COUNTING COLORS

PROBABILITY/STATISTICS

- Counting
- Sorting
- Graphing
- Chance

Getting Ready

What You'll Need

Color Tiles, 10 of each color per pair

Counting Colors spinner, page 90

Paper clips, 1 per pair

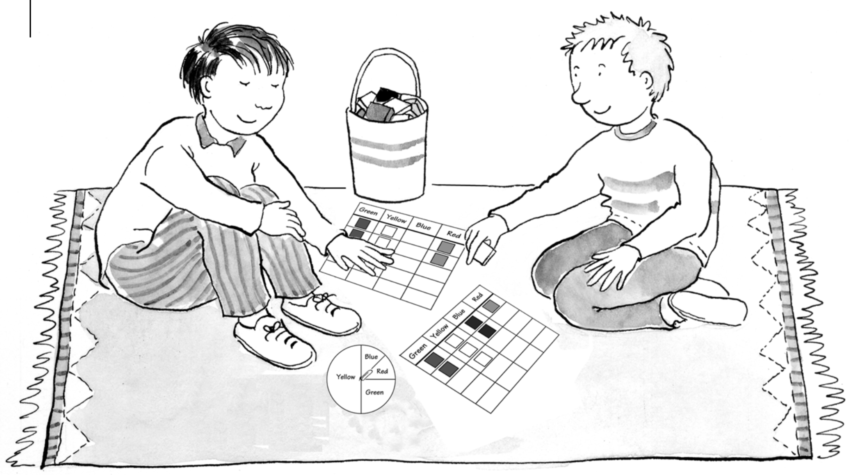
Long sheets of paper

Overhead Color Tiles and/or Color Tile grid paper transparency (optional)

Overview

Children spin a spinner with sectors allocated to the four Color Tile colors and keep track of how many times each color comes up within a specific number of spins. In this activity, children have the opportunity to:

- ◆ organize and graph data
- ◆ determine the probability of the occurrence of unequally likely events



The Activity

Assemble a Counting Colors *spinner by first straightening the end of a paper clip and then pushing the endpoint through the center point of the spinner.*

Introducing

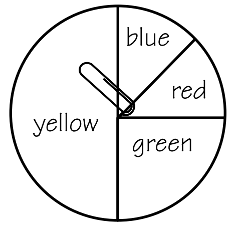
- ◆ Display the *Counting Colors* spinner. Invite children to describe what they see and how they might use the spinner.
- ◆ Explain to children that they are going to use the spinner to find out how may times they will spin each color.
- ◆ Draw these headings on the chalkboard and have children copy them on the top of long sheets of paper.

Green	Yellow	Blue	Red

- ◆ Call on a volunteer to spin the spinner. Have each child place a Color Tile on his or her paper in the column that corresponds to the color that comes up on the spinner.
- ◆ Choose more volunteers to spin the spinner. Continue having children record each spin by placing Color Tiles in the corresponding column on their papers.
- ◆ Elicit that by putting down tiles in this way, children have built a graph. Call on volunteers to "read" their graphs aloud.

On Their Own

Can you predict which color you will spin most often on this spinner?



- Work with a partner. Share a spinner that looks like this one.
- Set up a graph by writing color names at the top of your paper this way.

Green	Yellow	Blue	Red

- Get ready to spin the spinner. First decide which color you think will be the first to be spun 10 times. Write down your guess.
- Then take turns spinning the spinner. For each color that you spin, place a matching Color Tile in that column on the graph.
- Keep taking turns until 1 of the columns has 10 Color Tiles.
- Compare your guess to what happened. Be ready to talk about your graph.

The Bigger Picture

Thinking and Sharing

Invite pairs to post their graphs and report their results. Then compile everyone's findings into a larger class graph.

Use prompts such as these to promote class discussion:

- What did you notice about your results?
- Whose guesses turned out to be correct? Why did you guess that color?
- What does the class graph show about the Color Tile with the most spins?
- How does the class graph compare to your own graph?
- Would you call the spinner a "fair" spinner? Explain.

Extending the Activity

Have children create a new face for their spinner using any three Color Tiles and any allotment of sector space they like. Then have them repeat the activity.

Teacher Talk

Where's the Mathematics?

This activity introduces children to topics in probability. It also provides children with an opportunity to make connections among various areas of mathematics as they use counting and comparing skills to make their graphs and to work intuitively with fractions.

Many children are familiar with the use of spinners as part of board games that they have played at home. Typically, such spinners are divided into equal sectors and offer a "fair chance, or equally likely chances," of stopping on any given sector. Having a "fair chance" is what makes the game fun to play.

The spinner used in this activity is not fair. The chances of the spinner stopping on yellow are twice as great as its stopping on green and four times greater than its stopping on blue or red. Many children will not recognize this fact just by looking at the spinner. They will have to work through this activity and then, during the class discussion, reflect on why so many of their classmates' graphs had more yellow Color Tiles than green, blue, or red.

When children are initially asked to predict which color they will spin the most, many will pick their favorite color without observing the effect that the relative sizes of the sectors might have on the outcome. In fact, if you were to repeat this activity several days or weeks later, some children would still predict their favorite color. Only frequent experience with chance events over time can help children to solidify their grasp of probability.

Although the "unfair" spinner makes the lesson focus on chance events, children also get needed practice in collecting, organizing, and analyzing data. Young children gain experience with concrete graphs as they touch and manipulate actual objects. Watching how the pooling of information creates one large class graph that mimics the shape of many of the individual graphs can be an interesting revelation to children.

Later, as they become more sophisticated, children can move to more representational or abstract graphing.

In this activity, children have the opportunity to work with both experimental and theoretical probability. *Experimental probability* is the probability of an event based on the results of an actual experiment. Children experiment as they use the spinners and collect their data. During the first four spins, children might spin blue, green, yellow, and red, in which case the experimental probability of spinning a yellow is one out of four, or 1/4. *Theoretical probability* is what is likely to happen based on a great deal of data. When the children pool their collective data, make one large classroom graph, and analyze it, they are moving toward determining theoretical probability. For the spinner used in this activity, the theoretical probability of landing on yellow is one out of two, or 1/2, because the yellow sector is one half of the whole spinner. Theoretically, if the spinner were spun four times, one would expect the spinner to land on yellow twice. Frequently, the experimental probability of just a few spins does not exactly match the theoretical probability one would predict as the outcome. In later grades, children learn that the theoretical probability of spinning one color over another is based on the assumption that the spinner has been spun hundreds, or even thousands, of times.

Theoretically, then, if you had sixteen pairs of children in the class, you would expect that eight pairs (1/2) would report that the yellow column filled first, four pairs (1/4) that green came in first, two pairs (1/8) that blue came in first, and the final two pairs (1/8) that red came in first. In actuality, sixteen experiments is still a small sample space, so the results may not even be close to what is supposed to happen in theory. Repeating the activity over time and continuing to add the results to the original class graph will give results that will more closely align with what is theoretically probable.