Tantalizing Tangrams

Intended for Grade: Fourth

Subject: Math

Description: This project utilizes a series of Tangram puzzles to teach problem solving and critical thinking skills.

Objective: The student will be able to identify geometric transformations (slides, flips, and turns). The student will also be able to reconstruct Tangram silhouettes of animals found in Mississippi.

Mississippi Frameworks addressed:

- ☒ Math Framework 2a: Construct two- and three-dimensional geometric figures with concrete materials.
- ☒ Math Framework 2b: Identify, describe, classify, and compare two- and three-dimensional geometric shapes, figures, and models.
- ☒ Math Framework 2c: Investigate transformational results of slides, flips, and turns.
- ☒ Math Framework 2h: Investigate geometric concepts using interactive materials and resources.

National Standards addressed:

- ☒ Math Standard: Geometry
- ☒ Math Standard: Representation

Materials:

- ☒ Tangrams- one set per student
- ☒ Tangram-ing Mississippi Animals worksheet

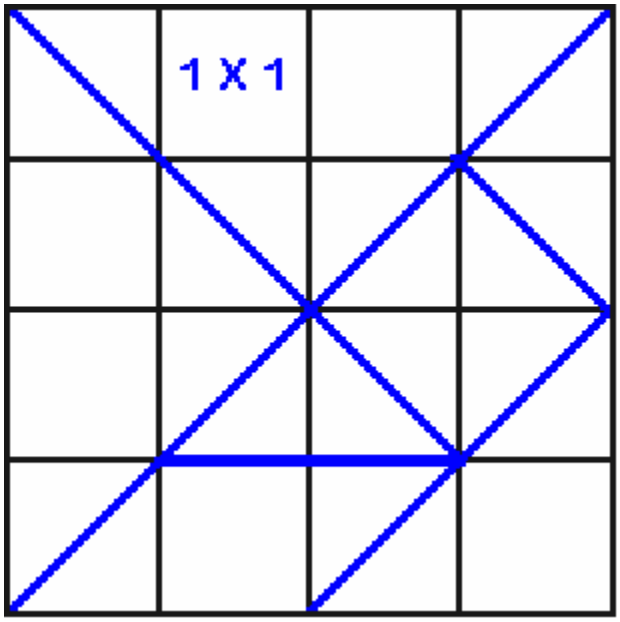
Background:

Tangrams is an ancient Chinese puzzle in which a set of seven geometric shapes are used to recreate various silhouettes. A single shape is called a "tan;" a complete set of Tangram tans includes two large triangles, two small triangles, a medium- sized triangle, a parallelogram, and a square, that can all be arranged without overlapping to form a large square. The area of the parallelogram tan, square tan, and the medium- sized triangle tan are all two times that of each small triangle tan. The area of each large triangle tan is four times that of each small triangle tan. Below you will find a picture showing all of the tans assembled to form a large square.

There are two rules we must follow when we try to solve Tangram puzzles:

1. **All seven tans must be used.**
2. **Each tan must lay flat on the workspace- *they must not overlap*.**

The Seven Tans



Procedure:

Introduce the class to TANGRAMS- An ancient Chinese puzzle in which a set of seven geometric shapes is used to recreate various

silhouettes. Two rules must be followed when you are trying to mimic Tangram silhouettes:

1. All seven tans must be used.
2. Each tan must lay flat on the workspace- they mustn't overlap.

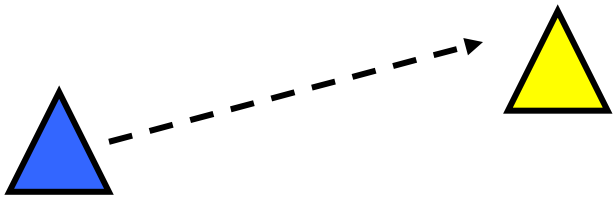
Activity One: Exploring Slides, Flips, and Turns

1. Print on overhead transparencies the SLIDE/FLIP/ROTATE EXAMPLE sheets found at the end of this project.
2. Ask the students to define slide, flip, and turn. Write responses on the board. If the students are having trouble coming up with definitions, prompt them to consider what these words mean on the playground:

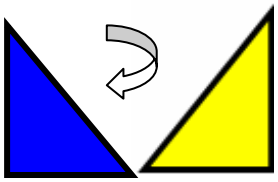
   a. SLIDE- When you go down the slide, your feet always point in the same direction while your entire body moves from one place to another.
   b. FLIP- When you flip off a swing, your feet go over your head but you end up very close to where you jumped off the swing.
   c. TURN- When you sit on the merry-go-round and it turns, you end up facing a new direction.

3. Explain to students that to solve Tangram puzzles we must often slide, flip, and turn tans and so it is important for everyone to understand what these transformations do.
4. Now, write the following definitions on an overhead transparency:

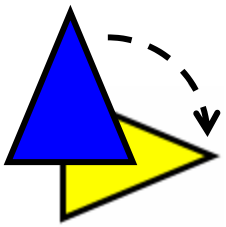
   d. **Slide**- The direction the object is pointing stays the same but the object's position is changed.



e. **Flip**- The object is turned over but its position is not changed.



f. **Turn**- The object's position stays the same but the object's orientation is changed.



5. Tape one of the large triangle tans to the board. Use the other large triangle tan to show the class what a slide, flip, and turn look like, using the above pictures as a guide.
6. Give each student one complete set of tans.
7. Explain to students that when they are trying to solve Tangram puzzles they may have to slide, flip, or turn tans.
8. Put one of the Slide/Flip/Rotate transparencies on the projector.
9. Have students solve the puzzle.
10. Now, put the other Slide/Flip/Rotate transparency on the projector and ask students what has been changed.
11. Students should note that the front foot of the rabbit is in a different position. Ask students to solve this new puzzle by moving only one tan.
12. Ask students whether they performed a slide, flip, or turn to solve this new puzzle. Some students may say "flip" while

others say "turn"- both are correct (a 180 degree turn is equivalent to a flip).

Activity Two: Tangram-ing Mississippi Animals

1. Explain to the class that to solve a Tangram puzzle we examine the silhouette and then try to make the identical silhouette following the Tangram puzzle rules:
   1. All seven tans must be used.
   2. Each tan must lay flat on the workspace- *they must not overlap*.
2. Partition the class into groups of four.
3. Give each student a complete set of tans along with a Tangram-ing Mississippi Animals worksheet.
4. Instruct students to solve as many Tangram puzzles as they can on their own and then to figure the rest out with the help of their groupmates. Remind students that if they are having trouble with puzzles they should consider sliding, flipping, or turning different pieces.
5. Select one puzzle from the worksheet to solve for the class. If you have a set of translucent tans, you may wish to use the overhead projector.
6. Have students return to their seats and take out a piece of paper. Select one Tangram puzzle and have students draw the solution to this puzzle on their paper.

Evaluation:

Activity 1: Students properly identify the geometric transformation they utilized to solve the second puzzle.
Activity 2: Students draw the correct placement of the tans for the selected Tangram puzzle.

Extended Activities:

1. Download more Tangram puzzle silhouettes from Mr. Crawford's Tangram website (http://www.tangrams.ca) for students to solve.
2. Have the students "reverse engineer" a Tangram puzzle by arranging the seven tans into a silhouette that resembles a familiar object. Have each student then tape the tans in place and then lay tracing paper on top of the tans. Students can then trace the silhouette of the form they created and then trade silhouettes with their classmates.

Sources:

Special thanks to Randy Crawford for all of the information he has published at http://www.tangrams.ca

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May 2006

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Tangram-ing Mississippi Animals

Recreate the following silhouettes of Mississippi animals and plants with your set of tans. Have fun and just make sure you follow the two Tangram puzzle rules:

1. You must use all seven tans.
2. All tans must lay flat on your workspace- tans must not overlap.

Let the puzzling begin!

1. The Eastern Cottontail Rabbit

2. The Eastern Grey Squirrel

3. The Coyote

4. The Evening Bat

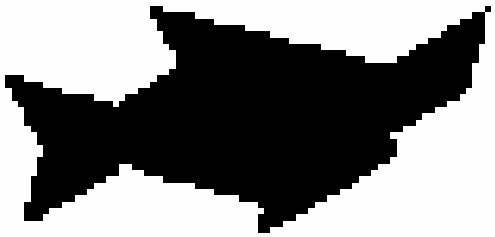
5. The Red Bat

6. The American Black Bear

7. The Turkey Vulture

8. The Blue Crab

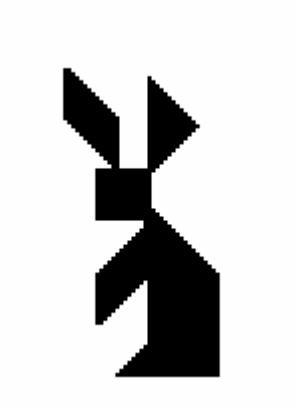
9. The Paddlefish

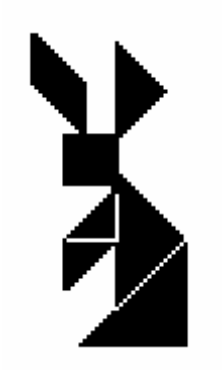


10. The Bobcat

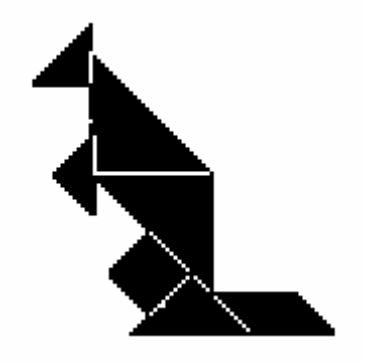
TANGRAM PUZZLE SOLUTIONS

1. The Eastern Cottontail Rabbit

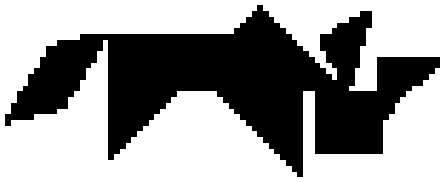


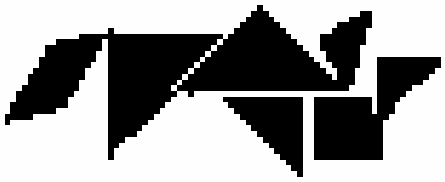


2. The Eastern Grey Squirrel



3. The Coyote





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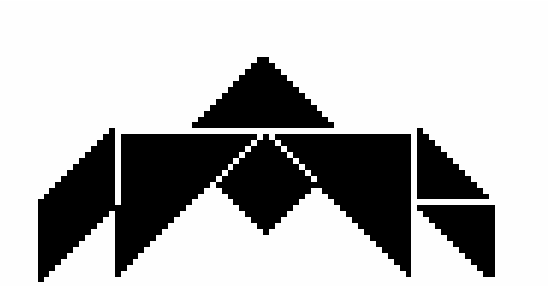
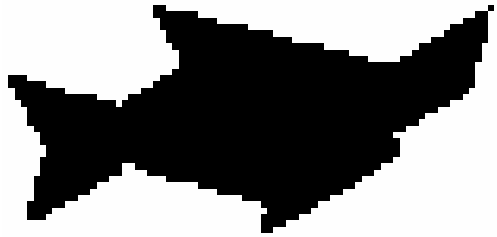
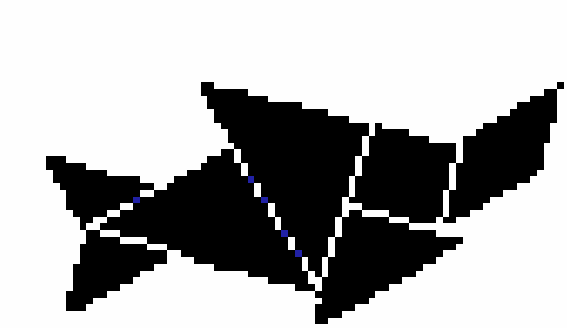


9. The Paddlefish





10. The Bobcat

SLIDE/FLIP/TURN EXAMPLES