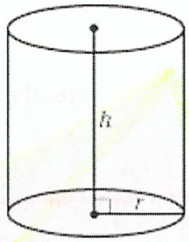
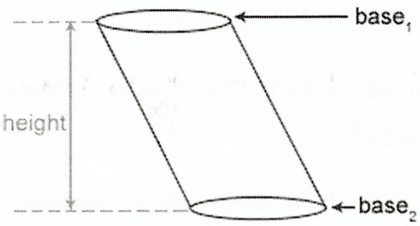
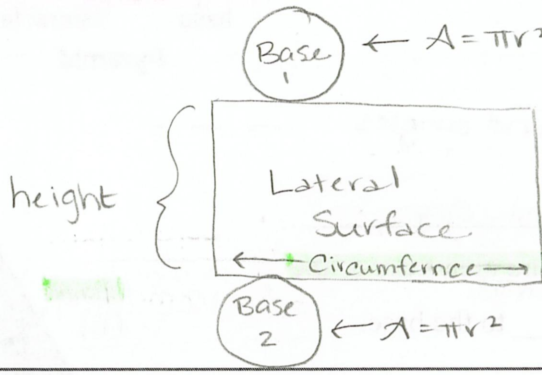
Cylinder: A solid with congruent, circular, parallel bases.

Right Cylinder: Segment joining the centers of the bases is perpendicular to the bases.





Cylinder Net:



$\leftarrow A = \pi r^2$ (Base 1)

$\leftarrow$ Lateral Area (Rectangle) $= b \cdot h$

$= C(h)$

$= (2\pi r)h$

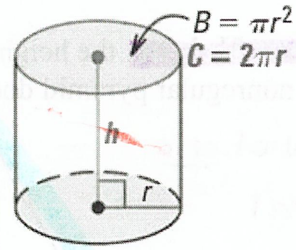
$\leftarrow A = \pi r^2$ (Base 2)

Surface Area of a Right Cylinder:

The surface area S of a right cylinder is

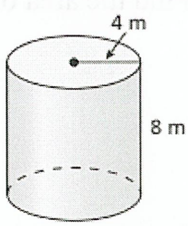
$$SA = 2B + Ch \rightarrow SA = \underbrace{2(\pi r^2)}_{\text{Areas of bases}} + \overbrace{(2\pi r)h}^{\text{Area of Lateral Surface}}$$

Base Area $= \pi r^2$ Circumference $= 2\pi r$



Where B is the area of a base, C is the circumference of a base, r is the radius of a base and h is the height.

Example #5: Find the surface area of the right cylinder.



$SA = 2(\pi \cdot 4^2) + (2\pi \cdot 4)8$

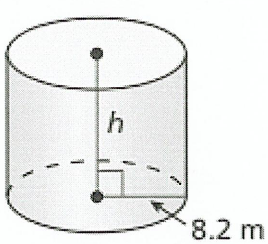
$SA = 32\pi + 64\pi$

$\boxed{SA = 96\pi \text{ m}^2}$ ← Exact Surface Area

$\boxed{SA \approx 301.59 \text{ m}^2}$ ← Approx Surface Area

Example #6: Find the height of the right cylinder.

$S = 1097 \text{ m}^2$



$1097 = 2(\pi \cdot 8.2^2) + (2\pi \cdot 8.2)h$

$1097 = 422.48 + 51.52h$

$-422.48 \quad -422.48$

$\frac{674.52}{51.52} = \frac{51.52h}{51.52}$

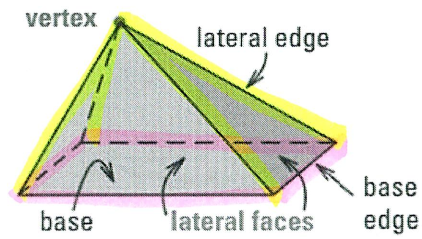
$\boxed{h \approx 13.09 \text{ m}}$

Chapter 12.3: Surface Area of Pyramids and Cones

Pyramid: a polyhedron in which the base is a polygon and the lateral faces are triangles with a common vertex.

Lateral Edge: Intersection of two lateral faces.

Base Edge: Intersection of the base and a lateral face.

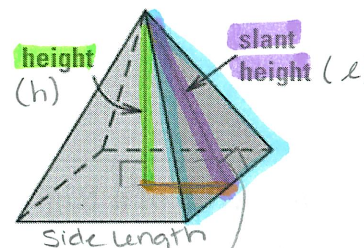


Pyramid

All sides and angles are ≅

Regular Pyramid: has a regular polygon for a base and the segment joining the vertex and the center of the base is perpendicular to the base.

height of pyramid.

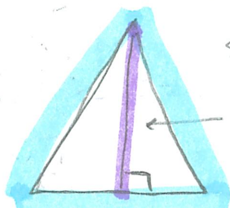


Regular pyramid

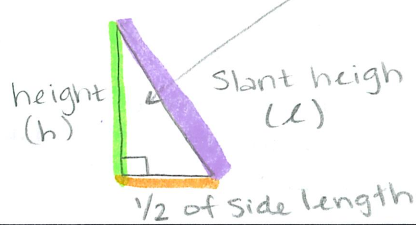
Lateral Faces are all congruent isosceles triangle

Slant Height: the height of a lateral face of the regular pyramid (A nonregular pyramid does not have aslant height)

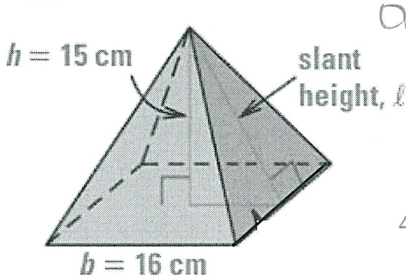
veiw of one lateral face →

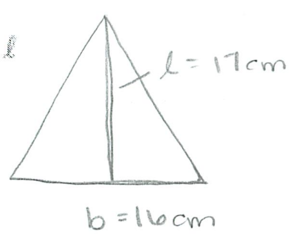


Slant height (ℓ) is the height of the 2-D lateral face



Example #1: A regular square pyramid has height of 15 cm and a base edge length of 16 cm. Find the area of each lateral face of the pyramid.



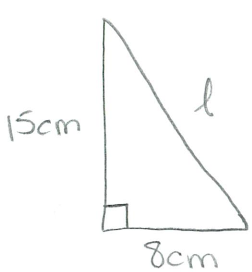


One Lateral Face Area $= \frac{1}{2}bh$

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

$= \frac{1}{2}(16)(17)$

$\boxed{A = 136\text{ cm}^2}$



$15^2 + 8^2 = \ell^2$

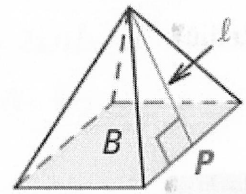
$\ell = \sqrt{15^2 + 8^2}$

$\ell = 17$cm

Surface Area of a Regular Pyramid (Theorem 12.4):

The surface area S of a regular pyramid is

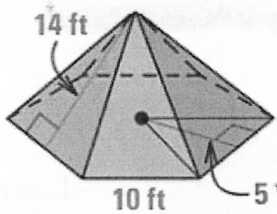
$$SA = \underbrace{B}_{\text{Base Area}} + \underbrace{\tfrac{1}{2} P l}_{\text{Lateral faces Area}}$$



where B is the area of the Base, P is the perimeter of the base, and l is the slant height.

Base Area formula used will depend on the shape of the base

Example #2: Find the surface area of the regular hexagonal pyramid. → $SA = B + \frac{1}{2} P l$



Base Area $= \frac{1}{2} a P$

$a = 5\sqrt{3}$ ft

$P = 10(6)$

$P = 60$ ft

$l = 14$ ft

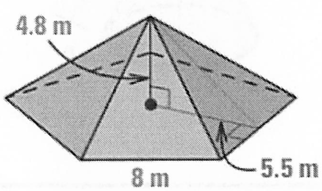
$B = \frac{1}{2}(5\sqrt{3})(60)$

$B \approx 259.81 \text{ ft}^2$

$SA = 259.81 + \frac{1}{2}(60)(14)$

$\boxed{SA \approx 679.81 \text{ ft}^2}$

Example #3: Find the surface area of the regular pentagonal pyramid shown → $SA = B + \frac{1}{2} P l$



Base Area $= \frac{1}{2} a P$

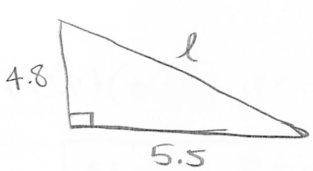
$a = 5.5$ m

$P = 8(5)$

$P = 40$m

$B = \frac{1}{2}(5.5)(40)$

$B = 110 \text{ m}^2$



$4.8^2 + 5.5^2 = l^2$

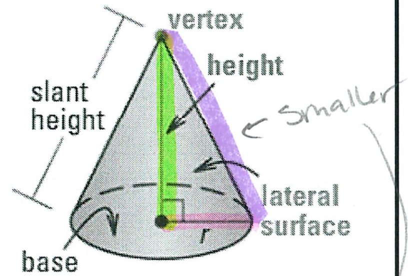
$l = \sqrt{4.8^2 + 5.5^2}$

$l = 7.3$m

$SA = 110 + \frac{1}{2}(40)(7.3)$

$\boxed{SA = 256 \text{ m}^2}$

Cone: a solid with a Circular base and a vertex that is not in the same plane as the base.



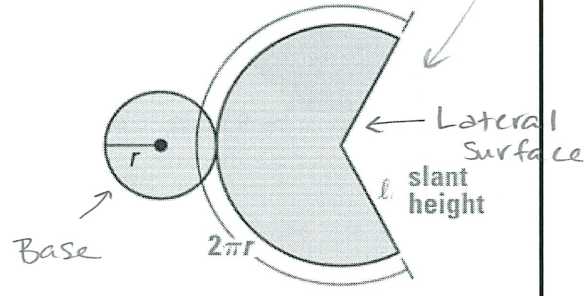
Right cone

Radius: Radius of the base is the radius of the cone

Height: Segment connecting the base the vertex

In a right cone, the (the height) segment joining the vertex and the cen[illegible] is perpendicular to the base, and the Slant height is the distance between the vertex and a point of the base edge.

Lateral Surface: consists of all segments that connect the vertex to the base.



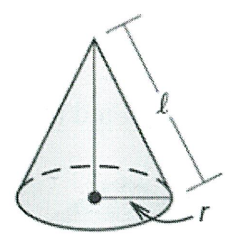
Cone Net

Surface Area of a Right Cone (Theorem 12.5):

The surface area S of a right cone is

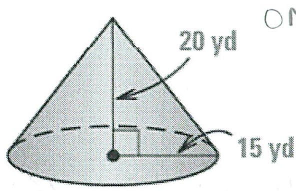
$$SA = \underbrace{\overset{\pi r^2}{B}}_{\text{Base Area}} + \underbrace{\tfrac{1}{2}\overset{2\pi r}{C}\ell}_{\text{Lateral Area}} \Rightarrow SA = \pi r^2 + \tfrac{1}{2}(2\pi r)\ell$$

$$SA = \pi r^2 + \pi r \ell$$



where *B* is the area of the Base, *C* is the circumference of the base, *r* is the radius of the base, and *l* is the slant height.

Example #4: Find the lateral area of the right cone. ONLY (DO NOT include base area) $\rightarrow SA = \cancel{B} + \frac{1}{2}C\ell$



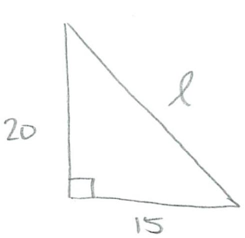
$C = 2\pi r$

$C = 2\pi(15)$

$C = 30\pi$ yd

Lateral Area $= \frac{1}{2}(30\pi)(25)$

$\boxed{\approx 1,178.10 \text{ yd}^2}$

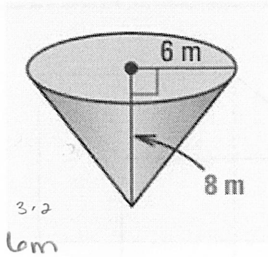


$20^2 + 15^2 = \ell$

$\ell = \sqrt{20^2 + 15^2}$

$\ell = 25$ yd

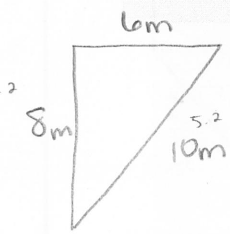
Example #5: Find the surface area of the right cone. $\rightarrow SA = B + \frac{1}{2}C\ell$



$SA = (\pi \cdot 6^2) + \frac{1}{2}(\cancel{2}\pi \cdot 6)(10)$

$SA = 36\pi + 60\pi$

$\boxed{SA \approx 301.59\, m^2}$



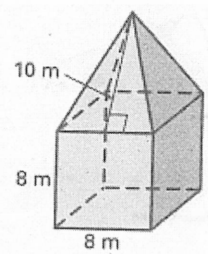
$6^2 + 8^2 = \ell^2$

$\ell = \sqrt{6^2 + 8^2}$

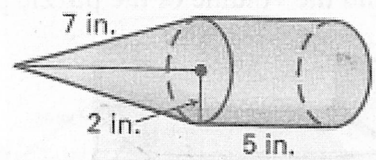
$\ell = 10m$

Example #6: Find the surface area of the solid. The pyramids are regular and the cones are right. Round your answer to the nearest hundredth, if necessary.

a.)



b.)



Cube: (5 sides)

SA of one side $= 8(8)$
$= 64\, m^2$

SA of 5 sides $= 5(64)$
$= 320 m^2$

Pyramid: (no base)

$SA = \cancel{B} + \frac{1}{2}P\ell$

$P = 8(4)$

$P = 32m$ $\ell = 10m$

$SA = \frac{1}{2}(32)(10)$
$= 160\, m^2$

$\boxed{\text{Total } SA = 320 + 160 = 480\, m^2}$

Cylinder: (only 1 base)

$SA = \cancel{2}B + Ch$

$SA = (\pi \cdot 2^2) + (2\pi \cdot 2)(5)$

$SA = 4\pi + 20\pi$

$SA = 24\pi\, in^2$

Cone: (No base)

$SA = \cancel{B} + \frac{1}{2}C\ell$

$SA = \frac{1}{2}(\cancel{2}\pi \cdot 2)(7)$

$SA = 14\pi\, in^2$

Total $SA = 24\pi + 14\pi$

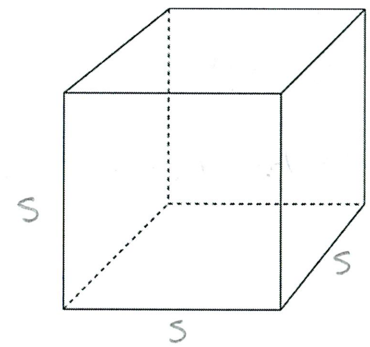
$SA = 38\pi\, in^2 \leftarrow$ Exact

$SA \approx 119.38\, in^2 \leftarrow$ Approx

Chapter 12.4: Volume of Prisms and Cylinders

Volume: the number of cubic units contained in its interior.

Measured in cubic units → in^3, cm^3, ft^3



Volume of a Cube (Postulate 27):

The volume of a cube is the cube of the length of its side. $V = s^3$

Volume Congruence Postulate (Postulate 28):

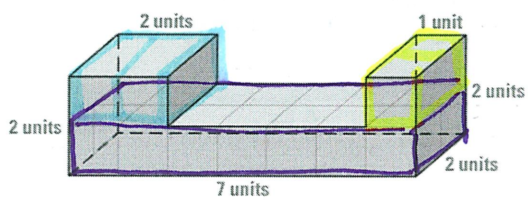
If two polyhedral are congruent, then they have the same volume.

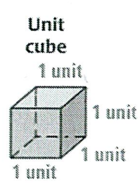
Volume Addition Postulate (Postulate 29):

The volume of a solid is the sum of the volumes of all its nonoverlapping parts.

(Example #1)

Example #1: Find the volume of the puzzle piece in cubic units.





Volume of Bottom = 14 $unit^3$

Volume of top left = 4 $unit^3$

Volume of top right = 2 $units^2$

Total Volume = 14 + 4 + 2

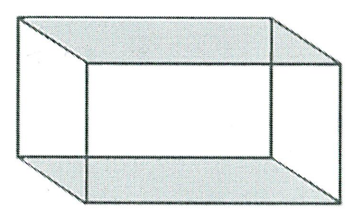
$\boxed{V = 20 \, unit^3}$

Volume of a Prism (Theorem 12.6):

The volume V of a prism is $V = B \cdot h$

where B is the area of a base and h is the height.

(Base Area formula used will depend on the shape of the base)



Volume of a Cylinder (Theorem 12.7):

The volume V of a cylinder is $V = B \cdot h$

Where B is the area of a base, h is the height, and r is the radius of a base.

$B = \pi r^2$ (everytime)