Grade 4
Unit: Probability

Theoretical vs Experimental Probability

https://www.nctm.org/Classroom-Resources/Illuminations/Interactives/Adjustable-Spinner/

Overall Expectations:

- Predict and investigate the frequency of a specific outcome in a simple probability experiment

Specific Expectations:

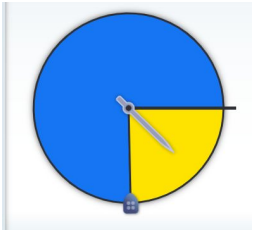
- Predict the frequency of an outcome in a simple probability experiment or game (e.g.,"I predict that an even number will come up 5 times and an odd number will come up 5 times when I roll a number cube 10 times."), then perform the experiment, and compare the results with the predictions, using mathematical language;
- Demonstrate, through investigation, an understanding of fairness in a game and relate this to the occurrence of equally likely outcomes

Resources: coins, spinners(if wanted), pen, paper
Previous Knowledge: Students will have to know proportions, and fractions.

Setting Up the Lesson

Plan: We will discuss and explore the differences between theoretical and experimental probability today, as well as what makes a fair game. Theoretical is what we expect to happen, and experimental is what actually happens. We can show the class this by a simple coin flip. We ask them if we flip it 10 times what do we expect? (they should say 5 heads and 5 tails) We will flip the coin and see that it (probably) doesn't happen. Why not? This will be discussed, but not too much as they will learn themselves as they do the experiments. (5-10mins)

We will look at different spinners and discuss what the experimental probability is. Students may get into small groups to play this activity.



If a point is scored to each player when it lands on their colour is this a fair game? Make some predictions on how many times each colour will come up when spun. Compare these predictions with the actual results.

How could we make it fair? (Kids may say make yellow worth 2 points instead of 3) Play a game with the points system and see who ends up winning then discuss. Since blue is 3 times as large as yellow, landing on yellow should be worth 3 times as many points to be a fair game.


Similar activity here

(10-20 mins)

Have them create a spinner for 2-4 players where the game is fair, and no piece of pie is the same size. Have them play their game and see if it is fair and if not try and explain why not. (20 mins)

Extension: Play a similar game using 2 dice instead of spinners. Have students pick a number from 2-12 and see who wins when dice are rolled multiple times. How many points should each number be given to make this a fair game?

Predicting Results and Making Fair Games

Graph	How many times do you expect it to land on each colour after 10 spins?	How many times did it land on each colour after 10 spins?	How many times do you expect it to land on each colour after 50 spins?	How many times did it land on each colour after 50 spins?