PROBABILITY and DATA COLLECTION

Experiment 1- Coin Toss

Materials

- A coin
- A book and pen to record results

Step-by-Step Instructions

1. Toss a coin 20 times and record whether it lands on heads or tails.
2. Compare the number of heads and tails to see if they approach a 50-50 split.
3. Increase the number of tosses (e.g., 50 or 100) to observe if the results get closer to the theoretical probability (50% for each side).

Explanation

Each coin toss has a probability of 1/2 for heads and 1/2 for tails. This demonstrates how more trials bring experimental results closer to theoretical probabilities.

Reflection Questions:

1. Did the results of your tosses match the theoretical probability of 50% for heads and 50% for tails?
2. How did the results change as you increased the number of tosses?
3. If you tossed two coins at once, what are all the possible outcomes? (e.g., heads-heads, heads-tails, etc.) What is the probability of each outcome?
4. Could the way you toss the coin affect the results?

Fun Facts:

Origins of Coin Tossing: Coin tossing has been used for centuries to make fair decisions. The ancient Romans called it “navia aut caput” (ship or head), referring to the designs on their coins.

Mathematical Probability: While the theoretical probability of heads or tails is 50%, imperfections in coins or tossing methods can introduce slight biases.

Longest Coin Toss: The longest recorded coin toss took 10 seconds and was achieved with a specially thrown nickel.

Experiment 2 - Spinning a Homemade Spinner

Materials

- A circular piece of cardboard
- A marker
- A paperclip
- A pencil

Step-by-Step Instructions

1. Divide the cardboard circle into equal sections and label them with different numbers or colors.
2. Place the paperclip at the center and hold it down with the pencil. Flick the paperclip to spin it.
3. Record the section it lands on after each spin and calculate the experimental probabilities.

Explanation

This activity demonstrates how uniform probabilities apply when all outcomes are equally likely. Changing the size of the sections can introduce non-uniform probabilities for further exploration.

Reflection Questions:

1. How often did the spinner land on each section? Did the results match the size of the sections?
2. If you changed the size of one section to make it larger, how would it affect the probability of landing on it?
3. How could you make a spinner where one outcome has a higher probability than the others?
4. If you spun the spinner many times, would the experimental probabilities get closer to the theoretical probabilities?

Fun Facts:

Game Night Origin: Spinners have been used in board games since the 19th century to replace dice in generating random outcomes.

Roulette Inspiration: The spinner's principle is similar to a roulette wheel, which dates back to 18th-century France and uses probabilities to determine winnings in gambling.

Circular Motion: A spinner works because of rotational motion and friction; too little friction, and it wouldn't stop; too much friction, and it wouldn't spin properly.

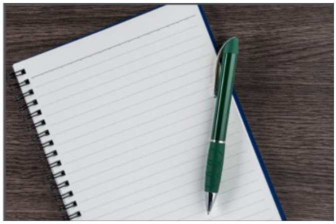
Experiment 3 - Counting Colours and Recording

Materials

- A small bag of colourful candies/beads (e.g. gems)
- Paper and a pen

Step-by-Step Instructions

1. Sort the candies by colour.
2. Count how many candies are in each colour group and record the data in a table.
3. Create a bar graph or pie chart to represent the distribution of colours.



Explanation

This teaches categorical data collection and how to visualize it in graphs. The bar graph makes it easy to see which colour occurs most often.

Reflection Questions

1. Which colour appeared the most? Which appeared the least?
2. If you opened another bag of candy, do you think the distribution of colours would be the same? Why or why not?
3. How could this experiment help candy manufacturers plan their production?

Fun Fact:

Some candy brands use algorithms to randomly mix colours while ensuring that certain colours are more or less frequent!

Experiment 4 - Family Preferences Survey

Materials

Paper and pen

Step-by-Step Instructions

1. Create a short survey (e.g., "What's your favourite fruit?") with 3-5 options.
2. Ask each family member to answer the survey.
3. Record the results in a tally table and create a pie chart to visualize the preferences.

Explanation

This experiment teaches how to collect and display categorical data using surveys and tally marks, turning them into meaningful graphs.

Reflection Questions:

1. Which option was the most popular? Did the results surprise you?
2. How could you survey more people to get a better representation of preferences?
3. If you repeated this survey next year, do you think the results would change? Why?

Fun Fact:

Surveys are used in everything from elections to planning new products. In fact, many movies rely on audience surveys during test screenings to decide the ending.