8.4a Differences in Proportions of Orange

There are three ways in which you might use this Fathom activity:

1. Have students work through the Fathom activity after they've done the hands-on activity in the student text.
2. Work through the Fathom activity in front of the class after students have done the hands-on activity.
3. Use the Fathom activity instead of the hands-on activity.

If you used Fathom in Activity 8.3a and students saved their Fathom documents, this activity will be easy. Use the directions on page 527 of the *Statistics in Action* student text (and the lesson notes on pages 166–167 of the *Instructor's Guide, Volume 2*) and modify the Activity 8.3a Fathom simulation as follows.

Procedure

Skittles and Milk Chocolate M&M's both contain 20% orange candies. To simulate taking samples of size 50 from these populations, for steps 1–4, change the sliders and table headers to **PropSkittlesOrange** and **PropMMsOrange** and set both sliders to **0.20.** Then add cases to the collection so you have 50 cases, and collect 100 measures. You will probably want a new collection of measures rather than emptying the measures from Activity 8.3a. That is, select the **Candies Sample** collection and choose **Collection | Collect Measures** rather than selecting the measures collection and choosing **Collection | Collect More Measures.**

8.5a Random Assignment in an Experiment

Fathom Skills

- No new skills are required.

Materials

- Fathom document **TerminalBoredom.ftm**

There are three ways in which you might use this Fathom activity:

4. Have students work through the Fathom activity after they've done the hands-on activity in the student text.
5. Work through the Fathom activity in front of the class after students have done the hands-on activity.
6. Use the Fathom activity instead of the hands-on activity.

If you used Fathom in Activities 8.3a or 8.4a, the directions in this activity will be familiar. Use the directions on pages 539 and 540 of the *Statistics in Action* student book, and the lesson notes on pages 180–181 of the *Instructor's Guide, Volume 2*.

You may wish to do a few simulations with your class, as described in steps 1–4 of the student book. This simulation will be repeated with Fathom, but it may help students better visualize the experiment.

What's Important Here

- Observing what a sampling distribution of the difference of two proportions in an experiment looks like when there is no difference between two treatments

Procedure

For steps 8 and 9, students should notice that the dot plot looks approximately normal and is centered at 0. The values range from −0.4 to 0.4. Students may also note that the standard error is about 0.097. Page 541 of the student text describes the formula for standard error.

Discussion Questions

- Why is the distribution of the differences of the proportions normal and centered at 0? Why is the range −0.4 to 0.4?

Extensions

1. If the sample size changes to 1000, the distribution becomes more approximately normal.
2. To change the proportion of students cured to 90% or 10%, open the Inspector window for **Terminal Boredom Experiment.** Select the **Measures** tab, and in the **Result_of_Treatment** formula, change 0.75 to 0.90 or 0.10. If the proportion of students cured changes to 90% or 10%, the distribution is still approximately normal and centered at 0. However, the range changes to −0.2 to 0.2, and the standard error is about 0.067.