

LOGIC RIDDLES

NUMBER • LOGIC

- Counting
- Fractions
- Deductive reasoning

Getting Ready

What You'll Need

Color Tiles, 10 each of red, yellow, blue, and green per pair

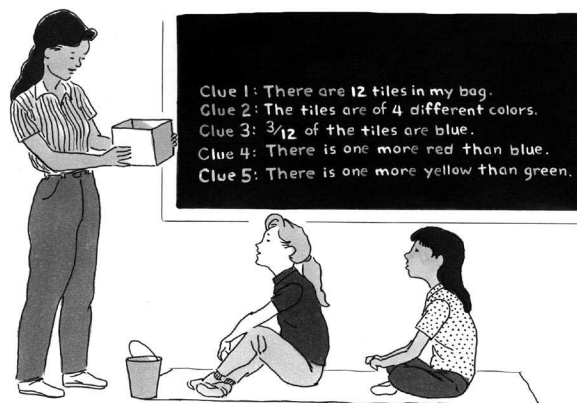
Small paper bags, 1 per pair

Paper clips, 1 per pair

Overview

Children create riddles that provide clues about Color Tiles that they have hidden in a paper bag. Then they try to solve one another's riddles. In this activity, children have the opportunity to:

- ◆ build logical reasoning skills
- ◆ make conjectures based on evidence
- ◆ find the fractional parts of a whole



The Activity

As you give each clue, you might want to write it on the chalkboard so that children can refer back to it during the discussion.

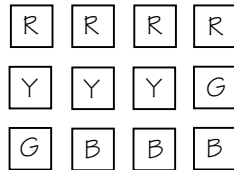
Introducing

- ◆ Display a sealed Riddle Bag containing four red, three yellow, two green, and three blue Color Tiles. Tell children that you will give clues to help them answer the riddle, "How many Color Tiles of each color are in this bag?"
- ◆ Give the first clue: *There are twelve tiles in my bag.* Have children follow this clue by counting out twelve tiles.
- ◆ Have children respond to the second clue: *The tiles are of four different colors.*
- ◆ Give the three following clues, pausing after each to allow children time to adjust their tiles to match it:
 - Three-twelfths of the tiles in my bag are blue.*
 - There is one more red than blue.*
 - There is one more yellow than green.*
- ◆ Have children display their solutions to the riddle. Then reveal the contents of the Riddle Bag.
- ◆ Discuss what qualities make a good riddle clue. Establish that each new clue should bring the solution closer.
- ◆ Point out that a good set of clues leads to just one solution.

On Their Own

Can you write a set of clues to make a Color Tile riddle?

- Work with a partner. Choose up to 12 Color Tiles. Notice how many you have of each color. Discuss what fractional part each color represents.
- Decide on 3 or 4 good clues for your riddle and write them down. At least 1 of your clues must contain a fraction. Here is an example of a riddle for these Color Tiles.



There are 12 tiles.

$\frac{3}{12}$ are blue.

There is 1 more red than blue.

There is 1 more yellow than green.

- Now test your riddle. Do this by pretending you don't know the answer and are trying to solve it.
- Put your tiles into the paper bag, close it, and clip your riddle to the bag.
- Exchange Riddle Bags with another pair. Try to solve their riddle. Then look into the bag to check your solution.
- Be prepared to talk about how you made and solved riddles.

The Bigger Picture

Thinking and Sharing

Invite children to talk about how they wrote and tested their own riddles and how they solved the riddles written by others.

Use prompts such as these to promote class discussion:

- ◆ What words helped you to create clues?
- ◆ Did you ever change any tiles as you wrote your clues? Why?
- ◆ After reading the other pair's first clue, did you know anything for sure about the tiles in their bag? Explain.
- ◆ Did any clues tell about what was *not* in the bag? What were some of these?
- ◆ What kinds of clues give the most information?
- ◆ Does the order of the clues matter? Explain.
- ◆ If no one else can solve your riddle, what might be the reason?
- ◆ Was there more than one solution to any riddle? Why? Is there a way to change some clues to make that riddle have only one solution?

Extending the Activity

Tell children to imagine that Color Tiles come in two more sizes, 2-inch squares and 3-inch squares. Have them cut out cardboard squares of those

Teacher Talk

Where's the Mathematics?

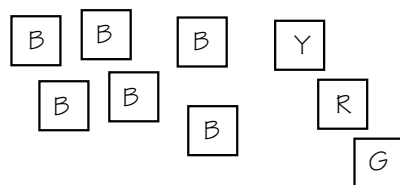
The language of logic has been called the language of everyday life, since logical thinking underlies much of human activity. In this activity, children use language in a way that is mathematically powerful through words and phrases such as "All our tiles are blue or green," "Some of the tiles are yellow," "There are three more red than green," "None of the tiles are red," and "If there are seven tiles and two are red and there are no blues or greens, then five tiles must be yellow."

Children can easily write clues that identify their total number of tiles and the number of each color. They will have more difficulty writing clues that make comparisons within a group of tiles and those that identify fractional parts of the whole group. Initially, their clues need to be monitored closely for accuracy because children may have trouble wording their clues or may write too few clues in order to enable others to correctly identify their tiles.

Children will probably find solving riddles easier than writing them. Even though they may feel a certain comfort level in using their own words to communicate their ideas, children soon realize that they must take special care to see that their written clues really provide the information they are meant to convey. The task of writing clues helps children to become aware of the importance of using precise mathematical language.

When children create their clues, they are reasoning deductively as they use the number and color of the tiles to draw conclusions which are the written clues. When they solve the clues, they apply deductive reasoning again as they use the evidence of the written clues to come to a conclusion about the number and color of the tiles. As they gain more experience in dealing with clues, children may also gain an appreciation of the usefulness of clues that contain the words *not* or *no*. For example, if the bag has "no yellow tiles," children may conclude that the tiles in the bag are red, green, and/or blue.

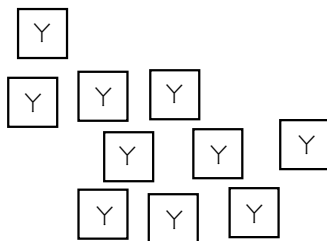
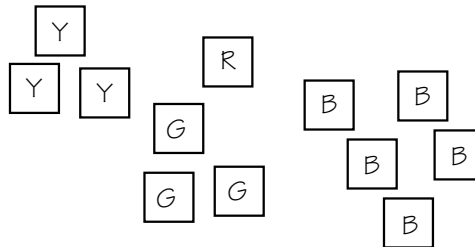
As they write and test their riddles, children may discover and use different types of clues. Here are the clues written by three pairs of children. Notice the differences in the nature of the clues as well as which riddles are successful and which are not:



$\frac{2}{3}$ of our tiles are blue.
 $\frac{1}{9}$ is yellow.
 $\frac{1}{9}$ is red.
 $\frac{1}{9}$ is green.

sizes and color them to match the Color Tiles. Allow them to use the tiles of three sizes as the basis of another riddle. After pairs solve each other's riddles, discuss how the tiles of the new sizes made a difference in writing and solving riddles.

Half of the tiles are green
and yellow.
 $\frac{1}{12}$ is red.
There are more blue tiles
than any other color.



There are 10 tiles.
None of the tiles are red.
None of the tiles are blue.
None of them is green.

You may want to present the second set of clues (the unsuccessful riddle) to children, challenging them to change the first clue or add a clue to make the riddle work.

Children may realize that the order in which the clues are presented or used can affect the difficulty of the riddle. Some children may first read all the clues and then try to satisfy the ones that seem most important, most difficult, or most useful. Consider this set of clues:

None of the tiles are blue or yellow.
There is one more red than green.
There are 7 tiles.

Faced with these clues, children will find that it would be more challenging to use them in the order given than to scan them, then follow them in a *third-clue, first-clue, second-clue* order.

The skill of writing good riddles can be improved over time. Consider revisiting this activity periodically throughout the school year to provide children with the opportunity to master this skill.