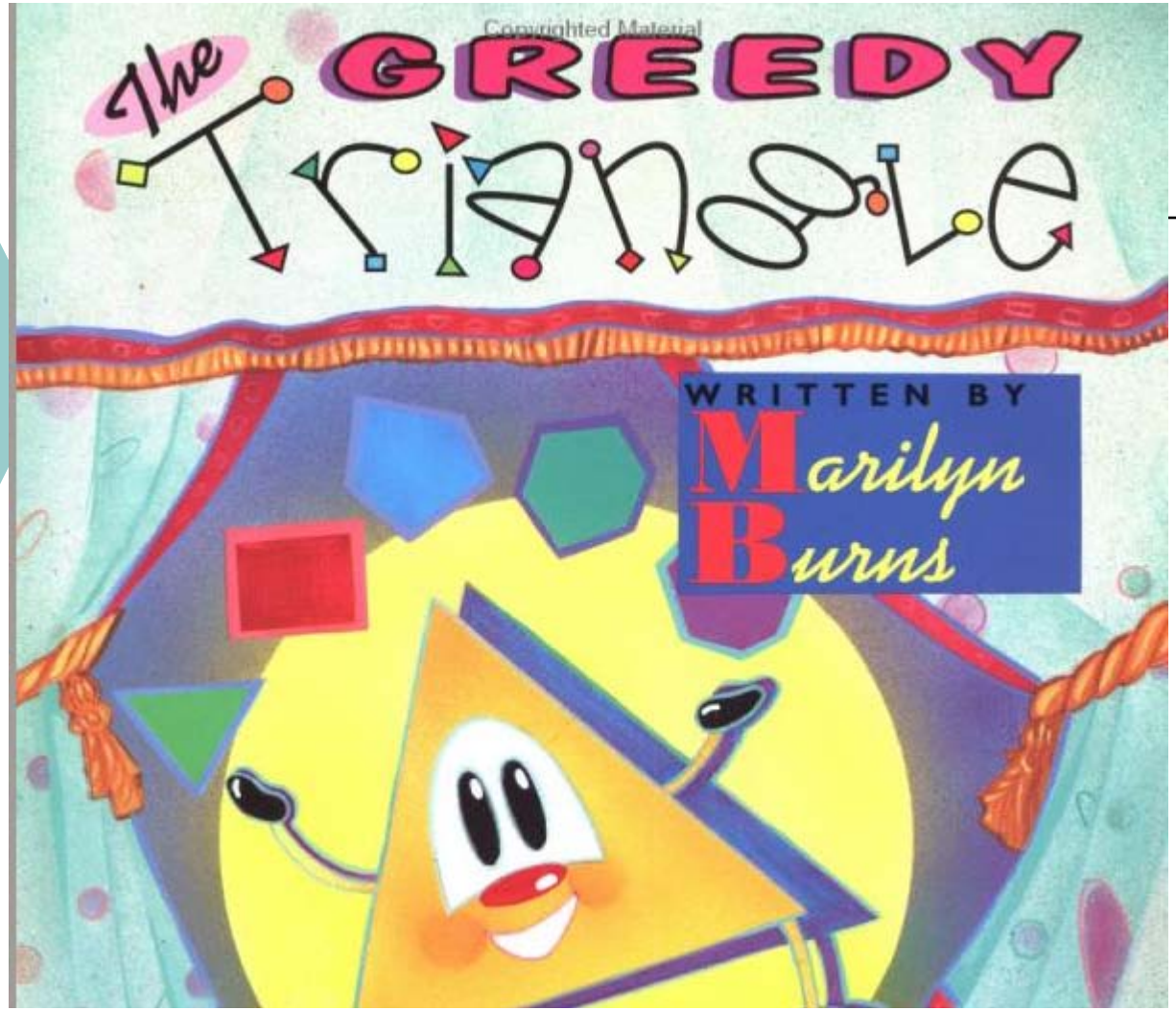
Building with Triangles

Prelesson #4

Jennifer Suh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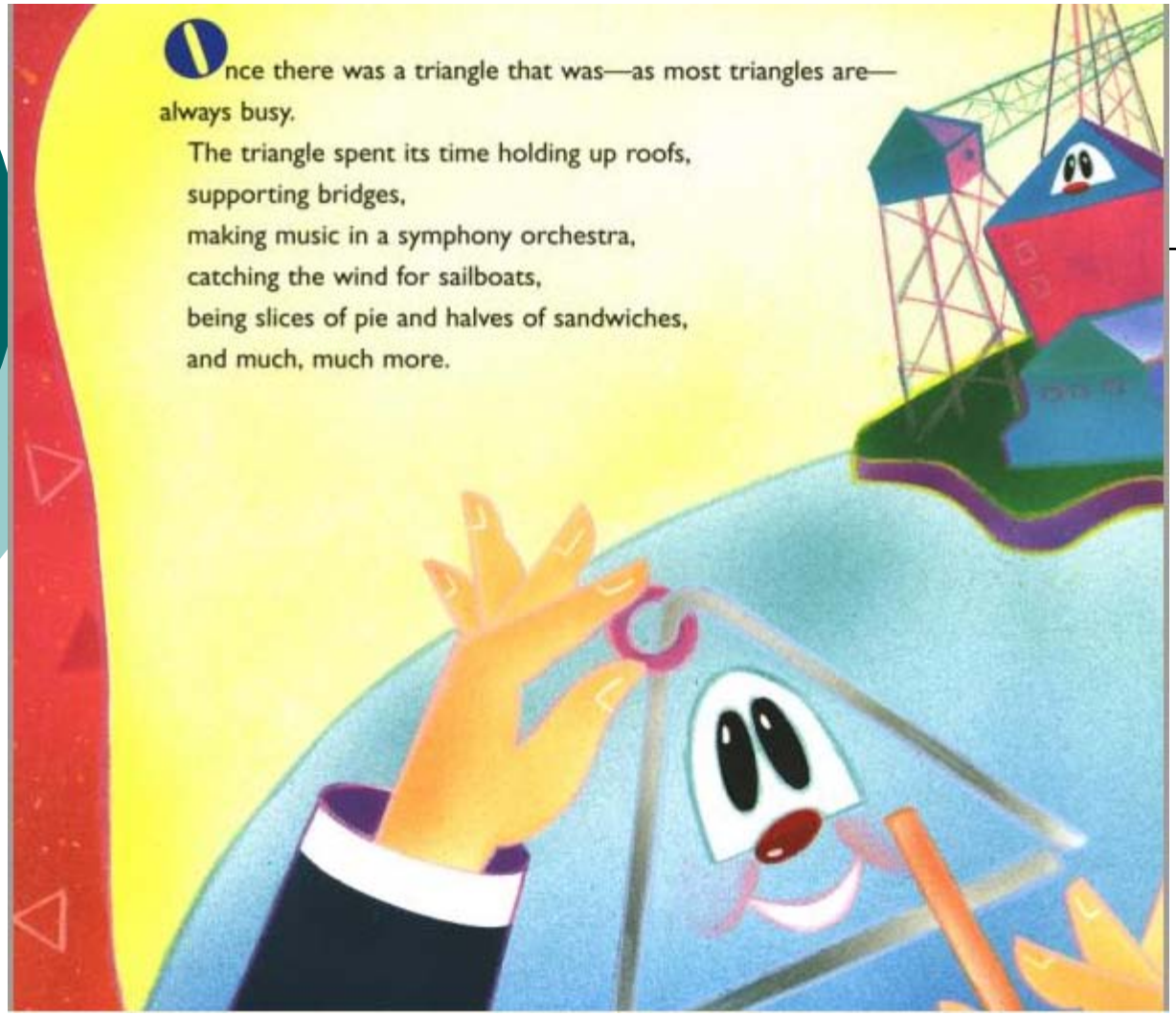
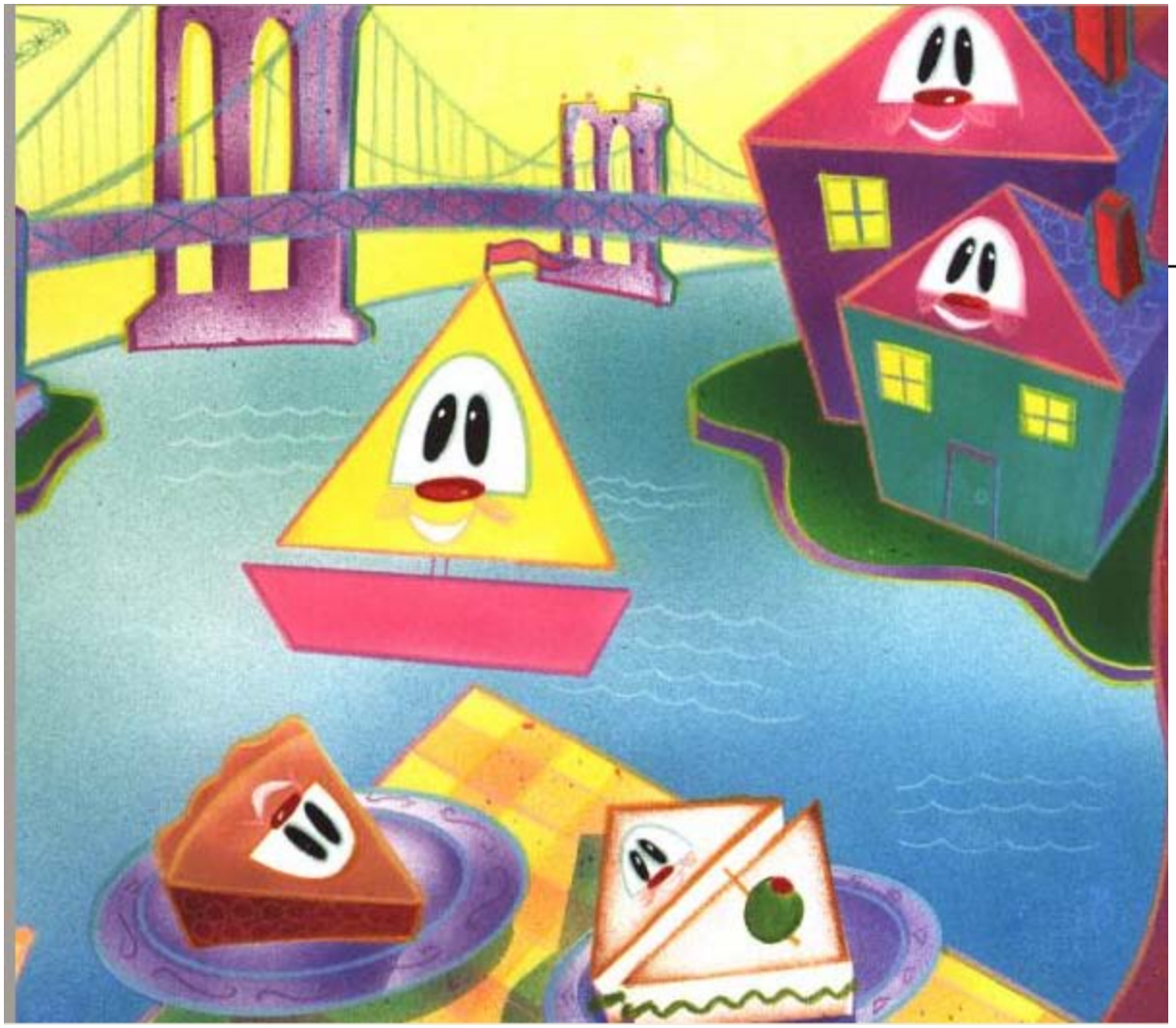
The GREEDY Triangle
WRITTEN BY
Marilyn Burns


Once there was a triangle that was—as most triangles are—
always busy.
The triangle spent its time holding up roofs,
supporting bridges,
making music in a symphony orchestra,
catching the wind for sailboats,
being slices of pie and halves of sandwiches,
and much, much more.



Building with Triangles

http://illuminations.nctm.org/LessonDetail.aspx?id=U93

Individual Lessons

Lesson 1 - What Can You Build With Triangles?

Students explore ways of building different basic shapes from triangles. They also investigate three dimensional shapes constructed from triangles.

Lesson 2 - How Do You Build Triangles?

Students investigate the basic properties of triangles. Students also investigate the relationships among other basic geometric shapes.

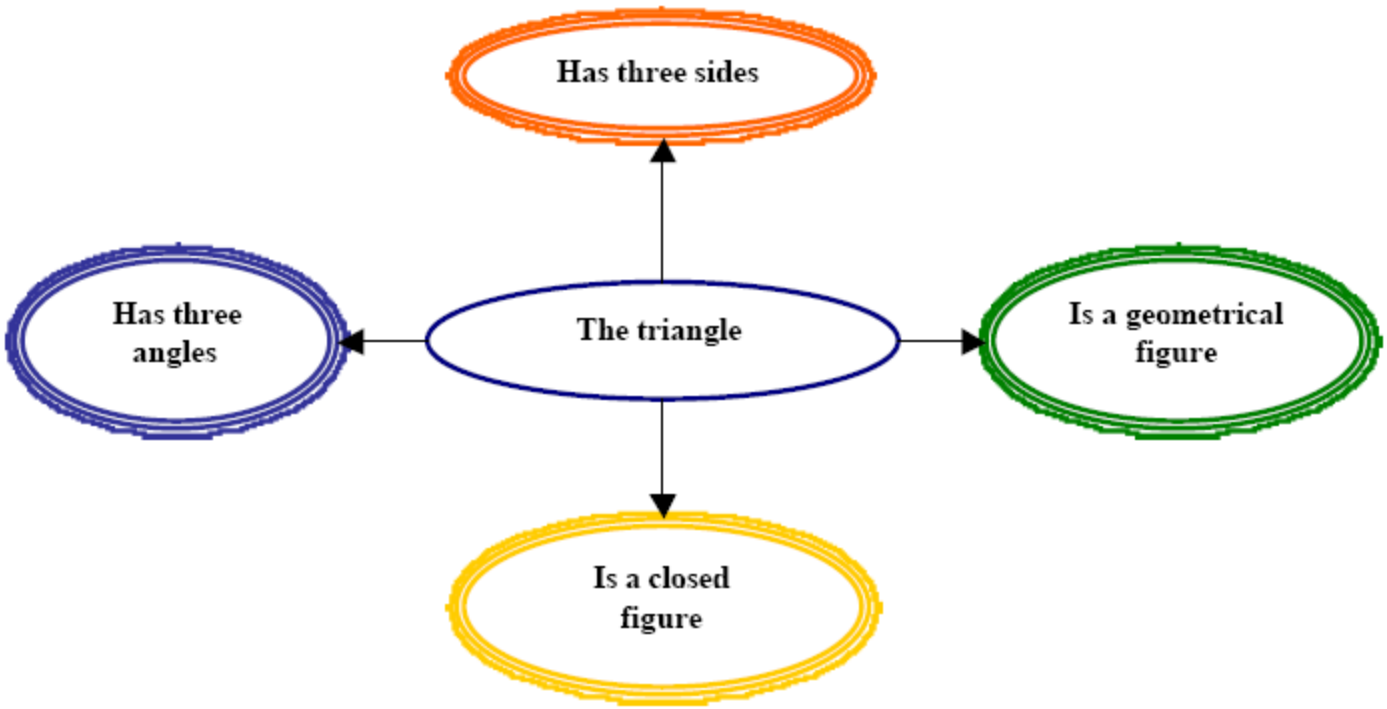
Lesson 3 - What's Important About Triangles?

Students explore the importance of the side lengths of a triangle and when triangles can or cannot be constructed on the basis of these lengths.

Lesson 4 - How Many Triangles Can You Construct?

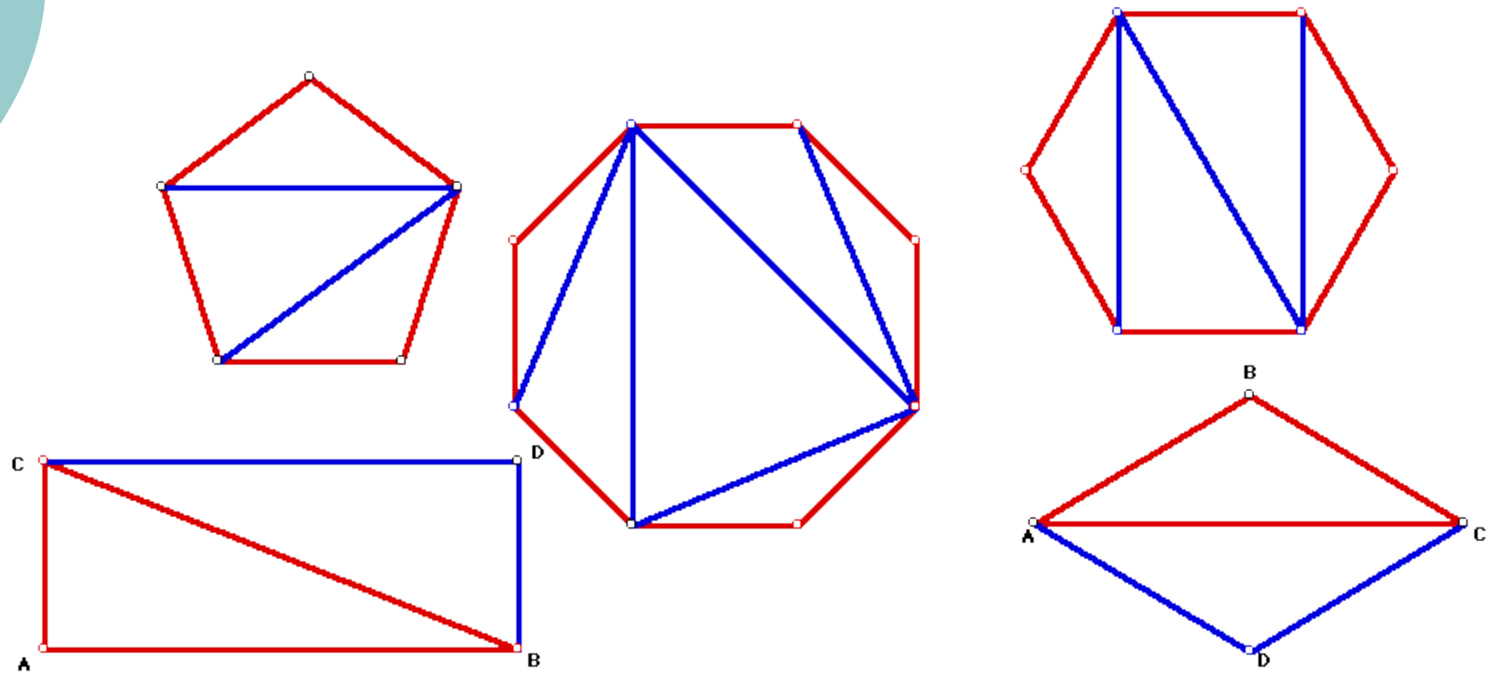
Students identify patterns in a geometrical figure (based on triangles) and build a foundation for the understanding of fractals.

What is a triangle?



Importance of triangles

- http://www.pbs.org/wgbh/buildingbig/educator/act_straw_ei.html

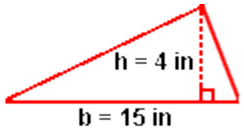


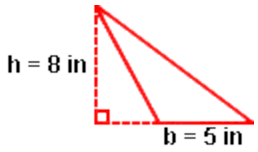
Misconceptions

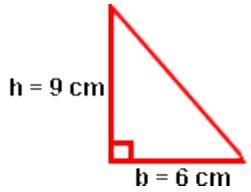
- Imprecise language plagues students' work in geometry (Burger & Shaughnessy, 1986).

- Misconceptions on concept of height.

The base and height of a triangle must be perpendicular to each other.

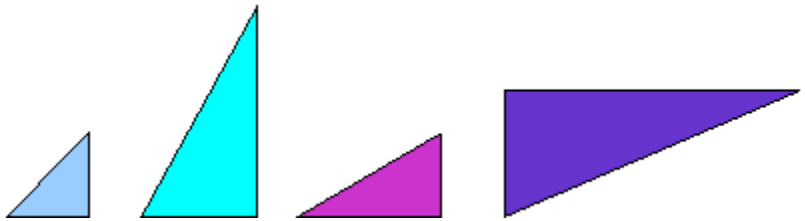






Warning! Danger!!!

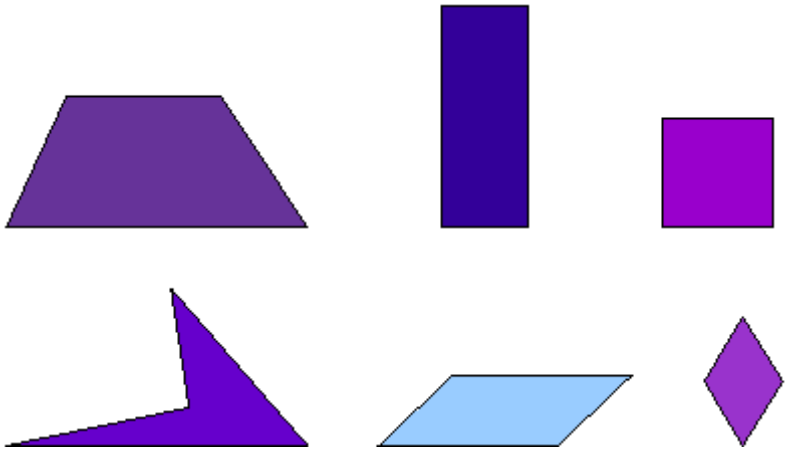
Concept image- a combination of all the mental pictures and properties that have been associated with the concept. Students often use concept images rather than definitions of concepts in their reasoning (ex. Right angle left angle, upside down triangle



Multiple drawings

- Importance Multiple drawings – (Clements, 2003).

"Pictures need to be varied so that students are not led to form incorrect concepts (concept images)



Explore!

Children should manipulate concrete geometric shapes and materials so they can pursue their own explorations of geometric shapes. They might combine, fold, create sharpes or they might copy shapes on geoboards by drawing and tracing (Clements, 2003).

Constructing and Dissecting Shapes

- Children need to freely explore how shapes fit together to make larger shapes and how larger shapes can be made of smaller shapes (Clements, 2003).

Lesson 1: What Can You Build With Triangles?

Students explore ways of building different basic shapes from triangles. They also investigate three dimensional shapes constructed from triangles.

Learning Objectives

Students will:

explore ways of building different basic shapes from triangles

investigate three dimensional shapes constructed from triangles

communicate their findings to their peers

Materials

Just Two Triangles Activity Sheet

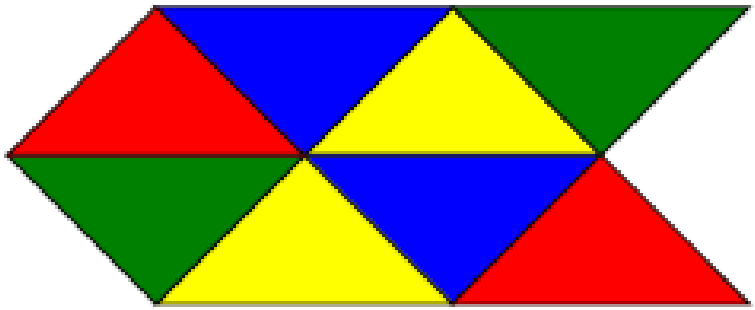
Scissors, Glue, Masking Tape

Duplicated examples of a square, a triangle, and a parallelogram

Just Two Triangles

NAME _____

Cut out the triangles shown below. Build different shapes with two triangles. Can you build a square? Can you build a triangle? What else can you build? Glue your shapes in the frame below.



Lesson 2:
How Do You Build Triangles?

Students investigate the basic properties of triangles. Students also investigate the relationships among other basic geometric shapes.

Learning Objectives

Students will:

investigate basic properties of triangles

investigate the relationships among basic geometrical shapes

Materials

How Do You Build Triangles? Activity Sheet

Triangular shapes of various sizes

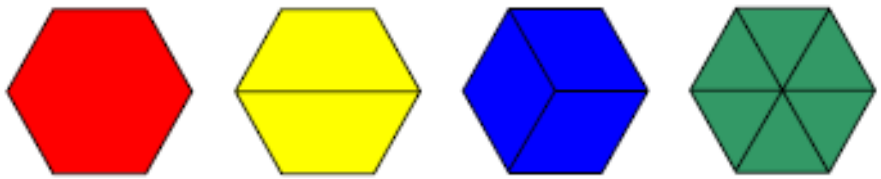
Pattern blocks (You may choose to use the Patch Tool Applet)

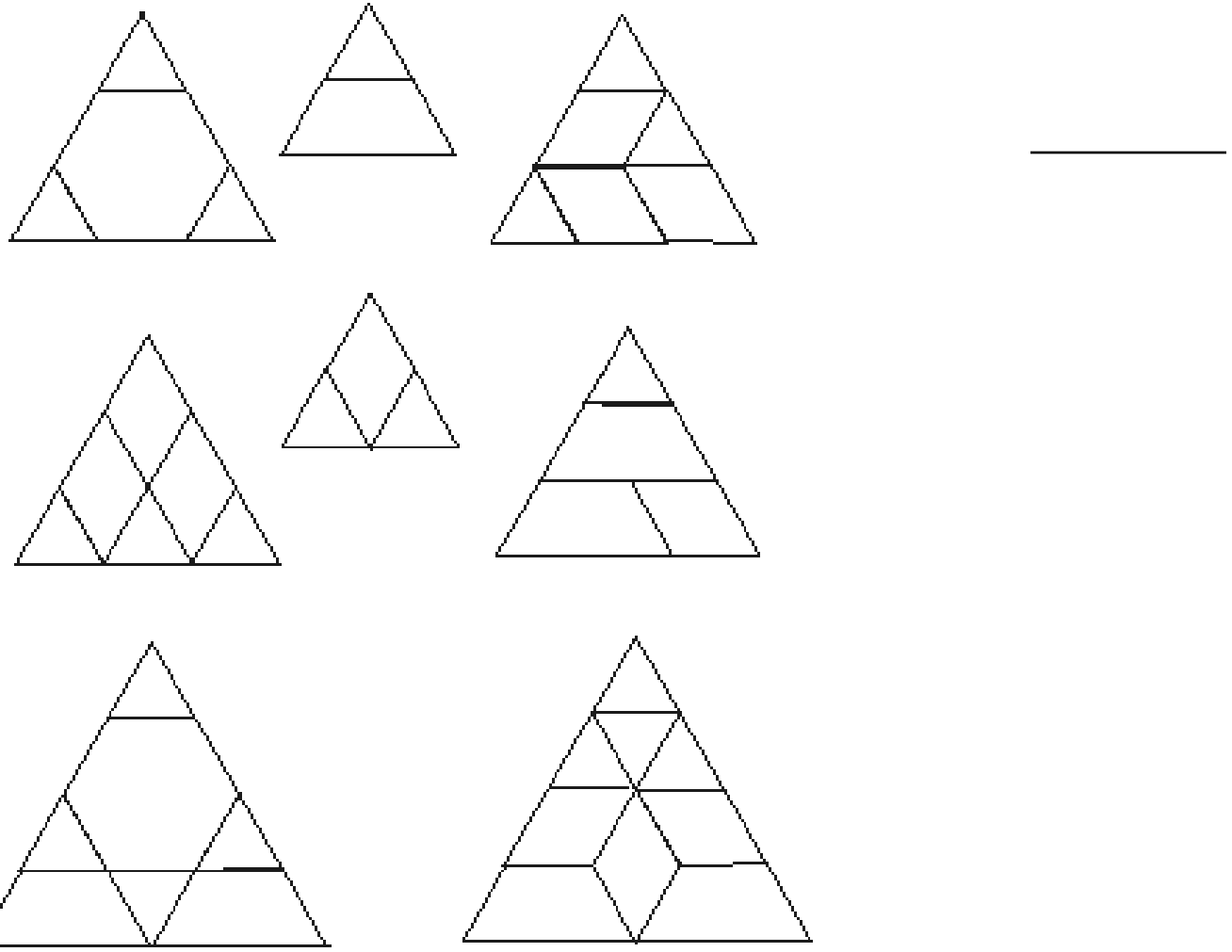
Scissors, Glue, Paper

How Do You Build Triangles?

NAME _____

How many different triangles can you build with pattern blocks? To find out, cut out the pattern blocks below. Glue your solutions inside the frame.





Lesson 3: What's Important About Triangles?

Students explore the importance of the side lengths of a triangle and when triangles can or cannot be constructed on the basis of these lengths.

Learning Objectives

Students will:

discover that it is not possible to construct some triangles from give lengths

discover a rule that states whether or not it is possible to construct triangles from given lengths

learn about the perimeter of a triangle

Materials

What's Important about Triangles? Activity Sheet (copied onto cardstock)

Tape, Scissors

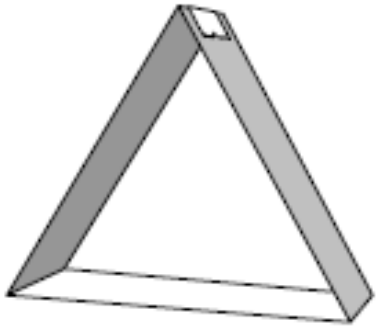
Spinner with numbers 1 through 6

What's Important?

NAME _____

Make important discoveries about triangles by measuring and taping strips of construction paper together. Choose a partner. Cut out strips from the centimeter grid paper on the next page. Measure, fold, and tape a strip together to construct triangles A-H.

For instance, a triangle with sides of 5 cm, 5 cm, and 5 cm would be cut and folded as follows:



Use the measurements below to make your triangles. Be sure to label each triangle with its letter.

A: 6 cm, 6 cm, 6 cm

B: 6 cm, 7 cm, 4 cm

C: 4 cm, 9 cm, 5 cm

D: 7 cm, 4 cm, 7 cm

E: 4 cm, 4 cm, 8 cm

F: 7 cm, 4 cm, 2 cm

G: 5 cm, 5 cm, 8 cm

H: 4 cm, 4 cm, 4 cm

Lesson 4: How Many Triangles Can You Construct?

Students identify patterns in a geometrical figure (based on triangles) and build a foundation for the understanding of fractals. A **fractal** is "a rough or fragmented geometric shape that can be subdivided in parts, each of which is (at least approximately) a reduced-size copy of the whole“

Learning Objectives

Students will:
identify patterns in a geometrical figure
build a foundation for the understanding of fractals
make hypothesis and then develop experiments to test them

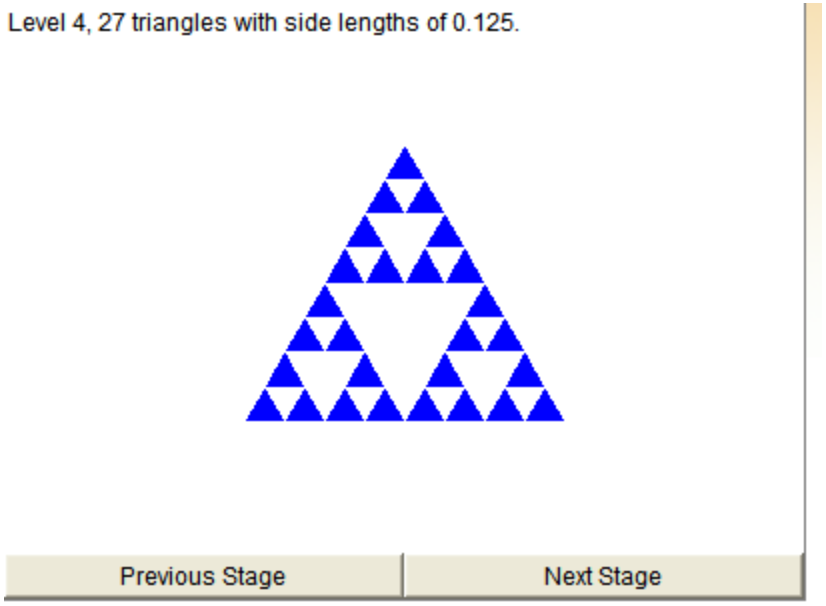
Materials

How Many Triangles? activity sheet
Let's Work Together Family Page (photocopied on cardstock)
Ruler, pencils, or fine-line markers
Writing paper

Lesson 4: How Many Triangles Can You Construct?

What is Sierpinski's Triangle?

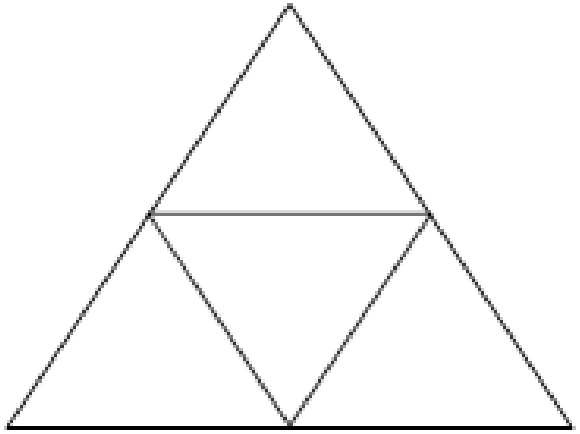
http://www.shodor.org/interactivate/activities/SierpinskiTriangle/



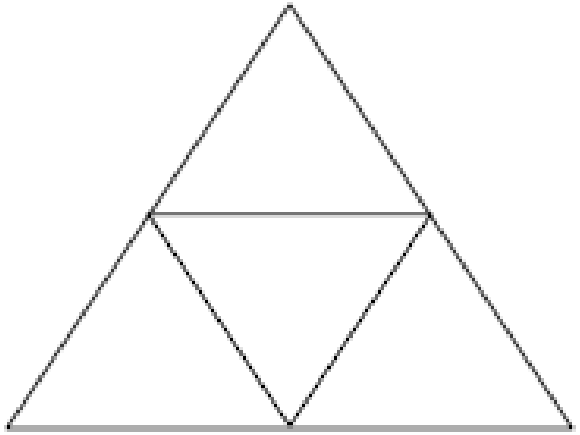
How Many Triangles?

NAME _____

1. When the midpoints of each side of a triangle are connected, they divide the figure into four smaller triangles, as shown below. Now, divide each of these four triangles by connecting the midpoints of their sides. Repeat this process several times. How many triangles do you think you will get? With a partner, try this experiment. Write a rule that describes what you discover in the number patterns.



2. As above, the midpoints of the triangle have been joined. Shade in the middle triangle, and then join the midpoints of the sides of the other triangles. Repeat this process at least two more times. What patterns do you think will emerge? Compare the sizes of the triangles. How far do you think you can take this process? What conclusions can you draw from these experiments?



Extension: Tangram

- *Family Page: Let's Work Together*
  Duplicate the Let's Work Together family page on cardstock. Distribute a copy to each student to complete at home with a family member. (An interactive applet is available at http://standards.nctm.org/document/eexamples/chap4/4.4/index.htm).

Clements, D. (2003). Teaching and learning geometry. *A Research Companion to Principles and Standards for School Mathematics*. Reston,VA:National Council of Teachers of Mathematics.