U9D4_T_Surface Area of 3_D Shapes

Tuesday, May 22, 2018 9:21 PM

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MPM 1DI U9D4

Surface Area of 3-Dimensional Shapes

Prism:

Surface Area: $A_{total} = 2 \times A_{base} + A_{rectangles}$

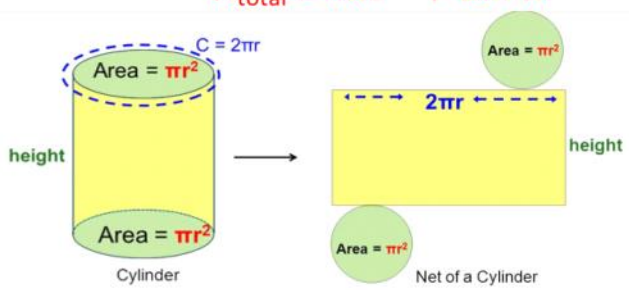
Pyramid:

Surface Area: $A_{total} = A_{base} + A_{triangles}$

Cylinder:

Surface Area: $A_{total} = 2 \times A_{circular\ base} + A_{lateral\ face}$

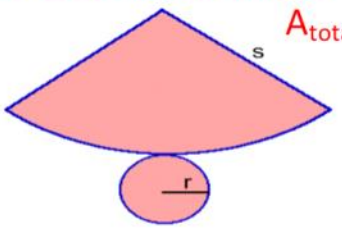
$$A_{total} = 2\pi r^2 + 2\pi rh$$



Cone:

Surface Area: $A_{total} = A_{circular\ base} + A_{lateral\ face}$

$$A_{total} = \pi r^2 + \pi rs$$



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Sphere:

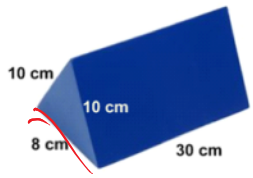
Surface Area: $A_{total} = 4\pi r^2$

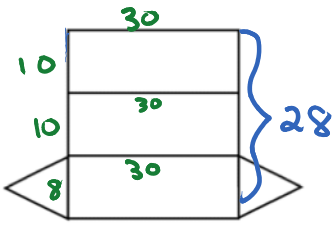
Demonstration surface area of sphere using Surface Area of Cylinder:
https://www.youtube.com/watch?v=Fyvq-jIQKr8

Orange Demonstration:
https://www.youtube.com/watch?v=FB-acn7d0zU

Another Video of interest:
https://www.youtube.com/watch?v=T_DBkFnr4NM

Example 1: Calculate the surface area of the following triangular-based prism.





$h^2 = 10^2 - 4^2$

$h^2 = 84$

$h = \sqrt{84}$ or $-\sqrt{84}$

$A_{TOTAL} = 2A_{\triangle} + A_{\square}$'s

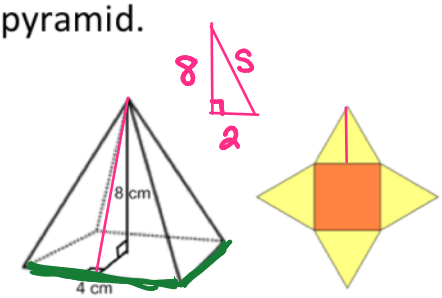
$= 2\left(\frac{bh}{2}\right) + lw$

$= 8\sqrt{84} + (28)(30)$

$= 913.3212\ldots$

$\doteq 913.3\ cm^2$

Example 2: Calculate the surface area of the square-based pyramid.



$s^2 = 8^2 + 2^2$

$s^2 = 68$

$s = \sqrt{68}$ or ~~$-\sqrt{68}$~~

$A_{TOTAL} = A_{\square} + 4A_{\triangle}$

$= b^2 + \cancel{4}^{2}\left(\frac{bs}{\cancel{2}_{1}}\right)$

$= 4^2 + 2(4)(\sqrt{68})$

$= 81.96969\ldots$

$\doteq 82.0\ cm^2$

Include the .0 to show the accuracy of your answer.

$A_{CONE} = \pi r^2 + \pi rs$

Example 3: The slant height of a cone is tripled. Does this triple the surface area of the cone? Explain.

Tripling the s will triple the area of the lateral surface but not the circular base.
The total surface area will not be tripled.

Example 4: A cone is formed from a circle with a 90º sector removed. Another cone is formed from a semicircle with the same radius. How do the two cones differ? How are they the same?

Same → slant height

different → height
→ base radius
→ volume
→ surface area

πrs

Example 5: The lateral area of a cone with slant height 14 cm is 132 cm^2.

a) Find the radius of the cone, to the nearest cm.

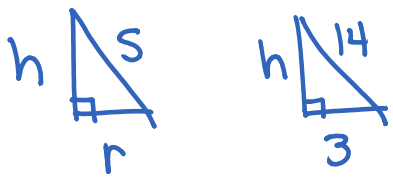
$\pi rs = A_{lateral\ surface}$

$\pi r(14) = 132$

$\frac{14\pi r}{14\pi} = \frac{132}{14\pi}$

$r \doteq 3\ cm$

b) Find the height of the cone, to the nearest tenth of a cm.



$h^2 = 14^2 - 3^2$

$h^2 = 196 - 9$

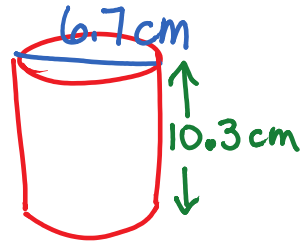
$h^2 = 187$

$h = \sqrt{187}$ or $-\sqrt{187}$

$h = 13.67...$

$h \doteq 13.7\ cm$

Example 6: A can of soup is 10.3 cm high and its diameter is 6.7 cm. How much paper is required to make the soup can label?



$r = \frac{6.7}{2}$

$r = 3.35\text{ cm}$

$A_{\text{lateral surface}} = 2\pi rh$

$A_{\text{paper}} = 2\pi(3.35)(10.3)$

$\doteq 216.8\text{ cm}^2$

$\therefore$ the paper area needs to be 216.8cm^2.

Example 7: The radius of a sphere is tripled. Does this triple the surface area of the sphere? Explain.

↳ $A_{\text{sphere}} = 4\pi r^2$

r is squared so tripling r will result in a surface area 9 times the original surface area.

Example 8: The surface area of an orange is 147 cm^2. What is the diameter of the orange? Round your answer to two decimal places.

$A_{sphere} = 4\pi r^2$

$4\pi r^2 = 147$

$\frac{4\pi r^2}{4\pi} = \frac{147}{4\pi}$

$r^2 = 11.69788...$

$r \doteq 3.420$ or $r \doteq -3.420$

$d \doteq 6.84$

$\therefore$ the diameter of the orange is 6.84 cm