

**GAMES AND LESSON PLANS**

**FRACTILES-7  
MAGNETIC TILING TOYS**

## MIRROR YOUR FRIEND GAME

Grades 1 and up, a game for two or more players

Teaches Reflection Symmetry, cooperation

Materials needed: One large or one travel set

*Allow five minutes or more*

First set up the game by placing any two tiles, edges together, near the center of the board.

Player #1 places a third tile adjacent to one of the tiles on the board so that the three tiles together form a design with reflection (mirror image) symmetry.

Player #1 selects a fourth tile and adds it to the design making sure that the next player will be able to place a tile that mirrors that move.

Player #2 places a tile that mirrors the last player's move, and then adds a tile of her own for the next player to mirror.

Continuing in this manner, it is fun to see the cooperative designs that emerge. This is an easy game to play with young children.

## SYMMETRY GROUPS

Grades 2 and up

Teaches recognition of basic symmetry groups

Materials needed: One large or 2 travel sets

*Allow 15 minutes or more*

### **Symmetry Groups, Part 1**

First review the principals of symmetry with the class. (Refer to "Fractiles and Symmetry" on the inside cover of the Fractiles-7 package for illustrations and definitions of symmetry groups.)

Next, arrange some tiles on the board to show students some simple designs that are examples of each symmetry group - or ask your students to this.

Give each child at least seven tiles of each color. Have each student use their tiles to create one or more simple designs for each of the symmetry groups.

Then have a discussion asking the children to think of some everyday objects belonging to each of the symmetry groups. Ask them to name some examples that are man-made and some that are natural forms. Examples might include the human face as reflection symmetry, a daisy as rotational symmetry, and a checkerboard as translation symmetry. Hint - some objects have more than one kind of symmetry.

### **Symmetry Groups, Part 2**

Materials needed: Magazines with lots of colored pictures, scissors, paste, scrap book.

*Allow 15 minutes or more*

Peruse the magazines, select and cut out pictures that are examples of the different symmetry groups you have learned about. Use the pictures to begin a symmetry scrapbook with separate pages or chapters for each symmetry group. Explain in your own words why each picture belongs to a particular symmetry group.

## MAKING SMALL CIRCLES

Grades 2 and up

Teaches symmetry, area, angle combinations

Materials needed: One large set or 2 travel sets

*Allow 15 minutes or more*

First divide the tiles into smaller sets of 21 tiles - 7 of each color. Give each student one of these sub sets and a Fractiles board or other suitable steel based playing surface.

Let each child work independently to form a circle using their 21 tiles. It might be helpful to show students an example of a small circle (see packaging for several illustrations of 21 piece circles). It will be much more challenging if an example is not shown.

Challenge your students to discover their own unique method of tiling the same circular area with their 21 tiles.

Then ask the class to describe their circles. What symmetries emerged? Does their circle demonstrate translation symmetry?, rotation?, reflection?, more than one kind of symmetry?, no symmetry? Ask them to compare their circles and describe the similarities and differences.

## STAR MAKING

Grades 3 and up

Develops awareness of spatial relationships, and angle combinations.

One large or 2 travel sets

*Allow at least 15 minutes*

If desired, the teacher can illustrate the three diamonds or rhombus shapes on the board and discuss the angle degrees and their relationships. (Refer to package instructions section "Why the Tiles Fit Together So Many Ways".)

Give each student at least 14 red tiles, 7 yellow tiles, and 7 blue tiles. Students can use a Fractiles board or any flat steel-based surface - such as a cookie sheet or a steel based whiteboard.

Ask if students know how many degrees there are in a circle. (360)

Have students individually or in teams make a star of yellow tiles. (7 tiles)

Ask what fraction of 360 degrees is the yellow tile's angle ( $1/7$  of 360 degrees)

Ask how many degrees there are in a single yellow tile if the whole star has 360 degrees.

Next ask them to make a star with red tiles (14 tiles).

Ask what fraction of 360 degrees is a red tile's angle ( $1/14$ )

Ask how many degrees there are in a single red tile knowing the whole star has 360 degrees.

Next have students try using the blue tiles to make a star. Can you make a blue star the same way as you made a yellow or red star? Why or why not?

Next ask students to make another star, this time using more than one kind of tile. After they have made this star, have them replace some of the tiles in their star with different tiles. For instance, two red tiles will fit in the place of one yellow tile. Ask students to explain what this tells them about the relationships of the angles.

## **FOUR PLUS STARS GAME**

Grades 2 and up, for 2 or more players

Develops awareness of spatial relationships and angle combinations.

*Allow 15 minutes or more*

Object of the game: Be the first player to complete a star composed of 4 or more tiles.

A star in this game is made of 4 or more tiles whose corners meet in the middle. Together these tiles close the circle. In other words, their adjacent corners have angles which add up to 360 degrees.

How to Play:

Set up the game by placing one tile near the center of the board

Players take turns placing one tile at a time on the board.

The tile being placed must have at least one of its edges adjacent to the edge of a tile that is already on the board.

Tiles may not hang over the edge of the board or overlap other tiles.

You are not allowed to make a star with only 3 tiles as this is too easy and the game would end quickly.