**Fraction Tangrams**

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| In this lesson, students solve fraction tangram puzzles and compare the fractional size of regions to other regions.  |

**NC Mathematics Standards:**

**Number and Operations - Fractions**

**NC.4.NF.2** Compare two fractions with different numerators and different denominators, using the denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.  Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions by:

* Reasoning about their size and using area and length models.
* Using benchmark fractions 0, ½, and a whole.
* Comparing common numerator or common denominators

**Standards for Mathematical Practice:**

1. Make sense of problems and persevere in solving them.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

**Student Outcomes:**

* I can compare fractional parts of a shape to other fractional parts.

**Math Language:**

* denominator/numerator
* equivalent
* greater than/less than
* partition
* compare

**Materials:**

* scissors
* tangrams (can be printed from <https://www.activityvillage.co.uk/sites/default/files/downloads/tangram_template.pdf>)
* online tangrams: <http://www.abcya.com/tangrams.htm>
* student handouts

**Advance Preparation**:

* Have tangrams available or print sets on cardstock from link provided above
* Make copies of the student handouts

**Launch:**

1. Introducing Tangrams (8-10 minutes)

Bring students together to introduce the tangram pieces (if this is a new manipulative). Tell students that these seven pieces can be used to make different shapes and designs.

Today we are going to be using a square as our main shape. Have students work together to create the large square using all seven pieces of the tangrams.



Tell students that this square is going to represent our whole in today’s activity. Provide students with Tangram Task Sheet. Tell students that their job is to determine what fractional size of each tangram piece, if the large square has a value of one.

**Explore:**

1. Exploring Tangrams (18-20 minutes)

Let students work to figure out the fractional size of each tangram piece. It is assumed that the entire square (picture above) represents 1 or 1 whole. Look for students who place pieces on top of each other to compare them to each other. Observe: How are students making sense of the values? Can they identify the value of the two large triangles together as ½?

As students work, as questions such as:

* 1. How does this piece relate to the whole? How do you know?
	2. What is the fractional name for this piece?
	3. What is the relationship between these two pieces?
	4. Can two pieces with different shapes have the same value?

As you observe, decide which students should share their strategies with the class.

**Discuss:**

1. Discussion of Tangrams (10-12 minutes)

After most students have finished Tangram Task Sheet 1, regroup the entire class together. Have selected students share their strategies for finding the value of each shape. You may want to have multiple copies of the tangram template handy so that students can visually see students’ various strategies. Have students share their strategies for identifying the tangram pieces.

Ask questions to further the discussion, such as:

* 1. How do these strategies relate?
	2. Is there another way to find the value of this piece?
	3. What other piece can we identify based on this thinking?
	4. How did comparing the fractional parts you already identified help?

Post several effective strategies that emerged from the discussion.

Tell students that now that they have learned some new strategies for comparing fractional parts of a whole, they are going to try out a different tangram puzzle. Have students work in partners to use the strategies learned to complete Tangram Task 2.

As students finish, they should write in their math journals about how comparing the size of fractional parts helps them name fractions.

**Evaluation of Student Understanding:**

**Informal Evaluation:**

* Observe and monitor students as they solve the problem. How are they making sense of the problem? Are they laying the pieces on top of each other? Can they identify the half?

**Formal Evaluation/Exit Ticket:**

* Students will repeat this activity with the large square not being the value of one. Choose one of the pieces in the tangram, and say that it is now 1, what size are the other pieces? What are the other sizes if the small square is half?

**Meeting the Needs of the Range of Learners:**

**Intervention:**

* Students who are having trouble with this activity may want to start with pattern blocks, if hexagon is the whole, what is the value of the trapezoid? Triangle?

**Extension:**

* Students should work on Tangram Task Sheet 3, students can create their own puzzles and answer sheet. Remind students that they need to be accurate to the best of their ability. Share their puzzles with others. Online tangram website has been included for early finishers.

**Possible Misconceptions/ Suggestions**

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| **Possible Misconceptions** | **Suggestions** |
| Students struggle to get started on the task. | * “Can you see a way to divide the whole square into half?”
* “What do you notice about the 2 large triangles?”
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| Students are unable to find the fractional value of smaller shapes. | * “How many of the <shape> would it take to cover the entire square? Is there a way we could find out?”
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**Tangram Task Sheet**

Record the size of each tangram piece in the picture below.



How did you discover the size of each piece? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Write a comparison statement about two of the shapes.

Example: “I know that the shape \_\_\_ is larger than \_\_\_\_ because \_\_\_\_.” \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Tangram Task Sheet 2**

Record the size of each tangram piece in the picture below.

How did you discover the size of each piece? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Write a comparison statement about two of the shapes.

Example: “I know that the shape \_\_\_ is larger than \_\_\_\_ because \_\_\_\_.” \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Tangram Task Sheet 3**

Create your own Tangram Puzzle for your friends to solve.

This puzzle was made by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Person who solved the puzzle: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Write a comparison statement about two of the shapes.

Example: “I know that the shape \_\_\_ is larger than \_\_\_\_ because \_\_\_\_.” \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Tangram Fractions Exit Ticket

Now suppose the small square is one whole. Record the size of each of the other tangram pieces in the picture below.



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