

MATH 300: Independent Samples t-test Practice

For the following scenarios:

1. Write out the null and alternate hypotheses
2. Describe the consequences of α and β errors. Choose an appropriate α -level.
3. Calculate or write out the sample statistics (\bar{X} , s , and n)
4. Sketch the sampling distribution of interest
5. Calculate the p-value (or find the critical region on the sampling distribution)
6. Draw a conclusion (do you reject or retain the null hypothesis?)

1. Professional basketball teams in the NBA are divided into two conferences: the Eastern Conference and the Western Conference. In 2003, the following average salaries were computed for each conference:

Eastern Conference: 215 players with an average salary of \$3.58 million (standard deviation = 3.773)

Western Conference: 197 players with an average salary of \$3.96 million (standard deviation = 4.396)

Test the hypothesis that players in the Western conference earn more than players in the Eastern Conference.

2. A company claims that its light bulbs are superior to those of its main competitor. If a study showed that a sample of 40 of its bulbs has a mean lifetime of 647 hours of continuous use (with a standard deviation of 27 hours), while a sample of 40 bulbs made by its main competitor had a mean lifetime of 638 hours (with a standard deviation of 31 hours), does this substantiate the claim at the 0.10 level of significance? How about at a 0.05 level of significance?

Extra: With the proliferation of the internet and 24-hour cable news outlets, it has become much easier for people to hear much more information, much more quickly. However, this has led to speculation that news organizations attempt to convey information before it has been properly verified in an effort to feed our impatience. *USA Today* reported that newspapers appear to be losing credibility over time (03/2004). They cited a nationwide sample of 1,002 adults interviewed via telephone (under the direction of the Princeton Survey Research Associates) during the period May 6-16, 2002. One of the survey questions asked subjects to rate the credibility of “the daily newspaper you are most familiar with.”

Of the 932 respondents to this question, 587 (or 63%) rated their daily newspaper as being “largely believable.”

When the same question was asked four years earlier, 618 of 922 (or 67%) rated their daily newspaper as being “largely believable.”

We want to test the hypothesis to see if the proportion of Americans rating their newspapers as being believable has actually dropped over the past four years.

Hint: This will be a test of proportions.

If we assume the null hypothesis is true (the population proportions are equal), we can find the weighted average proportion across the two groups:

$$\hat{p}_{pooled} = \frac{n_1 \hat{p}_1 + n_2 \hat{p}_2}{n_1 + n_2} = \frac{932(.63) + 922(.67)}{932 + 922} = 0.65$$

We can then use that weighted average to calculate the standard error for the difference in proportions:

$$SE(\hat{p}_1 - \hat{p}_2) = \sqrt{\hat{p}_{pooled}(1 - \hat{p}_{pooled})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)} = \sqrt{.65(1 - .65)\left(\frac{1}{932} + \frac{1}{922}\right)} = 0.0222$$