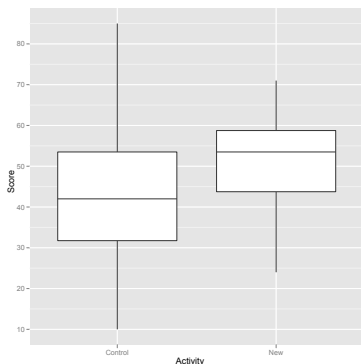


## Chapter 24 Notes

### Comparing Two Means

An educator believes that new reading activities for elementary school children will improve reading comprehension scores. She randomly assigns her third-grade students to one of two groups. The first group will use a traditional reading program and the second group will use the new reading activities. At the end of the experiment, both groups take a reading comprehension exam. Are the scores for the new reading activities group higher than for the traditional group?



1

### Comparing Two Means

Now that we are comparing two groups, there is more notation to keep straight.

### Sampling Distribution of $\bar{y}_1 - \bar{y}_2$

2

Under certain conditions/assumptions we are able to describe the sampling distribution of  $\bar{y}_1 - \bar{y}_2$ .

1. Independence assumption
2. Randomization condition
3. 10% condition
4. Nearly Normal condition

If the assumptions hold, the sampling distribution of  $\bar{y}_1 - \bar{y}_2$  is

BUT WE DON'T KNOW THE TRUE STANDARD DEVIATIONS FOR THE GROUPS!

$$df = \frac{\left( \frac{s_1^2}{n_1} + \frac{s_2^2}{n_2} \right)^2}{\frac{1}{n_1-1} \left( \frac{s_1^2}{n_1} \right) + \frac{1}{n_2-1} \left( \frac{s_2^2}{n_2} \right)}$$

3

4

DON'T PANIC!

TWO-SAMPLE CONFIDENCE INTERVALS FOR  $\mu_1 - \mu_2$

Recall that the general form of a confidence interval is:

$$estimate \pm ds_n \times SE$$

5

EXAMPLE 1 - READING CONT.

The educator takes a random sample of all third graders in a large school district and divides them into the two groups. The mean score of the 18 students in the new activities group was 51.72 with a standard deviation of 11.71. The mean score of the 20 students in the traditional group was 41.8 with a standard deviation of 17.45. Make a 90% Confidence Interval for the difference in the mean reading scores.

6

EXAMPLE 2 - DO BEER GOGGLES EXIST?

*"An explanation for enhanced perceptions of attractiveness after alcohol consumption"*. Researchers have conducted an experiment showing once and for all that Beer Goggles are real. 64 Randomly sampled Participants, 36 sober and 28 Intoxicated were asked to identify 20 faces, presented in a random order as symmetric or asymmetric. Researchers had previously determined that symmetric faces were deemed more attractive. The response measured was the number of incorrect answers.



**Symmetric**

**Asymmetric**

Make a 95% confidence interval for the difference in the mean number of incorrect answers for the two groups.

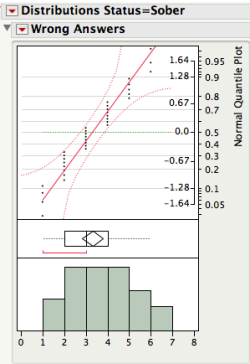
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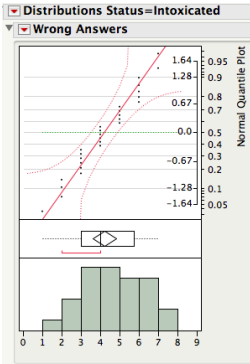
CHECK CONDITIONS:

MAKE 95% CONFIDENCE INTERVAL

Sober	$n_1 = 36$	$\bar{y}_1 = 3.30$	$s_1 = 1.47$
Intoxicated	$n_2 = 28$	$\bar{y}_2 = 4.21$	$s_2 = 1.59$



9



10

Two-Sample Hypothesis Tests for  $\mu_1 - \mu_2$

1. Checking the conditions and assumptions.

3. Test statistic.

4. P-value

$$H_A : \mu_1 - \mu_2 \neq 0$$

2. State your hypotheses.

$$H_A : \mu_1 - \mu_2 > 0$$

$$H_A : \mu_1 - \mu_2 < 0$$

## 5. Decision

- if  $p\text{-value} < \alpha$
- if  $p\text{-value} \geq \alpha$

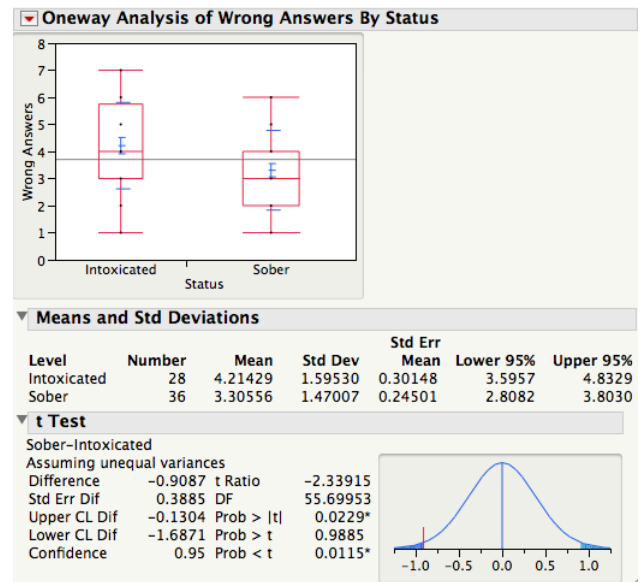
## 6. Conclusion stated in the context of the problem.

### BEER GOGGLES EXAMPLE

Does the Intoxicated group wrongly identify the symmetry of the faces more often than the sober group?

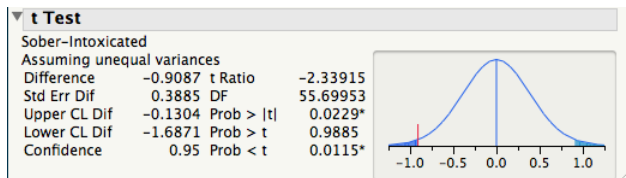
1. State the hypotheses:

2. Conditions:



13

14



Conclusions:

15

16