

Name: \_\_\_\_\_ Hour: \_\_\_\_\_ Date: \_\_\_\_\_

## How Well Can You Taste the Rainbow?



In this lesson, we are in search of the true proportion of correct flavor identifications for all Skittles when "Tasting the Rainbow", which we will call  $p$ .

Your group of four already took a sample of 50 Skittles and calculated the proportion of correct flavor identifications. Let  $\hat{p}$  = the proportion of the sample with correct flavor identifications.

1. For your group, what was the proportion of correct flavor identifications ( $\hat{p}$ )? 0.52  
This is called the **point estimate**.

2. What is the formula for calculating the standard deviation of the sampling distribution of  $\hat{p}$ ?

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$$

3. We don't know the value of  $p$  (that's the whole point of a confidence interval) so we will use  $\hat{p}$  instead. Calculate the **standard deviation** using your  $\hat{p}$  value.

$$\sigma_{\hat{p}} = \sqrt{\frac{(0.52)(0.48)}{50}} = 0.071$$

4. Would it be appropriate to use a normal distribution to model the sampling distribution of  $\hat{p}$ ? Justify your answer.

Yes!

$$n \times \hat{p} = 50(0.52) = 26$$

$$n(1 - \hat{p}) = 50(0.48) = 24$$

Large Counts  
# successes  $\geq 10$   
# failures  $\geq 10$

5. The **critical value** is the number of standard deviations away from the mean needed to capture a certain percentage of the data.

68% of the data lies within 1 standard deviations of the mean

95% of the data lies within 2 standard deviations of the mean

99.7% of the data lies within 3 standard deviations of the mean

}  $z^*$

6. Calculate the **margin of error** for a 95% interval by multiplying the **critical value** and **standard deviation** you calculated. Show your work.

$$2 \times \sqrt{\frac{(0.52)(0.48)}{50}} = 0.142$$

} margin of Error =  $z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$   
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7. Find the 95% confidence interval using point estimate +/- margin of error.

$$0.52 \pm 0.142 = (0.378, 0.662) \left\{ \hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \right.$$

8. Interpret your interval in context.

We are 95% confident that the interval from 0.378 to 0.662 captures the true proportion of correct identifications.

9. Add your interval to the graph on the board. Sketch the graph below.

10. What do you think is the true proportion of correct flavor identifications for all Skittles when "Tasting the Rainbow"? Explain using the graph.