<table>
<thead>
<tr>
<th>Sample Item Id:</th>
<th>MAT.04.PT.4.ARTPJ.A.155</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title:</td>
<td>Art Project Fractions</td>
</tr>
<tr>
<td>Grade:</td>
<td>03</td>
</tr>
<tr>
<td>Primary Claim:</td>
<td><strong>Claim 4: Modeling and Data Analysis</strong>&lt;br&gt;Students can analyze complex, real-world scenarios and can construct and use mathematical models to interpret and solve problems.</td>
</tr>
<tr>
<td>Secondary Claim(S):</td>
<td>Claim 1: Concepts and Procedures</td>
</tr>
<tr>
<td>Primary Content Domain:</td>
<td><strong>Numbers and Operations—Fractions</strong></td>
</tr>
<tr>
<td>Secondary Content Domain(S):</td>
<td>Measurement and Data</td>
</tr>
<tr>
<td>Assessment Target(S):</td>
<td>4 A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.&lt;br&gt;1 F: Extend understanding of fraction equivalence and ordering.&lt;br&gt;1G: Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.</td>
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<tr>
<td>Standard(S):</td>
<td>4.NF.1, 4.NF.2, 4.NF.3, 4.NF.4, 3.NF.1, 3.NF.2, 3.NF.3, 3.MD.6, 3.MD.7</td>
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<tr>
<td>Mathematical Practice(S):</td>
<td>1, 2, 3, 4, 5, 6</td>
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<tr>
<td>DOK:</td>
<td>3</td>
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<tr>
<td>Item Type:</td>
<td>PT</td>
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<tr>
<td>Score Points:</td>
<td>14</td>
</tr>
<tr>
<td>Difficulty:</td>
<td>M</td>
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<tr>
<td>How This Task Addresses The “Sufficient Evidence” For This Claim:</td>
<td>The student is given directions to create a design and then asked to construct and use mathematical models within the design to interpret and solve problems.</td>
</tr>
<tr>
<td>Target-Specific Attributes (E.G., Accessibility Issues):</td>
<td>Accommodations may be necessary for students who have fine-motor-skill challenges or are visually challenged.</td>
</tr>
<tr>
<td>Stimulus/Source:</td>
<td>Pattern blocks</td>
</tr>
<tr>
<td>Notes:</td>
<td>Multi-part performance task</td>
</tr>
<tr>
<td>Task Overview:</td>
<td>Students are asked to create a design using pattern blocks, figure the unit fraction each block represents if 1 yellow hexagon represents one whole, combine each group of unit fractions, make comparisons among the fractions, and create a design representing a specific value based on what was learned about the shapes and the unit fractions they represent.</td>
</tr>
<tr>
<td>Teacher Preparation/Resource Requirements:</td>
<td>Students should have access to pattern blocks. (Only yellow hexagons, red trapezoids, blue rhombi, and green triangles are needed. Tan rhombi and orange squares are not needed.)&lt;br&gt;<a href="http://www.aug.edu/~lcrayford/Tools/pattern_blocks.pdf">http://www.aug.edu/~lcrayford/Tools/pattern_blocks.pdf</a> has cutout pages of pattern blocks. These will need to be prepared in advance. Each student should get a minimum of 1 yellow hexagon, 2 red trapezoids, 3 blue rhombi, and 6...</td>
</tr>
<tr>
<td>Teacher Responsibilities During Administration:</td>
<td>Monitor individual work; hand out and collect materials as required for each session.</td>
</tr>
<tr>
<td>Time Requirements:</td>
<td>Two sessions totaling no more than 120 minutes. Each part of this task should be done in sequential order.</td>
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- green triangles.
- Plain white paper or 1-inch isometric dot paper is also needed.
- [http://www.printablepaper.net/preview/IsometricDots-1inch](http://www.printablepaper.net/preview/IsometricDots-1inch) has a free downloadable version of the isometric dot paper.
The Task:

Session 1

Art Project with Pattern Blocks

Use the pattern blocks that your teacher gives you to help you with this task. There are five parts to this task, and you must work through them in order.

Be sure you have the following pattern blocks before you begin.

![Pattern blocks: Yellow Hexagon, Red Trapezoid, Blue Rhombus, Green Triangle]

**Part A**

Each yellow hexagon pattern block represents one whole. The other colored pattern blocks represent a fraction of the whole yellow hexagon.

Write the fraction of the yellow hexagon each colored shape represents.

1 yellow hexagon represents ______ yellow hexagon.

1 red trapezoid represents ______ yellow hexagon.

1 blue rhombus represents ______ yellow hexagon.

1 green triangle represents ______ yellow hexagon.
Part B

Use the pattern block shapes to make a picture for an art project.

These rules for making your picture must be followed:

- At least one of each shape must be included in the picture.
- The shapes may touch the edges of other shapes.
- The shapes must **not** overlap each other.

Click on a shape and then click in the space below to put a shape in the picture. Continue as many times as necessary.

Yellow Hexagon  Red Trapezoid  Blue Rhombus  Green Triangle

Click on the turn button if you need to turn your shape.  
Click on the trash can and then click on the shape if you want to delete a shape.
**Part C**

Count all the colored shapes you used in your picture. Write the total number of each colored shape you used in the picture.

___ yellow hexagon(s)  ___ blue rhombus (rhombi)

___ red trapezoid(s)  ___ green triangle(s)

When all of the shapes of one color are combined, they represent a fraction or a mixed number of yellow hexagons. Complete the sentences below showing these fractions or mixed numbers.

___ red trapezoid(s) represents ___ yellow hexagon(s).

___ blue rhombus (rhombi) represents ___ yellow hexagon(s).

___ green triangle(s) represents ___ yellow hexagon(s).

This is the end of Session 1. You will not be able to go back to Parts A, B, or C once you click “Submit.”
Session 2  
Part D

For his art project, Carter used 2 yellow hexagons, 5 red trapezoids, 2 blue rhombi, and 7 green triangles. A picture of Carter’s art project is shown below.
Carter thinks that he can use 7 green triangles and 2 blue rhombi to show that \( \frac{7}{6} \) is greater than \( \frac{2}{3} \) \( \left( \frac{7}{6} > \frac{2}{3} \right) \). Use pictures, numbers, and/or words in the space below to show whether Carter’s thinking is correct or not.

Carter also thinks he can use 2 yellow hexagons and 2 blue rhombi to show that \( \frac{2}{1} \) is equal to \( \frac{2}{3} \) \( \left( \frac{2}{1} = \frac{2}{3} \right) \).

- He says that the sizes of the shapes do not matter.
- He counts the number of each shape and uses this number as the numerator in each fraction.
- He says that the fractions are equal because the numerators are equal.

Use pictures, numbers, and/or words in the space below to show whether Carter’s thinking is correct or not.
Part E

Use the pattern block shapes to make a new picture. This picture must represent a value that is equal to $5 \frac{1}{6}$ yellow hexagons.

The other rules still apply:

- At least one of each shape must be included in the picture.
- The shapes may touch the edges of other shapes.
- The shapes must not overlap each other.

Click on a shape and then click in the space below to put a shape in the picture. Continue as many times as necessary.

Click on the turn button if you need to turn your shape.

Click on the trash can and then click on the shape if you want to delete a shape.
Explain how you know the shapes in your picture represent $5 \frac{1}{6}$ yellow hexagons.
Sample Top-Score Response:

**Part A**
1 red trapezoid represents $\frac{1}{2}$
1 blue rhombus represents $\frac{1}{3}$
1 green triangle represents $\frac{1}{6}$

**Part B**
Not scored. The following illustration is an example top-score response only. Whatever the student constructs must be interpreted for **Part C**.

```plaintext
The example above uses 3 hexagons, 5 trapezoids, 8 rhombi, and 7 triangles.

**Part C**
5 red trapezoids is the same as $\frac{5}{2}$ (or $2\frac{1}{2}$)
8 blue rhombi is the same as $\frac{8}{3}$ (or $2\frac{2}{3}$)
7 green triangles is the same as $\frac{7}{6}$ (or $1\frac{1}{6}$)
```
Part D

I can show that Carter's thinking is correct and that $\frac{7}{6} > \frac{2}{3}$. It takes 6 triangles to make 1 whole hexagon. That leaves one extra or $\frac{1}{6}$. It takes 3 rhombi to make 1 whole hexagon. I have 2 rhombi, which is $\frac{2}{3}$. I know that $\frac{2}{3}$ is less than 1 whole, so it also has to be less than $\frac{7}{6}$.

I can show that Carter's thinking is not correct and that $\frac{2}{1}$ is not equal to $\frac{2}{3}$. The hexagons represent wholes, and the fraction $\frac{2}{1}$ means that there are 2 wholes. It would take 3 rhombi to make 1 whole. Carter is using 2 of them, which is less than 1 whole. That means Carter is wrong when he says 2 wholes is equal to $\frac{2}{3}$. Carter would need $\frac{6}{3}$ or 6 rhombi to equal 2 whole hexagons.

Part E

Creates a new picture that uses at least one of each colored shape with no overlap that represents $5 \frac{1}{6}$ yellow hexagons. One example is shown below; however, there are many ways to correctly complete this part.

Expects how the picture represents a value that is equal to $5 \frac{1}{6}$ yellow hexagons.

Example: "I know my picture equals $5 \frac{1}{6}$ hexagons because it takes 2 trapezoids to make 1 hexagon, 3 rhombi to make 1 hexagon, and 6 triangles to make 1 hexagon. I started with 2 hexagons. Then I used 4 trapezoids, which equals 2 more hexagons. It takes 2 triangles to make 1 rhombus, so 2 triangles + 2 rhombi = 1 hexagon. That makes 5 hexagons. The remaining triangle is $\frac{1}{6}$ of a hexagon, so I have the same as $5 \frac{1}{6}$ hexagons in my picture."
**Scoring Notes:**
Each scored portion of the task is evaluated individually. The total number of points is determined by adding the points assigned for each part of the task.

<table>
<thead>
<tr>
<th><strong>Scoring Rubric:</strong></th>
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<tr>
<td>Responses to this item will receive 0–14 points, based on the following:</td>
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</table>

**Part A:** 3 points (1 point for each correct fraction)
- 1 red trapezoid represents \( \frac{1}{2} \)
- 1 blue rhombus represents \( \frac{1}{3} \)
- 1 green triangle represents \( \frac{1}{6} \)

**Part B:** Not scored. While it is desirable that the student followed the directions to create a picture that uses at least one of each colored shape with no overlap, the resulting picture has no measureable value in terms of fractional sense and understanding areas with respect to shapes.

**Part C:** 3 points  
Correctly writes the total number represented by each shape (1 point per shape)

**Part D:** 4 points (2 per explanation)  
Correctly explains why Carter is correct in his first thought and incorrect in his second thought.

**Part E:** 4 points (2 point for the picture, 2 point for a thorough explanation)  
Creates a picture that uses at least one of each colored shape with no overlap that represents \( \frac{5}{6} \). A single error can be made that is used consistently throughout the picture to earn 1 point for the picture. For example, the student can repeatedly use the blue rhombus as \( \frac{1}{4} \) of the yellow trapezoid (instead of \( \frac{1}{3} \)).

Explains how the picture represents a value that is equal to \( \frac{5}{6} \) yellow hexagons. If an error is made in referencing the fraction of the yellow trapezoid that another shape is (like the blue rhombus being called \( \frac{1}{4} \)), full credit can still be earned for a thorough explanation, even with the error in value...as long as the parts still add up to \( \frac{5}{6} \) using the flawed fractional value.