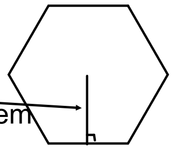
Area of a Regular Polygon

A=1/2aP

the letter a represents the apothem



P represents the perimeter of the polygon

The **apothem** is the segment in a regular polygon that is drawn from the center of the polygon to the midpoint of the one side. It is always perpendicular to the side.

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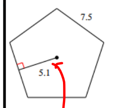

Here is an easy one

find the area

A = 1/2aP

A = 1/2 (5.1)(37.5)

A = 95.63 sq units

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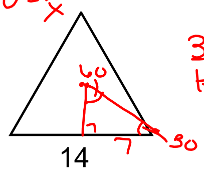
$\tan 60 = \frac{7}{x}$



What is the area?

$\frac{360}{\#\text{ of sides}}$ $\frac{360}{3} = 120$

$120 \div 2 = 60$

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

$P = 14(3) = 42$

$a = 12.125$

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

$A = \frac{1}{2}(12.12)(42)$

$A = 254.6$ units sq.

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WHAT IS THE AREA

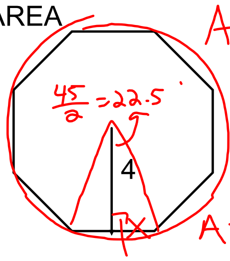
$\frac{360}{8} = 45°$

$45/_2 = 22.5$

$\tan 22.5 = \frac{x}{4}$

$4 \tan 22.5$

$1.66(2)$



Each side is 3.31

$3.31(8)$

$P = 26.5$

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

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

$A = \frac{1}{2}(4)(26.5)$

≈ 53 units squared

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What is the area? 23.4 apothem

$\cos 30 = \frac{y}{3}$

$3\cos 30 = 2.6$

$\boxed{a = 1.5\sqrt{3}}$

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

1) $360 \div 6 \div 2 = 30°$

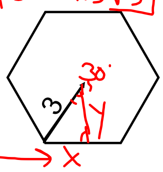
2) $\sin 30 = \frac{x}{3}$

$3 \sin 30$

1.5 ($\frac{1}{2}$ side)

Each side = 3

Looking for the side → x



$A = \frac{1}{2}(2.6)(18)$

$\boxed{P = 3(6) = 18}$

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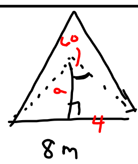
1.



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

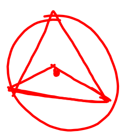
$A = \frac{1}{2} \cdot a \cdot 24$

$\frac{360}{3} = \frac{120}{2} = 60$

$\tan 60 = \frac{4}{a}$

$\frac{4}{\tan 60} = a$

$2.31 = a$



$A = \frac{1}{2} \cdot 2.31 \cdot 24$

$A = 27.7\ m^2$

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$A = \frac{1}{2} a P$

$\frac{360}{5} = \frac{72}{2} = 36$

$a =$

$\cos 36 = \frac{a}{10}$

$10 \cos 36 = 8.09$

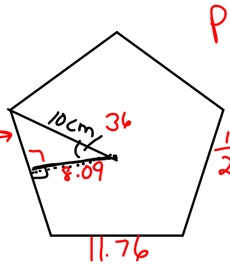
$\frac{1}{2}$ side $= x$

$\sin 36 = \frac{x}{10}$

$10 \sin 36 = \frac{1}{2}$ side

5.88

whole side = 11.76



$P = 11.76 \times 5 = 59$

$A = \frac{1}{2}(8.1)(59)$

239.71 cm^2

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$\frac{360}{6} = \frac{60}{2} = 30$

$\tan 30 = \frac{x}{6}$

$6 \tan 30 = x$

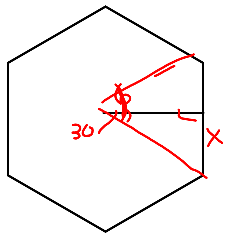
3.46

$\frac{1}{2}$ side $= 3.46$

whole side $= 6.92$

$P = 6.92(6)$

41.5



$A = \frac{1}{2} \cdot 6 \cdot 41.5$

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$A = \frac{1}{2} a P$

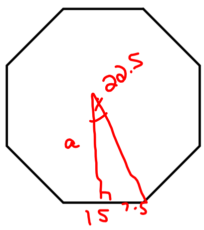
$P = 15(8) = 120$

$\frac{360}{8} = \frac{45}{2} = 22.5$

$\tan 22.5 = \frac{7.5}{a}$

$18.12 = a$

$A = \frac{1}{2}(18.12)(120) \approx 1087.2$



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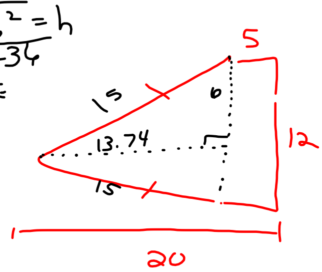
$\sqrt{15^2 - 6^2} = h$

$\sqrt{225 - 36}$

$\sqrt{189} =$

13.74



5×12 $\quad \frac{1}{2} \cdot 12 \cdot 13.74$

$60 + 82.4$

$82.4 + 60 = 142.4$

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$h^2 + 6^2 = 15^2$

$h^2 + 36 = 225$

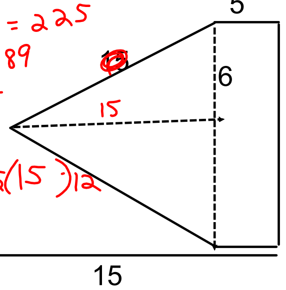
$h^2 = 189$

$h = 13.75$

Area of triangle $= \frac{1}{2}(15)12$

90

150



$5 \times 12 = 60$

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$A = \frac{\bigcirc}{\pi r^2}$

$D = 3$

$R = 1.5$

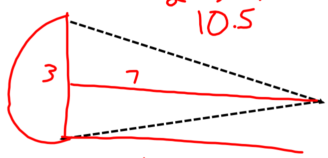
$\frac{\pi (1.5)^2}{2}$

$A = 3.5$

$= \frac{1}{2} b h$

$\frac{1}{2}(3)(7)$

10.5



$3.5 + 10.5$

14

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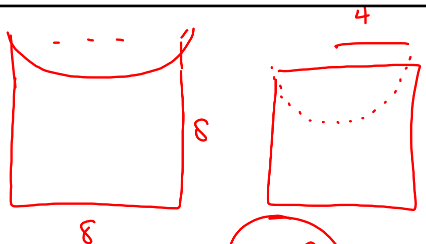

$8 \times 8 \rightarrow 64 - \frac{\pi r^2}{2}$

38.9

$64 - \frac{\pi 4^2}{2}$

$64 - 8\pi$

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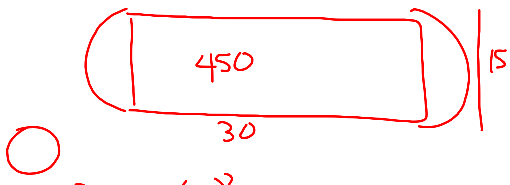
$\boxed{450}$ + πr^2 = 626.71

30×15 176.7



$\pi r^2 = \pi(7.5)^2 = 176.7$

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11.5

Vocabulary

A **polyhedron** is a solid that is bounded by polygons, called **faces**, that enclose a single region of space.

An **edge** of a polyhedron is a line segment formed by the intersection of two faces.

A **vertex** of a polyhedron is a point where three or more edges meet.

The **bases** of a prism are congruent polygons in parallel planes. The **base** of a pyramid is a polygon.

Theorem 1 Euler's Theorem: The number of faces (F), vertices (V), and edges (E) of a polyhedron are related by the formula $F + V = E + 2$.

A polyhedron is **regular** if all of its faces are congruent regular polygons.

A polyhedron is **convex** if any two points on its surface can be connected by a segment that lies entirely inside or on the polyhedron.

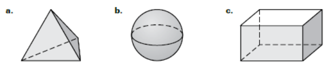
A polyhedron is *concave* if any two points on its surface can be connected by a segment that goes on the outside of the polyhedron.

Platonic solids are five regular polyhedra that include the regular tetrahedron, cube, regular octahedron, regular dodecahedron, and regular icosahedron.

A **cross section** is the intersection of a plane and a solid.

Identify and name polyhedra

Tell whether the solid is a polyhedron. If it is, name the polyhedron and find the number of faces, vertices, and edges.



Solution

a. The solid is formed by polygons, so it is a polyhedron. The base is a triangle, so it is a triangular pyramid. It has 4 faces, 4 vertices, and 6 edges.

b. The sphere has a curved surface, so it is not a polyhedron.

c. The solid is formed by polygons, so it is a polyhedron. The two bases are congruent rectangles, so it is a rectangular prism. It has 6 faces, 8 vertices, and 12 edges.

Geometry

Apr 4-7:44 AM

11.6

Find volumes of prisms and cylinders.

Vocabulary

The **volume** of a solid is the number of cubic units contained in its interior.

Postulate 27 Volume of a Cube Postulate: The volume of a cube is the cube of the length of its side.

Postulate 28 Volume Congruence Postulate: If two polyhedra are congruent, then they have the same volume.

Postulate 29 Volume Addition Postulate: The volume of a solid is the sum of the volumes of all its nonoverlapping parts.

Theorem 6 Volume of a Prism: The volume V of a prism is $V = Bh$ where B is the area of a base and h is the height.

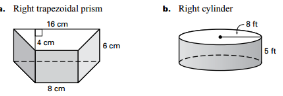
Theorem 7 Volume of a Cylinder: The volume V of a cylinder is $V = Bh = \pi r^2 h$, where B is the area of a base, h is the height, and r is the radius of a base.

Theorem 8 Cavalieri's Principle: If two solids have the same height and the same cross-sectional area at every level, then they have the same volume.

Find volumes of prisms and cylinders

Find the volume of the solid.

a. Right trapezoidal prism **b.** Right cylinder



Solution

a. The area of the base is $\frac{1}{2}(4)(16 + 8) = 48\text{ cm}^2$ and $h = 6$ cm.
$V = Bh = 48(6) = 288\text{ cm}^3$

b. The area of the base is $\pi r^2 = (8)^2 = 64\pi\text{ ft}^2$. Use $h = 5$ ft to find the volume.
$V = Bh = 64\pi(5) = 320\pi \approx 1005.31\text{ ft}^3$

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11.7

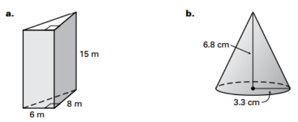
Volumes of pyramids and cones.

Vocabulary

Theorem 9 Volume of a Pyramid: The volume V of a pyramid is $V = \frac{1}{3}Bh$ where B is the area of the base and h is the height.

Theorem 10 Volume of a Cone: The volume V of a cone is $V = \frac{1}{3}Bh = \frac{1}{3}\pi r^2 h$, where B is the area of the base, h is the height, and r is the radius of the base.

Find the volume of a solid.



Solution

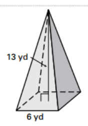
a. $V = \frac{1}{3}Bh = \frac{1}{3}\left(\frac{1}{2} \cdot 6 \cdot 8\right)(15) = 120\text{ m}^3$

b. $V = \frac{1}{3}Bh = \frac{1}{3}(\pi r^2)(h) = \frac{1}{3}(\pi \cdot 3.3^2)(6.8)$

$V = 24.684\pi \approx 77.55\text{ cm}^3$

Exercise for Example 1

1. Find the volume of the pyramid. Round your answer to two decimal places.



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