Grade Level/Course:
Grade 3

Lesson/Unit Plan Name:
Partitioning Wholes into Parts

Rationale/Lesson Abstract:
This lesson helps builds student's understanding of fractions. Using geometric shapes, students must partition a shape into equal pieces and name the fraction of one part of the shape. Students will continue to develop an understanding of fractions using a number line being able to grade a number line and partition the number line to show

Timeframe:
Activity 1 Fraction Strips – 60 min
Activity 2 Pattern Blocks – 60 min

Common Core Standard(s):
3.G.2 Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.*

3.NF.1 & 3.NF.2
Develop understanding of fractions as numbers.

1. Understand a fraction 1/*b* as the quantity formed by 1 part when a whole is partitioned into *b* equal parts; understand a fraction *a*/*b* as the quantity formed by *a* parts of size 1/*b*.
2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.
    a. Represent a fraction 1/*b* on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* equal parts. Recognize that each part has size 1/*b* and that the endpoint of the part based at 0 locates the number 1/*b* on the number line.
    b. Represent a fraction *a*/*b* on a number line diagram by marking off *a* lengths 1/*b* from 0. Recognize that the resulting interval has size *a*/*b* and that its endpoint locates the number *a*/*b* on the number line.

Instructional Resources/Materials:

1. Paper Strips – About 8 paper strips measured 1" x 12"
2. Pencil, crayons or markers
3. Ruler

Activity/Lesson:

Note on student background knowledge: In 2nd grade students have not been formally introduced to fractions. (The *Numbers and Operations – Fractions* domain begins in 3rd grade). However, students have begun the conceptual development of what a fraction is by learning how to partition rectangles and circles in equal shares, focusing on 2 equal shares, 3 equal shares and 4 equal shares. In 2nd grade students should be able to identify these as *halves, thirds, half of, a third of ,* etc*.* Students should also know that two halves make a whole, three thirds make a whole, and four fourths make a whole. Students should also be able to recognize that equal shares of identical wholes need not have the same shape. (see 2.G.3)

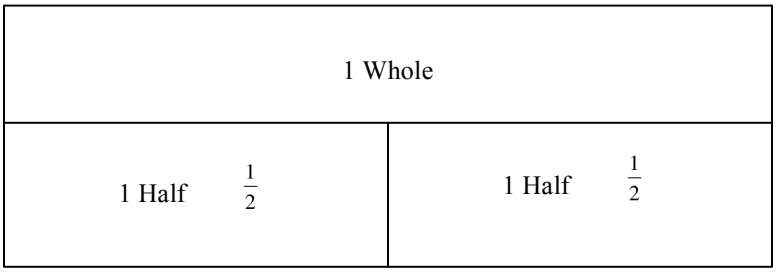
The activities in these lessons continue to develop students' conceptual understanding of a fraction and prepare them to work with unit fractions, representing wholes as fractions, and fraction equivalence. The fraction strips made during this learning activity can be saved and used again throughout a unit on fractions.

Activity 1:

For this activity each student will need about 8 paper strips, pencil and ruler.

1. Have students take one strip of paper and fold it in half.

   Ask students: "Is there more than one way to fold it in half?" [Yes, vertically in half, or horizontally in half]
   For this activity, have students fold the paper vertically in half like the diagram below.



   Students should fold one paper strip in half, then as a class discuss the number of equal parts and the fraction that represents one part. Label each part with the fraction name and the fraction number.

   Ask the following questions using choral response.
   - How many equal parts do we have? [2]
   - One part is how much of the whole? [1 half]
   - Which fraction represents each part? [1/2]

2. Continue with the other strips for fourths and eighths. Then thirds and sixths. And then fifths and tenths.

   Once students understand the process, allow students to work in partners or groups to complete the other fraction strips. Walk around the classroom to make sure students understand the task and are completing the other fraction strips.

   Look for students who are having difficulty in folding/measuring that results in equal parts.

My Fraction Strips

1 Whole

1 Half $\frac{1}{2}$	1 Half $\frac{1}{2}$

1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$

1 Eighth $\frac{1}{8}$	1 Eighth $\frac{1}{8}$	1 Eighth $\frac{1}{8}$	1 Eighth $\frac{1}{8}$	1 Eighth $\frac{1}{8}$	1 Eighth $\frac{1}{8}$	1 Eighth $\frac{1}{8}$	1 Eighth $\frac{1}{8}$

1 Third $\frac{1}{3}$	1 Third $\frac{1}{3}$	1 Third $\frac{1}{3}$

1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$

1 Fifth $\frac{1}{5}$	1 Fifth $\frac{1}{5}$	1 Fifth $\frac{1}{5}$	1 Fifth $\frac{1}{5}$	1 Fifth $\frac{1}{5}$

1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$	1 Tenth $\frac{1}{10}$

3. Check for Understanding:

   Have students show their fraction strips and explain how they know each part is an equal size and why each one has its fraction name. Here is a sample dialogue.

   Teacher: “Show me the fraction strip that has two equal pieces.” [all students raise the fraction strip with two halves]

   Teacher: “Prove to me that this fraction strip has two equal pieces [have students justify why it is the fraction strip they are holding.”
   Students can use a ruler to measure; they can fold it in half and show each part is the same size, etc.]

   Teacher: “Class, what is the fraction name for one part of this strip?” [Choral Response: one half]

   Continue discussing fractions strips. Some suggested prompts:
   - The fraction strip that shows five equal pieces.
   - The fraction strip that shows four equal pieces.
   - Suppose your fractions strips represent a candy bar. Which fraction strip shows how you would share your candy bar fairly with two other people?
   - Suppose your fraction strip represents a garden. Which fraction strip shows how you would plant one third of your garden with tomatoes?

4. Think Pair Share

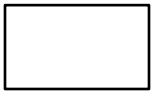
   Teacher: Think about the relationship of the number of equal parts in the whole to the name of the fraction for each part.
   What is the relationship between the amount of equal parts in the whole to the name of the fraction for each part?

   Give students time to discuss in partners, then share out as a class.
   Make sure students’ understand the following points:
   - The whole must be partitioned into equal sized pieces in order to name the parts with a fraction.
   - The amount of equal pieces in the whole is related to the fraction name.
   - The number of equal pieces in the whole is the denominator of the fraction.

5. Application

Example 1

Serena made brownies in a rectangular pan to share with her 3 friends. Show how Serena might cut the brownies so that Serena and her friends get the same size piece of brownie (with none leftover)? If possible, show more than one solution.



Model to students what you are thinking about as you try and solve the word problem.

"In this problem Serena made a pan of brownies and she wants to share the brownies with 3 friends. (point to the text that tells you this information)"

"What is the problem asking me to do?" (Reread the second and third sentence in the problem.)

In your own words summarize the problem, making sure all the necessary details are included. "The problem is asking me to show how Serens should cut the brownies so that everyone gets the same size piece. And if possible, show more than one way."

Model your plan and solution. "First, I am going to draw a rectangle to represent the brownies." [Draw a rectangle]

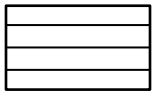
"Next, I need to think about how the brownies can be shared equally. How many pieces do I need to cut the brownies into? Let's look back at the problem. It says, "*Serena made brownies….to share with her 3 friends*" That means the brownies need to be cut into 4 equal pieces: Serena + Her 3 Friends = 4 people."

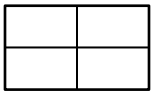
"Let's partition the rectangle into 4 equal pieces."

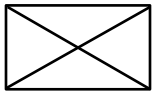
"Is there another way we could have drawn the 4 equal pieces?"

Explore different ways to draw the pan of brownies showing 4 equal pieces. Include non-examples and discuss why it does not work.

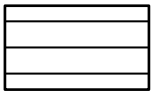
Other Possible Solutions:







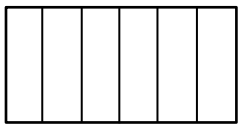
Non-Examples:

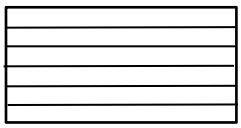


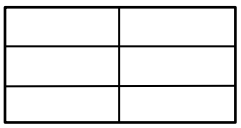
You Try 1

Matais made a loaf of banana bread to share with his family. If Matais has 5 people in his family. Show how Matais might cut the loaf of banana bread so that Matais and his 5 family members get the same size piece of banana bread (with none leftover)? If possible, show more than one solution.

Possible solutions:

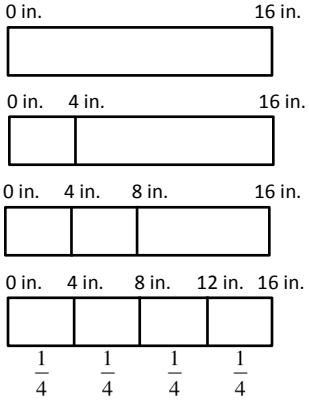






Example 2

A plumber has 16 feet of pipe. He cuts it into pieces that are each 4 feet in length. What fraction of the pipe would one piece represent?



Model to students what you are thinking about as you try and solve the word problem.

"In this problem the plumber has 16 ft. of pipe that he needs to cut into 4 in. pieces. (Point to the text that tells you this information)"

"What is the problem asking me to do?" (Reread the last sentence, question, in the problem.)

In your own words summarize the problem, making sure all the necessary details are included. "The problem is asking me to show how the plumber will cut the pipe so that each piece is the same size, 4 inches."

Model your plan and solution. "First, I am going to draw a rectangle to represent the pipe, which is 16 inches." [Draw a rectangle]

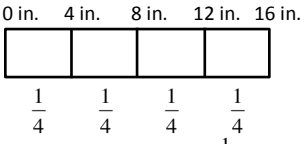
"Next, I need to think about making a cut in the pipe every 4 inches. Let's put some measurements n the pipe to show every 4 inches. The beginning of our pipe is at 0 inches. Our first cut will be at 4 inches. Where will the second cut be? 4 inches plus another 4 inches is 8 inches. Let's make a mark at 8 inches. Where will the next cut be? 8 inches plus 4 inches is 12 inches. Let's make a mark at 12 inches. "

"What about this last piece? Is it 4 inches from 12 inches to 16 inches?" [Yes]

Help students recognize that we are counting by 4's. "This reminds me of when we practice our skip counting by 4's."

Discuss with students how we know each piece is the same size. In this case, we could "measure" each piece and see that they are all 4 inches in length.

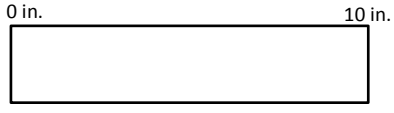
"How much does one piece represent of the whole?" [one fourth or $\frac{1}{4}$]

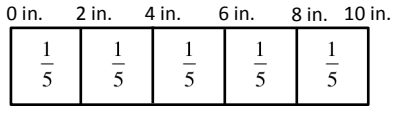


$\therefore$ Each 4 in. piece of pipe represents $\frac{1}{4}$ of the entire piece of pipe.

You Try 2

A carpenter has a 10-foot piece of wood. If the carpenter cuts the wood into 2-foot length pieces, what fraction of the wood would one piece represent?





$\therefore$ The wood should be cut into 5 equal pieces so that each piece is 2 inches long. Each piece of wood represents $\frac{1}{5}$ of the entire piece of wood.

Example 3

Samuel folds a rectangular piece of paper in half, then in half again. Which fraction strip could represent Samuel's folded piece of paper?

Teacher: "Let's think about our experience with our fractions strips."

"If we fold a strip in half, how many pieces do we have?" [Choral Response: 2]

"What is the fraction name for each piece?" [Choral Response: one half or $\frac{1}{2}$]

"What happens when we fold that strip in half again? Which fraction strip are we making?" (Give students time to think about which fraction strip it is.)

"Hold up the fraction strip that it represents?" [Students should hold up the fraction strip that has four equal pieces, the FOURTHS fractions strip]

1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$

You Try 3

Jayden folds a rectangular piece of paper in thirds, then in half again. Which fraction strip could represent Jayden's folded piece of paper?

1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$

Student Worksheet: Partitioning Fractions

Example 1
Serena made brownies in a rectangular pan to share with her 3 friends. Show how Serena might cut the brownies so that Serena and her friends get the same size piece of brownie (with none leftover)? If possible, show more than one solution.

You Try 1
Matais made a loaf of banana bread to share with his family. If Matais has 5 people in his family. Show how Matais might cut the loaf of banana bread so that Matais and his 5 family members get the same size piece of banana bread (with none leftover)? If possible, show more than one solution.

Example 2
A plumber has 16 feet of pipe. He cuts it into pieces that are each 4 feet in length. What fraction of the pipe would one piece represent?

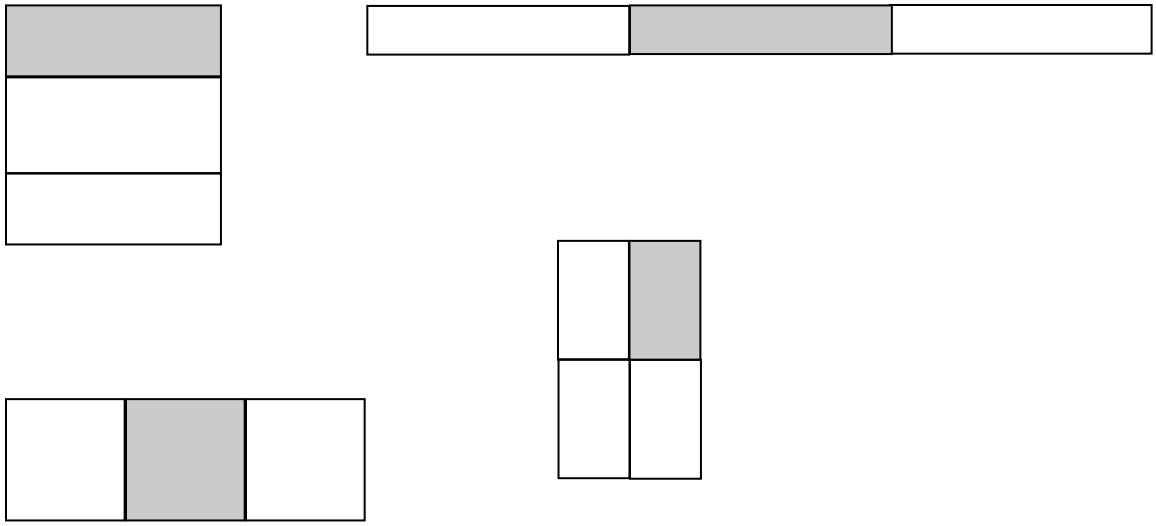
You Try 2
A carpenter has a 10-foot piece of wood. If the carpenter cuts the wood into 2-foot length pieces, what fraction of the wood would one piece represent?

Example 3
Samuel folds a rectangular piece of paper in half, then in half again. Which fraction strip could represent Samuel's folded piece of paper?

You Try 3
Jayden folds a rectangular piece of paper in thirds, then in half again. Which fraction strip could represent Jayden's folded piece of paper?

Assessment – Fraction Strips:

1. Circle all of the models that shows *one third* of the rectangle is shaded.



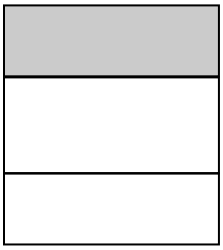
2. To make a small garage for his toy car, Jonathon took a rectangular piece of cardboard and bent it in half. He then bent it in half again. Which of your fraction strips matches this story well?

    c. What fraction of the original cardboard is each part? Draw and label the fraction strip.

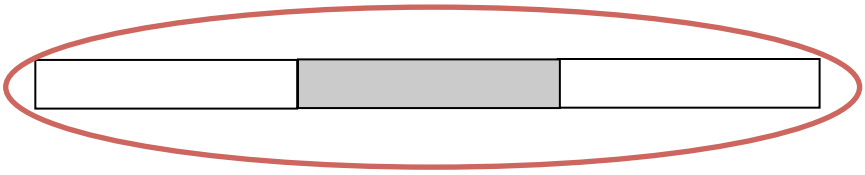
    d. Jonathon took a different piece of cardboard and bent it into thirds. He then bent each third in half. Which of your fraction strips matches this story well? Draw and label the matching fraction strip in the space below.

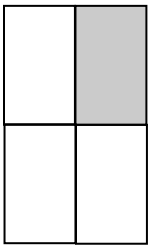
KEY Assessment – Fraction Strips:

1. Circle all of the models that shows *one third* of the rectangle is shaded.

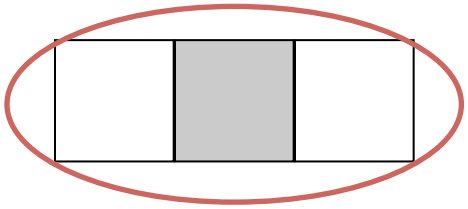


The 3 regions of this shape are not of equal size.





This shape shows 1 shaded region out of 3 shaded regions total. The fraction that is shaded is *one-fourth*.



2. To make a small garage for his toy car, Jonathon took a rectangular piece of cardboard and bent it in half. He then bent it in half again. Which of your fraction strips matches this story well?

   e. What fraction of the original cardboard is each part? Draw and label the fraction strip.

1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$	1 Fourth $\frac{1}{4}$

   f. Jonathon took a different piece of cardboard and bent it into thirds. He then bent each third in half. Which of your fraction strips matches this story well? Draw and label the matching fraction strip in the space below.

1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$	1 Sixth $\frac{1}{6}$

Activity 2: Pattern Blocks

Objective: Students will be able to identify the fraction name for a pattern block in relation to another pattern block.

Materials:
Pattern blocks (the only pieces needed are: yellow hexagons, red trapezoids, blue rhombuses and green triangles)

Activity

1. Explore and play. Give students a few minutes to explore and play with the pattern blocks. At the one-minute countdown, have students begin to arrange them on their desk so that they have a space to work and the pattern blocks are in one area on their desk.

2. Examples & You Tries

   Example 1: Hexagons & Trapezoids (hexagon will represent 1 whole).

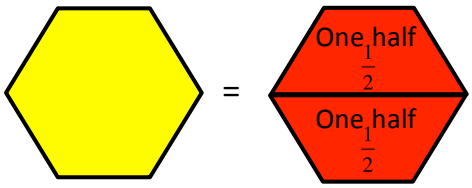
   Teacher: "Show me the Yellow Hexagon." [Students respond by raising the correct shape]
   Teacher: "Show me the Red Trapezoid." [Students respond by raising the correct shape]

   Teacher: "Let's explore how many Red Trapezoids are needed to make a Yellow Hexagon." Have students explore by placing the Red Trapezoids on top of the Yellow Hexagon until they can show two Red Trapezoids makes one Yellow Hexagon. Students should place 2 Red Trapezoids on top of the Yellow Hexagon (or next to the yellow hexagon).

   Teacher: "The Yellow Hexagon represents *one whole*. How many Red Trapezoids are needed to make a Yellow Hexagon?" [2}

   There are __2__ Red Trapezoids in 1 Yellow Hexagon.

   Teacher: "What fraction is 1 red trapezoid of the Yellow Hexagon?" [one half or $\frac{1}{2}$]

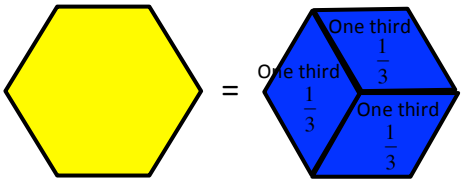
   $$1 \text{ whole } = \frac{1}{2} + \frac{1}{2}$$

   One Red Trapezoid is __One Half $\frac{1}{2}$__ of a Yellow Hexagon.

   Teacher: "We can write an equation to show the relationship between the whole and the fractions parts."

You Try 1a: Hexagons & Rhombi (a hexagon will represent 1 whole).

Teacher: "Explore with the Yellow Hexagon & Blue Rhombus."
How many Blue Rhombi are needed to make a Yellow Hexagon? [3]
What fraction is 1 rhombus in the hexagon? [one third]



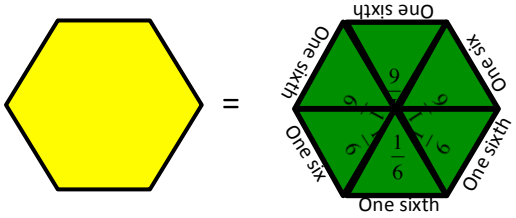
$$1 \text{ Whole} = \frac{1}{3}+\frac{1}{3}+\frac{1}{3}$$

a.) There are 3 Blue Parallelograms in 1 Yellow Hexagon.

b.) One Blue Parallelograms is $\frac{1}{3}$ of a Yellow Hexagon.

You Try 1b: Hexagons & Triangles (a hexagon will represent 1 whole)..

Teacher: "Explore with the Yellow Hexagon & Green Triangles."
How many Green Triangles are needed to make a Yellow Hexagon? [6]
What fraction is 1 green triangle of the yellow hexagon? [one sixth]



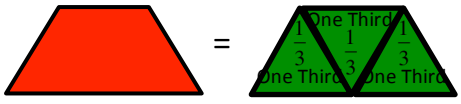
$$1 \text{ Whole} = \frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}+\frac{1}{6}$$

a.) There are 6 Green Triangles in 1 Yellow Hexagon.

b.) One Green Triangle is $\frac{1}{6}$ of a Yellow Hexagon.

Example 2: Triangles & Trapezoid (a trapezoid will represent 1 whole).

Teacher: "Explore with a Red Trapezoid & Green Triangles."
How many Green Triangles are needed to make a Red Trapezoid? [3]
What fraction is 1 green triangle of the yellow hexagon? [one third]



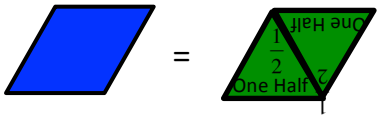
$$1 \text{ Whole} = \frac{1}{3}+\frac{1}{3}+\frac{1}{3}$$

a.) There are 3 Green Triangles in 1 Red Trapezoid.

b.) One Green Triangle is $\frac{1}{3}$ of a Red Trapezoid.

You Try 2: Triangles & Rhombi (a rhombus will represent 1 whole).

Teacher: "Explore with a Green Triangles & Blue Rhombus."
How many Green Triangles are needed to make a Blue Rhombus? [2]
What fraction is 1 green triangle of the Blue Rhombus? [one half]



$$1 \text{ whole } = \frac{1}{2} + \frac{1}{2}$$

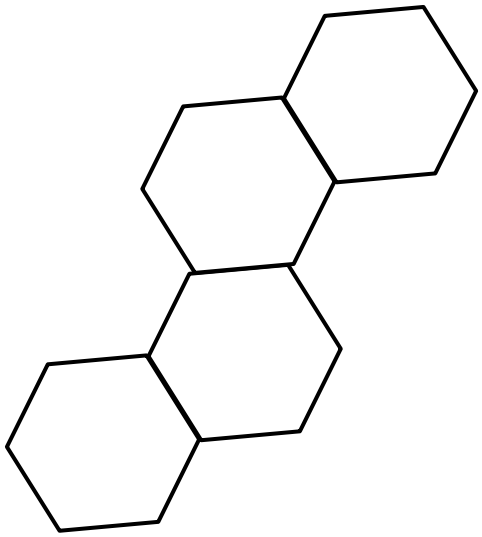
a.) There are __2__ Green Triangles in 1 Blue Rhombus.

b.) One Green Triangle is _____$\frac{1}{2}$_____ of a Blue Rhombus.

3. Challenge & Extension.

If students understand the concept of a whole and the relationship between a whole and the part, extend the activity so that it goes beyond 1 yellow hexagon as the whole. Now two or three hexagons can be the whole, or any other combination of shapes.

Challenge 1: The shape below represents one whole. Determine what fraction of the whole is each pattern block. Fill in the statements a – d.



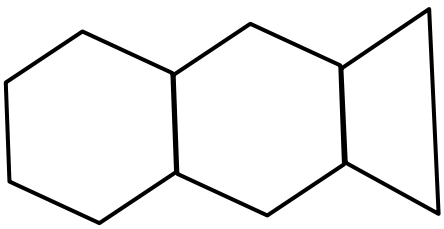
a. One Yellow Hexagon is _____$\frac{1}{4}$_____ of the whole.

b. One Red Trapezoid is _____$\frac{1}{8}$_____ of the whole.

c. One Blue Rhombus is _____$\frac{1}{12}$_____ of the whole.

d. One Green Triangle is _____$\frac{1}{24}$_____ of the whole.

Challenge 2: The shape below represents one whole. Identify the fraction of the whole for each pattern block. Fill in the statements e – h.

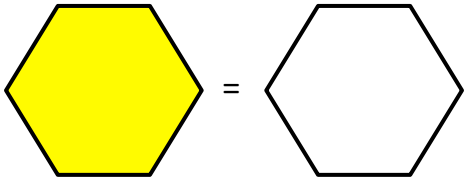


a. One Red Trapezoid is _____$\frac{1}{5}$_____ of the whole.

b. One Green Triangle is _____$\frac{1}{15}$_____ of the whole.

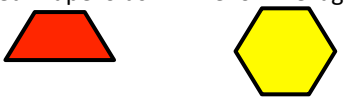
Student Worksheet: Partitioning Shapes – Pattern Blocks

Example 1 Show how many Red Trapezoids make a Yellow Hexagon. Write an equation to represent the number of unit fractions parts that equal one whole.



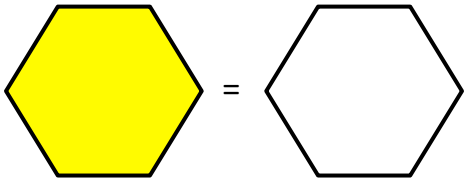
Equation:

a.) There are _____ Red Trapezoids in 1 Yellow Hexagon.



b.) One Red Trapezoid is _____ of a Yellow Hexagon.

You Try 1a Show how many Blue Rhombi make a Yellow Hexagon. Write an equation to represent the number of unit fractions parts that equal one whole.

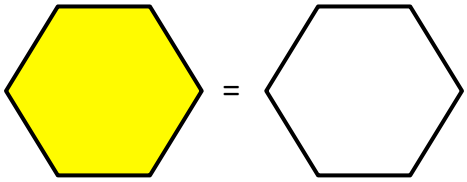


Equation:

a.) There are _____ Blue Rhombi in 1 Yellow Hexagon.

b.) One Blue Rhombus is _____ of a Yellow Hexagon.

You Try 1b Show how many Green Triangles make a Yellow Hexagon. Write an equation to represent the number of unit fractions parts that equal one whole.

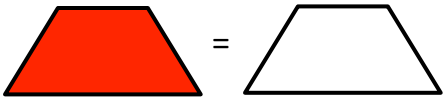


Equation:

a.) There are _____ Green Triangles in 1 Yellow Hexagon.

b.) One Green Triangle is _____ of a Yellow Hexagon.

Example 2 Show how many Green Triangles make a Red Trapezoid. Write an equation to represent the number of unit fractions parts that equal one whole.

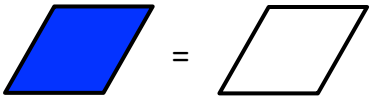


a.) There are _____ Green Triangles in 1 Red Trapezoid.


b.) One Green Triangle is _____ of a Red Trapezoid.


Equation:

You Try 2 Show how many Green Triangles make a Blue Rhombus. Write an equation to represent the number of unit fractions parts that equal one whole.



a.) There are _____ Green Triangles in 1 Blue Rhombus.

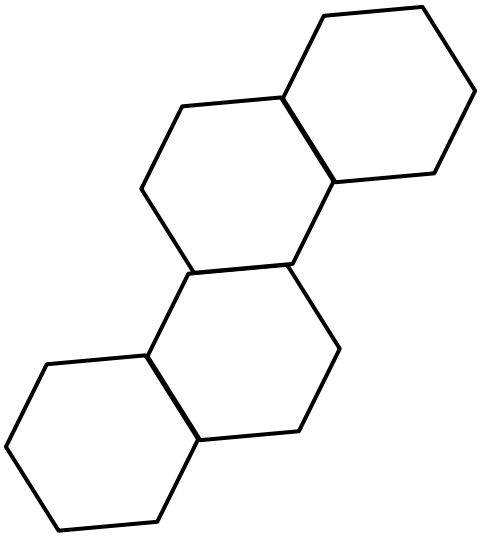

b.) One Green Triangle is _____ of a Blue Rhombus.


Equation:

Student Worksheet – Pattern Block Challenge:

Challenge 1

The shape below represents one whole. Determine what fraction of the whole is each pattern block. Fill in the statements a – d.



a. One Yellow Hexagon is _____ of the whole.

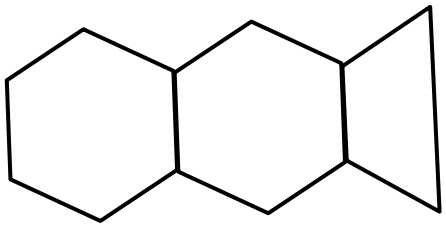
b. One Red Trapezoid is _____ of the whole.

c. One Blue Rhombus is _____ of the whole.

d. One Green Triangle is _____ of the whole.

Challenge 2

The shape below represents one whole. Identify the fraction of the whole for each pattern block. Fill in the statements a – d.

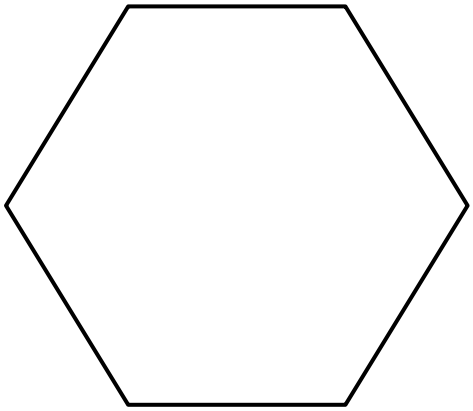


a. One Red Trapezoid is _____ of the whole.

b. One Green Triangle is _____ of the whole.

Assessment – Pattern Blocks:

1. One yellow hexagon represents one whole. Draw and label the hexagon to show three equal parts. Write an equation to represent the number of unit fractions parts that equal one whole.



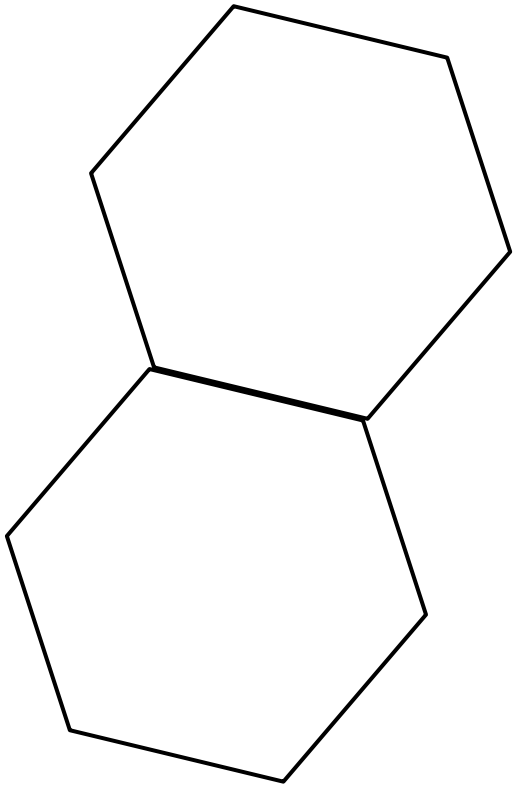
2. If the shape below represents one whole, complete the following statement for the fraction amount that each piece would represent.

a. One Yellow Hexagon is _____ of the whole.

b. One Red Trapezoid is _____ of the whole.

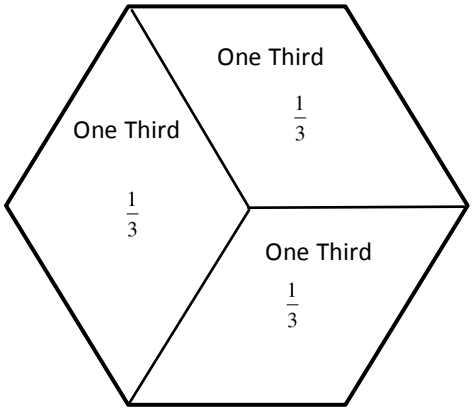
c. One Blue Rhombus is _____ of the whole.

d. One Green Triangle is _____ of the whole.



KEY: Assessment – Pattern Blocks:

1. One yellow hexagon represents one whole. Draw and label the hexagon to show three equal parts. Write an equation to represent the number of unit fractions parts that equal one whole.



Equation:

$$1 \text{ Whole} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3}$$

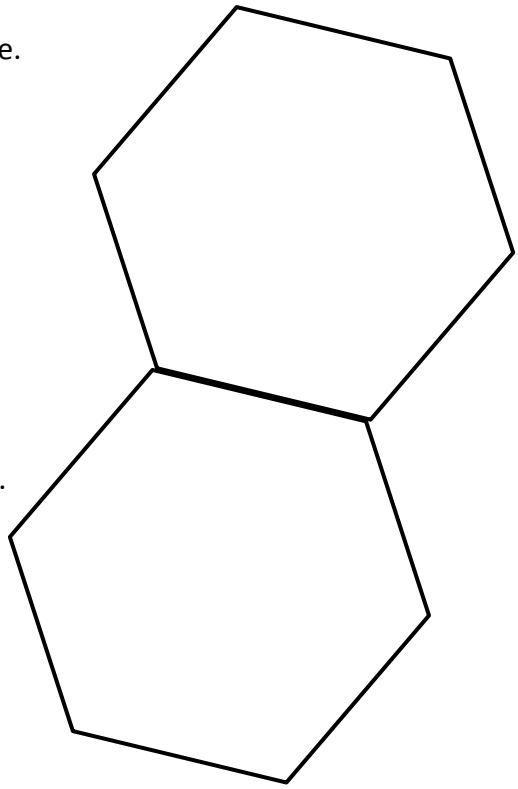
2. If the shape below represents one whole, complete the following statement for the fraction amount that each piece would represent.

a. One Yellow Hexagon is $\frac{1}{2}$ of the whole.

b. One Red Trapezoid is $\frac{1}{4}$ of the whole.

c. One Blue Rhombus is $\frac{1}{6}$ of the whole.

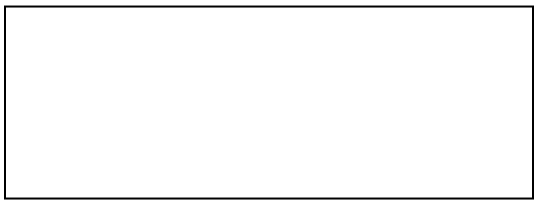
d. One Green Triangle is $\frac{1}{12}$ of the whole.



Warm-Up

3.G.2 Partition a Shape

Show how the rectangle below can be divided into 4 equal parts.



If possible, show more than one way to divide the rectangle into 4 equal parts. Use the back of the paper to show your work.

Fluency Practice: 4's & 8's

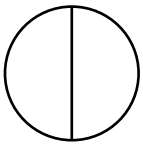
Skip count by 4 starting at 0. Write down the first 11 numbers.

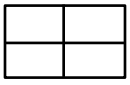
Now skip count by 8. Circle the numbers above that are the multiples of 8.

Current: 2.G.3

Match the picture to the fraction name.

a. Halves b. Thirds c. Fourths

_____ 

_____ 

_____ 

Fluency Practice Extension

What patterns do you notice about the numbers you skipped counted for 4 and the numbers you skipped counted for 8?