

MEASURE TWICE, CUT ONCE

Project Based Learning

QUILTING

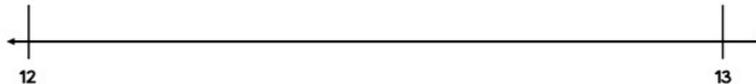
4th Grade Math
Print & Digital

MEASURING FABRIC

The table shows the measurements for the 5 fabrics Grandmother is using in each of the 9-Patch squares.

	Pink Solid Fabric	Blue Solid Fabric	Yellow Print Fabric	Pink Print Fabric	Green Print Fabric
Length in inches	$12 \frac{1}{2}$ inches	$12 \frac{2}{4}$ inches	$12 \frac{1}{4}$ inches	$12 \frac{1}{3}$ inches	$12 \frac{3}{4}$ inches

1. Place the measurements where they will fall on the number line.

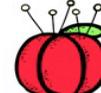
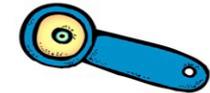
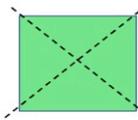


2. Which two fractions on the number line are equivalent?



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.



Use four different color pieces of construction paper. Take enough paper to make three, 8-inch squares of paper. Measure each side and cut each piece. Next, on each square, draw two cutting lines that go diagonally from corner to corner to show your cutting lines. Carefully, cut each square into four triangles.

Record how many triangles you cut from each color of paper.

How many triangles did you cut altogether? Solve two ways, once using addition and once using multiplication.

Grandmother did this to make a Triple Triangle quilt for her bed, she will use 960 triangles. How many 8-inch squares will she use? Show how you know.

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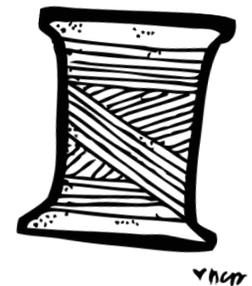
FOR THE TEACHER

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 4th grade CCSS standards:

- 4.MD.A.1 Know relative sizes of measurement units within one system of units. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a 2-column table.
- 4.MD.A.2 Use the 4 operations to solve word problems, including problems involving single fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as a number line that feature a measurement scale.
- 4.MD.A.3 Apply area and perimeter formulas for rectangles in real world and mathematical problems.
- 4.MD.B.4 Make a line plot to display a data set of measurements in fractions of a unit. Solve problems involving addition and subtraction of fractions by using information presented in line plots.
- 4.MD.C.5 Recognize angles as geometric shapes that are formed by 2 rays that share a common endpoint and understand concepts of angle measurement.
- 4.MD.C.6 Measure and sketch angles in whole-number degrees using a protractor.
- 4.MD.C.7 Relate area to the operations of multiplication and addition.
- 4.GA.1 Draw points, lines, line segments, rays, angles, and perpendicular/parallel lines. Identify these in 2-D figures.
- 4.G.A.2 Classify 2-D figures based on the presence or absence of parallel or perpendicular lines, or angles.. Recognize and identify right angles
- 4.G.A.3 Recognize a line of symmetry for a 2-D figure as a line across the figure, such that the figure can be folded along the line into matching parts. Identify and draw lines of symmetry.

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.

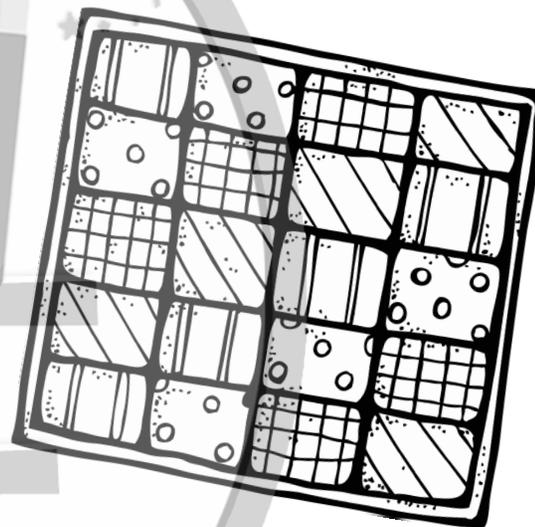


MEASURE TWICE, CUT ONCE

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.



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.

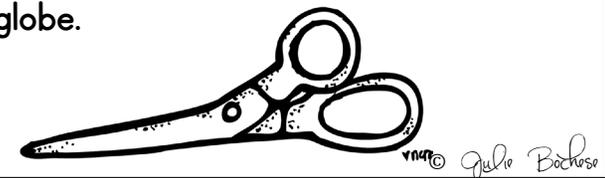
Quilting dates back to ancient times. In London, England, at the British Museum, an ivory carving shows the king of the First Egyptian Dynasty wearing a cloak that appears to be quilted. There is evidence of quilt works found in Asia that dates to the late BC and early AD years. We also know that quilted 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.



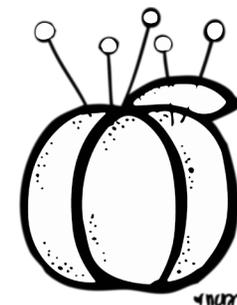
DEVELOPING MEASUREMENT SKILLS

Grandmother asks you to cut a square into eighths, three different ways. Draw lines to show where you will cut the squares.



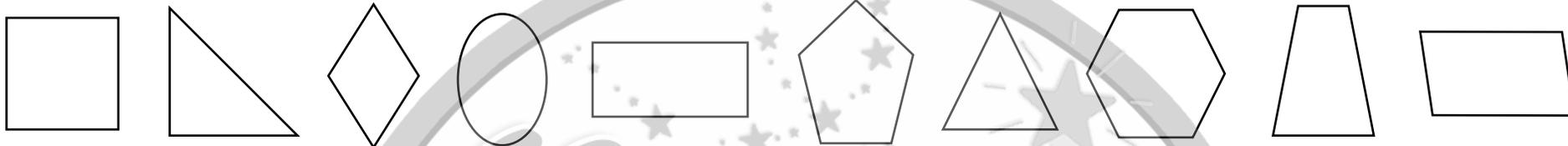
QUILTING

Grandmother always says it is better to, "Measure Twice and Cut Once." What does she mean?



CLASSIFYING SHAPES

Quilt patterns are made up of many different shapes. Sort the shapes by their attributes and write their names in the table. Some shapes may fit in more than one category.



Polygon with at least two sets of parallel lines	Quadrilateral with two acute angles	Equilateral polygon	Polygon with at least one right angle	Polygon with at least one obtuse angle

1. Draw one set of perpendicular lines.

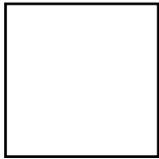
2. Draw a ray.

3. Draw an obtuse angle.

FINDING LINES OF SYMMETRY

Quilters use lines of symmetry to help them create patterns for their quilts. Follow the directions as you explore lines of symmetry.

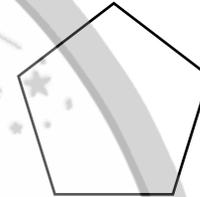
1. How many lines of symmetry do these shapes have? Draw the lines and write the number under each shape.

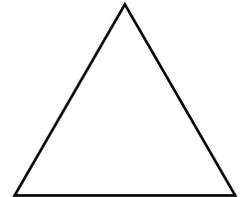












2. Imagine these shapes have a paper covering the bottom half at the line of symmetry. Draw the part that is under the paper.



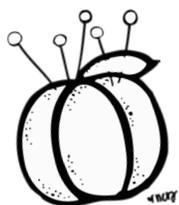
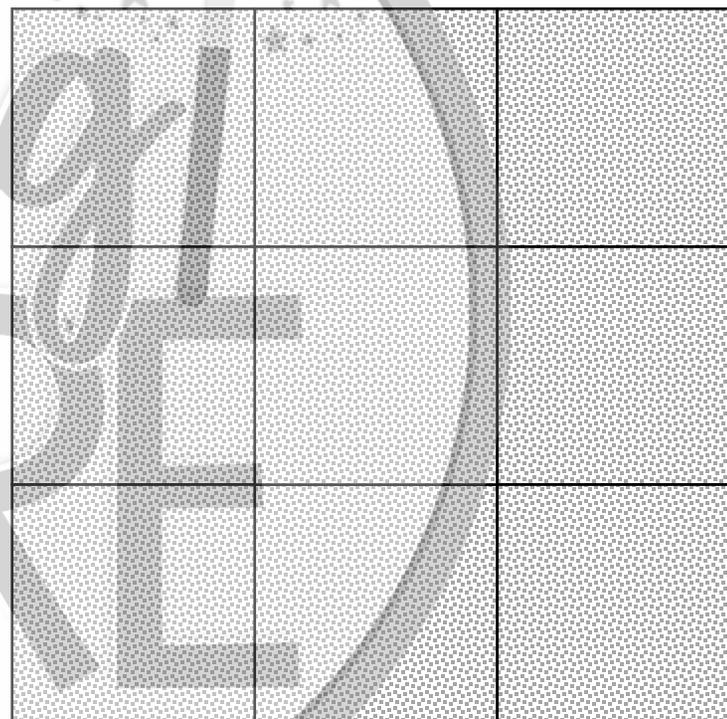
FINDING AREA

Grandmother shows you one quilt square from the new quilt she is making for her bed. The quilt is called the 9-Patch Quilt. For each square, Grandmother will sew 9 smaller squares together to form a 9-Patch square. When the quilt is finished it will have eight, 9-Patch squares across by six, 9-Patch squares from top to bottom. Below shows one 9-Patch square from Grandmother's quilt.

1. Write the missing patch measurements on the lines. $3\frac{1}{2}$ inches $3\frac{1}{2}$ inches _____ inches

2. What is the area, in square inches, of one 9-Patch square?

3. Draw a sketch of the finished quilt. What are the dimensions of the finished quilt?



4. Calculate the area and perimeter of the finished quilt.

CREATING AN ARRAY

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

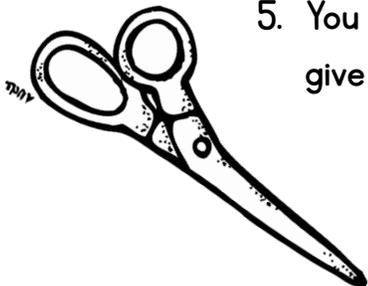
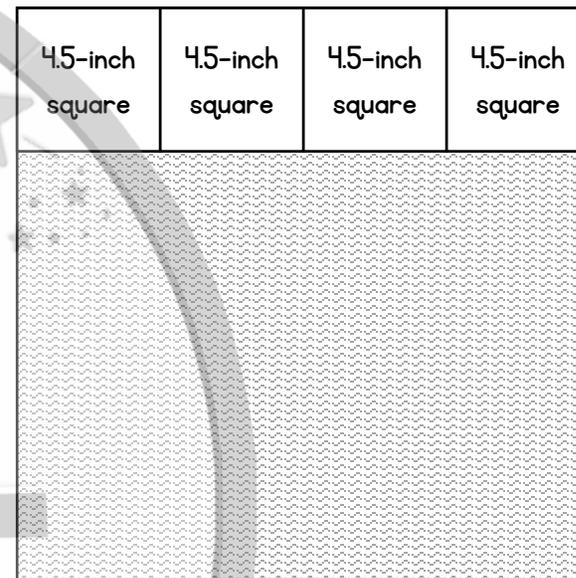
1. Estimate how many 4.5-inch pieces you can cut from one square.

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 ten 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 ten large squares of fabric into 4.5-inch squares. How many 4.5 squares will you give to Grandmother?



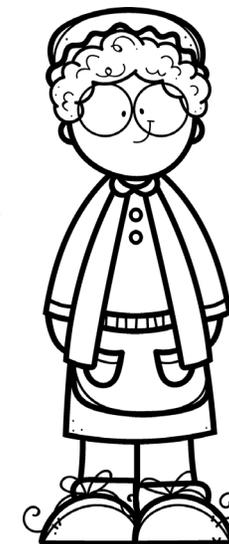
GETTING STARTED ON YOUR QUILT

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 feet and inches.

	Green Solid Fabric	Blue Solid Fabric	Blue Print Fabric	Green Print Fabric
Length in Inches	49 inches	64 inches	56 inches	70 inches
Round to the Nearest Foot				
Convert Inches to Feet/Inches				

1. The pattern calls for $3\frac{1}{2}$ 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 $9\frac{1}{2}$ 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.



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.

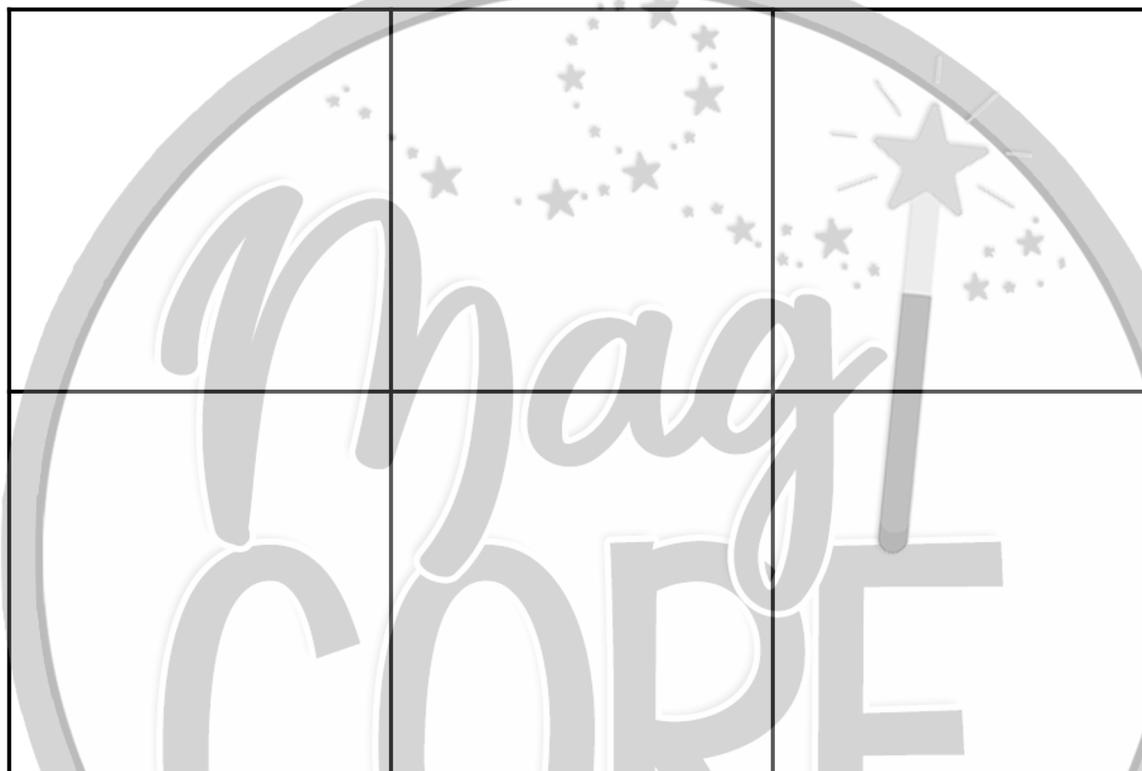


Start by picking four different color pieces of construction paper. Take enough paper to make three 8-inch squares of each color. Measure and cut each piece. Next, on each square, draw two cutting lines that go diagonally from corner to corner, just like Grandmother's diagram. Carefully, cut each square 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? Solve two ways, once using addition and once using multiplication.
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 how you know.

MAKING PATTERNS

Arrange your 6 pattern pieces into a 2×3 array. Sketch your quilt below.



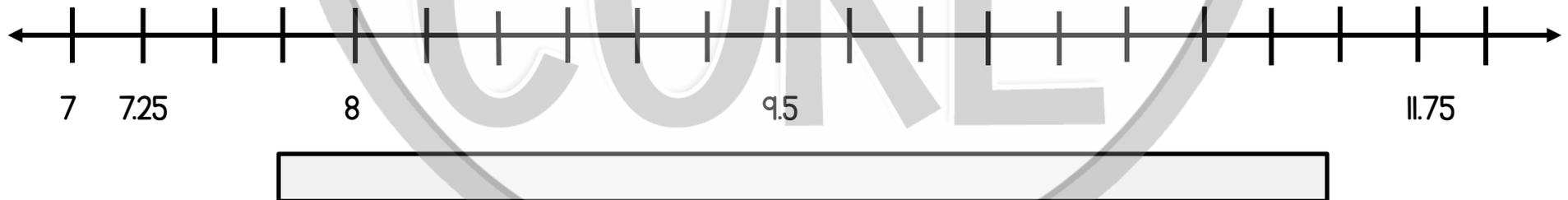
1. Grandmother said you will make a total of 24 squares for your quilt. Draw two different arrays that show how you might arrange your quilt squares.

CHALLENGE 2-GRANDMOTHER'S FAVORITE PATTERNS

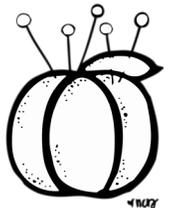
Grandmother uses different sizes of squares for her quilts. The table shows the sizes of the squares, in inches, for her favorite quilt patterns. Help Grandmother make a line plot using her data.

Sizes of squares in Grandmother's favorite quilt patterns											
9 Patch	Easy Star	Log Cabin	Brick Walk	Half Squares	X's and O's	Pop Dots	Striped Fan	Flower Basket	Pieced Hexagon	Triple Triangle	Simple Steps
9.5 inches	10 inches	8.75 inches	11.25 inches	9.5 inches	8.5 inches	9 inches	9.75 inches	8.75 inches	8.25 inches	10.5 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 a comparison question about the line plot data.



RUBRIC

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

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

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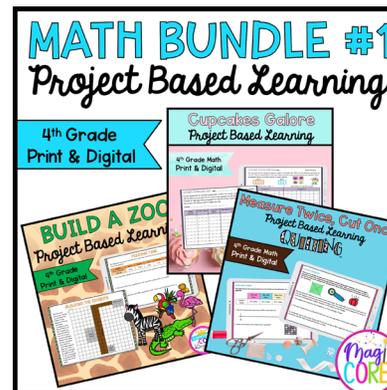
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