Polyhedron Nets

National Standards (NCTM)

Instructional programs from prekindergarten through grade 12 in Geometry should enable each and every student to…

Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships

with expectations in grades 6–8 each and every student should

Precisely describe, classify, and understand relationships among types of two- and three-dimensional objects using their defining properties

Texas Essential Knowledge & Skills (TEKS)

Mathematics 7.9 (D) Expressions, equations, and relationships.

The student applies mathematical process standards to solve geometric problems. The student is expected

(D) to solve problems involving the lateral and total surface area of a rectangular prism, rectangular pyramid, triangular prism, and triangular pyramid by determining the area of the shape's net.

Mathematics 1.6 (E) Geometry and measurement.

The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to:

(E) identify three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes), and triangular prisms, and describe their attributes using formal geometric language;

Mathematics 2.8 (B) Geometry and measurement.

The student applies mathematical process standards to analyze attributes of two-dimensional shapes and three-dimensional solids to develop generalizations about their properties. The student is expected to

(B) classify and sort three-dimensional solids, including spheres, cones, cylinders, rectangular prisms (including cubes as special rectangular prisms), and triangular prisms, based on attributes using formal geometric language;

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Objective

In this activity students will study two- and three-dimensional geometry, spatial visualization, problem solving, area, surface area, and hexominoe* nets.

a polygon in the plane made of 6 equal-sized squares connected edge-to-edge

Materials

- A Rubik's Cube for each student or group of 3 students
- Scissors
- Small boxes (1 for each group of 3 students) - Ask parents to donate empty cereal boxes, tissue boxes, etc
- Markers (red, blue, green, yellow, orange)
- Rulers
- Glue Sticks or tape
- Copies of graph paper (copy on cardstock or construction paper)

Procedure

1. Begin by asking students to define the following terms and label the diagram (draw the cube [below] on the board).

   - **Polyhedron**: a three dimensional figure whose surfaces are polygons
   - **Face**: the polygons that form the polyhedron
   - **Edge**: the intersection of two faces
   - **Vertex**: a point where edges intersect
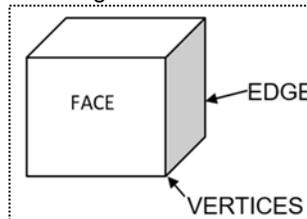
2. Divide students in small, cooperative groups and hand out materials.

3. Have students measure the length, width, and depth of a small cereal box (when assembled).

4. Complete the following steps together, as a class.
   - Cut open the cereal box so that it is one piece of cardboard.
   - Label the faces with the appropriate dimensions.
   - Compare and discuss the nets. (A polyhedron net is a two-dimensional representation of a three-dimensional shape. A *hexominoe net* is comprised of 6 squares, and can be folded to create a cube.)
   - Calculate the total surface area of the polyhedron nets.

5. Next examine the Rubik's Cube. How many small cubes make up a 3x3x3 Rubik's Cube?

Procedure

6. Invite each group to create their own Rubik's Cube from nets!
   - Students will use the graph paper to design 27 hexominoe nets and fold each into a cube (representing the 27 smaller cubes that comprise a 3x3 Rubik's Cube.
   - As a group, place all cubes together to form one large cube and color each side of the cube to match that of the Rubik's Cube.

7. Display for all to see!

Notes to Teacher

- This lesson will take approximately two 45-minute class periods.
- Make many copies of the graph paper.
- Supply tape in case the glue isn't holding the cubes together well. - Students may also need to include extra paper (tabs) to use for applying the glue to/ keeping the model secured as a cube.
- Encourage students to try many different net arrangements to create the 27 hexominoe nets for the Rubik's Cube. There are 11 different set ups that work.

Geometry Lesson – Polyhedron Nets
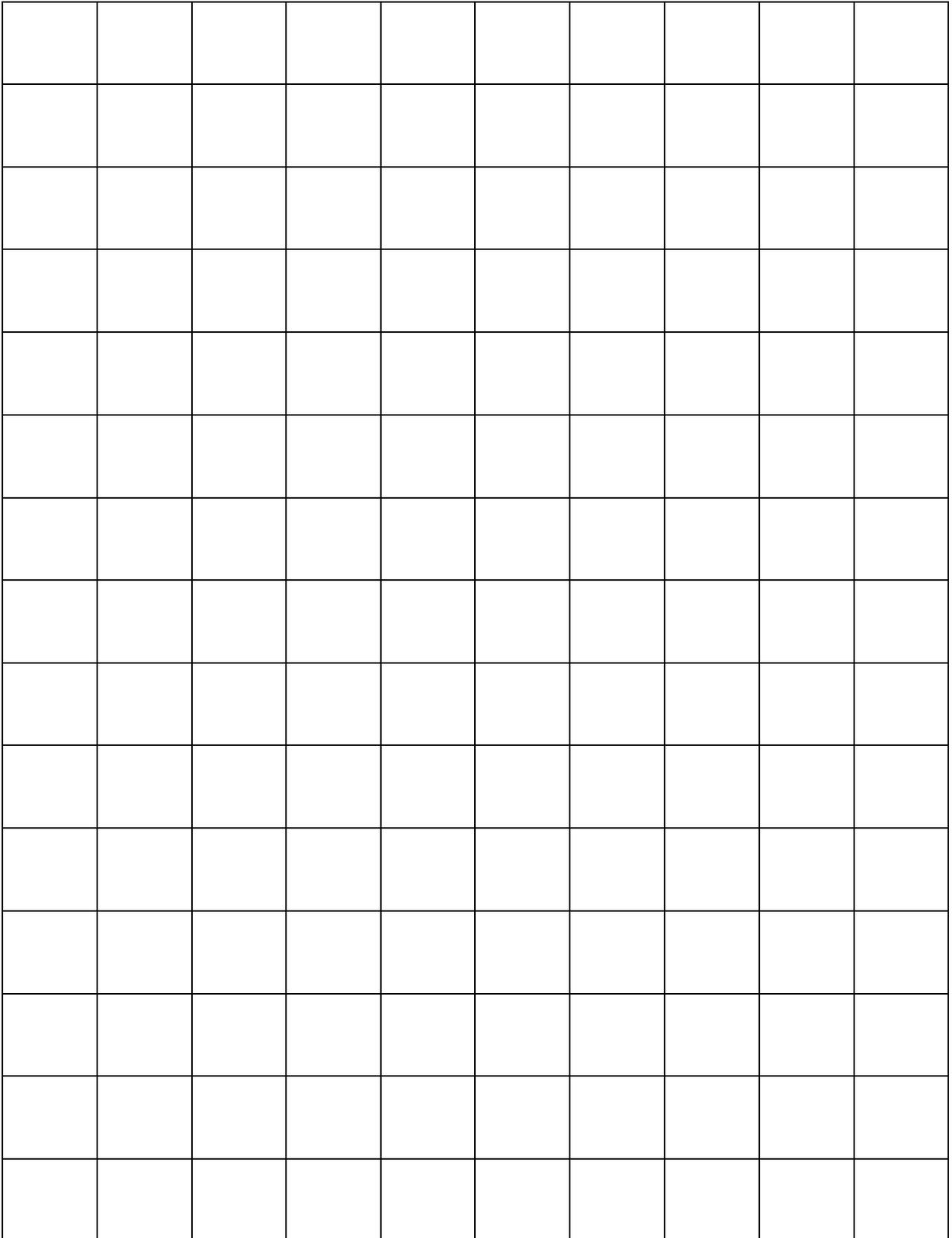
Nets Activity Page

Predict which nets can be folded to make a cube.

Recreate on graph paper, cut out, and fold to test your predictions.