# <u>“Skittles Probability”</u>

***Objective:*** Students will recognize the difference between theoretical and experimental probabilities. They will construct and carryout out an experiment and then compare the theoretical probability to the experimental probability.

***Background Knowledge:*** Students need to be familiar with sample spaces, possible outcomes, and the definitions of theoretical and experimental probability.

***Materials:*** Student recording sheets, cups of Skittles candies with 5 green, 5 red, 5 yellow, and 5 orange candies in each, pencils

***Directions/Activity:***

1. Distribute recording sheets (1 for each student) and cups of candies (1 per pair of students).
2. Review the definitions for experimental and theoretical probability. Theoretical is what should happen and Experimental is what actually happens.
3. Working in pairs the students will work through the “lab” together by following the steps listed on their recording sheets. You may want to work through the theoretical probability section together before allowing them to begin the experimental section.
4. Once students have completed the experimental section, you will need to come back as a whole group to share results and compile a whole class tally as well. The most important part of the activity is when they compare their actual results (experimental) to what should have happened (theoretical). As pairs, most of the results will differ from what should have happened, but when you look at the whole class outcomes, the experimental probability and theoretical probabilities should be closer. This should happen because the more you do an experiment, the closer the experimental and theoretical probabilities should become.

**"Skittles Probability Student Worksheet"** **Name: ________________**

Theoretical Probability

If you picked a Skittle from your cup and replaced it after every pick, how many times **should** you pull out each of the following colors?
Green_____ Red_____ Yellow_____ Orange_____

Express each theoretical probability as a fraction.

Green = Red = Yellow = Orange =

What do you notice about the probability (likelihood) for picking each color? _______________________________________________

So, if I picked a Skittle out of the cup (replacing it after each pick) 100 times, how many times **should** I pick out each color?

Green _____ Red _____ Yellow_____ Orange _____

Now express those theoretical probabilities as fractions in lowest terms.

Green = Red = Yellow = Orange =

If we actually did this experiment, do you think we would get those exact results? Why? Why not?

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**Experimental Probability**

Now we are actually going to do an experiment and see if our experimental probabilities (actual outcomes) match our theoretical probabilities (what should happen or our predicted outcomes).

You will take turns with your partner picking a Skittle out of your cup. Make sure you return your Skittle to the cup after each turn. Also, you need to close your eyes when selecting your candy each time. Make sure you both record your outcomes on the chart below.

| Trial # | Green | Red | Yellow | Orange |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |
| 11 | | | | |
| 12 | | | | |
| 13 | | | | |
| 14 | | | | |
| 15 | | | | |
| 16 | | | | |
| 17 | | | | |
| 18 | | | | |
| 19 | | | | |
| 20 | | | | |
| Totals | | | | |

Now that you have compiled your actual results, answer the following questions.

1. How many of each color did you actually pull?
Green ___ Red ___ Yellow ___ Orange ___

2. Express each experimental probability as a fraction in lowest terms. Don't forget that your denominator should be the total number of trials you completed.

Green = Red = Yellow = Orange =

3. How does your experimental probability (in fraction form) compare to your theoretical probability (in fraction form) for each color? (Is it less than, greater than, or equal to)

| Color | Experimental | Theoretical | Comparison |
|---|---|---|---|
| Green | | | |
| Red | | | |
| Yellow | | | |
| Orange | | | |

4. How did your results compare? Why do you think this happened?
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

**Class Results:**

Now, let's look at the whole group's results when we put everyone's results together.

1. Make a prediction about how the experimental probability of the whole class will compare to the theoretical probability. Explain why you think this will happen.

_______________________________________________________________
_______________________________________________________________
_______________________________________________________________
_______________________________________________________________

2. Record the whole class results in the chart below.

| Colors | Number of Outcomes | Experimental Probability (Fraction) | Theoretical Probability (Fraction) | Comparison (<, >, =) |
|---|---|---|---|---|
| Green | | | | |
| Red | | | | |
| Yellow | | | | |
| Orange | | | | |

What do you notice about the relationship between the experimental probability and the theoretical probability now that we have more data (more trials)?

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_______________________________________________________________
_______________________________________________________________
_______________________________________________________________

What conclusions can you make about the relationship between experimental and theoretical probability?

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_______________________________________________________________
_______________________________________________________________
_______________________________________________________________
_______________________________________________________________
_______________________________________________________________

**Solution page:**

Green__**5**__ Red__**5**__ Yellow_**5**__ Orange___**5**__

Express each theoretical probability as a fraction.

**Green=** $\frac{5}{20}=\frac{1}{4}$ **Red =** $\frac{5}{20}=\frac{1}{4}$ **Yellow =** $\frac{5}{20}=\frac{1}{4}$ **Orange =** $\frac{5}{20}=\frac{1}{4}$

What do you notice about the probability (likelihood) for picking each color? **_They are all equally likely (equivalent)_______________**

So, if I picked a Skittle out of the cup (replacing it after each pick) 100 times, how many times **should** I pick out each color?

Green _**25**__ Red __**25**_ Yellow__**25**_ Orange __**25**_

Now express those theoretical probabilities as fractions in lowest terms.

**Green =** $\frac{25}{100}=\frac{1}{4}$ **Red =** $\frac{25}{100}=\frac{1}{4}$ **Yellow =** $\frac{25}{100}=\frac{1}{4}$ **Orange =** $\frac{25}{100}=\frac{1}{4}$

**Note: The rest of the answers are based on the experiment.**