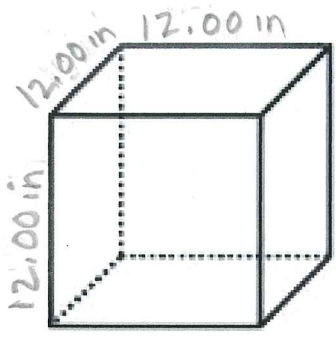


Measuring Volume Using Cubic Units

Name Key

Volume equals length x width x height



This box is 12.0 inches long, 12.0 inches wide and 12.0 inches tall. What is the volume of the box in cubic inches? (Show work.)

$12.00 \text{ in} \times 12.00 \text{ in} \times 12.00 \text{ in} = 1728 \text{ in}^3$

Since 12 inches equals 1 foot, you can also give the volume of the box in cubic feet. Show how to calculate this.

$1 \text{ ft} \times 1 \text{ ft} \times 1 \text{ ft} = 1 \text{ ft}^3$

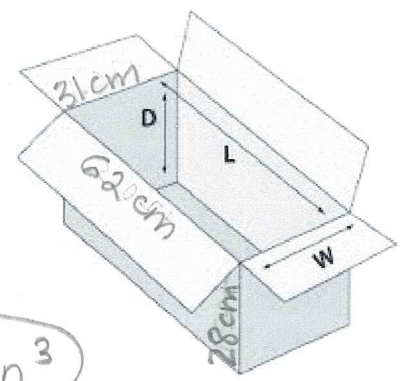
Therefore we can conclude that 1 ft^3 equals 1728 in^3 .

Any equality involving length can be converted to a volume equality by cubing the length equality.

$2.54 \text{ cm} = 1 \text{ in}$
 $2.54^3 \text{ cm}^3 = 1^3 \text{ in}^3$
 $16.4 \text{ cm}^3 = 1 \text{ in}^3$

Find the volume of this box in cubic centimeters (cm^3).

$31 \text{ cm} \times 62 \text{ cm} \times 28 \text{ cm} = 53816$
 $5.4 \times 10^4 \text{ cm}^3 \leftarrow = 54000 \text{ cm}^3$



What is the volume of the box in cubic inches (in^3)?

$54000 \text{ cm}^3 \div 16.4 \text{ cm}^3 = 3292.7 = 3300 \text{ in}^3$
 $3.3 \times 10^3 \text{ in}^3$

Another problem to try:

An aquarium is 30.0 cm long, 100.0 mm wide, and 22.0 cm tall.

a. What is the volume of the aquarium in cm^3 ?

$30.0 \text{ cm} \times 22.0 \text{ cm} \times 10.0 \text{ cm} = 6600 \text{ cm}^3$
 $6.60 \times 10^3 \text{ cm}^3$ (3 sf.)

b. What is the volume of the aquarium in in^3 ?

$6.60 \times 10^3 \text{ cm}^3 \div 16.4 \text{ cm}^3 = 402.439 \text{ in}^3$
 402 in^3

c. What is the volume of the aquarium in liters?

$6.60 \times 10^3 \text{ cm}^3 \div 1000 \text{ mL} = 6.6 \text{ L}$
 6.60 L (3 sf.)

d. What is the volume of the aquarium in gallons?

$6.60 \text{ L} \div 3.785 \text{ L/gal} = 1.749 \text{ gal} = 1.75 \text{ gal}$



Solve these problems. Show all work. Must use unit analysis.

1. A bottle of Gatorade contains 625 mL. How many cubic inches is this?

$$\frac{625 \text{ mL}}{1} \times \frac{1 \text{ cm}^3}{1 \text{ mL}} \times \frac{1 \text{ in}^3}{16.4 \text{ cm}^3} = 38.1 \text{ in}^3$$

$(2.54 \text{ cm})^3 = (1 \text{ in})^3$

2. A football field measures 100. yards long and 50. yards wide.

a. What is the area of a football field in square yds?

$$100. \text{ yd} \times 50. \text{ yd} = 5000$$

area $5.0 \times 10^3 \text{ yd}^2$

b. What is the area of a football field in acres? (4047 m² equals one acre.) and 1 yd = 36 in

$$\frac{5.0 \times 10^3 \text{ yd}^2}{1} \times \frac{1296 \text{ in}^2}{1 \text{ yd}^2} \times \frac{6.45 \text{ cm}^2}{1 \text{ in}^2} \times \frac{1 \text{ m}^2}{1 \times 10^4 \text{ cm}^2} \times \frac{1 \text{ acre}}{4047 \text{ m}^2} = 1.0 \text{ acre}$$

1 yd = 36 in 2.54 cm = 1 in 100 cm = 1 m

LAST!

3. The reflecting pool between the Lincoln Memorial and the Washington Monument is 2.000×10^3 feet long and 1.60×10^2 feet wide. The average depth of the pool is 30.0 inches. How many drops of water are in the reflecting pool? (24 drops = 1.00 mL)

$$\frac{30.0 \text{ in}}{1} \times \frac{1 \text{ ft}}{12 \text{ in}} = 2.50 \text{ ft}$$

LAST fact!

$$(2.000 \times 10^3 \text{ ft}) \times (1.60 \times 10^2 \text{ ft}) \times (2.50 \text{ ft}) = 800,000 \text{ ft}^3$$

$$\frac{8.00 \times 10^5 \text{ ft}^3}{1 \text{ ft}^3} \times \frac{1728 \text{ in}^3}{1 \text{ ft}^3} \times \frac{16.4 \text{ cm}^3}{1 \text{ in}^3} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} \times \frac{24 \text{ dr}}{1.00 \text{ mL}} = 5.44 \times 10^{11} \text{ drops}$$

$8.00 \times 10^5 \text{ ft}^3$

4. The patient required a transfusion of 2.5 pints of blood. How many cubic centimeters (cc or cm³) is this? (1 qt = 2 pt)

$$\frac{2.5 \text{ pints}}{1} \times \frac{1 \text{ qt}}{2 \text{ pt}} \times \frac{1 \text{ L}}{1.06 \text{ qt}} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{1 \text{ cm}^3}{1 \text{ mL}} = 1179.2$$

1200 cm^3
 $1.2 \times 10^3 \text{ cm}^3$