Geometry 12.3

Find lateral areas and surface areas of pyramids.

Find lateral areas and surface areas of cones.

tetrahedron (equil)

pyramid — polygon w/ 1 Base — triangle

apex/vertex

regular pyramid — reg.

base

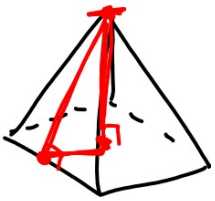
face — Δ faces

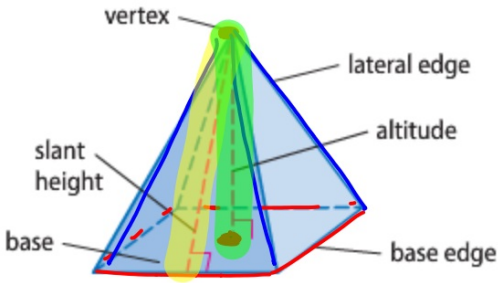
slant height (ℓ)

altitude (h)

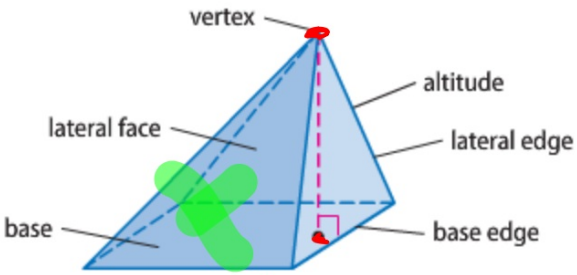
right cone

oblique cone

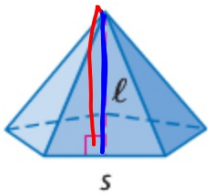


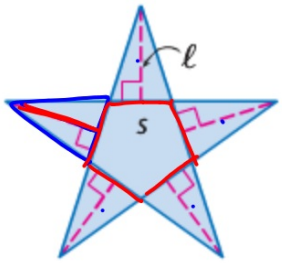


Regular Pyramid



Nonregular Pyramid





prism p^h popcorn box

$LA = \frac{1}{2}kh(n) = \frac{1}{2}p\ell$

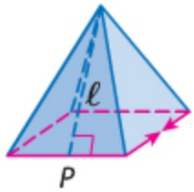
$SA = \downarrow + 1B$

KeyConcept Lateral Area of a Regular Pyramid

Words The lateral area L of a regular pyramid is $L = \frac{1}{2}P\ell$, where ℓ is the slant height and P is the perimeter of the base.

Symbols $L = \frac{1}{2}P\ell$

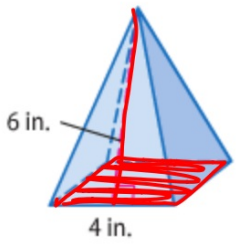
Model



Prisms LA=pl....sides are rectangles
Pyramids LA=1/2pl...sides are triangles

Example 1 Lateral Area of a Regular Pyramid

Find the lateral area of the square pyramid.



not h

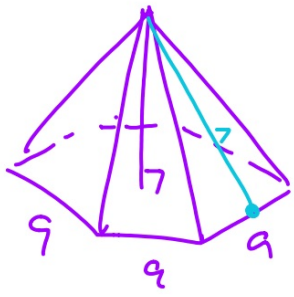
$$LA = \frac{1}{2} p \ell$$

$$= \frac{1}{2} \cdot 16 \cdot 6$$

$$= 48 \text{ in}^2$$

$$SA = 48 + 16 = 64 \text{ in}^2$$

1. Find the lateral area of a regular hexagonal pyramid with a base edge of 9 centimeters and a lateral height of 7 centimeters.



$P = 54$

$LA = \frac{1}{2} \cdot 54 \cdot 7$

$= 189 \text{ cm}^2$

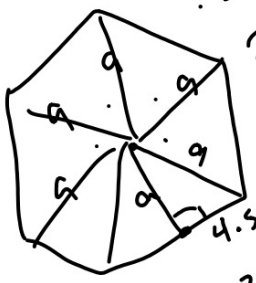
$SA = 189 + (210.33)$

399.3 cm^2.

$\frac{1}{2} aP$

$\frac{1}{2}(7.79)(54)$

210.33



$a^2 + 4.5^2 = 9^2$

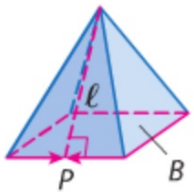
$a = 7.79$

KeyConcept Surface Area of a Regular Pyramid

Words The surface area S of a regular pyramid is $S = \frac{1}{2}P\ell + B$, where P is the perimeter of the base, ℓ is the slant height, and B is the area of the base.

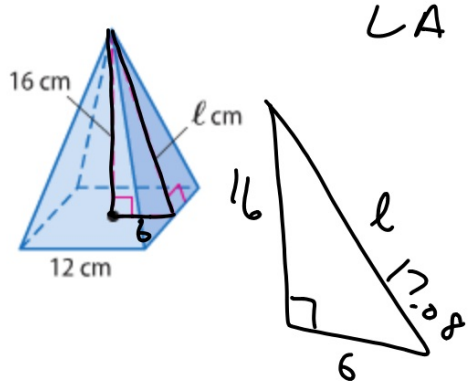
Symbols $S = \frac{1}{2}P\ell + B$

Model



Example 2 Surface Area of a Square Pyramid

Find the surface area of the square pyramid to the nearest tenth.



LA + B

$\frac{1}{2}pl + 144$

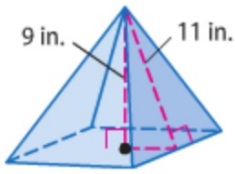
$\frac{1}{2} \cdot 48 \cdot 17.08 + 144$

$409.92 + 144$

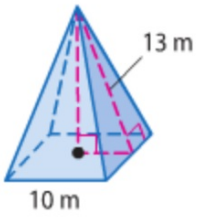
$553.9\ cm^2$

GuidedPractice

2A.

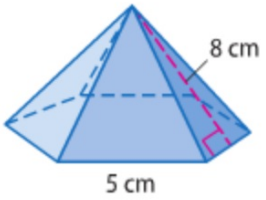


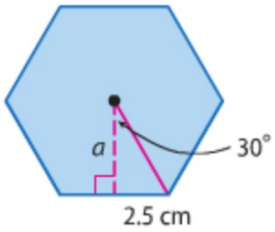
2B.



Example 3 Surface Area of a Regular Pyramid

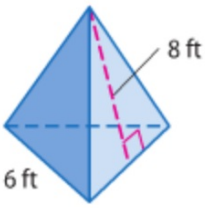
Find the surface area of the regular pyramid. Round to the nearest tenth.



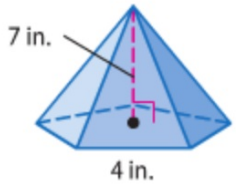


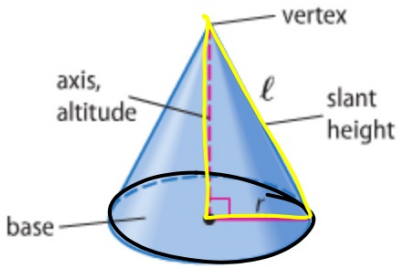
GuidedPractice

3A.

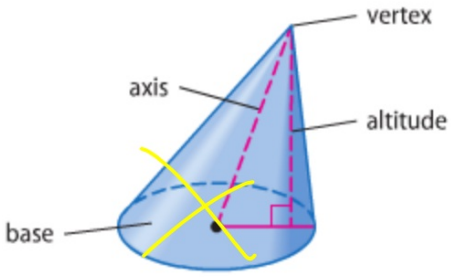


3B.





Right Cone



Oblique Cone

$C = \pi d$

$LA = \frac{1}{2} p l$

$\frac{1}{2} \cdot \pi \cdot d \cdot \ell$

KeyConcept Lateral and Surface Area of a Cone

Words

The lateral area L of a right circular cone is

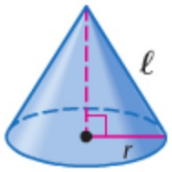
$$\frac{1}{2}P\ell$$

The surface area S of a right circular cone is

$$\frac{1}{2}P\ell + B$$

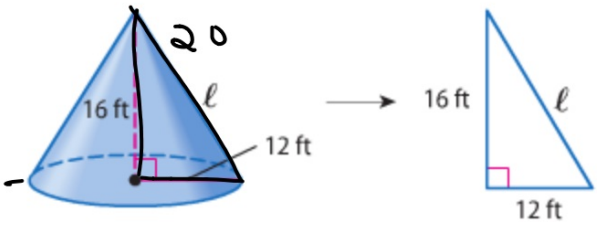
Symbols

Model



Real-World Example 4 Lateral Area of a Cone

ARCHITECTURE The conical slate roof at the right has a height of 16 feet and a radius of 12 feet. Find the lateral area.



$\frac{1}{2}p\ell = \frac{1}{2}(\pi \cdot 24)(20)$ 754.0 ft^2

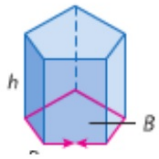
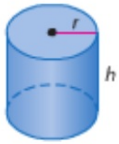
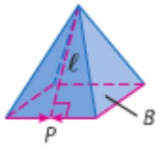
GuidedPractice

4. ICE CREAM A waffle cone is $5\frac{1}{2}$ inches tall and the diameter of the base is $2\frac{1}{2}$ inches. Find the lateral area of the cone. Round to the nearest tenth.

WatchOut!

Bases The bases of right prisms and right pyramids are not always regular polygons.

ConceptSummary Lateral and Surface Areas of Solids

Solid	Model	Lateral Area	Surface Area
prism		$L = Ph$	$S = L + 2B$ or $S = Ph + 2B$
cylinder			
pyramid		$L = \frac{1}{2}P\ell$	$S = \frac{1}{2}P\ell + B$
cone