Section 12 – Topic 10
Comparing Treatments – Part 2

A candle company introduced a new type of wax into their candles. They claim their candles burn longer than the leading brand. The burn times of ten candles (five from each brand), rounded to the nearest hundredth of an hour, are shown below. The candles are the same height and width. They were burned in the same conditions.

The candles with the new wax had the following burn times.

$$12.25, 11.89, 11.96, 12.15, 12.21$$

The candles from the leading brand had the following burn times.

$$12.14, 12.02, 11.56, 11.69, 11.92$$

Let's look at how we would carry out an actual randomized experiment with the data.

Step 1: Define the treatment group and the control group.

Step 2: Develop competing claims.

A **null hypothesis** claims that there is no difference between the two groups in the experiment.

  ➢ The new wax _____ _____ increase burn time.

An **alternative hypothesis** claims that there is a difference between the two groups.

  ➢ The new wax _____ _____ burn time.

Write a difference value inequality that supports the alternative hypothesis.

Step 3: Find the mean for each group and the difference value.

Step 4: Take all ten values and randomly assign them into two groups and find the difference values.

You can do this manually by writing the ten burn times on slips of paper, placing them in a bag, and drawing out five slips for the first group and the remaining five will be the second group. Find the difference value and repeat the process. Create a distribution of the difference values.

What are drawbacks of using the manual method?

We can also use technology to create the randomization distribution.

Step 5: Use the randomized distribution and the difference value inequality to determine the probability of getting a difference value greater than or equal to the one you found for the control and treatment group.

Step 6: Make a conclusion.

1. Consider the data from the candle burning experiment. It was discovered that two of the values were interchanged. The correct values are displayed below.

   The candles with the new wax had the following burn times.

   $$12.25, 11.89, 12.14, 12.15, 12.21$$

   The candles from the leading brand had the following burn times.

   $$11.96, 12.02, 11.56, 11.69, 11.92$$

   Part A: Calculate the difference value for the treatment group and the control group.

   Part B: Does this change your conclusion from the experiment?