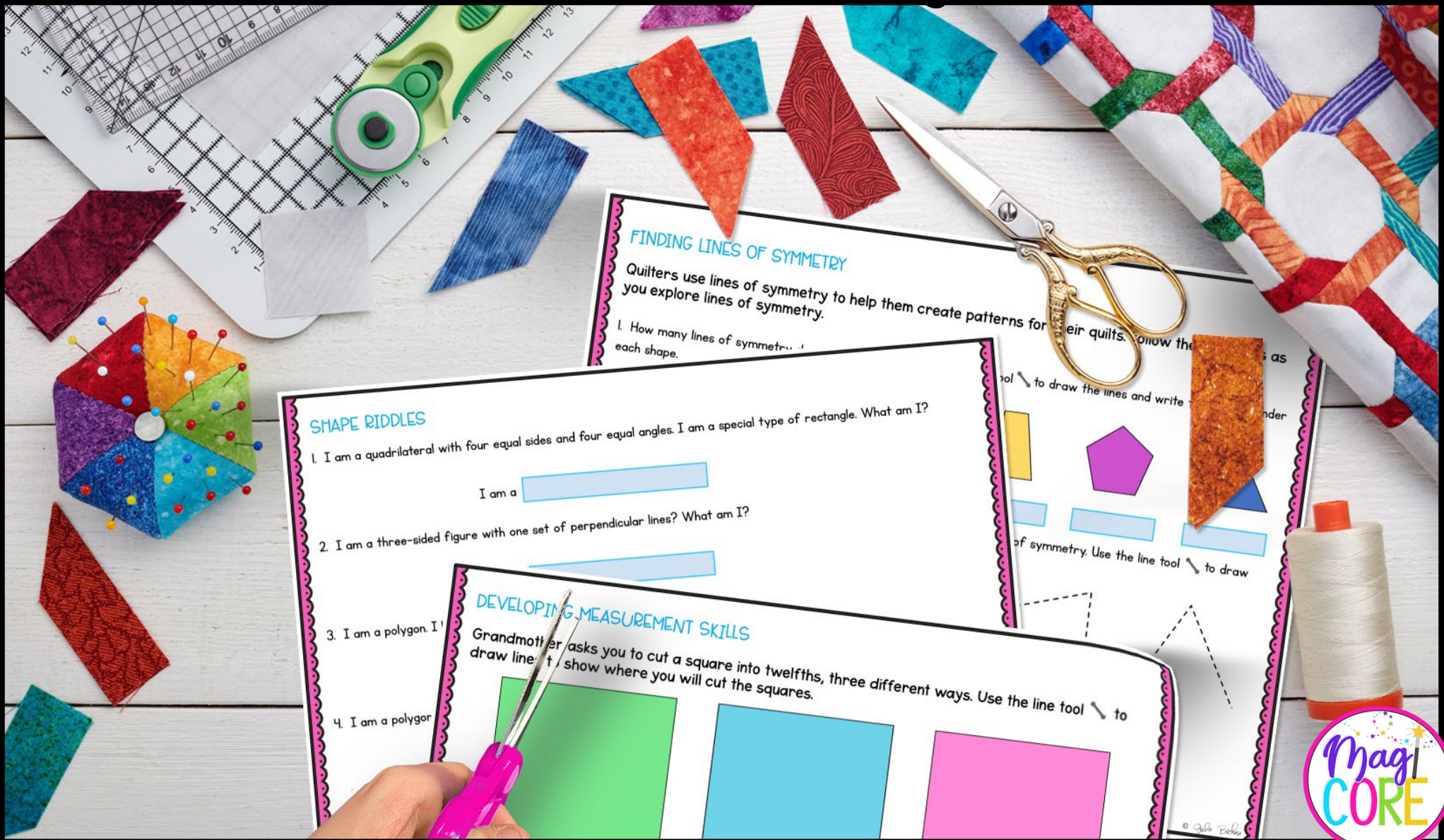
# Measure Twice, Cut Once

## Quilting Project Based Learning

## 5th Grade Print & Google Slides



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# FOR THE TEACHER

MEASURE TWICE, CUT ONCE is a project-based learning task that involves using Measurement and Geometry to solve problems related to quilt making. It addresses the following 5th grade CCSS standards:

- 5.NBT.B.6 Find whole number quotients of whole numbers with up to four-digit dividends and two-digit divisors. Illustrate and explain using equations, arrays, and/or area models.
- 5.NF.A.2 Solve word problems involving addition and subtraction of fractions referring to the same whole.
- 5.NF.B.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
- 5.NF.B.5 Interpret multiplication as scaling.
- 5.MD.A.1 Convert among different sized standard measurement units within a given measurement system.
- 5.MD.B.2 Make a line plot to display a data set of measurements in fractions of a unit.
- 5.G.B.3 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.

DIRECTIONS:

1. Assign students to work alone or in small groups.
2. Preview the activity with your students.
3. Allow students class time to complete the activity. This can span over several days.
4. Students have an opportunity to complete optional extra challenge activities.
5. Students will complete the self-evaluation reflection and evaluation rubric.
6. Allow students an opportunity to share their completed projects.
7. Put students' finished quilt pieces together to create a class quilt.

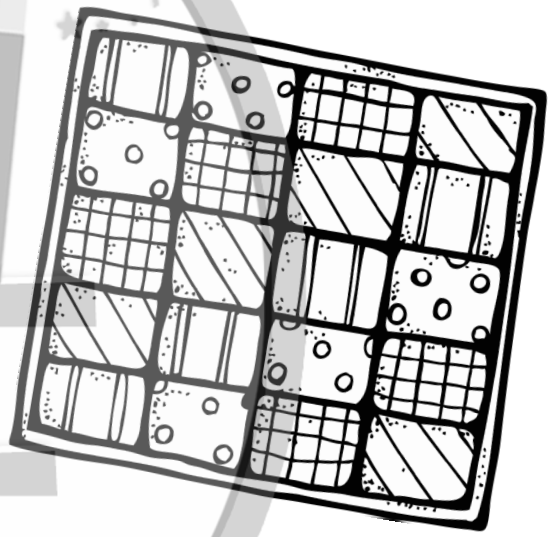


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# MEASURE TWICE, CUT ONCE

**Your grandmother is a master quilter. She wants to teach you about the history and art of quilt making. Follow the directions in this packet, and you will learn about quilt making as you practice many fun math skills, like geometry and measurement. When you are done, you will be ready to make your own quilt.**

## HERE ARE YOUR TASKS:



- Read through the entire packet before beginning.
- Read the informational slide about quilt making.
- Partition shapes into equal areas.
- Classify and sort shapes by attribute.
- Solve shape riddles.
- Work with lines of symmetry.
- Relate area of quilt top to multiplication and addition.
- Find the perimeter and area of Grandmother's quilt.
- Measure area of quilt top with unit squares.
- Measure, cut, and compare lengths of fabric.
- Place fractions on a number line.
- Follow directions for creating a pattern for your quilt.
- Draw a scaled bar graph with quilt measurements.
- Create a line plot, mark with whole numbers, halves, and quarters, and write your own comparison problem based on the data.
- (Optional) Complete the challenge pages.
- Complete the self-reflection and evaluation rubric.

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# WHAT IS QUILT MAKING?

Do you have a special quilt or blanket? Most people have that one cozy blanket that they want to sleep with every night. If you are lucky, yours is a quilt that was made by someone special who loves you very much.

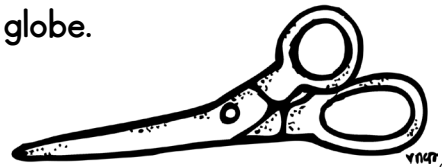
Quilting dates back to ancient times. In London, England, at the British Museum, an ivory carving shows the king of the First Egyptian Dynasty wearing a cloak that appears to be quilted. There is evidence of quilt works found in Asia that dates to the late BC and early AD years. We also know that quilted garments were worn by the Crusaders under their armor for warmth and protection in the 12th century.

Many quilts have been found in Europe. Most can be described as beautiful works of art, but quilts were usually made to be useful and practical. The Tristan Quilt, one of the earliest decorative quilts, was made in the 14th century in Sicily, Italy. Sections of the quilt are on display in the V&A Museum in London, England and in the Bargello Palace in Florence, Italy.

The craft of quilting came to America with the early settlers. At the time, quilts were made for only one purpose. They provided warmth. Families used them on their beds and to cover windows and doors to help keep the cold from coming into their homes. People had little money and few resources, so women used worn clothing to make quilts. Often, women gathered in quilting bees to sew for new neighbors and to teach young girls to quilt.

Quilts were sewn together by hand until 1846 when the sewing machine was invented. Soon, more and more colorful fabrics became available. People started creating different patterns for their quilts and began using quilts to decorate their homes. Women even made quilts for soldiers in hospitals, especially during wartime.

Quilt making has an important role in our country's history. It tells part of our American story. Quilting has taught generations of people valuable sewing and measurement skills. Today, quilting is no longer done just as a necessity. It has become an artistic expression and creative hobby enjoyed by people around the globe.

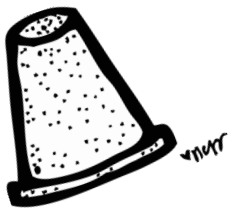


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# DEVELOPING MEASUREMENT SKILLS

**Grandmother asks you to cut the circle into 10ths. Use a ruler and protractor to draw lines to show where to cut the circle. Make sure the angles are the same size. What is the measurement of each angle?**









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# SHAPE RIDDLES

1. I am a quadrilateral with four equal sides and four equal angles. I am a special type of rectangle. What am I?

I am a _____.

2. I am a three-sided figure with one set of perpendicular lines? What am I?

I am a _____.

3. I am a polygon. I have 5 angles that are all obtuse. What am I?

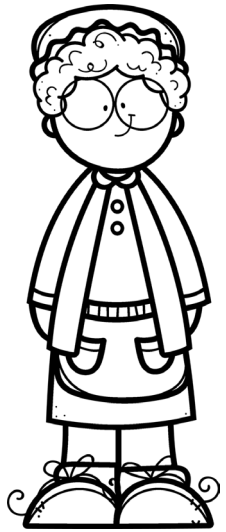
I am a _____.

4. I am a polygon with no right angles. My opposite sides are parallel. I have two long and two short sides. What am I?

I am a _____.

5. I am a quadrilateral. I have one pair of opposite sides that are parallel. What am I?

I am a _____.

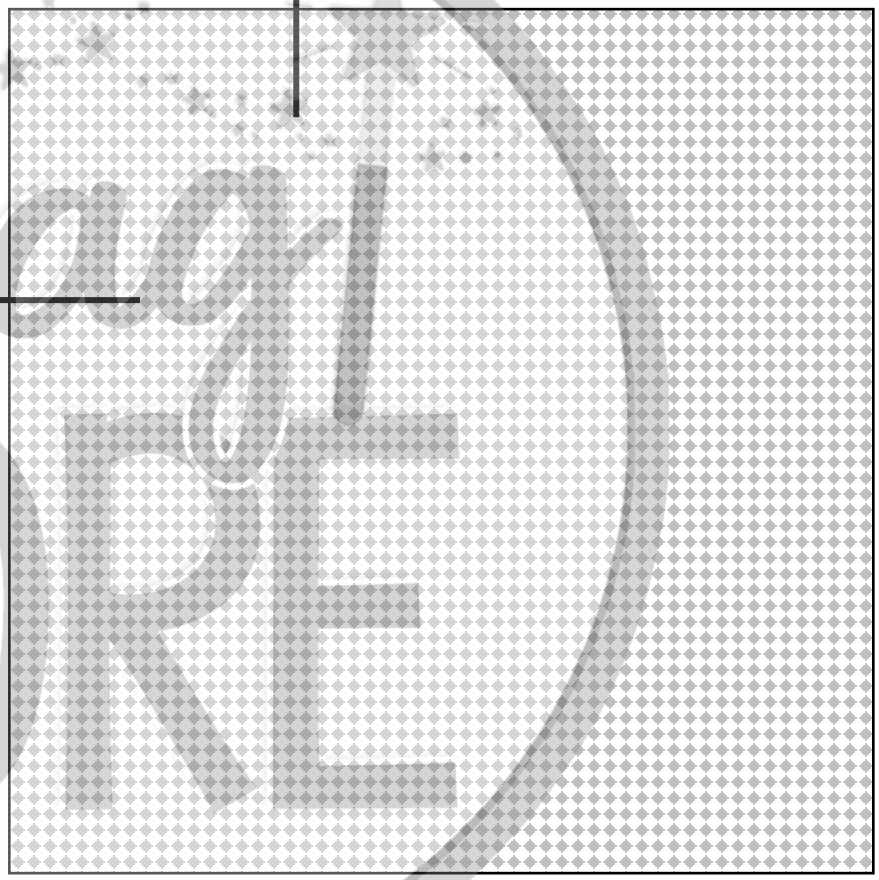


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# FINDING AREA

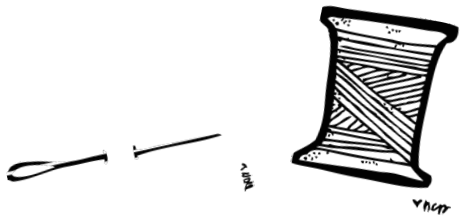
**Before you get started on your own quilt, Grandmother will help you learn some measurement skills. She cut one 12-inch square of fabric and asks you to divide it into 9 equal squares.**

1. Grandmother helped by making the first two cutting marks. Finish drawing in the lines to divide the square into 9 equal squares.



2. What are the dimensions of each square?

3. Grandmother needs to cut 20 different, 12-inch squares to make her quilt top. How many smaller squares will she cut from the larger squares? Use doubling and halving to solve.



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# MEASURING FABRIC

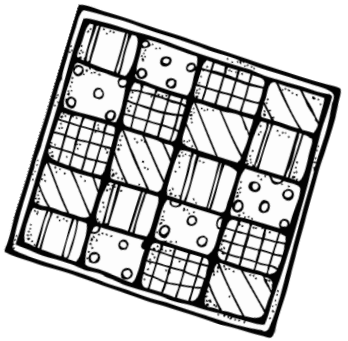
**The table shows the measurements for the 10 pieces of fabric Grandmother is using for her 9-Patch quilt.**

| | Pink Solid Fabric | Pink Print Fabric | Blue Solid Fabric | Blue Print Fabric | Gray Solid Fabric | Gray Print Fabric | Purple Solid Fabric | Purple Print Fabric | Yellow Solid Fabric | Yellow Print Fabric |
|---|---|---|---|---|---|---|---|---|---|---|
| Length in Yards | 3/2 yards | 6/8 yard | 6/3 yards | 2/3 yard | 3/4 yard | 1/4 yard | 1 ¼ yards | 4/3 yards | 1/3 yard | 1 yard |

1. Mark and label the fabric measurements to show where they fall on the number line.




2. Which two fractions on the number line are equivalent? Write another fraction that is equivalent to these two fractions.



3. How many pieces of fabric are larger than one yard? Name them.

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# CREATING AN ARRAY

**Grandmother gives you another measurement task. She asks you to cut a large square of pink fabric into 4.5-inch smaller squares. Use her model to answer the questions.**

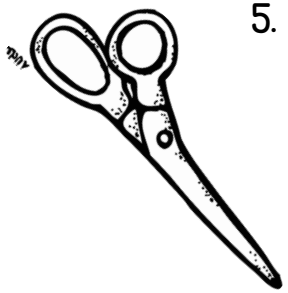
| 4.5-inch square | 4.5-inch square | 4.5-inch square | 4.5-inch square |
|---|---|---|---|
| | | | |

1. Estimate how many 4.5-inch pieces you can cut from one square.

2. Divide the pink fabric square into 4.5-inch squares using a ruler and pencil. How many smaller squares will you get from the large square?

3. What were the dimensions of the large square before you cut it into smaller squares?

4. Grandmother needs a total of 15 large squares of different fabrics to make her next quilt. If you laid all the large squares side by side in a long row, how many inches of fabric long would it be?



5. You must cut the 15 large squares of fabric into 4.5-inch squares. How many 4.5 squares will you give to Grandmother?

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# GETTING STARTED ON YOUR QUILT

**Grandmother let you pick four different fabrics for your quilt from her fabric closet. Each piece of fabric is 18 inches wide, but the lengths are different. The table shows the length of each fabric in inches. First, round the length of each fabric to the nearest foot. Then, convert the total inches to yards.**

| | Green Solid Fabric | Blue Solid Fabric | Blue Print Fabric | Green Print Fabric |
|---|---|---|---|---|
| Length in Inches | 77 inches | 64 inches | 96 inches | 84 inches |
| Round to the Nearest Foot | | | | |
| Round to the Nearest Yard | | | | |

1. The pattern calls for 5 yards of print fabric that is 18 inches wide. If you combine the blue and the green print fabric lengths, do you have enough print fabric for the quilt? Explain.

2. You need a total of 12 feet of solid fabric. Grandmother knows you do not have enough green and blue solid fabric. Calculate how many more inches of solid fabric you need.



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# CUTTING TRIANGLES

**Now you are ready to make your own pattern pieces using paper squares. You will cut paper squares so that they measure exactly 8 inches by 8 inches. Then, you will draw lines, corner to corner to show your cutting lines. Grandmother drew the diagram below to help you understand her directions.**



Start by picking four different color pieces of construction paper. Take enough paper to make four 8-inch squares of each color. Measure and cut each piece. Next, on each square, draw two cutting lines that go diagonally from corner to corner, just like Grandmother's diagram. Carefully, cut each square into four triangles.

1. Use multiplication to show how many triangles you cut from each color of paper.

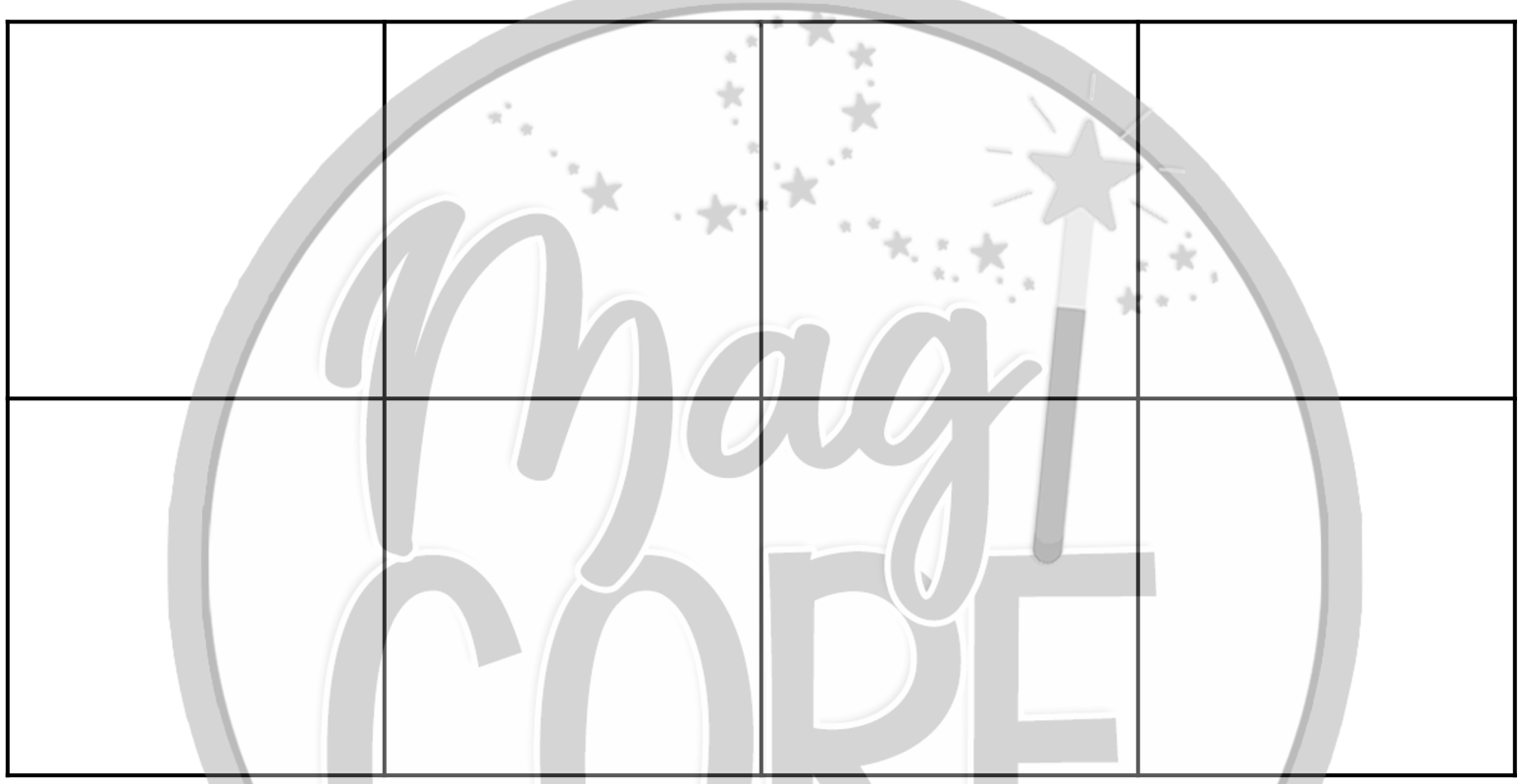
2. How many triangles did you cut altogether? Explain how you know.

3. Grandmother said, in order to make a Triple Triangle quilt for her bed, she will use 960 triangles. How many 8-inch squares will she need to make the Triple Triangle quilt? Show with a division area model.

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# MAKING PATTERNS

**Arrange your 8 pattern pieces into a 2 x 4 array. Tape them together. Sketch your quilt below.**



1. Grandmother said you will make a total of 36 squares for your quilt. Draw two different arrays that show how you might arrange your quilt squares.

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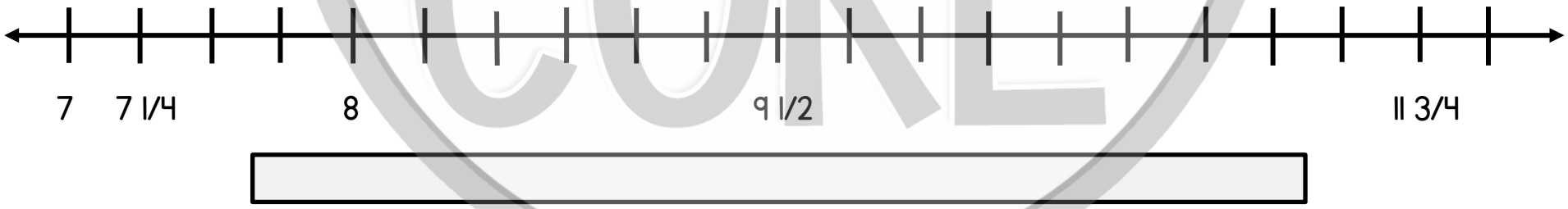
# CHALLENGE 2-GRANDMOTHER'S FAVORITE PATTERNS

**Grandmother uses different sizes of squares for her quilts. The table shows the sizes of the squares, in inches, for her favorite quilt patterns. Help Grandmother make a line plot using her data.**

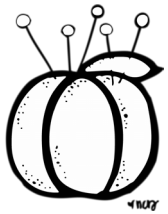
| Sizes of squares in Grandmother's favorite quilt patterns | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 Patch | Easy Star | Log Cabin | Brick Wall | Half Squares | X's and O's | Pop Dots | Striped Fan | Flower Basket | Pieced Hexagon | Triple Triangle | Simple Steps |
| 9 1/2 inches | 10 inches | 8 3/4 inches | 11 1/4 inches | 9 1/2 inches | 8 2/4 inches | 7 1/4 inches | 9 3/4 inches | 8 3/4 inches | 8 1/4 inches | 10 1/2 inches | 12 inches |

1. Finish adding numbers to the line plot. Then, add a title for the line plot in the gray box below it.

2. Use the numbers from the table to place Xs above the numbers on the line plot to show the data.




3. Write and answer two comparison questions about the line plot data.



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# MEASURE TWICE, CUT ONCE

SELF REFLECTION: Write a reflection of your experience with this project. How did you feel about the math problems and activities? Explain what you found easy to do and any difficulties you had while working on this project. Did you enjoy this activity? Why or why not?

## Rate This Project

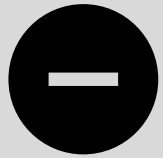
Circle the statement you most agree with.

I am ready for something harder. It was just right. I found this very challenging.

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# RUBRIC

SELF-EVALUATION RUBRIC: **Highlight or shade the parts of the rubric that express how you rate yourself on this Project Based Learning Activity.**

|  |  |  |
|---|---|---|
| I feel very confident about my ability to complete the math in this project. | I feel pretty good about my ability to complete the math in this project. | I feel a lot of the math in this project was too hard for me to do alone. |
| I understood all the math and did not need help to complete the problems. | I understood most of the math but needed a little help to solve some of the problems. | I understood some of the math but needed help to solve most of the problems. |
| I easily used many strategies to solve the math problems efficiently. | I needed some help to determine the best strategies for solving the math problems. | I had trouble understanding the best strategies to solve many of the math problems. |
| I feel I am ready for a harder math project. | I feel I should spend more time practicing similar math problems. | I feel I need assistance to work on similar math problems. |

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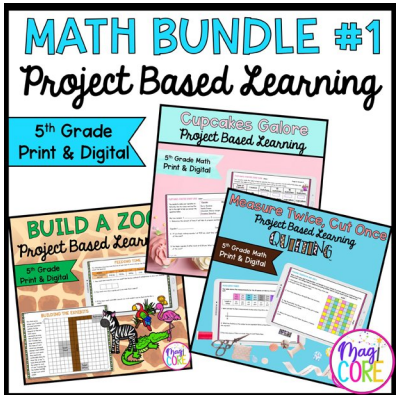
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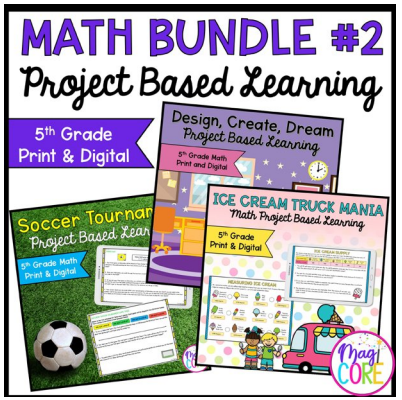
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