CHAPTER 9: VOLUME AND PERCENTS

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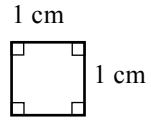
MATH NOTES

MEASUREMENT IN DIFFERENT DIMENSIONS

Measurements of **length** are measurements in **one dimension**. They are labeled as cm, ft, km, etc.

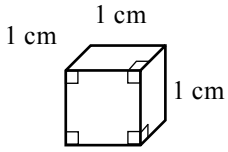
1 centimeter

Measurements of **area** are measurements in **two dimensions**. They are labeled as cm^2, ft^2, or, square centimeters, square feet, etc. The abbreviation "cm^2" is read as "square centimeters and *not* as "centimeters squared."



1 cm × 1cm = 1 cm^2

Measurements of **volume** are measurements in **three dimensions**. They are labeled as cm^3, ft^3, or, cubic centimeters, cubic feet, etc. Read "ft^3" as "cubic feet" and *not* as "feet cubed."

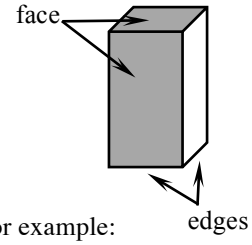


1 cm × 1 cm × 1 cm × = 1cm^3

PRISMS AND PYRAMIDS

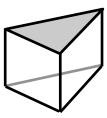
Three-dimensional figures are those that have length, width, and height. The flat sides of the figure are called **faces**, and an **edge** is where two faces meet. The point where three or more sides meet is called a **vertex** (plural: vertices).

A **prism** is a special kind of solid with flat faces, called a **polyhedron**. It has two parallel faces that are the same shape and size called **bases**. The other faces (called **lateral faces**) are parallelograms (or rectangles). No holes are permitted in the solid.



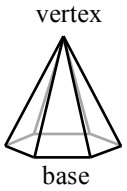
A prism is named for the shape of its base. For example:

triangular prism



pentagonal prism

A **pyramid** is a three-dimensional figure with a base that is a polygon. The lateral faces are formed by connecting each vertex of the base to a single point (the vertex of the pyramid) that is above or below the surface that contains the base.



VOLUME OF A PRISM

The **volume** of a prism is a measure of how many unit cubes exactly fill it. To calculate the volume, multiply the number of cubes in one layer by the number of layers it takes to fill the shape. Since the volume of one layer is the area of the base (B) multiplied by 1 (the height of that layer), you can use the formula below to compute the volume of a prism.

If h = height of the prism, V = (area of base) • (height)

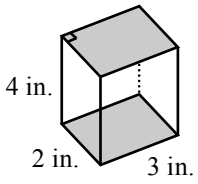
$$V = Bh$$

Example:

Area of base = (2 in.)(3 in.) = 6 in.^{2}

(Area of base)(height) = (6 in.^{2})(4 in.) = 24 in.^{3}

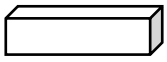
Volume = 24 in.^{3}

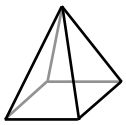


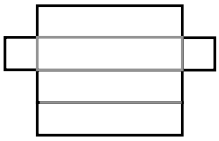
SURFACE AREA

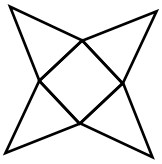
Surface area is a measure of the number of unit squares that completely wrap around a shape. The surface area of a prism or pyramid is the sum of the areas of each of the faces, including the bases. Surface area is expressed in square units.

A **net** is a drawing of each of the faces of a prism or pyramid, as if it were cut along its edges and flattened out. A net can be helpful to see the different area subproblems that need to be solved to find the total surface area. There are usually several ways to make a net of a prism or pyramid. One example for each solid is shown below.

prism 

pyramid 

net 

net 

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CALCULATING PERCENTS BY COMPOSITION

Calculating 10% of a number and 1% of a number will help you calculate other percents **by composition**.

$10\% = \frac{1}{10}$

$1\% = \frac{1}{100}$

To calculate 13% of 25, you can think of 10% of 25 + 3(1% of 25).

$$10\% \text{ of } 25 \Rightarrow \tfrac{1}{10} \text{ of } 25 = 2.5 \text{ and}$$

$$1\% \text{ of } 25 \Rightarrow \tfrac{1}{100} \text{ of } 25 = 0.25 \text{ so}$$

$$13\% \text{ of } 25 \Rightarrow 2.5 + 3(0.25) \Rightarrow 2.5 + 0.75 = 3.25$$

To calculate 19% of 4500, you can think of 2(10% of 4500) – 1% of 4500.

$$10\% \text{ of } 4500 \Rightarrow \tfrac{1}{10} \text{ of } 4500 = 450 \text{ and}$$

$$1\% \text{ of } 4500 \Rightarrow \tfrac{1}{100} \text{ of } 4500 = 45 \text{ so}$$

$$19\% \text{ of } 4500 \Rightarrow 2(450) - 45 \Rightarrow 900 - 45 = 855$$