**Who Am I? Puzzles**

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| In this lesson, students solve Who Am I? puzzles that require them to compare fractions and apply understanding of equivalent fractions and benchmark fractions. |

**NC Mathematics Standard(s):**

**Number and Operations - Fractions**

**NC.4.NF.2** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark such as ½. 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 using a fraction model.

* 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.

7. Look for and make use of structure.

**Student Outcomes:**

* I can use equivalent fractions and benchmark fractions to solve fractions puzzles.
* I can communicate my reasoning and problem solving strategies to my classmates.

**Math Language:**

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

**Materials:**

* Puzzle cards (attached)

**Advance Preparation**:

* Print and cut out puzzle cards

**Launch:**

1. Introducing a Fraction Puzzle (8-10 minutes)

Introduce the class to Puzzle 1:

**Puzzle 1**

1/4 1/2 3/4 4/4 5/4

Show the first clue to the puzzle: “I am more than one half.” Allow students to discuss.

Ask: “Which of these fractions does this clue help us eliminate? 1/4 and 1/2?”

Discuss with the class why this clue helps us determine which choices to eliminate.

Show the second clue to the puzzle: “My denominator is larger than my numerator.” Ask: “How does this help us get closer to the answer? This will eliminate the fraction 5/4, leaving us 3/4 and 4/4.”

Show the last clue: “I am not equivalent to 1.” The only fraction left that isn’t equivalent to 1 is 3/4. After the class has discussed how to use the clues to solve the puzzles, explain that they will be working on more puzzles in pairs

**Explore:**

1. Solving Puzzles (20-22 minutes)

Students work in pairs or at stations to solve the remaining Fraction Puzzles. As the students are working, observe how the students are solving the puzzles.

Possible questions:

* What are strategies that you used to get started?
* What clues are hard to figure out?
* How might equivalent fractions or benchmark fractions help with this clue?

When students are finished with the remaining puzzles, students are to attempt to write their own fraction puzzles in their math journal. Choose any five fractions and write clues that will help eliminate a fraction or two at a time, but keep the others. See if other classmates are able to solve their puzzles.

Observe students as they work and support them by asking questions.

* Which fraction does your clue help eliminate?
* What is true about this fraction that could help you write a clue?
* Which fractions are remaining to eliminate?

**Discuss:**

1. Discussion of Puzzles (10-12 minutes)

As a class, discuss how students were able to solve the puzzles. What clues were most helpful, and what clues were least helpful? Which clues did students need help with?

Share some of the puzzles that the students made. If time permits, work as a class to solve a few of the puzzles that students have created.

**Additional Activities:**

1. These activities could be completed by the entire class or as centers.

* **More Puzzle Work:** Use student made puzzles to make a class book of fractions puzzles. Share with other classrooms in you building. As students are putting together the book, encourage them to solve each others’ puzzles.
* **Build the Cookie:** Students need multiple copies of the pattern blocks: hexagon, trapezoid, rhombus, and triangle OR they can use the website: <https://apps.mathlearningcenter.org/pattern-shapes/>. Students should explore all of the different ways they can use the pattern blocks to build a hexagon and write it as an equation in terms of sixths. Example: Making a hexagon from a trapezoid, a rhombus, and 1 triangle could be written as 1 = 3/6 + 2/6 + 1/6.   
  Extension: Students can treat two joined hexagons as a whole and do the same activity so that the values would be: 1 trapezoid = ¼, 1 rhombus = 1/6, triangle = 1/12.
* **Drawing Equivalent Fractions:** Students start with ½ of a rectangle shaded and explore different ways to create fourths and eighths. Students could also start with 1/3 of a rectangle shaded and explore different ways to create sixths and twelfths. For each example, they should explain how they know they have created an equivalent fraction. Extension: This can also be done on a number line.
* **Fractions of a Region:** Students need graph paper. Have students partition the 6x4 grid into various size regions. Regions can be halves, thirds, fourths, sixths, eighths, and twelfths. Teachers can determine the size of fractions: halves and fourths are easier. When done, students need to write the fractional part of each region.

**Evaluation of Student Understanding**

**Informal Evaluation:**

* As students are working on their tasks, pose questions and make observations about which students need further support determining how to make bars, what fractional amounts each color represents, or how to write their equation.

**Formal Evaluation/Exit Ticket:**

* Students’ work on the puzzles can be used as a formal evaluation.

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

**Intervention:**

* Remove one of the incorrect choices to lessen the number of choices at the beginning of each puzzle.

**Extension:**

* Write puzzles that begin with only 3 possible answers. Only one or two clues would be needed to answer the puzzle.

**Possible Misconceptions/Suggestions:**

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| **Possible Misconceptions** | **Suggestions** |
| Students do not how to start the puzzles. | “What does the first clue mean to you? Can we eliminate one of your choices? Why?” |
| Students struggle reasoning mentally about fractions. | Have students draw a model of the fractions using an area model (rectangle) or number line or use a set of fraction tiles. |

**Special Notes:**

* The Additional Activities could be repeated in future lessons or in math stations.

**Solutions:**

* Puzzle 1: 3/4
* Puzzle 2: 2/3
* Puzzle 3: 4/6
* Puzzle 4: 5/12
* Puzzle 5: 9/10
* Puzzle 6: 9/6
* Puzzle 7: 1/3
* Puzzle 8: 3/8

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| **Puzzle 1**  1/4 1/2 3/4 4/4 5/4   * I am more than one half. * My denominator is larger than my numerator. * I am not equivalent to 1. * I am \_\_\_\_\_\_\_. | **Puzzle 2**  2/3 3/4 2/5 7/10 6/8   * My numerator is an even number. * I am greater than one half. * I am less than 3/4. * I am \_\_\_\_\_\_\_. |
| **Puzzle 3**  2/8 4/6 9/12 3/5 5/12   * I greater than 1/4. * My denominator is a multiple of three. * I am equivalent to 2/3. * I am \_\_\_\_\_\_. | **Puzzle 4**  1/2 5/12 1/4 8/10 1/3   * I am less than one half. * I am greater than 3/12. * I am 1/12 away from 1/2. * I am \_\_\_\_\_\_\_. |
| **Puzzle 5**  2/4 3/9 1/5 7/12 9/10   * I am greater than 1/2. * I am greater than 3/4. * I am closer to 1 than one half. * I am \_\_\_\_\_\_\_. | **Puzzle 6**  5/4 1/5 4/6 3/8 2/10   * I am less than one. * My denominator is even. * I am greater than 1/2. * I am another way to say 2/3. * I am \_\_\_\_\_\_\_. |
| **Puzzle 7**  6/10 4/8 5/9 1/3 3/12   * I am greater than one fourth. * I am not equivalent to 3/6. * I am less than one half. * I am \_\_\_\_\_\_\_. | **Puzzle 8**  7/8 3/8 2/10 9/6 2/12   * I am less than one half. * I am not equivalent to 1/6. * I am closer to one half than I am to zero. * I am \_\_\_\_\_\_\_. |