

## ***Cross Multiplication***

When making pesticide applications, you often need to figure out how much of a pesticide must be used to treat an area using the rate required on the label. If you can write your rate question as a proportion, you may be able to figure out most of the rate calculations needed for pesticide applications.

The rate given, such as pounds per acre, is a proportion or a ratio and can be written as a fraction. For example, applying 2 pounds per acre could be written 2 pounds / 1 acre. You can use this ratio to figure out how many pounds to apply to 5 acres:

$$\frac{2 \text{ pounds}}{1 \text{ acre}} = \frac{N \text{ pounds}}{5 \text{ acres}}$$

Then, cross multiply the two terms that are diagonal to each other:

$$\frac{2 \text{ pounds}}{1 \text{ acre}} = \frac{N \text{ pounds}}{5 \text{ acres}}$$


$$(2 \times 5) = (N \times 1)$$

$$10 = 1N$$

Then divide both sides of the = sign by the number with the unknown (N), which in this case is 1, to get the value of N:

$$\frac{N}{1} = \frac{10}{1}$$

$$N = 10 \text{ pounds}$$

When you use proportions or ratios to determine pesticide application rates, the units (feet, inches, pounds, ounces, etc.) on the top and bottom of one fraction or ratio have to match the units on top and bottom of the other fraction (ratio).

The label says to apply 2 lbs. of granular insecticide per 1,000 sq. ft. How much do you need to treat an area that is 7,000 sq. ft.?

Write this as a proportion with pounds on top for both ratios, and sq. ft. on the bottom for both:

$$\frac{2 \text{ pounds}}{1,000 \text{ sq. ft.}} = \frac{N \text{ pounds}}{7,000 \text{ sq. ft.}}$$

Cross multiply:

$$(2 \times 7,000) = (1,000 \times N)$$

$$14,000 = 1,000 N$$

Divide by the number with the unknown (N) to get the value of N:

$$N = \frac{14,000}{1,000} = 14 \text{ pounds}$$

**Practice:**

1. *The label says to apply 1.5 quarts of herbicide per acre. How much do you need to treat an area that is 70 acres?*

2. *The fungicide label says to apply 14 ounces per 1,000 sq. ft. How much do you need to treat 1,500 sq. ft.?*

3. *The insecticide label says to apply 3 fluid ounces per acre. How many fluid ounces do you need to treat 80 acres? How many quarts would that be, knowing that there are 32 fluid ounces in a quart?*

**Answers:**

- 1. The label says to apply 1.5 quarts of herbicide per acre. How much do you need to treat an area that is 70 acres?**

$$\frac{1.5 \text{ qt.}}{1 \text{ acre}} = \frac{N \text{ qt.}}{70 \text{ acres}}$$

$$1N = 1.5 \times 70 = 105 \text{ qts.}$$

- 2. The fungicide label says to apply 14 ounces per 1,000 sq. ft. How much do you need to treat 1,500 sq. ft.?**

$$\frac{14 \text{ ounces}}{1,000 \text{ sq. ft.}} = \frac{N \text{ ounces}}{1,500 \text{ sq. ft.}}$$

$$1,000 N = 14 \times 1,500$$

$$1,000 N = 21,000$$

$$N = \frac{21,000}{1,000} = 21 \text{ ounces}$$

- 3. The insecticide label says to apply 3 fluid ounces per acre. How many fluid ounces do you need to treat 80 acres? How many quarts would that be, knowing that there are 32 fluid ounces in a quart?**

$$\frac{3 \text{ fluid ounces}}{1 \text{ acre}} = \frac{N \text{ fluid ounces}}{80 \text{ acres}}$$

$1N = 3 \times 80 = 240$  fluid ounces. To convert 240 fl oz to quarts:

$$\frac{1 \text{ qt}}{32 \text{ fl oz}} = \frac{N \text{ qts}}{240 \text{ fl oz}}$$

$$32N = 240$$

$$\frac{240}{32} = 7.5 \text{ qts}$$