Chapter 9: Circles and Volume

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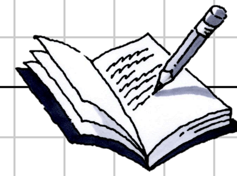

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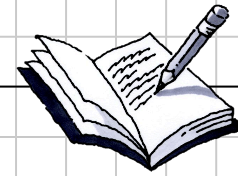
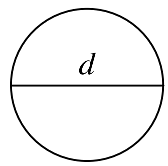


MATH NOTES

CIRCUMFERENCE AND AREA OF CIRCLES

The **circumference** (C) of a circle is its perimeter, that is, the "distance around" the circle.

$$C = \pi \cdot d$$



The number π (read "pi") is the ratio of the circumference of a circle to its diameter. That is, $\pi = \frac{\text{circumference}}{\text{diameter}}$. This definition is also used as a way of computing the circumference of a circle if you know the diameter as in the formula $C = \pi d$ where C is the circumference and d is the diameter. Since the diameter is twice the radius (that is, $d = 2r$) the formula for the circumference of a circle using its radius is $C = \pi(2r)$ or $C = 2\pi \cdot r$.

The first few digits of π are 3.141592.

To find the **area** (A) of a circle when given its radius (r), square the radius and multiply by π. This formula can be written as $A = r^2 \cdot \pi$. Another way the area formula is often written is $A = \pi \cdot r^2$.

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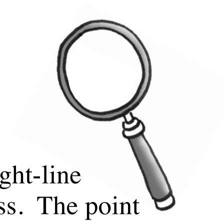
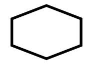
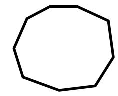
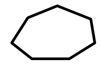
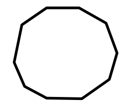
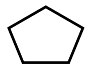
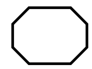
POLYGONS, PRISMS, AND PYRAMIDS



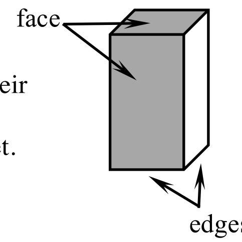
A **polygon** is a two-dimensional closed figure made of straight-line segments connected end to end. The segments may not cross. The point where two sides meet is called a **vertex** (plural: vertices). Polygons are named by the number of sides they have. Polygons with three through ten sides are named and illustrated below.

Triangle:  Hexagon:  Nonagon: 

Quadrilateral:  Septagon:  Decagon: 

Pentagon:  Octagon: 

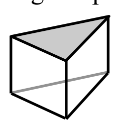
Three-dimensional figures are those that have length, width, and height. If a three-dimensional figure is completely bounded by polygons and their interiors, it is a **polyhedron**. The polygons are called **faces**, and an **edge** is where two faces meet. A cube and a pyramid are each an example of a polyhedron.



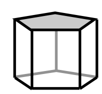
A **prism** is a special kind of polyhedron that has two congruent (same size and shape), parallel faces called **bases**. The other faces (called **lateral faces**) are parallelograms (or rectangles). No holes are permitted in the solid.

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

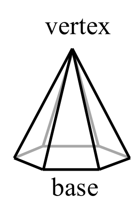
triangular prism



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.

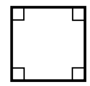


MEASUREMENT IN DIFFERENT DIMENSIONS

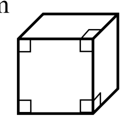
Measurements of **length** are measurements in **one dimension**. They are labeled as cm, ft, km, etc.

1 centimeter

Measurements of **area** are measurements in **two dimensions**. They are labeled as cm^2, ft^2, m^2, etc.



Measurements of **volume** are measurements in **three dimensions**. They are labeled as cm^3, ft^3, m^3, etc.

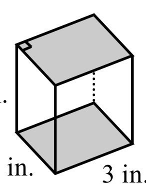


VOLUME OF A PRISM

The **volume** of a prism can be calculated by dividing the prism into layers that are each one unit high. To calculate the volume, multiply the volume of 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}



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