Section 9.3

Perimeter and Area

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Formulas

Figure	Perimeter	Area
Rectangle	$P = 2l + 2w$	$A = lw$
Square	$P = 4s$	$A = s^2$
Parallelogram	$P = 2b + 2w$	$A = bh$
Triangle	$P = s_1 + s_2 + s_3$	$A = \frac{1}{2}bh$
Trapezoid	$P = s_1 + s_2 + b_1 + b_2$	$A = \frac{1}{2}h(b_1 + b_2)$

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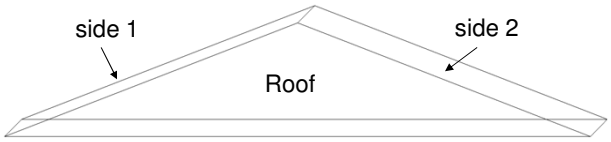
Example

- Marcus Sanderson needs to put a new roof on his barn. One square of roofing covers 100 ft^2 and costs $32.00 per square. If one side of the barn roof measures 50 feet by 30 feet, determine
  a) the area of the entire roof.
  b) how many squares of roofing he needs.
  c) the cost of putting on the roof.



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Example (continued)

- a) The area of one side of the roof is
  $A = lw$
  $A = 30 \text{ ft} \times 50 \text{ ft}$
  $A = 1500 \text{ ft}^2$
- Both sides of the roof = $1500 \text{ ft}^2 \times 2 = 3000 \text{ ft}^2$
- b) Determine the number of squares

$$\frac{\text{area of roof}}{\text{area of one square}} = \frac{3000\text{sq. ft.}}{100\text{sq. ft.}} = 30$$

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Example (continued)

- c) Determine the cost

  30 squares $\times$ \$32 per square

  \$960

  It will cost a total of \$960 to roof the barn.

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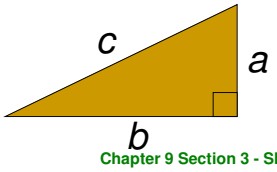
Pythagorean Theorem

The sum of the squares of the lengths of the legs of a right triangle equals the square of the length of the hypotenuse.

$$\text{leg}^2 + \text{leg}^2 = \text{hypotenuse}^2$$

Symbolically, if a and b represent the lengths of the legs and c represents the length of the hypotenuse (the side opposite the right angle), then

$$a^2 + b^2 = c^2$$



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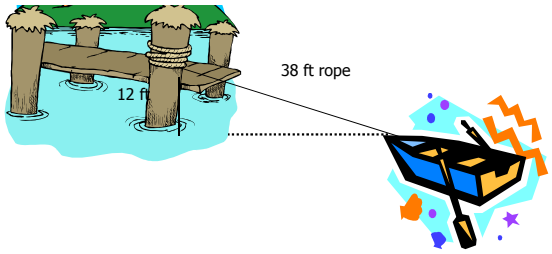
Example

- Tomas is bringing his boat into a dock that is 12 feet above the water level. If a 38 foot rope is attached to the dock on one side and to the boat on the other side, determine the horizontal distance from the dock to the boat.



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Example (continued)

- $a^2 + b^2 = c^2$

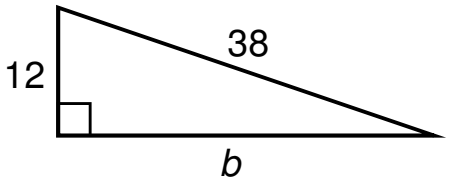
$12^2 + b^2 = 38^2$

$144 + b^2 = 1444$

$b^2 = 1300$

$b = \sqrt{1300}$

$b \approx 36.06$



- The distance is approximately 36.06 feet.

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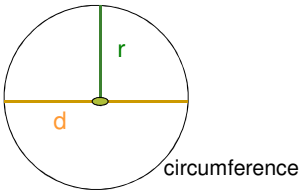
Circles

- A circle is a set of points equidistant from a fixed point called the center.
- A radius, *r*, of a circle is a line segment from the center of the circle to any point on the circle.
- A diameter, *d*, of a circle is a line segment through the center of the circle with both end points on the circle.



- The circumference is the length of the simple closed curve that forms the circle.

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Example

- Terri is installing a new circular swimming pool in her backyard. The pool has a diameter of 27 feet. How much area will the pool take up in her yard? (Use $\pi = 3.14$.)

$A = \pi r^2$

$A = \pi(13.5)^2$ The radius of the pool is 13.5 ft.

$A = 572.265$ The pool will take up about 572 square feet.

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Section 9.4

Volume and Surface Area

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Volume

- Volume is the measure of the capacity of a figure.

  It is the amount of material you can put *inside* a three-dimensional figure.

- Surface area is sum of the areas of the surfaces of a three-dimensional figure.

  It refers to the total area that is on the *outside* surface of the figure.

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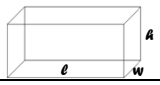
Volume Formulas

Figure	Formula	Diagram
Rectangular Solid	$V = lwh$	
Cube	$V = s^3$	
Cylinder	$V = \pi r^2 h$	
Cone	$V = \frac{1}{3}\pi r^2 h$	
Sphere	$V = \frac{4}{3}\pi r^3$	

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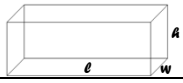
Surface Area Formulas

Figure	Formula	Diagram
Rectangular Solid	$SA = 2lw + 2wh + 2lh$	
Cube	$SA = 6s^2$	
Cylinder	$SA = 2\pi rh + 2\pi r^2$	
Cone	$SA = \pi r^2 + \pi r\sqrt{r^2 + h^2}$	
Sphere	$SA = 4\pi r^2$	

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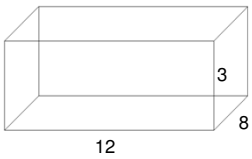
Example

- Mr. Stoller needs to order potting soil for his horticulture class. The class is going to plant seeds in rectangular planters that are 12 inches long, 8 inches wide and 3 inches deep. If the class is going to fill 500 planters, how many cubic inches of soil are needed? How many cubic feet is this?



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Example (continued)

- We need to find the volume of one planter.

$$V = lwh$$
$$V = 12(8)(3)$$
$$V = 288 \text{ in.}^3$$

- Soil for 500 planters would be

  500(288) = 144,000 cubic inches

- The number of cube feet

$$= 144{,}000 \text{ in}^3 \left(\frac{1 \text{ ft}^3}{1728 \text{ in}^3} \right) = \frac{144{,}000}{1728} \text{ ft}^3 = 83.33 \text{ ft}^3$$

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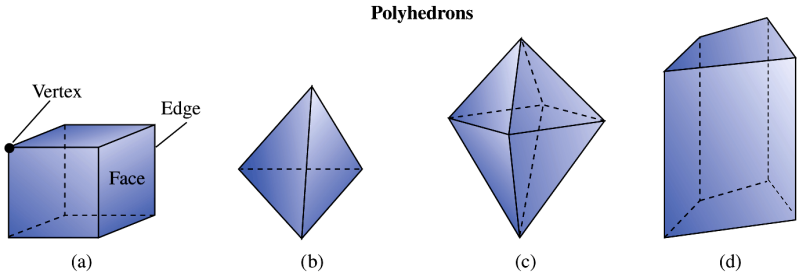
Polyhedron

- A polyhedron is a closed surface formed by the union of polygonal regions.



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Euler's Polyhedron Formula

- Number of vertices – number of edges + number of faces = 2
- Example: A certain polyhedron has 12 edges and 6 faces. Determine the number of vertices for this polyhedron.
- # of vertices – # of edges + # of faces = 2

$$x - 12 + 6 = 2$$
$$x - 6 = 2$$
$$x = 8$$

There are 8 vertices.

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Volume of a Prism

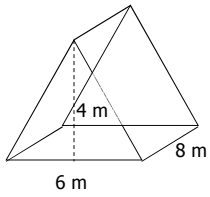
- A ***prism*** is a polyhedron whose bases are congruent and whose sides are parallelograms.
- $V = Bh$, where B is the area of the base and h is the height.
- Example: Find the volume of the figure.

Area of one triangle.

$A = \frac{1}{2}bh$

$A = \frac{1}{2}(6)(4)$

$A = 12 \text{ m}^2$



Find the volume.

$V = Bh$

$V = 12(8)$

$V = 96 \text{ m}^3$

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Volume of a Pyramid

- A **pyramid** is a polyhedron with one base, all of whose faces intersect at a common vertex.
- $V = \frac{1}{3}Bh$ where B is the area of the base and h is the height.

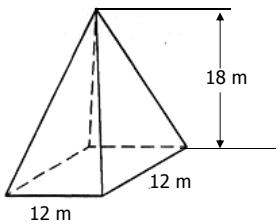
- Example: Find the volume of the pyramid.

Base area = $12^2 = 144$

$V = \frac{1}{3}Bh$

$V = \frac{1}{3}(144)(18)$

$V = 864 \text{ m}^3$



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