Math 9 – Unit 5: Measurement

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Lesson #3: Cones and Cylinders

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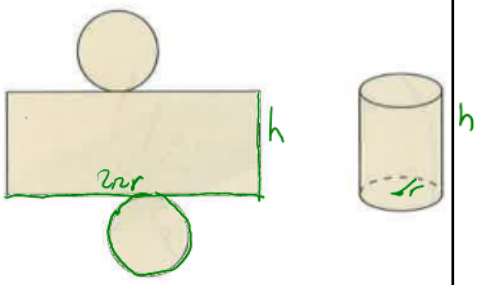
Learning Goal: We are learning to calculate the surface area and volume of cylinders and cones.

Important Formulas

Surface area of a cylinder = area of the rectangle + 2x area of circular base

$$SA = (2\pi rh) + 2(\pi r^2)$$

Side — the circles — Circumference



Volume of a cylinder = area of the base × height

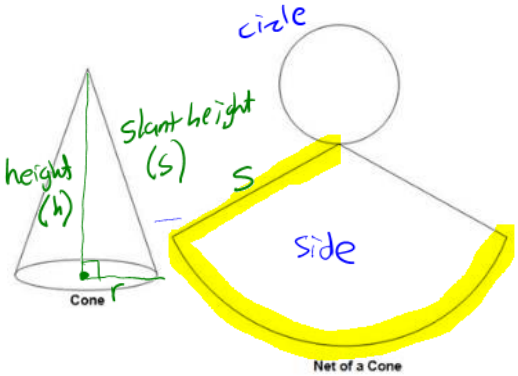
$$V = \pi r^2 h$$

= Area of base × height

Surface area of a cone = lateral area + area of the circular base

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

Side — circle — Slant height



Cones are tricky because you need to know the slant height. Which means, we will need the Pythagorean theorem!!!

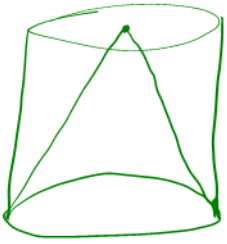
$$s^2 = r^2 + h^2$$

slant height — radius — height height

Volume of a ~~cylinder~~ cone = $\frac{1}{3}$ the volume of a cylinder with the same base!

$$V = \frac{1}{3}\pi r^2 h \quad \text{OR} \quad V = \frac{\pi r^2 h}{3}$$

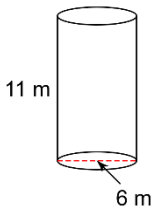
volume of cylinder

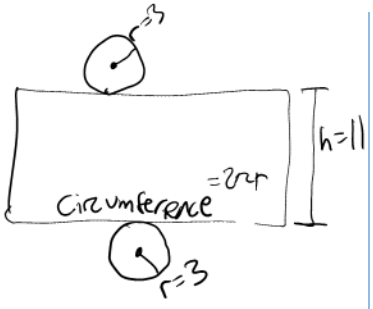


For each figure, draw the net, then calculate the surface area and the volume.

1.

h = 11
d = 6
r = 3





$S.A. = 2\pi rh + 2\pi r^2$

$= 2(3.14)(3)(11) + 2(3.14)(3^2)$ (9)

$= 207.24 + 56.52$

$SA = 263.76\ m^2$

$V = \pi r^2 h$

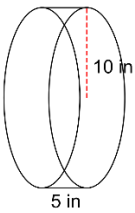
$= (3.14)(3)^2(11)$

$= (3.14)(9)(11)$

$V = 310.86\ m^3$

2.

h = 5
r = 10



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

$= 2(3.14)(10)(5) + 2(3.14)(10^2)$ (100)

$= 314 + 628$

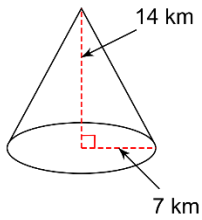
$S.A. = 942\ in^2$

$V = \pi r^2 h$

$= (3.14)(10^2)(5)$ (100)

$V = 1570\ in^3$

3.



$r = 7$

$h = 14$

$s = 15.65$ km

$s^2 = 7^2 + 14^2$

$s^2 = 49 + 196$

$\sqrt{s^2} = \sqrt{245}$

$s = 15.65$ km

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

$= (3.14)(7)(15.65) + (3.14)(7)^2$ (49)

$= 343.987 + 153.86$

$= 497.847\ km^2$

Round only @ the end

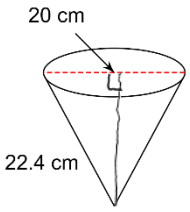
$SA = 497.8\ km^2$

$V = \frac{\pi r^2 h}{3}$

$= \frac{(3.14)(7)^2(14)}{3}$ (49)

$V = 718.01\ km^3$

4.



$d = 20$

$r = 10$

$s = 22.4$

$h = ?$

$s^2 = r^2 + h^2$

$-r^2 \quad -r^2$

$s^2 - r^2 = h^2$

$(22.4)^2 - (10)^2 = h^2$

$501.76 - 100 = h^2$

$\sqrt{401.76} = \sqrt{h^2}$

$20.04 = h$

$\boxed{20} = h$

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

$= (3.14)(10)(22.4) + (3.14)(10)^2$

$= 703.36 + 314$

$SA = 1017.36\ cm^2$

$V = \frac{\pi r^2 h}{3}$

$= \frac{(3.14)(10)^2(20)}{3}$ (100)

$V = 2093.\overline{3}\ cm^3$

Use the appropriate formula to solve for the missing measurement.

5. A Cylinder has a volume of 2769.48cm^3 with a height of 18cm. What is the length of the radius?

?

$V = \pi r^2 h$

$(2769.48) = (3.14)(r^2)(18)$

$\frac{2769.48}{56.52} = \frac{56.52\, r^2}{56.52}$

$\sqrt{49} = \sqrt{r^2}$

$7 = r$

The radius is 7cm long. !!

Success Criteria

- I can draw the net of a cylinder or cone
- I can use the appropriate formula to find the surface area or volume of a cone or cylinder
- If given the volume of a cone or cylinder, I can rearrange the equation to find the radius or height.