

Unit 7 Study Guide – Volume

Name Key S: _____

1. A cylindrical well has a radius of 10 feet and a height of 15 feet. How much water is needed to fill the well?


Water = $\pi(10)^2 \cdot 15$
 1500π or 4712.4
 ft^3

2. Nisha is making two terrariums for science class. One is a sphere with a radius of 8 inches. The other is a hemisphere with a radius of 12 inches. Which terrarium hold the most plant life?

$T_{r=8} \quad \frac{4}{3}\pi(8)^3 = 2,145 \text{ in}^3$

$T_{r=12} \quad \frac{2}{3}\pi(12)^3 = 3619 \text{ in}^3$

3. If diameter of a tennis ball is 6.86 cm, how many tennis balls can be shipped in a 1 cubic meter box? FYI – You're not concerned with wasted space.

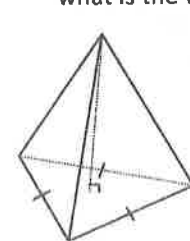


$r = \frac{6.86}{2} = 3.43$ $V_{TB} = \frac{4}{3}\pi(3.43)^3 = 169.033 \text{ cm}^3$
 1 cubic m = $(100 \text{ cm})^3 = 1,000,000 \text{ cm}^3$
 $\frac{1,000,000}{169.033} = 5,916$ Tennis Balls

4. A cylindrical grain storage crib holds 25,000 cubic yards of grain. If its height is 50 ft, what is its diameter?

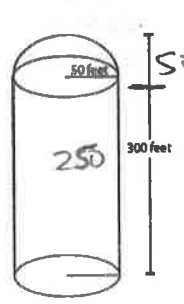
$h = \frac{50 \text{ ft}}{3 \text{ ft}} = 16.667 \text{ yards}$
 $\frac{25,000}{16.667\pi} = \pi(r)^2 \cdot 16.667$
 $r^2 = 477.455$
 $r = 21.851 \times 2 = 43.702 \text{ yards}$

5. A triangular pyramid has an equilateral base with side lengths of 2 feet. If the height of the pyramid is 3 feet, what is the volume?



$h = \sqrt{(2)^2 - (1)^2} = \sqrt{3}$
 $V = \frac{B \cdot h}{3} = \frac{2 \cdot \sqrt{3}}{2} = \sqrt{3} \text{ ft}^3$

6. Find the volume of the image below.



$V_{HC} = \frac{2}{3}\pi(50)^3 = 26,177.4$
 $V_{CY} = \pi(50)^2 \cdot 250 = 1,963,495.4$
 $V = 1,989,672.8 \text{ ft}^3$

Reminder: The effect of a dilation (SF) depends on the power. Area, Cone, Cylinder are squared while a sphere is cubed.
 Ex: The radius of a cone is dilated 4 times larger, so 4^2 equals 16 times more volume.

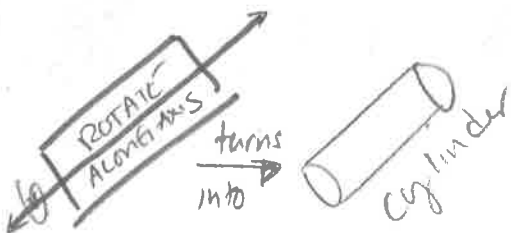
7. The earth's radius is 6,371 km, and the moon's radius is 1,737 km. What is the stretch scale factor of the moon to earth? How many moons could fit in the earth?

$SF = \frac{6371}{1737} = (3.668)^3 = 49.343$
 moons inside earth

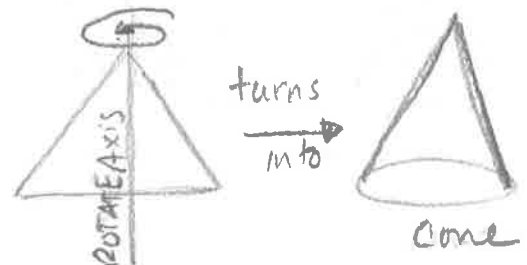
8. Tom has two cones. One cone has a radius that is 3 times the radius of the other cone. How much more volume does the larger cone have compared to the smaller cone?

$(3)^2 = 9$ times more volume

9. If you rotate a 2D rectangle along a line drawn down its center, what 3D solid will it create?



10. If you rotate a 2D equilateral triangle along its altitude, what 3D solid will it create?

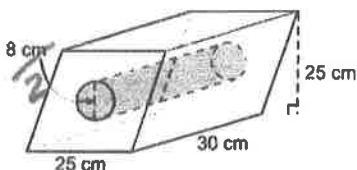


11. If Tokyo Japan' population is 13.93 million people and its population density is 6,000 people per square kilometer, find the area of the city.

$$\frac{13,930,000}{6000} = 2,321.7 \text{ km}^2$$

That's a lot of people!

13. The figure below is a rectangular oblique (slanted) prism, where $V = Bh$. If the cylinder is removed, what is the remaining volume?



Area of Prism Area Cyl

$$25 \times 30 \times 25 = (\pi (4)^2 \cdot 30)$$

$$18,750 - 1,507.964 = 17,242 \text{ cm}^3$$

15. A manufacturing device has two solids, a cylinder stacked on top of a cone. The cylinder is a reservoir for fluid that's transferred to the cone. If the cylinder is filled with fluid and then a portion is transferred to the cone, how much remains in the cylinder?

Ht of Cone = 24
- 17.8

6.2 cm

V Cyl $\pi (5)^2 \cdot 17.8 = 1398$

V cone $\frac{\pi (5)^2 \cdot 6.2}{3} = 162.316$

$1398 - 162.316 = 1,235.7 \text{ cm}^3$

12. 1 acre = 43,560 ft² - A construction company uses a bulldozer to remove, on average, 15 large rocks from 5,000 square feet in an hour. About how many rocks need to be removed from the 200 acres of land? How long does it take to clear the 200 acres?

$$43560 \times 200 = 8,712,000$$

$$\frac{8,712,000}{5000} = 1742 \text{ sections}$$

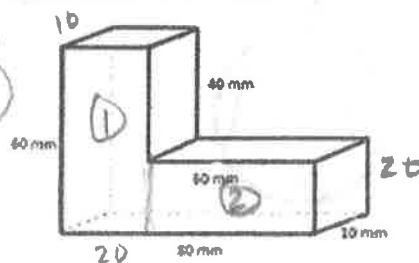
$$1742 \times 15 = 26,130 \text{ rocks to be moved}$$

1742 hours to remove the rocks

14. What is the total volume of the solid shown.

$$\text{Area 1} = 20 \times 10 \times 60 = 12,000$$

TTL Vol
 $24,000 \text{ mm}^3$



$$\text{Area 2} = 60 \times 10 \times 20 = 12,000$$

16. A group of boxes are shown stacked below. Assume that each bottom row is 2 boxes wide with no missing boxes. If the side of each box is 24 inches, how many cubic feet are in all the boxes combined?

$2 \times 2 \times 2 = 8$

$24 \times 24 \times 24 = 13,824 \text{ in}^3$

$\frac{13,824}{12(12)(12)} = 8 \text{ cubic feet/box}$

1
3
5
12

21 boxes

$21 \times 8 = 168 \text{ ft}^3$

17. Cavalieri's Principle states that, if any two parallel cross-sections that cut through two or more solids have the same area, and the solids have the same height, then the volume of the two solids will be equal. State which solids will have the same volume, based on the application of Cavalieri's Principle. The height of all solids is 2 m.

Cone	Oblique Prism	Pyramid	Cylinder	Sphere
no	yes	yes	no	no only hemisphere