 minutes per day watching television. The results of a random sample taken of 27 children yields an average of 250 minutes spending television per day and a sample standard deviation of 55 minutes. Test the SPCM's claim at 1% significance. You can assume that television watching times are normally distributed.

4- Find a 90% confidence interval for mean number of spelling mistakes per page in an Wawson College student essay if a sample of 25 essays is taken and finds an average of 5.6 mistakes per page and a standard deviation of 0.8 mistakes per page. Assume that spelling mistakes are normally distributed.

5- Find an 85% confidence interval for the proportion of students that pass math courses at Wawson College if a sample of 87 students yields 11 that failed their math course.

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SOLUTIONS

(1) $p' = \frac{743}{1000} = 0.743$

$n = 1000$

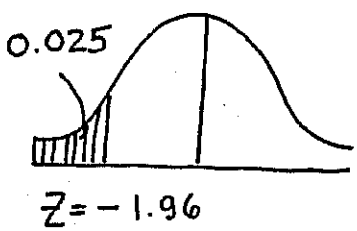
$H_0: \quad p \geq 0.66$

$H_a: \quad p < 0.66$

$np_0 = 1000(0.66) = 660 \geq 5$

$n(1-p_0) = 1000(0.34) = 340 \geq 5$

We can use the z-table



$$\sigma_0 = \sqrt{\frac{(0.66)(0.34)}{1000}} = 0.015$$

Test statistic $Z = \frac{p' - p_0}{\sigma_0}$

$= \frac{0.743 - 0.66}{0.015}$

$= 5.54$

Clearly not in the rejection region

Do not reject H_0

The claim that at least 66% of Americans believe there is too much violence on t.v. holds.

(2)

$H_0: \mu = 16.7$

$H_a: \mu \neq 16.7$

$n = 100$

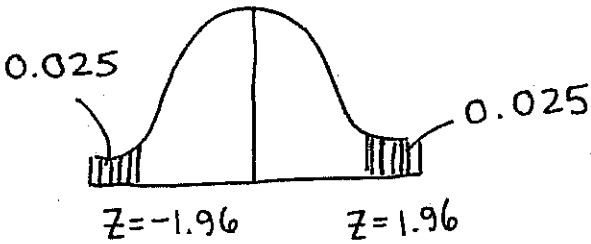
$\sigma = 1.4$

$\bar{x} = 17.1$

$\alpha = 5\%$

Since σ is known & $n = 100 \geq 30$

We can use z-table



REJECTION Regions

Test statistic $z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}$

$= \frac{17.1 - 16.7}{1.4/\sqrt{100}}$

$= 2.86$

Reject H_0

THE Average Age is NOT 16.7

(3)

$n = 27$

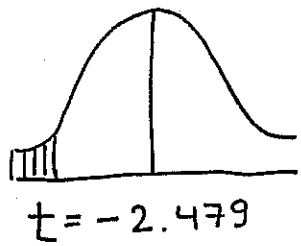
$\bar{x} = 250$

$S = 55$

$\alpha = 1\%$

$H_0: \mu \geq 231$

$H_a: \mu < 231$



Use t-test since σ is UNKNOWN

T.V TIME(WATCHING) are Normally distributed

So we can use the table

TEST STATISTIC $t = \frac{\bar{x} - \mu_0}{S/\sqrt{n}} = \frac{250 - 231}{55/\sqrt{27}}$

$= 1.795$

DO NOT REJECT H_0

Kids watch At least 231 minutes of T.V/day.

④ $\alpha = 0.10$

$1-\alpha = 0.90$ (confidence)

$n = 25$

$\bar{x} = 5.6$

$S = 0.8$

$df = 24$

Since σ is unknown use t-table

Since original pop. is normal we can do so.

$t_{\alpha/2} = t_{0.05}$ (Area in tail is 5%)

$= 1.711$ (24 degrees of freedom)

$$E = t_{\alpha/2} \cdot S/\sqrt{n}$$

$$= \frac{(1.711)(0.8)}{\sqrt{25}} = 0.27376$$

$$\bar{x} - E < \mu < \bar{x} + E$$

$$5.6 - 0.27376 < \mu < 5.6 + 0.27376$$

$$\boxed{5.326 < \mu < 5.874}$$

⑤ $\alpha = 0.15$

$Z_{\alpha/2} = Z_{0.075}$ (0.075 Area in tail)

$= 1.44$

$p' = 76/87 \doteq 0.874$

$$S = \sqrt{\frac{p'(1-p')}{n}}$$

$$= \sqrt{\frac{(76/87)(11/87)}{87}}$$

$= 0.0356$

We can use z-table since $np' = 76 \geq 5$ & $n(1-p') = 11 \geq 5$

$$E = Z_{\alpha/2} \cdot S$$

$= (1.44) \cdot (0.0356)$

$= 0.051264$

$$p' - E < p < p' + E$$

$$0.874 - 0.051 < p < 0.874 + 0.051$$

$$\boxed{0.822 < p < 0.925}$$