

is not a conversion factor and multiply it by any necessary number of conversion ratios, so that you end with the units which you want in the answer. Then you make the necessary arithmetical calculations and you have the required answer without bothering about any intermediate answers.

A complicated problem can involve several different kinds of conversion ratios. It may include a chemical conversion ratio, a density value, a percentage value, and one or more ordinary conversion ratios such as from grams to pounds. It may even include a conversion at the end from "pounds" to "dollars" if you know the cost of the material in dollars per pound.

You will find a use for the "units" method in the solving of many practical problems. For example, it can be used to calculate how many 9" x 9" tiles will be required to cover a floor 10' x 12'. And you can easily calculate how much the tile will cost at 80¢ per sq. ft. Or if you want to paint a house, or a room, then you can estimate the number of square feet to be covered and the number of square feet which can be covered by one gallon of paint. From this information you can easily calculate how many gallons of paint will be required and the cost of the paint at so much a gallon.

Problems Involving Units

1. How many cc. are there in 3 pts.?
2. How many yards are there in 50 meters?
3. Water weighs 8.33 lb. per gal. Calculate the weight in grams of 20 liters of water.
4. Suppose phosphoric acid costs \$0.50 per lb. What is the cost per gallon if the density of the acid is 1.44 gm. per ml.? (Start with a conversion ratio of \$0.50 over 1 lb.)
5. A web press operates at a web speed of 600 ft. per min. How many feet of paper will go through the press during six hours of continuous operation?
6. (a) Suppose you are going to print 500,000 sheets of size 25½" x 36". For a particular ink, you estimate that the coverage is 30%. You also estimate that the mileage of the ink is 100,000 sq. in. per lb. of ink. How many lb. of ink will be required to run the job? (b) How much will the ink cost, at \$1.75 per lb.? (Hint: In part (a) first calculate the area of one sheet and multiply this by 0.30 to get the sq. in. of ink on one sheet. Then you can set up a conversion ratio with this information and work the rest of the problem by the "units method.")
7. (a) Disodium phosphate, Na_2HPO_4 , reacts with phosphoric

acid to form monosodium phosphate, NaH_2PO_4 . Calculate how many grams of pure phosphoric acid will be required to react with 200 grams of disodium phosphate. (b) If instead of pure phosphoric acid you use the usual commercial phosphoric acid, which contains 85% phosphoric acid by weight and has a density of 1.44 gm. per ml., how many fluid ounces of this phosphoric acid solution will be required?

8. A blower has a capacity of 15,000 cu. ft. of air per minute. How many times per hour can it replenish the air in a room 50 x 30 x 10 feet? (Hint: Set up a conversion ratio, with "something" equal to "1 time." The units of the answer must be "times per hour" or $\frac{\text{times}}{\text{hour}}$).

9. A deep-etch solution has a density of 1.05 gms. per ml. Twenty pounds of this solution will occupy how many gallons?