

# Surface Area of Pyramids and Cones.notebook

MAAPC20S

Measurement

Lesson 3

## Lesson Three – Surface Areas of Right Pyramids and Right Cones

Recall:

Perimeter of a Square:  $P = 4s$        $s = \text{side length}$

Area of a Square:  $A = s^2$

Pythagorean Theorem:  $a^2 + b^2 = c^2$

Right pyramid – are 3-dimensional objects that have triangular faces and a base that is a polygon.

Right circular cone – is a 3-dimensional object that has a circular base and a curved surface.

**Tetrahedron** – a triangular pyramid



**Apex** – the point where the triangular faces meet

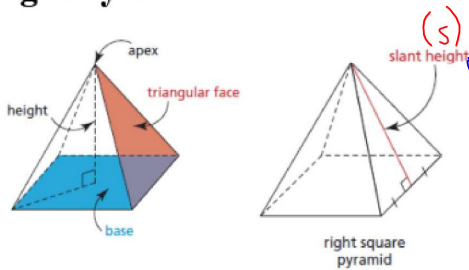
Height of the pyramid – is the perpendicular distance from the apex to the centre of the base.

**Regular Polygon** – a polygon that has all sides equal and all angles equal.

**Lateral Area** – the surface area of an object, not including the base (just the sides)

**Slant Height** – the height of a triangular face of a pyramid

### Right Pyramid



If the base is a regular polygon, the triangular faces are congruent.

To find the surface area of a Right Pyramid, you can find the area of each side, and then add together.

**Surface Area of a Right Pyramid with a Regular Polygon Base**

Total SA =  $\frac{(\text{Perimeter of the base})s}{2} + \text{base area}$

Lateral surface area (LSA)

(area of whatever shape the base is)

on formula sheet       $SA = \frac{Ps}{2} + B$

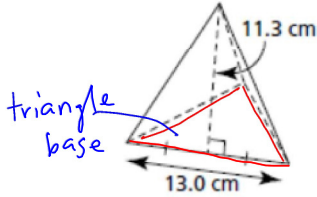
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**Example 1:** Find the lateral area of this right pyramid to the nearest square unit.



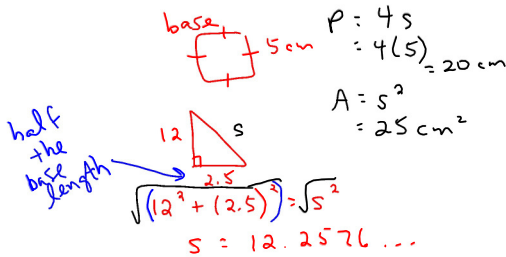
triangle base

just area of the sides

$$\begin{aligned} LSA &= \frac{Ps}{2} \\ &= \frac{39(11.3)}{2} \\ &= 220.35 \text{ cm}^2 \\ &\text{or } 220 \text{ cm}^2 \end{aligned}$$

$P = 3(13) = 39$

**Example 2:** Calculate the surface area of a right square pyramid with a base length of 5 cm and a perpendicular height of 12 cm.



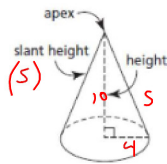
half the base length

$P = 4s = 4(5) = 20 \text{ cm}$   
 $A = s^2 = 25 \text{ cm}^2$

$$\begin{aligned} SA &= \frac{Ps}{2} + B \\ &= \frac{(12.2576...)(20)}{2} + 25 \\ &= 147.577 \text{ cm}^2 \end{aligned}$$

Note: Perpendicular height is given so use pyth theorem to determine slant height (s)

## Surface Area of a Right Circular Cone



**Surface Area of a Right Circular Cone**

$$SA = \text{lateral surface area} + \text{base area (circle)}$$

$$= \pi r s + \pi r^2$$

**Example 1:** A right cone has a base radius of 4 m and a height of 10 m. Calculate the surface area of this cone to the nearest square metre.

$$\begin{aligned} 4^2 + 10^2 &= s^2 \\ 116 &= s^2 \\ \sqrt{116} &= s \\ &\text{or } 10.7703... \end{aligned}$$

$$\begin{aligned} SA &= \pi r s + \pi r^2 \\ &= \pi(4)(10.7703...) + \pi(4)^2 \\ &= 185.6094... \\ &\text{or } 186 \text{ m}^2 \end{aligned}$$

perpendicular height

**Example 2:** The lateral area of a cone is 220 cm<sup>2</sup>. The diameter of the cone is 10 cm. Determine the height of the cone to the nearest tenth of a centimeter.

need brackets on Calc

$$\begin{aligned} LSA &= \pi r s \\ 220 &= \pi(5)s \\ \frac{220}{(5\pi)} &= s \\ s &= 14.0056... \end{aligned}$$



radius 5cm

$$\begin{aligned} h^2 &= (14.0056...) ^2 - 5^2 \\ h &= \sqrt{\text{ans}} \\ h &= 13.1 \text{ cm} \end{aligned}$$

Assignment: Pg 34; 4 a, 6a, 8, 12, 13 a, 16