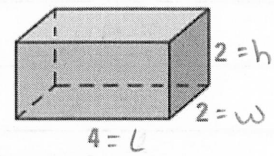
Chapter 12.7: Explore Similar Solids

Similar Solids: Two Solids of same type with equal ratios of corresponding linear measures.

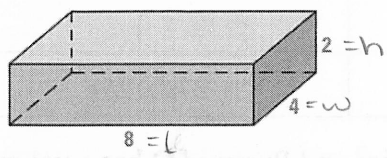
Scale Factor: common ratio to go from one solid to the other.

Example #1: Tell whether the given right rectangular prism is similar to the right rectangular prisms shown below.

Check all corresponding sides ratios (should be =)



a.)



lengths = $\frac{4}{8} = \frac{1}{2}$

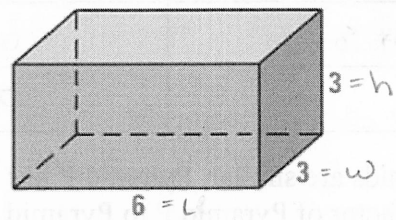
widths = $\frac{2}{4} = \frac{1}{2}$

heights = $\frac{2}{2} = 1$

Not similar

(All ratios need to be the exact same)

b.)



length = $\frac{4}{6} = \frac{2}{3}$

widths = $\frac{2}{3} = \frac{2}{3}$

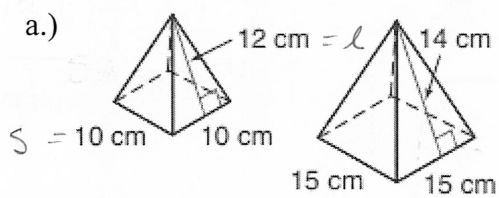
height = $\frac{2}{3} = \frac{2}{3}$

Similar

(All corresponding sides have the exact same ratio)

Example #2: Tell whether the pair of solids is similar.

a.)



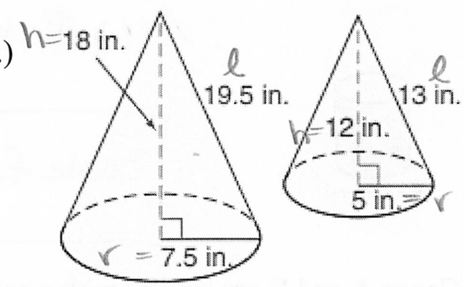
side length = $\frac{10}{15} = \frac{2}{3}$

$l = \frac{12}{14} = \frac{6}{7}$

Not the same

Not Similar

b.)



$r = \frac{7.5}{5} = \frac{75}{50} = \frac{3}{2}$

$h = \frac{18}{12} = \frac{3}{2}$

$l = \frac{19.5}{13} = \frac{195}{130} = \frac{3}{2}$

All the same

Similar

Similar Solids Theorem (Theorem 12.13):

If two similar solids have a scale factor of $a : b$, ← used for ANY corresponding lengths, perimeter / circumference, etc

then corresponding areas have a ratio of $a^2 : b^2$, ← Areas ONLY (includes SA)

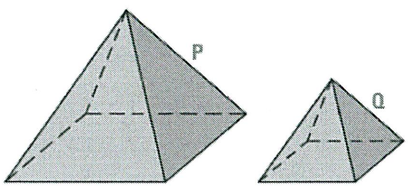
and corresponding volumes have a ratio of $a^3 : b^3$. ← Volumes ONLY

Example #2: Fill in the chart

Ratio of corresponding side lengths (Scale factor)	Ratio of Areas (surface area)	Ratio of Volumes
3:4	9 : 16	27 : 64
7:6	49:36	343 : 216
1 : 5	1 : 25	1:125
24:3 ≠ 8 : 1	64 : 1	512 : 1
3 : 5	9 : 25	$27\cancel{\pi}:125\cancel{\pi}$

Example #3: The pyramids are similar. Pyramid P has a volume of 1000 in^3 and Pyramid Q has a volume of 216 in^3. Find the scale factor of Pyramid P to Pyramid Q.

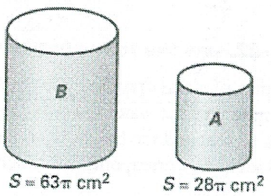
(simplify 1st)



Volume Ratio = $\frac{1000}{216} = \frac{125}{27}$

$\boxed{\text{Scale factor} = \frac{\sqrt[3]{125}}{\sqrt[3]{27}} = \frac{5}{3}}$

Example #4: The two cylinders are similar. Find the scale factor of Cylinder A to Cylinder B.



(simplify 1st)

Area Ratio = $\frac{28\cancel{\pi}}{63\cancel{\pi}} = \frac{4}{9}$

$\boxed{\text{Scale factor} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3}}$

Example #5: Cones A and B are similar with a scale factor of 5:2. Find the surface area of Cone B given that the surface area of Cone A is 2356.2 cm^2. Round your answer to the nearest hundredth.

A B

Scale Factor = $\frac{5}{2}\ \frac{(A)}{(B)}$

$\frac{25}{4} = \frac{2356.2}{B} \rightarrow \frac{25B}{25} = \frac{9424.8}{25}$

Area Ratio = $\frac{5^2}{2^2} = \frac{25}{4}$

$\boxed{B = 376.99\ cm^2}$

Surface Area of Cone B

b.) Find the volume of Cone B given that the volume of Cone A is 7450.9 cm^3. Round your answer to the nearest hundredth.

Scale Factor = $\frac{5}{2}\ \frac{(A)}{(B)}$

$\frac{125}{8} = \frac{7450.9}{B} \rightarrow \frac{125B}{125} = \frac{59607.2}{125}$

Volume Ratio = $\frac{5^3}{2^3} = \frac{125}{8}$

$\boxed{B = 476.86\ cm^3}$

Volume of Cone B