Geometry 12.3

Find lateral areas and surface areas of pyramids.

Find lateral areas and surface areas of cones.

pyramid

apex/vertex point at top

regular pyramid

base any polygon

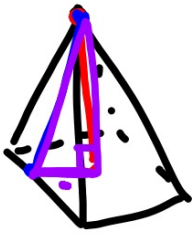
face

* slant height (l)

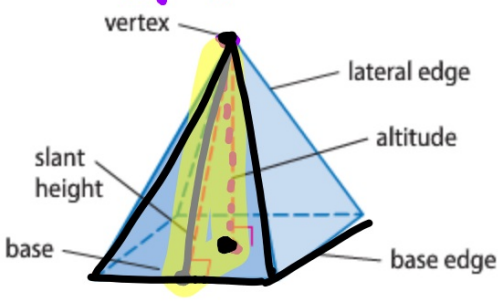
* altitude (h)

right cone

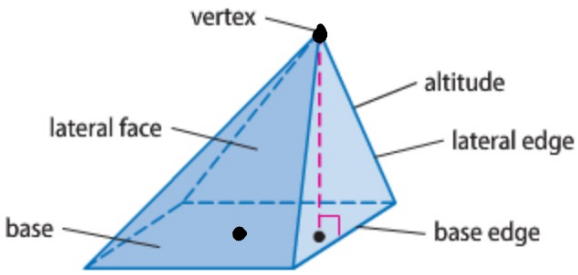
oblique cone



apex

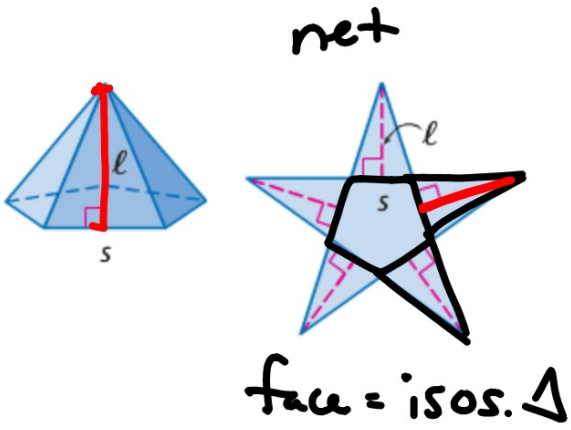


Regular Pyramid



Nonregular Pyramid

oblique



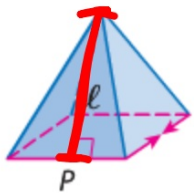
popcorn box

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



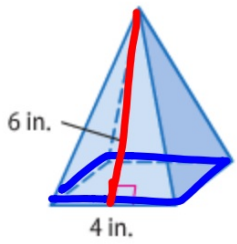
LA: $\frac{1}{2}P\ell$

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

$SA = LA + B$

Example 1 Lateral Area of a Regular Pyramid

Find the lateral area of the square pyramid.



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

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

$= 48 in^2$

$SA = 48 + 16 = 64 in^2$

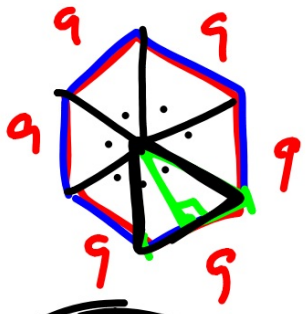
$\frac{1}{2} p \cdot l$

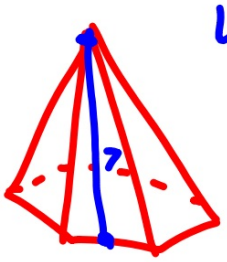
$\frac{1}{2} \cdot 16 \cdot 6$

SA = LA + B

189 + 210.6 = 399.6 cm²

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





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

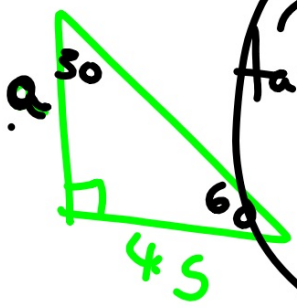
$= \frac{1}{2} \cdot 54 \cdot 7$

$= 189 \text{ cm}^2$

$\frac{1}{2} a p$

$\frac{1}{2}(7.8)(54)$

210.6



$\tan 60 = \frac{a}{4.5}$

$a = 4.5(1.73)$

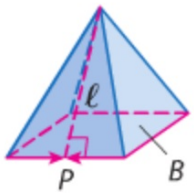
$a = 7.8$

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

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.

Model



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

LA

$SA = LA + B$

$410.16 + 144 = 554.2\ cm^2$

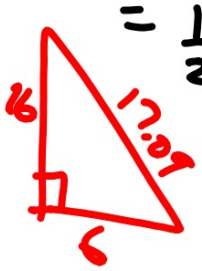
Example 2 Surface Area of a Square Pyramid

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

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

$= \frac{1}{2} \cdot 48 \cdot 17.09$

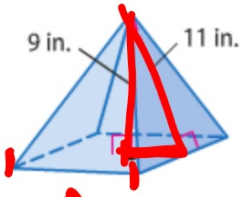
$= 410.16$

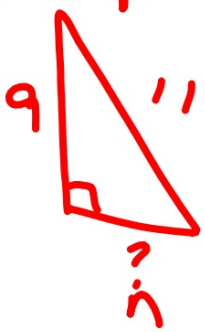


$SA = LA + B$

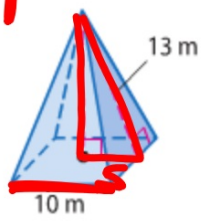
GuidedPractice

2A.



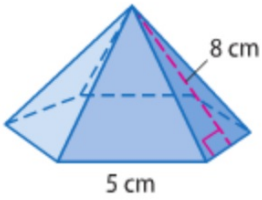


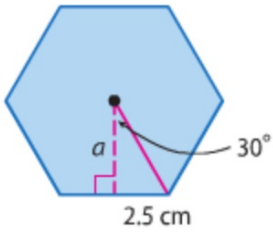
2B.



Example 3 Surface Area of a Regular Pyramid

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

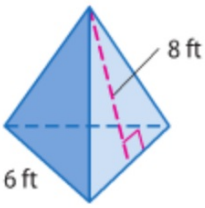




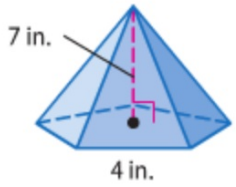
Reg. polygon: A=(1/2)ap

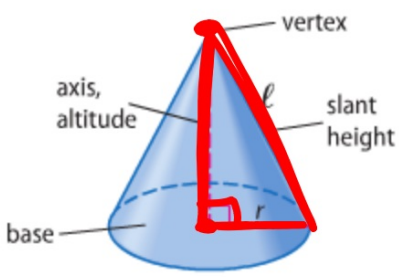
GuidedPractice

3A.

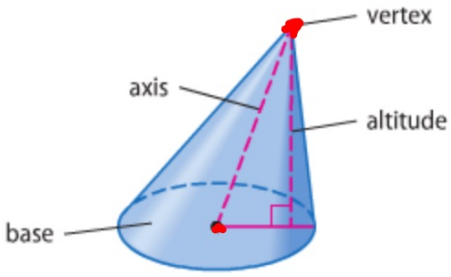


3B.





Right Cone



Oblique Cone

KeyConcept Lateral and Surface Area of a Cone

Words

The lateral area L of a right circular cone is

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

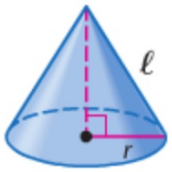
The surface area S of a right circular cone is

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

Symbols

$SA = LA + B$

Model

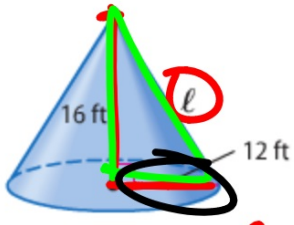


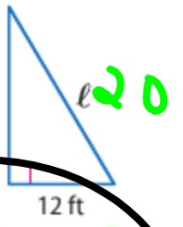
SA = LA + B

Real-World Example 4 Lateral Area of a Cone

754 + 452.39 1206.4 ft²

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





754 ft²

LA = ½ p · ℓ
= ½ (π 12) 20

πr²
452.39

GuidedPractice

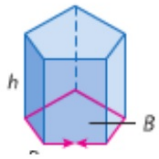
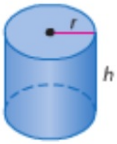
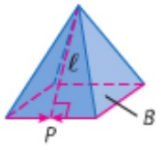
4. ICE CREAM A waffle cone is $5\frac{1}{2}$ inches tall and the diameter of the base is $2\frac{1}{2}$ inches. Find the lateral area of the cone. Round to the nearest tenth.

p 856
7-19
55 56 57

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