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Candy Machine Activity!

www.rossmanchance.com (Reese's Pieces Applet)

Imagine a very large candy machine filled with orange, brown, and yellow candies. When you insert money, the machine dispenses a sample of candies. In this activity, you will use an applet to investigate the sample-to-sample variability in the proportion of orange candies dispensed by the machine.

1. Launch the Reese's Pieces applet (google Reese's Pieces applet rossmanchance), and change the population proportion of orange candies to $p = 0.45$ (the applet calls this value π instead of p). Click the box that says "Summary Stats" and the bubble that says "proportion of orange."

2. Click on the "Draw Samples" button. An animated simple random sample of $n = 25$ candies should be dispensed. Was your sample proportion of actual orange candies close to the actual population proportion, $p = 0.45$? Look at the value of $\hat{p}$ in the applet window.

3. Click "Draw Samples" 9 more times, so that you have a total of 10 samples. Look at the dotplot of your $\hat{p}$-values. What is the mean of your 10 sample proportions? What is their standard deviation?

4. To take many more samples quickly, enter 390 in the "number of samples" box. Click on the Animate box to turn the animation off. Then click "Draw Samples." You have now taken a total of 400 samples of 25 candies from the machine. Describe the shape, center, and spread of the approximate sampling distribution.

Shape:

Center:

Spread:

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5. How would the sampling distribution of the sample proportion $\hat{p}$ change if the machine dispensed $n = 50$ candies each time instead of 25? "Reset" the applet. Take 400 samples of 50 candies. Describe the shape, center, and spread of the approximate sampling distribution.

Shape:

Center:

Spread:

6. How would the sampling distribution of p change if the proportion of orange candies in the machine was $p = 0.15$ instead of $p = 0.45$? Does your answer depend on whether $n = 25$ or $n = 50$? Use the applet to investigate these questions. Then write a brief summary of what you learned.

7. For what combinations of n and p is the sampling distribution of $\hat{p}$ approximately Normal? Use the applet to investigate.