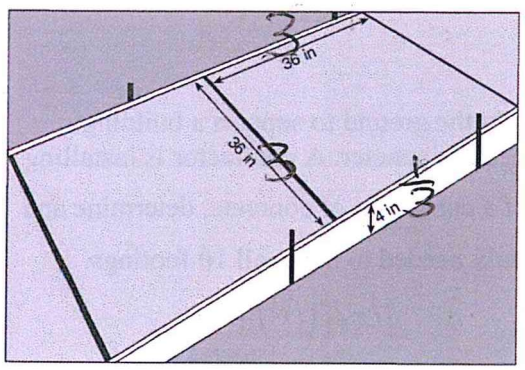
Name Schlansky
Mr. Schlansky

Date _____
Geometry

Modeling Volume with Conversions

1. Ian needs to replace two concrete sections in his sidewalk, as modeled below. Each section is 36 inches by 36 inches and 4 inches deep. He can mix his own concrete for $3.25 per cubic foot. How much money will it cost Ian to replace the two concrete sections?



$\frac{36in}{12} = 3ft$ $V = lwh$

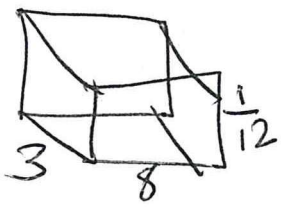
$V = 3(3)(\frac{1}{3})$

$\frac{4in}{12} = \frac{1}{3}ft$ $V = 3ft^3$

$3\,ft^3 \cdot \frac{3.25\,\$}{1\,ft^3} \cdot 2 = \$19.50$

2. A rectangular tabletop will be made of maple wood that weighs 43 pounds per cubic foot. The tabletop will have a length of eight feet, a width of three feet, and a thickness of one inch. If the maple costs $12.59 per pound, how much will it cost to make 5 tabletops?

$\frac{1in}{12} = \frac{1}{12}ft$



$V = lwh$

$V = 8(3)(\frac{1}{12})$

$V = 2ft^3$

$2ft^3 \cdot \frac{43\ pounds}{1\,ft^3} \cdot \frac{12.59\,\$}{1\ pound} \times 5$

$\$5413.70$

3. Ali made six solid spherical decorations out of modeling clay. Each decoration has a radius of 2.5 inches. The weight of clay is 68 pounds per cubic foot. Determine and state, to the *nearest pound*, the total weight of the six decorations.

$V = \frac{4}{3}\pi r^3$

$V = \frac{4}{3}\pi(\frac{5}{24})^3$

$\frac{2.5in}{12} = \frac{5}{24}ft$

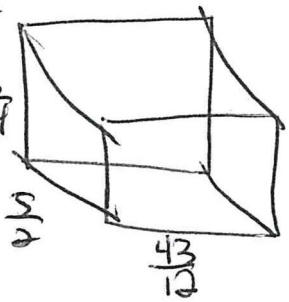
$V = .037\,ft^3 \cdot \frac{68\ pounds}{1\,ft^3} \times 6 = 15\ pounds$

$\frac{43\text{ in}}{12} = \frac{43}{12}\text{ ft}$

4. A sandbox in the shape of a rectangular prism has a length of 43 inches and a width of 30 inches. Jack uses bags of sand to fill the sandbox to a depth of 9 inches. Each bag of sand has a volume of 0.5 cubic foot. What is the minimum number of bags of sand that must be purchased to fill the sandbox?

$\frac{30\text{ in}}{12} = \frac{5}{2}\text{ ft}$

$\frac{9\text{ in}}{12} = \frac{3}{4}\text{ ft}$



$V = lwh$

$V = \frac{43}{12}\left(\frac{5}{2}\right)\left(\frac{3}{4}\right)$

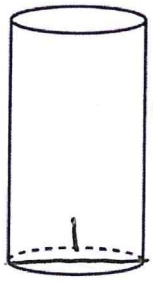
$V = \frac{215}{32}\text{ ft}^3$

$\frac{215\text{ ft}^3}{32\text{ ft}^3} \cdot \frac{1\text{ bag}}{0.5\text{ ft}^3} = 13.4375$

14

5. A concrete footing is a cylinder that is placed in the ground to support a building structure. The cylinder is 4 feet tall and 12 inches in diameter. A contractor is installing 10 footings. If a bag of concrete mix makes $\frac{2}{3}$ of a cubic foot of concrete, determine and state the minimum number of bags of concrete mix needed to make all 10 footings.

$\frac{12\text{ in}}{12} = 1\text{ ft}$



$V = \pi r^2 h$

$V = \pi(.5)^2(4)$

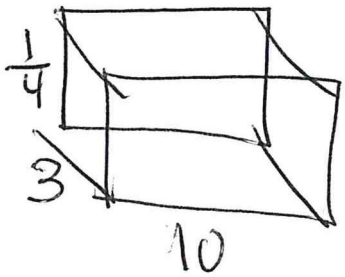
$V \approx 3.\ldots\text{ ft}^3$

$3.\ldots\text{ ft}^3 \cdot \frac{1\text{ bag}}{\frac{2}{3}\text{ ft}^3} \times 10 = 47.12\ldots$

48

6. A gardener wants to buy enough mulch to cover a rectangular garden that is 3 feet by 10 feet. One bag contains 2 cubic feet of mulch and costs ~~$3.66~~. How much will the minimum number of bags cost to cover the garden with mulch 3 inches deep? → irrelevant

$\frac{3\text{ in}}{12} = \frac{1}{4}\text{ ft}$



$V = lwh$

$V = 10(3)\left(\frac{1}{4}\right)$

$V = 7.5\text{ ft}^3$

$7.5\text{ ft}^3 \cdot \frac{1\text{ bag}}{2\text{ ft}^3} = 3.75\text{ bags}$

4 bags

$\frac{12 in}{12} = 1 ft$

7. A child-sized swimming pool can be modeled by a cylinder. The pool has a diameter of $6\frac{1}{2}$ feet and a height of 12 inches. The pool is filled with water to $\frac{2}{3}$ of its height. Determine and state the volume of the water in the pool, to the *nearest cubic foot*. One cubic foot equals 7.48 gallons of water. Determine and state, to the *nearest gallon*, the number of gallons of water in the pool.

$V = \pi r^2 h$

$V = \pi(3.25)^2(\frac{2}{3})$

$V = 22 ft^3$

$V = 22 ft^3$

$22 ft^3 \cdot \frac{7.48 gal}{1 ft^3} = 165 gallons$

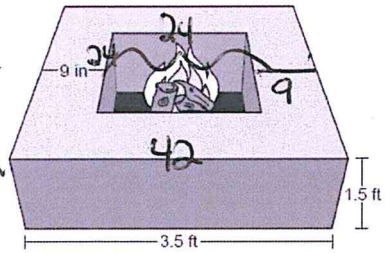
8. Josh is making a square-based fire pit out of concrete for his backyard, as modeled by the right prism below. He plans to make the outside walls of the fire pit 3.5 feet on each side with a height of 1.5 feet. The concrete walls of the fire pit are going to be 9 inches thick. If a bag of concrete mix will fill 0.6 ft^3, determine and state the minimum number of bags needed to build the fire pit.

$\frac{24 in}{12} = 2 ft$

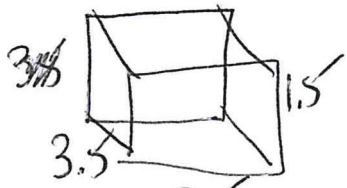
$\frac{9 in}{12} = \frac{3}{4} ft$

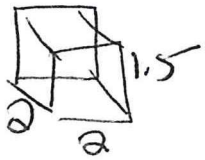
$3.5 ft \times 12 = 42$

$1.5 ft \times 12 = 18$



$V = lwh$





$V = 3.5(3.5)(1.5)$

$V = 18.375$

$V = 2(2)(1.5)$

$V = 6$

$18.375 - 6$

$12.375 ft^3$

$12.375 ft^3 \cdot \frac{1 bag}{.6 ft^3}$

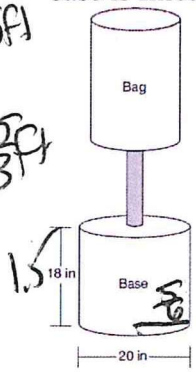
20.625

21 bags

9. Shae has recently begun kickboxing and purchased training equipment as modeled in the diagram below. The total weight of the bag, pole, and unfilled base is 270 pounds. The cylindrical base is 18 inches tall with a diameter of 20 inches. The dry sand used to fill the base weighs 95.46 lbs per cubic foot.
To the *nearest pound*, determine and state the total weight of the training equipment if the base is filled to 85% of its capacity.

$\frac{18 in}{12} = 1.5 ft$

$\frac{20 in}{12} = \frac{5}{3} ft$



$V = \pi r^2 h$

$V = \pi(\frac{5}{3})^2(1.5)$

$V = 3... ft^3$

$3... ft^3 \cdot \frac{95.46 lb}{1 ft^3} \times .85 = 265.. pounds$

270

+265..

536 pounds