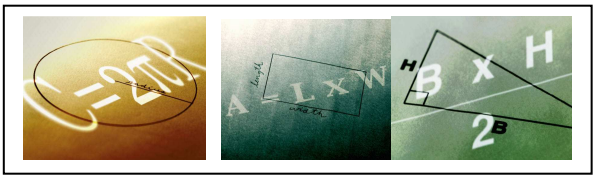
ALGEBRA/GEOMETRY INSTITUTE
SUMMER 2007



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J. Z. George High School
6th – 8th Grade

Teaching Objective(s)

The students will work in small groups to:

1. use nets to find the surface area of cubes and prisms
2. define what a face is in a solid object
3. distinguish between two dimensional objects and solids
4. identify familiar shapes on a solid

Instructional Activities

- **Bell-ringer**

  Use prior knowledge to answer the following questions.

  1. What formula is used to find the area of a rectangle? A=b x h or bh
  2. What formula is used to find the area of a triangle? A=½ bh
  3. What formula is used to find the area of a square? $A=s^2$

- **Review bell work**

  1. Explain that they will use the formulas discussed in the bell-ringer to find the surface area of space figures (cubes, prisms, and cylinders). Define each new term.

     - Bases are the two parallel faces. The other faces are called lateral faces.
     - Space figures are three dimensional **solid** figures.
     - Cube is a rectangular prism with six congruent square faces.
     - Prism is a space figure with two parallel and congruent polygonal faces, called bases.
     - Surface area is the number of square units that covers the outside of the figure.

- **Lesson Procedure**

  1. Explain that two dimension figures can be combined to form a polyhedron. Polyhedra are space figures whose faces are all polygons.
  2. Place a copy of "What is that shape?" on the overhead. Have students describe the characteristics of the cube and prisms.
  3. First, look at the shape labeled cube, "How many faces are on the cube, and what is the name of the shape(s) of the faces?" (6 faces and squares)

4. Now, look at the shape labeled rectangular prism, “How many faces are on the prism, and what is the name of the shape(s) of the faces?” (6 faces and rectangles/squares).
5. Now, look at the shape labeled triangular prism, “How many faces are on the prism, and what is the name of the shape(s) of the faces?” (5 faces and triangles, rectangles).
6. Explain that the rectangular prism and triangular prism are only two of the basic polyhedra. Tell them that the prism is named by the shape of its base.
7. Explain to the students that the surface area is the number of square units that cover the outside of the figure. Ask: Who can give an example of a real life use of surface area? (skin, present wrapping)
8. Teacher will tell the students that they will use a real life example (boxes of various sizes) to help them understand the meaning of surface area. Pass out the boxes. The student will unfold the boxes that were precut and taped. The teacher will explain that an example of a net is when the box is lying flat.
9. Identify and label the net box by folding to check where the front, back, sides, top, and bottom are located.
10. After students have identified and labeled each of the box nets, have the students measure each face in centimeters (cm). While the students are measuring, pass out $1cm^2$ graph paper. After the students are finished, ask them to draw the unfolded figures on the graph paper. Students will use the measurement of each face as the dimensions. Check your measurement from the ruler in *cm* with your measurement on the graph paper by counting each square. Write the number of squares on the graph paper. Then compute the area (lw) of each face of the unfolded box. The student will exchange models and repeat the process of drawing the figure on the graph paper.
11. Ask the students to determine the formula for finding the area of a cube. ($6s^2$)
12. Let student find the dimensions for the remaining solid figures, then use the sum of the faces and the formula to find the surface area. Surface area for a rectangular prism is *2lw + 2hl + 2wh*. Surface area for a triangular prism is *2 (½bh) + lw (of rectangle 1) + lw (of rectangle 2) + lw (of rectangle 3).*
13. Ask one student from each group to describe one kind of prism that this group had and use terms like faces, edge, vertices, opposite, and congruent.(Cube has 6 congruent lateral faces, eight vertices, and twelve edges. Rectangular prism has 6 rectangular faces, eight vertices, opposite sides are congruent, and twelve edges. A triangular prism has 5 faces, six vertices, and nine edges.) What do you think a hexagonal prism would look like? Allow someone to go to the board to draw the figures.
14. Complete Surface Area of Polyhedra handout.

- **Closure**

Tell students that they used nets to help them understand the surface area. They also explored measuring the flat model of the boxes and drew nets from a model. They determined the formula and calculated the surface area of each figure.

Materials

(per group of 3 or 4)

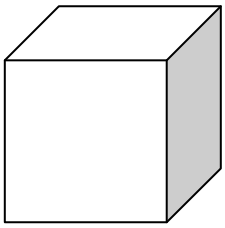
Transparency - What Is That Shape.
Model Boxes: cube, rectangular pyramid and triangular prism.
Surface Area of Polyhedra Handout
1cm square graph paper
Scissors
Rulers

Assessment

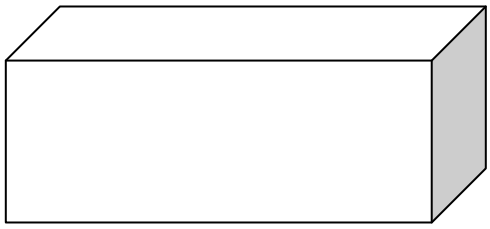
Teacher observations
Surface Area of Polyhedra handout will be graded

What Is That Shape?

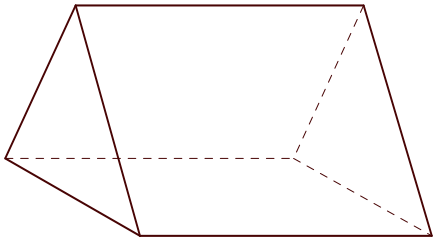
Names of Solids



Cube



Rectangular Prism



Triangular Prism

Characteristics of Solids

Name_____Date_____

Surface Area of Polyhedra

Find the surface area of each prism for the following questions. You may sketch the net of the prism.

1. A box with each side measuring 5.5 feet.

2. A box of cereal 6" wide, 5" long and 5" tall.

3. A triangular prism whose base measures 6 meters for the base, 2.5 meters for the height, 5 meters and 3 meters for the other two sides and an overall height of 4 meters.

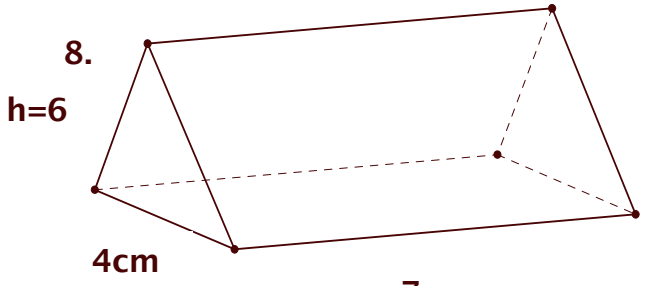
4. A DVD case 9cm by 4cm by 1cm.

5. A triangular prism with an isosceles triangular base that measures 10 in, 10 in, 12 in for the sides. The base has a height of 8 in, but the overall height of the prism is 15 in.

6. A triangular prism with a right triangular base that measures 24" for the base, 7” for the height and 25” for the hypotenuse. The height of the prism is 10".

7. A compact disc case with length 14.3 cm, width 12.5 cm and height 1cm.

8.



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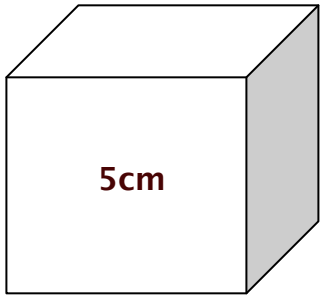

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