

WARMUP #5

Write an Equation of the line in slope-intercept form.

1) $(5, -2), m = 2$

$$\begin{aligned} (-2) &= (2)(5) + b \\ -2 &= 10 + b \end{aligned}$$

$$b = -12$$

$$y = mx + b$$

slope

y intercept

(Where it crosses the y axis)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

2) $(-4, 0), m = -\frac{1}{2}$

$$0 = \left(-\frac{1}{2}\right)(-4) + b$$

$$0 = 2 + b$$

$$-2 = b$$

$$y = \left(-\frac{1}{2}\right)x - 2$$

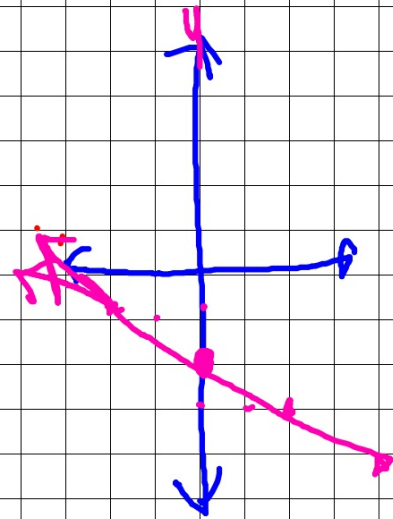
$$y = 2x - 12$$

3) $(-10, 3), m = -\frac{2}{5}$

$$3 = \left(-\frac{2}{5}\right)(-10) + b$$

$$-1 = b$$

$$y = -\frac{2}{5}x - 1$$



SECTION 12.5:

AREAS & VOLUMES OF SIMILAR SOLIDS

Standards:

8.0: Students know, derive, and solve problems involving the perimeter, circumference,

area, volume, lateral area, and surface area of common geometric figures.

9.0: Students compute the volumes and surface areas of prisms, pyramids, cylinders, cones, and spheres; and students commit to memory the formulas for prisms, pyramids, and cylinders.

11.0: Students determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.

SIMILAR SOLIDS

Similar polygons are polygons that have the same shape but not necessarily the same size. Similar solids are solids that have the same shape but not necessarily the same size. Just as all circles are similar, all spheres are similar. (Squares, all cubes)

Two solids are similar IFF their bases are similar and their corresponding lengths are proportional.

AREAS & VOLUMES OF SIMILAR SOLIDS

If the scale factor of 2 similar solids is $a:b$, then

- 1) the ratio of the corresponding perimeters is $a:b$
- 2) the ratio of the base areas, of the lateral areas, and the total areas is $a^2 : b^2$
- 3) the ratio of the volumes is $a^3 : b^3$

Sides \rightarrow areas \rightarrow Vol. Δ Δ

$1:3$ $1:9$ $1:27$ $16:81$

$\frac{16}{81} = \frac{32}{x}$

Sides $4:9$

Area

I-4: Are the given solids similar?

1) Two regular square pyramids have heights 10 and 12. The bases are squares with sides 4 and 4.8, respectively.

✦ YES

$$\frac{10}{12} = \frac{4}{4.8}$$

$$\sqrt{48} = 48$$

2) One rectangular solid has length 7, width 5, and height 3. Another rectangular solid has length 14, width 10, and height 9.

✦

$$\frac{7}{14} = \frac{5}{10} = \frac{3}{9}$$

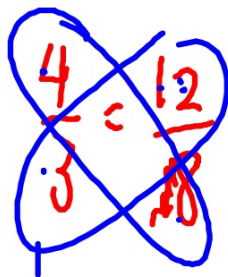
I-4: Are the given solids similar?

3) Two right triangular prisms have heights 4 and 6. Their bases are triangles with sides of 3, 4, 5, and 6, 8, 10, respectively.

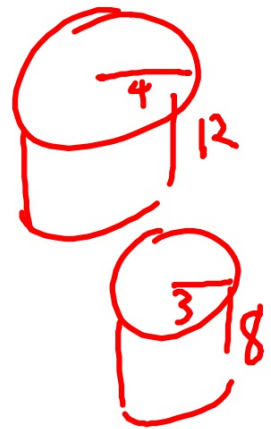


4) Two cylinders have radii 4 cm and 3 cm. The heights are 12 cm and 8 cm, respectively.

 **NO**



~~32~~ / ~~36~~



5-9: Complete the table, which refers to similar prisms.

	5)	6)	7)	8)	9)
Scale factor	1 2:5	◆ 1:3	◆	◆	◆
Ratio of base perimeters	1 ◆ 2:5	◆ 1:3	◆	◆	◆
Ratio of heights	1 ◆ 2:5	1:3	◆	◆	◆
Ratio of lateral areas <u>92</u>	◆ 4:25	◆ 1:9	4:49	◆	◆
Ratio of total areas <u>92</u>	◆ 4:25	◆ 1:9	◆	◆	◆
Ratio of volumes <u>3</u>	◆ 8:125	◆ 1:27	◆	125:216	27:1000

$$\frac{S}{L}$$

$$\frac{S}{L}$$

10) Two similar cones have volumes 27π and 64π . Find the ratio of:

a) the radii

✦ $3:4$

b) the slant heights

✦ $3:4$

c) the lateral areas

✦ $9:16$

$3^2 \quad 4^2$

$\sqrt[3]{27} \quad \sqrt[3]{64}$
 $3 \cdot 3 \cdot 3 \quad 4 \cdot 4 \cdot 4$



11) Two spheres have radii 5 cm and 7 cm. Find the ratio of:

a) the areas



b) the volumes



12) Two spheres have diameters 12 and 28. Find the ratio of :

a) the areas



b) the volumes



13) Two foam plastic balls have scale factor 2 : 3.

a) If the smaller ball has radius 6 cm, what is the radius of the larger ball?



9cm

13) Two foam plastic balls have scale factor 2 : 3.

b) If the area of the larger ball is $36\pi \text{ cm}^2$, what is the area of the smaller ball?



13) Two foam plastic balls have scale factor 2 : 3.

c) If the larger ball weighs 12 g,
about how much does the
smaller ball weigh? (*Hint*
Weight is related to volume.)



The ratio of the volumes of 2 similar solids is 16:54.
If the total area of the smaller solid is 10, find the
total area of the larger solid.

Answer

The ratio of the volumes of 2 similar solids is 16:54.
If the total height of the larger solid is 9, find the
height of the smaller solid.

Answer

17. Two similar pyramids have lateral areas 8 ft^2 and 18 ft^2 . If the volume of the smaller pyramid is 32 ft^3 , what is the volume of the larger pyramid?

ANSWER

HOMWORK

Assignment #12.5a

- Pages 511-512 #1-11, 13-15, 17, 18
- Page 513 ST #1-6
- Page 496 ST #7, 8

tues AR slope
intercept

****WEDNESDAY - QUIZ CHAPTER 12****

****FRIDAY - TEST CHAPTER 12****

Written Exercises

Two cones have radii 6 cm and 9 cm. The heights are 10 cm and 15 cm, respectively. Are the cones similar?

The heights of two right prisms are 18 ft and 30 ft. The bases are squares with sides 8 ft and 15 ft, respectively. Are the prisms similar?

Two similar cylinders have radii 3 and 4. Find the ratios of the following:
a. heights b. base circumferences c. lateral areas d. volumes

Two similar pyramids have heights 12 and 18. Find the ratios of the following:

a. base areas b. lateral areas c. total areas d. volumes

Assume that the Earth and the moon are smooth spheres with diameters 12,800 km and 3,200 km, respectively. Find the ratios of the following:
a. lengths of their equators b. areas c. volumes

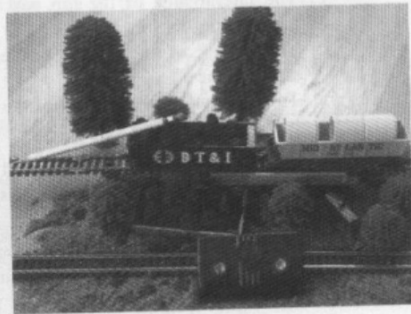
Two similar cylinders have lateral areas 81π and 144π . Find the ratios of:
a. the heights b. the total areas c. the volumes

Two similar cones have volumes 8π and 27π . Find the ratios of:
a. the radii b. the slant heights c. the lateral areas

Two similar pyramids have volumes 3 and 375. Find the ratios of:
a. the heights b. the base areas c. the total areas

The package of a model airplane kit states that the scale is 1:200. Compare the amounts of paint required to cover the model and the actual airplane. (Assume the paint on the model is as thick as that on the actual airplane.)

The scale for a certain model freight train is 1:48. If the model hopper car (usually used for carrying coal) will hold 90 in.^3 of coal, what is the capacity in cubic feet of the actual hopper car? (*Hint*: See Exercise 10, page 477.)



Two similar cones have radii of 4 cm and 6 cm. The total area of the smaller cone is $36\pi \text{ cm}^2$. Find the total area of the larger cone.

13. Two balls made of the same metal have radii 6 cm and 10 cm. If the smaller ball weighs 4 kg, find the weight of the larger ball to the nearest 0.1 kg.

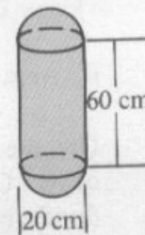
14. A snow man is made using three balls of snow with diameters 30 cm, 40 cm, and 50 cm. If the head weighs about 6 kg, find the total weight of the snow man. (Ignore the arms, eyes, nose and mouth.)

17. Two similar pyramids have lateral areas 8 ft^2 and 18 ft^2 . If the volume of the smaller pyramid is 32 ft^3 , what is the volume of the larger pyramid?

18. Two similar cones have volumes 12π and 96π . If the lateral area of the smaller cone is 15π , what is the lateral area of the larger cone?

Self-Test 2

1. Find the area and volume of a sphere with diameter 6 cm.
2. The volume of a sphere is $\frac{32}{3}\pi \text{ m}^3$. Find the area of the sphere.
3. The students of a school decide to bury a time capsule consisting of a cylinder capped by two hemispheres. Find the volume of the time capsule shown.
4. Find the area of the circle formed when a plane passes 12 cm from the center of a sphere with radius 13 cm.
5. One regular triangular pyramid has base edge 8 and height 6. A similar pyramid has height 4.
 - a. Find the base edge of the smaller pyramid.
 - b. Find the ratio of the total areas of the pyramids.
6. The base areas of two similar prisms are 32 and 200, respectively.
 - a. Find the ratio of their heights.
 - b. Find the ratio of their volumes.



Ex. 3

7. A solid metal cylinder with radius 2 and height 2 is recast as a solid cone with radius 2. Find the height of the cone.
8. A prism with height 2 m and a pyramid with height 5 m have congruent triangular bases. Find the ratio of their volumes.

