



Snippets: Mathematics on the Cutting Edge



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Snippets: Mathematics on the Cutting Edge

The National Council of Teachers of Mathematics (NCTM) Content and Process Standards addressed in these activities include:



Numbers and Operations
Geometry
Measurement
Problem Solving
Reasoning and Proof
Communication
Connections
Representation



For more information visit: <http://standards.nctm.org/>

Image Maker Snippets

If you fold a piece of paper in half and then in half again and then cut out a triangle at the corner where the folds meet what shape will you see when you unfold the paper?

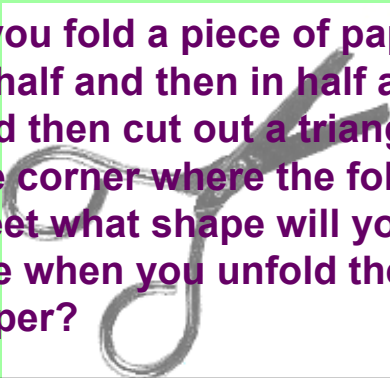


Image Maker Snippets

This activity is designed to reinforce students' visualization and spatial reasoning skills.

Materials

Several 8" x 8" paper squares, scissors, paper and pencils

What to Do

- Begin by folding one of the 8" x 8" paper squares in half.
- Draw a shape on one side of the folded paper. It might be half a heart or tree.
- Ask students to imagine what the paper will look like if you cut along the outline and then unfold the paper.
- Have students describe what the paper will look like when unfolded.
- Cut along the outline shape.
- Unfold the paper and show how it looks.

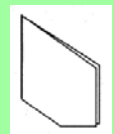
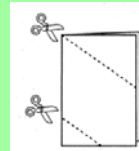
Image Maker Snippets

- Look carefully and closely at the following figures.
- Notice how the paper is folded.
- Notice the cut lines.
- Draw what the paper will look like when unfolded.
- Compare the unfolded paper to the drawings.
- How did you draw the shape?
 - Have students work with a partner to create their own paper folding cuts. Students should take turns creating and predicting the shapes.

Source

Wheatley, Grayson H. and Reynolds, Anne M. "Image Maker" *Developing Spatial Sense*. Teaching Children Mathematics: Reston, VA: NCTM, (February, 1999) 374-378.

Image Maker Snippets



Solution

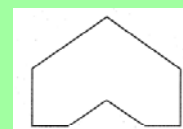
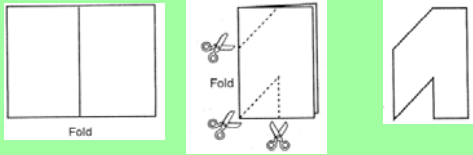


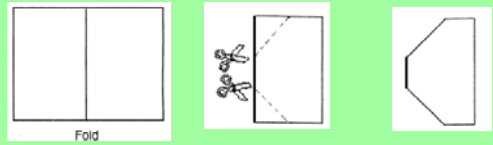
Image Maker Snippets



Solution



Image Maker Snippets

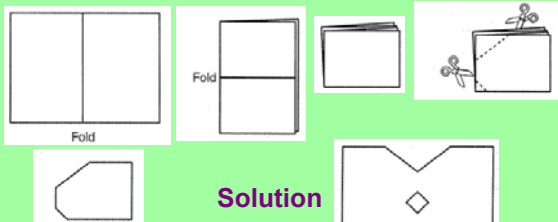


Solution

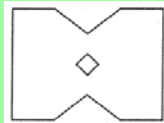


Image Maker Snippets

Double Fold



Solution



Shape Shifter Snippets

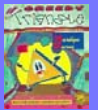
This activity is designed to provide an opportunity for students to visualize and describe smaller shapes that are created by cutting larger shapes.

Materials

- Paper squares, scissors, rulers (straight edge), pencils, glue

What to Do

- Read aloud the Greedy Triangle by Marilyn Burns
- Give each student several paper squares and scissors.
- Have students cut off one corner from the square. Identify the new shape. (pentagon)
- Cut off another corner from the square. Identify the new shape. (hexagon)
- Cut off another corner from the square. Identify the new shape. (heptagon)
- Cut off another corner from the square. Identify the new shape. (octagon)
- Continue by having students cut off sections and identify the new shape.
- Is it possible to continue cutting corners until a circle is formed?



Polygon Snippets

This activity is designed to reinforce critical thinking skills, spatial relationships, flips, slides and rotations and an understanding of the attributes of various polygons.

Materials

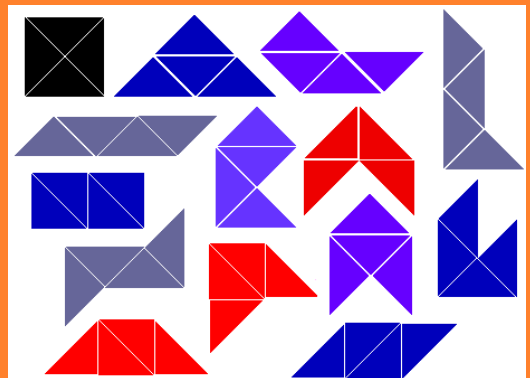
- Scissors, 6" x 6" squares cut from construction paper, chart paper, pencils, glue



What to Do

- Give students a 6" x 6" paper square.
- Have students make a diagonal fold to divide the square into two triangular regions.
- Have students fold the triangle in half again to divide the square into four triangular regions.
- Have students carefully cut out each triangle.
- Next, have students rearrange the triangles to create as many polygons as possible. **NOTE:** The sides must touch.
- Have students record each of their solutions and identify the polygons created. (There are 14 different solutions.)
- Have students identify whether a flip, slide or rotation was used to create each of the polygons.

Polygon Snippets



Area and Perimeter Snippets

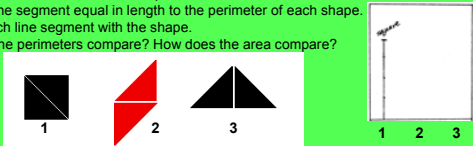
This activity provides an opportunity for students to distinguish between area and perimeter.

Materials

- Scissors, 6" x 6" squares cut from construction paper, chart paper, pencils, glue, string (opt), rulers

What to Do

- Give students a 6" x 6" paper square.
- Have students make a diagonal fold to divide the square into two triangular regions.
- Have students carefully cut out each triangle.
- Have students put the triangles together in various ways.
- Have students glue the shapes created onto a piece of construction paper. Number each shape.
- Have students find the perimeter of the shapes they made. Note: String may be used to measure around each shape.
- Draw a line segment equal in length to the perimeter of each shape.
- Label each line segment with the shape.
- How do the perimeters compare? How does the area compare?



Tangram Snippets

This activity is designed to reinforce the understanding of geometric attributes.

Materials

- Scissors, 8" x 8" paper squares, story, glue, construction paper

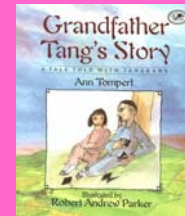
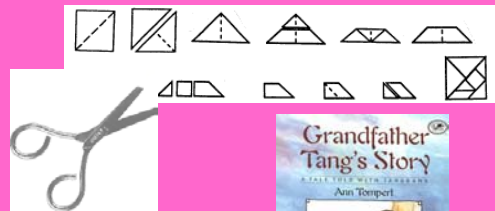
What to Do

- Read aloud: **Grandfather Tang's Story** by Ann Tompert. (ISBN 0-517-57487-X)
- Give each student an 8" x 8" paper square. Have students fold the square along its diagonal and cut along the fold.
- Take one of the triangles and fold it in half. Then unfold it and cut along the fold. Place the three pieces back together to form the original square.
- Set the two smaller triangles aside. Take the large triangle and fold it in half. Open it up and fold the top half down until its tip meets the bottom center.
- Cut along the second fold. Set aside the small triangle piece that was cut from the top of the larger triangle.

Tangram Snippets

- The piece that is left is a trapezoid. Hold it with its longest side toward you. It still has a fold line down the middle.
- Fold the lower left edge corner so that the corner meets at the bottom of the center fold line. Unfold it and cut along the diagonal fold and the center fold lines. The shapes cut are a square and a small triangle. The remaining shape is a trapezoid.
- Take the trapezoid and fold it to form a triangle and a parallelogram by folding the bottom left corner up to meet the top right corner. Cut along the fold to create the sixth and seventh tangram pieces.
- Place all the pieces back together to form a square.
- Have students create their own tangram creatures using their tangram pieces.
- Have students use their tangram pieces to create various polygons. For example:
 - Create a square using 1, 2, 3, 4, 5, 6, or 7 pieces.
 - Create a rectangle using 1, 2, 3, 4, 5, 6, or 7 pieces.
 - Create a triangle using 1, 2, 3, 4, 5, 6, or 7 pieces.
 - Create a pentagon using 1, 2, 3, 4, 5, 6, or 7 pieces.

Tangram Snippets



Starry Snippets

This activity is designed to enhance spatial sense, measurement skills and geometric attributes.

Materials

- Scissors, 8 1/2" x 11" piece of paper, rulers

What to Do

- Read aloud: **Draw Me A Star** by Eric Carle.
- Give each student an 8 1/2" x 11" piece of paper.
- Fold the paper in half along the 8 1/2" side.
- Take the bottom right corner and fold until it meets in the middle of left side.
- Take the bottom left corner and fold up until it meets the bottom of the first folded piece.
- Now fold the left section over until it meets the opposite side.
- Measure 8.5 cm from the bottom point along the left edge. Make a dot at that point.
- Now measure 4 cm from the bottom point along the right edge and make another point.
- Draw a line connecting the two points and cut along the line.
- Carefully unfold to unveil a five-pointed star!



Circular Snippets

This activity is designed to reinforce an understanding of fractions.

Materials

- Construction paper, compasses or small paper plates, scissors, glue

What to Do

- Read aloud: **Picture Pie** and **Picture Pie 2** by Ed Emberley



- A circle, like a pie can be divided into sections. Basic circular sections are shown below:



Circular Snippets

- Have students use a compass to draw a circle on one of the pieces of colored paper. NOTE: For younger students, have them trace around a small paper plate.
- Have students carefully cut out the circle.
- Have students fold the circle in half and identify each section as half of the circle.
- Cut the circle in half along the fold line.
- Have students fold one of the half circles in half. Identify the new section as one fourth.
- Cut the half circle along the fold line to create two fourths.
- Have students fold one of the fourths in half. Identify the new sections formed as eighths.
- Discuss each of the cut out sections. Ask students to describe the relationships between the sections.
 - How many half circles are needed to make a whole circle?
 - How many fourths are needed to make a whole circle?
 - How many eighths are needed to make a whole circle?
 - How many fourths are needed to make half of a circle?
 - How many eighths are needed to make half of a circle?
 - How many eighths are needed to make one fourth of a circle?

Circular Snippets

- Have students create a bird as shown by Ed Emberley using the half circle, a quarter of a circle, and two eighths of a circle.



- Have students create additional fractional designs. Students may choose to use a triangle, square or rectangle to create their designs.



This fish was created using two squares. Each square is folded along the diagonal to create a triangle. The triangle is folded in half, then in half again. Each square has 8 triangular regions. Cut the triangles out and create the fish. This fish uses 13 triangles. When compared to the original squares this fish represents $1 \frac{5}{8}$.

Fraction Snippets

This activity is designed to reinforce an understanding of fractions, symmetry and congruence.

Materials

- A large supply of six-inch squares cut from construction paper, Scissors, Rulers, Pencils

What to Do

- Give each student one construction paper square.
- Ask the students to cut a model for the fraction one-half from the square in such a way that two congruent pieces result.
- Give the students another square and ask them to create a different model for one-half that is not congruent to the models they created in their first cut.
- Have student continue to cut out as many additional representations for one-half as they can that are not congruent to any they have previously created.
- Ask students to describe the strategies they used to determine different ways in which to cut the paper square in half.
- Once the students have created several models for halves, have them move on to representing thirds, fourths, sixths, eighths, tenths and twelfths.
- As they create each of the models, have them keep a journal and respond to questions such as the following:
 - Was it easy to create multiple models for fourths? Sixths? Eighths? Tenths? Twelfths? Why or why not? (Usually, models for fractions with even denominators are easier to create than models for fractions with odd denominators.)
 - How can you prove that two fractional pieces are equal parts of the same whole? (If the parts are congruent, use transformations to show that if rotated, reflected or translated, the parts can be made to coincide.)

Connecting Snippets

This activity is designed to reinforce the understanding of patterns, ordinals, operations and fractions.

Materials

- Scissors, 16" x 5" strips of paper, story, crayons



What to Do

- Make several of the people patterns on heavy card stock paper for students to trace.
- Read aloud: *The Land of Many Colors* by the Klamath County YMCA Family Preschool (Scholastics).
- Give each student a 16" x 5" strip of paper.
- Fold each strip in half and then in half again.
- Have students place the pattern on the folded paper strip and trace around.
- Cut the figure out and carefully unfold it.
- Decorate each figure. Figures can be colored in a repeating color pattern: Blue, Red, Blue, Red.
- Connecting Snippets can also be used to demonstrate addition, subtraction, and fractions.



Tessellating Snippets

This activity is designed to enhance spatial sense and an understanding of flips, slides and rotations.

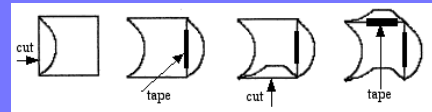
Materials

- Scissors, construction paper, 2"x 2" or 3"x 3" tag board squares

What to Do

- Cut a small square (2"x 2" or 3"x 3") from tag board (poster board).
- Draw a line beginning at the top left corner of the small square and ending at the bottom left corner.
- Carefully cut along this line. Then, attach the straight edge of the cut out piece to the opposite side of the small square.
- Next, make another line beginning at the bottom left corner of the small square and ending at the bottom right corner.
- Again, cut along the line. Then, attach the straight edge of the cut out piece to the top straight edge of the small square.
- Trace the new figure on a piece of paper and cut it out.
- Continue tracing and cutting out additional pieces until there are ten or more identical pieces.
- Arrange the pieces on a large sheet of paper such that the pieces fit together and form a tessellating pattern.
- Glue the pieces on the large piece on paper and add any finishing touches.

Tessellating Snippets



For additional information about tessellations, visit the MC Escher website at:
<http://library.thinkquest.org/16661/escher.html>