SOL Objective G.14 Practice

Name Master E

Date _____ Block _____

SOL G.14: The student will use similar geometric objects in two- or three-dimensions to

a) compare ratios between side lengths, perimeters, areas, and volumes;

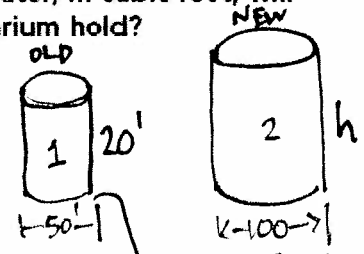
b) determine how changes in one or more dimensions of an object affect area and /or volume of the object;

c) determine how changes in area and/or volume of an object affect one or more dimensions of the object; and

d) solve real-world problems about similar geometric objects.

1. An aquarium curator wants to expand his facility by constructing a new aquarium. The old aquarium is a cylinder that is 20 feet tall with a diameter of 50 feet. The new aquarium will be a similar cylinder with a diameter of 100 feet. How much more water, in cubic feet, will the new aquarium hold?

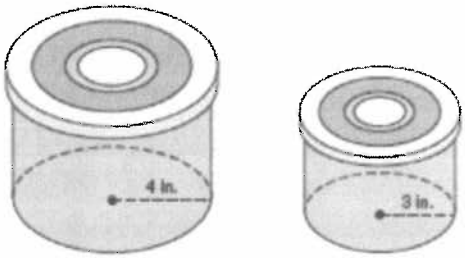
A 78,540
B 117,810
C 274,890
D 314,160



$SF = \frac{50}{100} = \frac{1}{2} \Rightarrow V = \frac{1}{8} \Rightarrow V_1 = \pi(25)^2(20)$ 39269.9

$V_2 - V_1 = 274889.4 \Leftarrow V_2 = 314159.3$

2. Two cylindrical kitchen canisters are similar. How many times more volume will the larger canister hold?



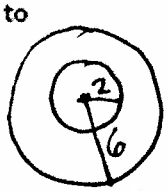
F $\frac{4}{3}$ times more
G $\frac{8}{3}$ times more
H $\frac{16}{9}$ times more
J $\frac{64}{27}$ times more

$a:b = 4:3$

$V = a^3 : b^3 = 64:27$

3. There are two concentric circles at the center of a basketball court. The radius of the inner circle is 2 feet and the radius of the outer circle is 6 feet. What is the ratio of the circumference of the inner circle to the circumference of the outer circle?

A 1 : 3
B 1 : 6
C 1 : 9
D 1 : 27

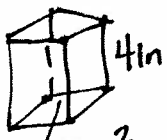


$2:6 = 1:3$

Ratio of radii = Ratio of circumferences!

4. A gift box in the shape of a rectangular prism has a base area of 56 square inches and a height of 4 inches. What is the volume of the box in cubic inches?

F 224
G 448
H 896
J 12,544

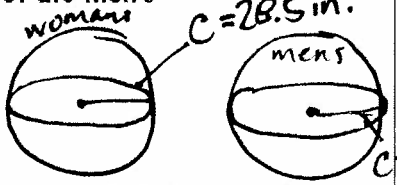


$B = 56 in^2$

$V = B \cdot h$
$= 56 \cdot 4$
$= 224 in^3$

5. The circumference of a great circle of a women's league basketball is 28.5 inches, and the circumference of a great circle of a men's league basketball is 29.5 inches. Which is *closest* to the ratio of the surface area of the women's basketball to the surface area of the men's basketball?

A 0.902
B 0.933
C 0.966
D 1.035



$28.5 : 29.5 = a:b$

$812.25 : 870.25 = a^2 : b^2$

$\frac{812.25}{870.25}$

6. The surface area of a right cylinder is three times the surface area of a smaller similar cylinder. What is the ratio of the radius of the larger cylinder to the radius of the smaller cylinder?

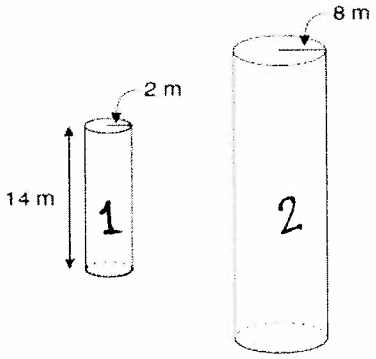
F $\sqrt[3]{3} : 1$
G $\sqrt{3} : 1$
H 9 : 1
J 27 : 1

$3 : 1 = a^2 : b^2$

What is $a:b$ if $a^2 : b^2 = 3:1$

then $a:b = \sqrt{3} : \sqrt{1} = \sqrt{3} : 1$

7. The cylinders shown are similar.



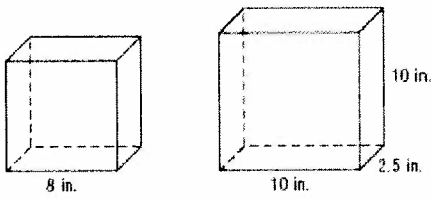
$a:b$
$=2:8$
$=1:4$
$\therefore a^3:b^3$
$=1:64$
so $64 \times V_1$

What is the volume of the larger cylinder?

A 56π m^3
B 224π m^3
C 896π m^3
D $3{,}584\pi$ m^3

$V_2 = 64 \cdot V_1$
$V_1 = \pi(2)^2(14)$
$V_1 = 56\pi$
$V_2 = 64 \cdot 56\pi = 3584\pi$

8. **Two storage boxes are similar. About how many times more volume will the larger box hold?**

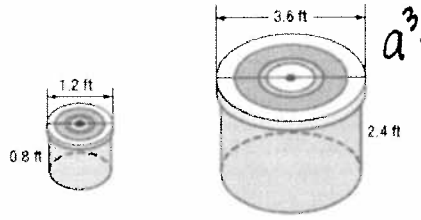


$a:b = 8:10$
$= 4:5$
$V = 4^3:5^3$
$= 64:125$

A The larger box will hold 1.25 times as much.
B The larger box will hold 1.56 times as much.
C The larger box will hold 1.95 times as much.
D The larger box will hold 2.44 times as much.

$= \frac{125}{64}$
$= 1.95$

9. Two cylindrical storage containers are similar. About how many times larger is the volume of the larger container?

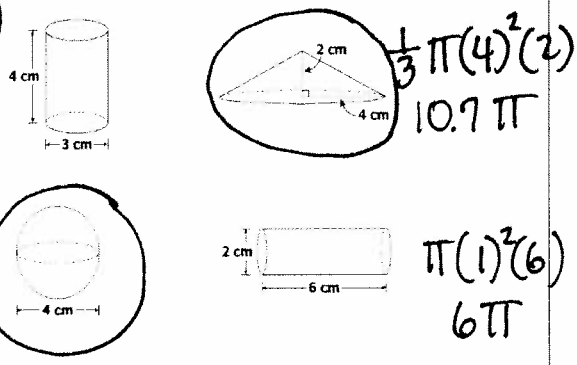


$a:b = 1.2:3.6$
$= 1:3$
$a^3:b^3 = 1:27$

F The volume is 3 times larger.
G The volume is 6 times larger.
H The volume is 9 times larger.
J The volume is 27 times larger.

10. Two cylinders, a sphere, and a cone are shown. Select the two objects with the same volume.

Directions: Click on the two objects you want to select.



$\pi(1.5)^2(4)$
9π

$\frac{1}{3}\pi(4)^2(2)$
10.7π

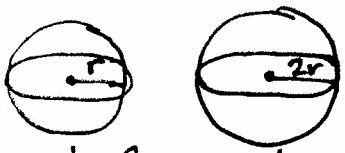
$\frac{4}{3}\pi(2)^3$
10.7π

$\pi(1)^2(6)$
6π

*You have to find the volume of all 4 shapes!

11. A sphere has a volume of 20 cm^3. If the radius of the sphere is doubled what is the volume of the new sphere?

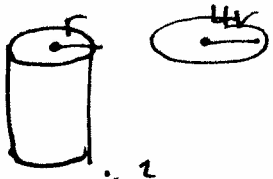
A. 160 cm^3
B. 20 cm^3
C. 40 cm^3
D. 80 cm^3



$1:2 = a:b$
$1^3:2^3 = a^3:b^3$
$1:8$
so the volume of the new sphere is 8 times the small one.
$20 \cdot 8 = 160$

12. The surface area of a cylinder is 20 square inches^2. If all its dimensions are quadrupled, what is the surface area of the new cylinder?

A. 160 square inches
B. 320 square inches
C. 80 square inches
D. 20 square inches



$SA = 20 \text{ in}^2$
$a:b = 1:4$
$a^2:b^2 = 1:16$
so the S.A of the new cylinder is 16 times 20!
$16 \cdot 20 = 320$

Total Area means SA!

13. If the total area of a cubic box is decreased by factor 0.09, how many times smaller is the edge of the new cubic box?

A. 3
B. 0.3
C. 0.09
D. 0.9

$a^2 : b^2 = 1 : 0.09$

so $a : b = \sqrt{1} : \sqrt{0.09}$

$= 1 : .3$

14. If the volume of a sphere is increased by factor 27, how many times larger is the radius of the new sphere?

A. 13.5
B. 9
C. 6
D. 3

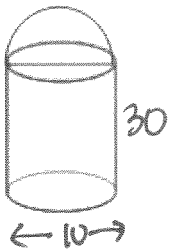
$a^3 : b^3 = 1 : 27$

$a : b = \sqrt[3]{1} : \sqrt[3]{27}$

$= 1 : 3$

15. Paint is being used to recover the surface of a birdhouse, formed by placing a hemisphere on top of a cylinder that has the same diameter of 10 inches. The bottom of the cylinder is not painted, however the rest of the exposed surface is covered by paint. How many square inches of paint is used? Round to the nearest tenth.

LA



h = 30 inches

Cylinder LA

$2\pi(5)(30) = 300\pi$

Hemisphere SA

$\frac{4\pi(5)^2}{2} = 50\pi$

$300\pi + 50\pi = 350\pi = 1099.6\ in^2$

16. The *heights* of two similar cylinders are 6 in. and 18 in. $6 : 18 = 1 : 3$

a. What is the ratio of the radii of their bases?

A. $\frac{6}{18}$ B. $\frac{1}{9}$ C. $\frac{1}{3}$ D. $\frac{1}{2}$

b. What is the ratio of their surface areas?

A. $\frac{1}{9}$ B. $\frac{1}{3}$ C. $\frac{1}{27}$ D. $\frac{1}{4}$

c. What is the ratio of the *perimeters* of their bases?

A. $\frac{1}{9}$ B. $\frac{1}{3}$ C. $\frac{1}{27}$ D. $\frac{1}{6}$

d. What is the ratio of their *volumes*?

A. $\frac{1}{9}$ B. $\frac{1}{3}$ C. $\frac{1}{27}$ D. $\frac{9}{27}$

17. Two similar rectangular prisms have side lengths with a ratio of 1:3. $= a : b$

1:9 **a.** What is the ratio of their surface areas?

$a^2 : b^2 = 1 : 9$

1:27 **b.** What is the ratio of their volumes?

$a^3 : b^3 = 1 : 27$

18. The dimensions of a triangular prism with a surface area of 51.46 cm^2 are multiplied by a scale factor of 2.5 to create a similar triangular prism.

$a : b = 1 : 2.5$

$a^2 : b^2 = 1 : 6.25$

321.6 cm^2 **a.** What is the surface area of the new triangular prism?

$6.25(51.46) = 321.625\ cm^2$

15.6x **b.** What is the relationship between the volume of the original prism and the volume of the new prism?

$a^3 : b^3 = 1 : 15.625$ The Volume of the new prism is 15.625 times the size of the original prism