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Estimating Pi by dropping Toothpicks   April 26, 2021

Activity goals:

- The student will properly lay out the page that toothpicks will be dropped on
- The student will appropriately drop toothpicks onto the page keeping track of how many they dropped
- The student will properly count how many toothpicks intersected the drawn line
- The student will correctly complete the math problem at the end of the experiment to estimate pi.

Objective of the activity:

- Students will estimate pi (3.14) with correct arithmetic using Buffon's Needle Experiment on ⅔ trials.
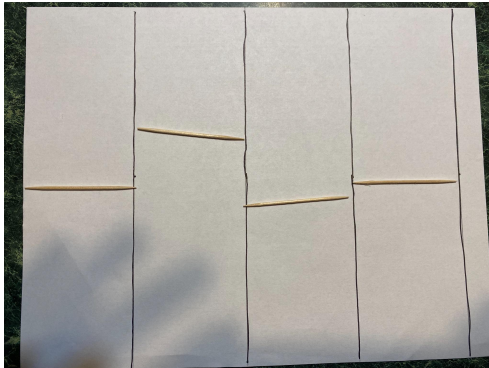
Materials needed for activity:

- Toothpicks
- Pencil/pen
- Activity worksheet
- Ruler
- Paper to drop toothpicks on

Step 1: Begin with a blank piece of copy paper place in landscape position
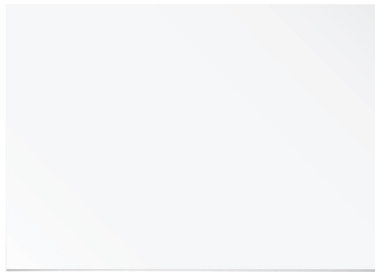
Step2: Place a toothpick on the paper and make columns with a width of the size of the toothpick.

Step 3: Randomly toss toothpicks on the paper, keeping track of how many you toss onto the paper.

Step 4: Of the toothpicks tossed onto the paper, count how many toothpicks intersected the lines that were drawn on the paper

I removed all tooth picks that did not intersect the drawn lines.

I originally tossed 40 toothpicks onto the paper, with 27 of them intersecting the line

Step 5: The Math (Estimating)

We are going to use the formula:

$$\frac{2 \; x \; the \; \# \; of \; toothpicks \; thrown}{\# \; of \; toothpicks \; intersected \; with \; the \; lines}$$

- Our information:
    - We threw 40 toothpicks
    - 27 of them crossed the lines

-We get 2.96296296 as our estimation which some may say is not very close to pi (3.14159), but the more toothpicks you drop the more estimation you get. Let's try one together with dropping 55 toothpicks

Using 55 toothpicks:

$$\text{Formula:} \quad \frac{2 \ x \ the \ \# \ of \ toothpicks \ thrown}{\# \ of \ toothpicks \ intersected \ with \ the \ lines}$$

Your Turn!

1. Toss 60 toothpicks onto the paper below and solve for the estimation of Pi.

2. Toss 25 toothpicks onto the paper below and solve for the estimation of Pi.

3. How do the two compare, what number has the closer estimation. Why do you think there is this relationship?

4. Pick an amount if toothpicks of your own and toss the amount onto the paper below, what is the estimation of pi?