Mathematical Melodies

A Square

Music and Lyrics by Ruth Jean Charles

A Square

A square's a quadrilateral, a rectangle, a trapezoid, with four equal sides (four equal sides).

A square has four right angles a perimeter the total of the length of each side (length of each side)

Cause if I learn all my shapes my teacher says "I'll be great, shapes are part of mathematics and I will be the best one at it"

A circle's like your dinner plate the wheels you need when you're late for your date (for your date)

Perfectly round is its shape a result of the radius, and circumference (circumference)

A triangle's a pyramid, with 3 angles and edges like a truss on a bridge (truss on a bridge) Scalene, Equilateral, Isosceles are types based on the side and angles (sides and angles)

A Square

Junior: Grade 4, Grade 5 and Grade 6

The Big Ideas

What makes shapes alike and different can be determined by an array of geometric properties. Shapes of different dimensions and their properties can be described mathematically. Students need the special language of geometry in order to classify shapes into categories. Classification is an important process for making sense of the shapes in the world around us. By coding information into categories students condense it and gain mastery.

To participate in this important process of classification, we need mathematical ideas related to the significant properties used to put shapes into various categories. We form categories in mathematics by recognizing attributes shared by various elements and then form these elements into a set. Although the elements in the set differ, they have something the same about them. When a set is particularly significant, we give it a name.

One such category is based on angles. Students should learn to understand and use, in context right angles and degrees in measuring rotation of angles, particularly as related to geometric shapes.

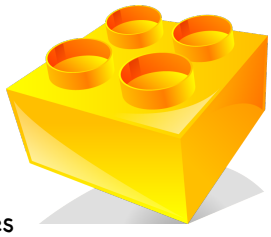
Finally, shapes can be seen from various perspectives. The ability to perceive shapes from different view points helps us understand relationships between two and three dimensional figures while mentally changing the position and size of shapes.

Curriculum Connections

Spatial Sense and Geometry

Geometric Properties

Grade 4



- identify and compare different types of quadrilaterals (i.e., rectangle, square, trapezoid, parallelogram, rhombus) and sort and classify them by their geometric properties (e.g., sides of equal length; parallel sides; symmetry; number of right angles);
- identify benchmark angles (i.e., straight angle, right angle, half a right angle), using a reference tool (e.g., paper and fasteners, pattern blocks, straws), and compare other angles to these benchmarks

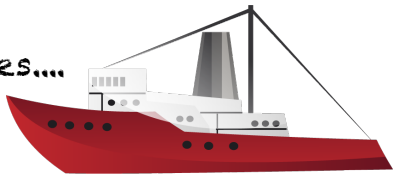
Grade 5

- distinguish among polygons, regular polygons, and other two-dimensional shapes;
- identify and classify acute, right, obtuse, and straight angles;
- identify triangles(i.e.,acute,right,obtuse, scalene, isosceles, equilateral), and classify them according to angle and side properties;

Grade 6

- sort and classify quadrilaterals by geometric properties related to symmetry, angles, and sides, through investigation using a variety of tools (e.g., geoboard, dynamic geometry software) and strategies (e.g., using charts, using Venn diagrams);
- sort polygons according to the number of lines of symmetry and the order of rotational symmetry, through investigation using a variety of tools (e.g., tracing paper, dynamic geometry software, Mira);

Inaugural Voyage One way to learn about Triangles....



Triangle Toss Up – A Balancing Act

Supplies: Construction Paper, handout of Triangle Toss Up, scissors, glue

Concept maps are exemplary tools to help students organize complex data. They can be used in geometry to organize information and create categories related to features of shapes. In this exercise, students will use a concept map to identify, describe, classify and compare types of triangles.

I. First, have students work in groups of 4 and brainstorm what they know about triangles. While students share their ideas with the whole class list them on chart paper or the blackboard.

II. Explain to students that they are going to organize these ideas (from the chart paper or blackboard) using a concept map. Distribute enlarged copies of the Triangle Toss Up. Have students find the largest triangle on the sheet and cut it out. In the top triangle provide a definition of a triangle (A polygon with three angles and three sides. The sum of angles inside a triangle is always 180 degrees). Then glue it at the top of the construction paper.

III. Then ask students what the two main ways to classify a triangle? (Sides and Angles) Have them write this in the next two triangles (that are equal in size). Then glue them below the largest triangle equal distance apart.

IV. Next, ask students what congruent means? (same shape and size) How many congruent sides can a triangle have? (0, 2 and 3 congruent sides). Students cut out the three triangles that have 0, 2, and 3 congruent sides. Have students mark each triangle with ticks to indicate congruent sides. Glue each triangle below the large triangle marked 'Sides.'

V. Now students work on the angles. Ask students, what three types of angles does a triangle need in order to be classified by the name of the angle? (1 right angle, 1 obtuse angle, 3 acute angles). Have students label the relevant triangles and cut out and paste below the triangle labeled 'angles.'

VI. For the final triangles have students write the names of the relevant triangles that match each description (Sides: Scalene Triangle, Isosceles Triangle, Equilateral triangles; Angles: Right Triangle, Obtuse Triangle, Acute Triangle) cut them out and glue them under the relevant triangle (side or angle). Students now have a concept map of all triangles and their relevant features.

Extension: Use the concept map to create a mobile. Cut out each triangle. Using thin pieces of metal wire and fishing line students create their own unique mobiles. Students are encouraged to plan ahead and use their understanding of fulcrums to balance their mobile.

Resources for Mobiles:

Alexander Calder and His Magical Mobiles by Jean Lipman

Alexander Calder by Mike Venezia or Alexander Calder by A.R. Schaefer

National Gallery of Art in Washington provides some great ideas for lessons on Calder's art and life http://www.nga.gov/education/classroom/counting_on_art/

Handout(s):
Triangle Toss Up

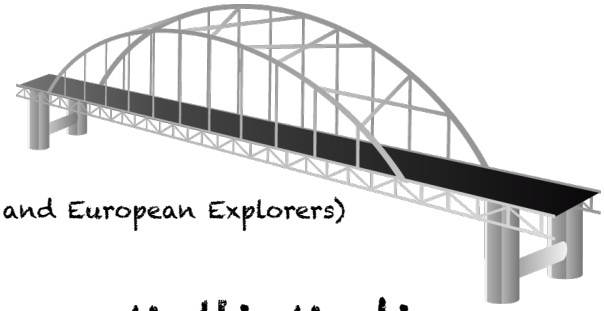
Handout(s):
Shape Shuffle

Hands On Math...The SHAPE SHUFFLE

Students will work in groups of 4 with a set of 2 dimensional shapes found in the handout entitled Shape Shuffle. Each group will be given 2 pieces of yarn or string. First the students will make one circle with their string and do the following (taking turns): Students will select a shape, put it in the centre of the circle, and describe the shape.

After removing that shape, students will then close their eyes and pick two new shapes to compare by placing them in the centre of the circle next. They will discuss the similarities and differences of their two shapes. After removing the last 2 shapes the students will pick one shape at random and place it in the centre. Their goal is to find shapes that are similar and put them in the circle. Finally, students play a game using both pieces of string by creating a venn diagram. Students classify shapes according to how they are similar and how they are different.

Cross Curricular



Math and Social Studies (Grade 4: Medieval Times, Grade 5: Early Civilizations, Grade 6: First Nation Peoples and European Explorers)

GROOVY GARMENTS...

The wearing of clothing is a feature of nearly all human societies. Clothing performs a range of functions: protection from the elements, affirming (or denying) social or cultural expectations. Clothing clearly reflects different historical identities, so exploring clothing related to certain historical periods offers a way for children to understand a history from a unique perspective that they can easily identify with. Connecting the making of clothing to math is also a distinct way to explore how math and/or technology has or has not changed over time.

For this lesson, to connect garment making with geometry begin by reading the book A Cloak for the Dreamer by Aileen Friedman (A tailor asks each of his sons to make a cloak that will keep out the wind and the rain. One son uses rectangles; another uses squares and triangles; the youngest uses circles, making a cloak full of holes. Their father finds a "geometric" way to fix the cloak).
Stop mid way through (before the author explains how the father solved the problem) and ask your students to solve the following:
How would you change the cloak so the circles would fit together? Please answer this question using your understanding of geometric concepts. Please explain your thinking by using pictures and writing.
Answer: (which is well explained in the book)
The problem? Circles do not have any angles so tailors cannot wedge them together to make long seams. Change the shape into a hexagon. It is possible to piece any triangle or quadrilateral into a patchwork design. That is because the sum of the four interior angles of quadrilaterals equals 360 degrees (it fills the space around a point). The sum of the three interior angles of triangles equals 180 degrees and, therefore, the angles of two triangles add up to 360 degrees. Hexagons? The sum of the interior angles of a hexagon is 720 degrees. Regular hexagons have six angles the same size, each 120 degrees (720/6). And since three 120's make 360, regular hexagons can be sewn together.

Resources - Traveling Edukits from ROM

School Cases: **World Garments - A cooperative learning kit**
http://www.rom.on.ca/programs/edukits/casesD.php

Handout(s):
Problem Solving Sheet

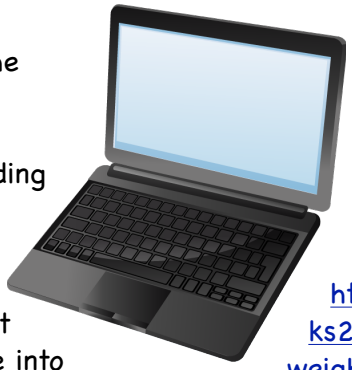
Multi-Media

Websites:

Shape memory test
http://www.primaryresources.co.uk/online/memory.html

Polygon Playground - Build or design using shapes
http://www.mathcats.com/explore/polygonplayground.html

Dare to be Square - Create more squares than your opponent
http://www.funbrain.com/sqr/index.html



Geometry Quiz - very challenging!
http://www.mathsnet.net/js/geomquiz/geometryquiz.html

Polygon Sort:
http://www.crickweb.co.uk/ks2numeracy-shape-and-weight.html#fruitbalance3

Triangle Sort:http://www.crickweb.co.uk/ks2numeracy-shape-and-weight.html%23fruitbalance3

Shapes - A game from the BBC
http://www.crickweb.co.uk/ks2numeracy-shape-and-weight.html%23fruitbalance3

SmartBoard: Shapes
http://exchange.smarttech.com/search.html?q=shapes

The Geometry of Constellations

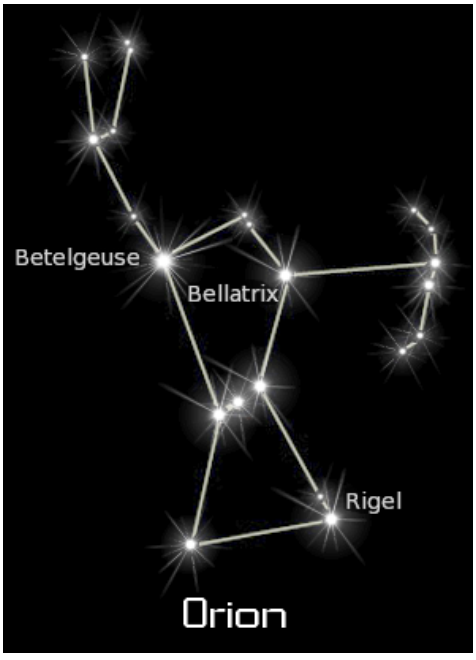
Connecting Grade 6 Math (Geometry and Spatial Sense) with Grade 6 Science (Space)

Book: The Stars by Cynthia Pratt Nicolson

Media: Canadian Science and Technology Museum's Monthly Star Charts and Star Finder (pick a star chart based on the month you are teaching the unit. 12 months are provided on the website) http://www.sciencetech.technomuses.ca/english/whatson/astronomy-resources-activity-templates.cfm
and/or you can use the Canadian Space Agencies astronomy resources which contain an applet (any small application that performs one specific task that runs within the scope of a larger program) of winter and summer constellations http://www.asc-csa.gc.ca/eng/educators/resources/astronomy/applets.asp#module1

Supplies: Star charts, Worksheet Geometry of Constellations, black construction paper, glow in the dark paint (or chalk if paint not available).

Introduction: Turn of all the lights (close the drapes) in the classroom and put the overhead entitled Common Constellations for the Northern Hemisphere on (or use the applet provided from the CSA on a projector and screen). Start by asking, "Have you ever laid in the grass on a cool summer night and stared up at the sky? The same stars that you see have captivated sky watchers for thousands of years. For centuries, people have told stories to explain the stars. Ask students to find Orion on the overhead or applet. What shapes do they see? (irregular polygon, quadrilateral). Read the star tale (found on page 13 of The Stars by Cynthia Pratt Nicolson) about Orion, the great hunter.



Then ask students if they have ever gazed at the stars at night and have seen patterns, objects or shapes in the stars?

Activity: Students are now provided with a Monthly Star Chart and they are asked to find constellations containing polygons such as triangles, quadrilaterals, pentagons, hexagons, and others. Using a yellow marker or pencil crayon students outline and identify various shapes. Students record their results on the worksheet entitled Geometry of Constellations.

Extension: If time allows ask students to create their own constellation using geometric shapes. Provide each student with black construction paper and glow in the dark paint. Students will draw and then name their constellation. Hang them on the ceiling to create a night sky.

Handout(s):
Geometry of Constellations

Picture This!

More Literature Links for geometry...

Fiction:

Shape Up: Fun with Triangles and Other Polygons by David Addler (1998)
Uses cheese slices, pretzel sticks, a slice of bread, graph paper, a pencil, and more to introduce various polygons, flat shapes with varying numbers of straight sides.

The Shape Game by Anthony Browne (2004)
A unique and witty book inspired by the author's work with children in the Tate Britain gallery in London. A family reluctantly visits an art gallery, but one by one each member is energized by a different picture in the gallery and transported into the imaginative and colourful world of art.

Ed Emberley's Picture Pie: A Circle Drawing Book by Ed Emberley (1984)
Shows how to cut a basic circle into arcs and curves and use the pieces to draw birds, animals, snowmen, fish, and many other objects and designs.

Non-Fiction:

Shapes in Sports by Rebecca Rissman (2009)
These fun titles introduce children to different shapes in a range of real-world situations. Each book uses similar, patterned text to teach children basic vocabulary, and includes stunning photographs that show how shapes can be found in many places.

Board Games for developing spatial awareness, and problem solving using geometric shapes:

Blokus by Mattel
The original game, for 2 to 4 players, which has become a classic board game throughout the world. It is comprised of a square board containing 400 squares, and 84 pieces made up of small squares. Play it with your family or among friends: with Blokus Classic you are guaranteed to have fun moments that challenge you and make you think. When it is played by four people, the game is very animated and the outcome is never certain! Played by two people (where each player has two colours), the game provides the opportunity for more strategic and careful thinking.

Katamino by DJ Games
KATAMINO is an ever-changing puzzle and is a stimulating brain teaser. It calls on thinking ability and develops observation skills, and is pleasing to the eye with its colorful and durable wood construction. Build perfect units called pentas by placing a certain number of pentaminos on the game board. The game becomes harder as the number of tokens used increases. There are thousands of possible combinations! Includes 10 pentominoes, 3 small brown, and 5 small red pieces, 1 setting stick, 1 grid, instructions. For 1 or 2 players ages 3 and up.

All content for Picture This was provided by Novelist (http://www.ebscohost.com/novelist/).

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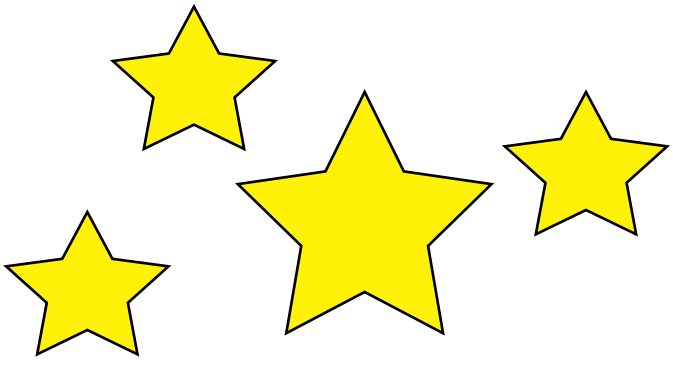
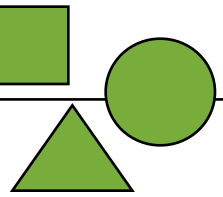
The Geometry of Constellations

Name of Shape	Drawing	Constellation Name



Problem Solving



My Problem

My Work

My Explanation

My Answer

Name: _____

Dear Math Journal,

In math today I _____

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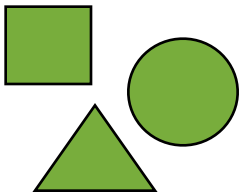
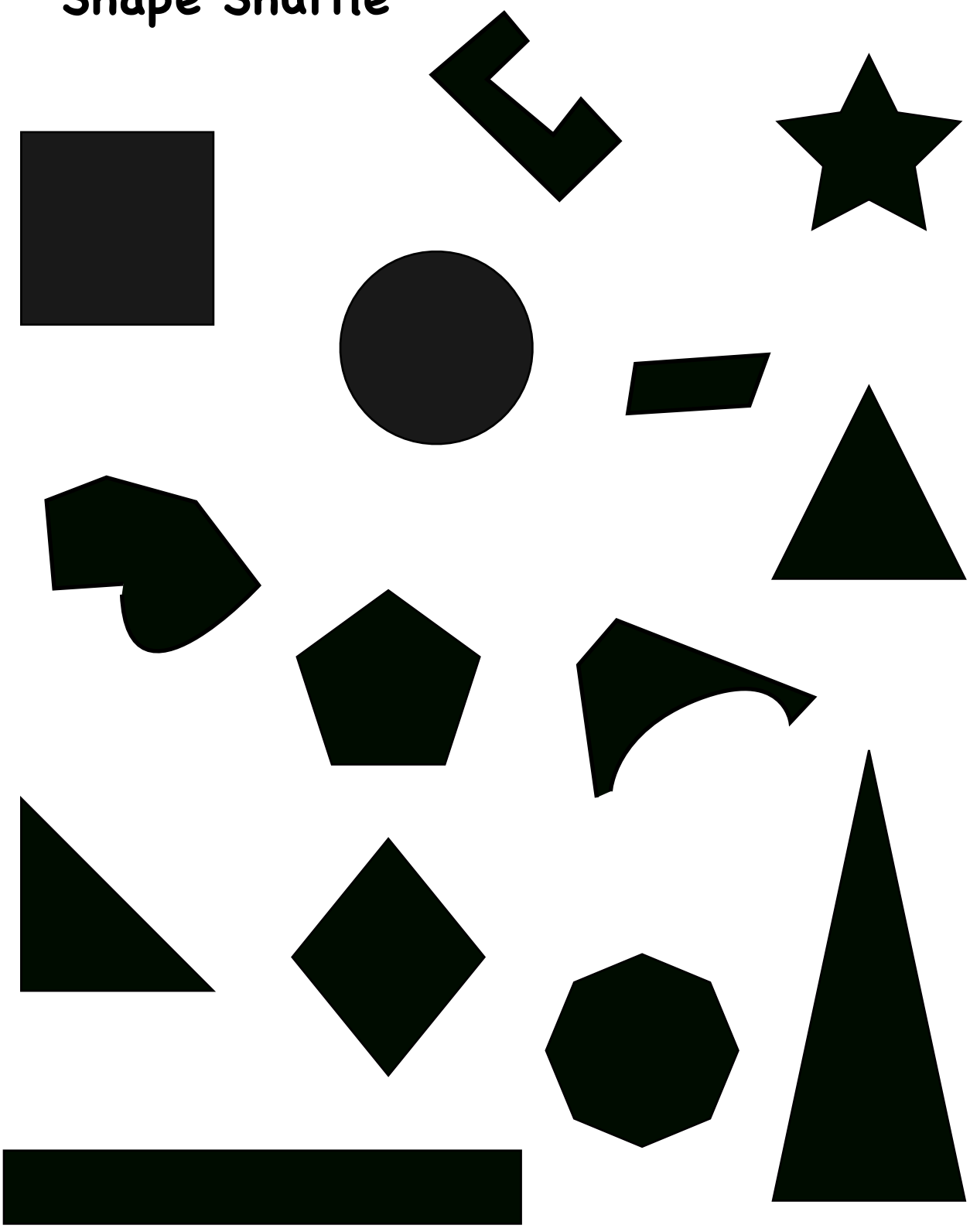


Shape Shuffle



Triangle Toss Up