Determine Amount of Granular Product Needed:

The label says to apply a fungicide at a rate of 2 pounds per acre. How much do you need to treat 40 acres?

We'll look at two ways to solve this, so you have more tools for doing math work: cross multiplication and unit cancellation.

For **Cross Multiplication**, set up the problem as ratios or proportions. Have pounds on top for both sides of the equal sign, and acres on the bottom for both sides OR have acres on top for both sides and pounds on bottom for both sides; it doesn't matter which way you do it. Just make sure the same units are on the top, and the same units are on the bottom.

$$\frac{\text{2 pounds}}{\text{1 acre}} = \frac{\text{N pounds}}{\text{40 acres}}$$

Then Cross Multiply:

$$\frac{\text{2 pounds}}{\text{1 acre}} \text{ X } \frac{\text{N pounds}}{\text{40 acres}}$$

This means you have (2 X 40) = (1 X N) or 80 = 1N

The answer is 80 pounds.

You could set it up the other way and get the same answer

$$\frac{\text{1 acre}}{\text{2 pounds}} = \frac{\text{40 acres}}{\text{N pounds}}$$

Then Cross Multiply:

$$\frac{\text{1 acre}}{\text{2 pounds}} \text{ X } \frac{\text{40 acres}}{\text{N pounds}}$$

This means you have (1 X N) = (2 X 40) or 1N = 80 The answer is 80 pounds.

Practice:

1. ***The label says to apply 12 ounces of granular insecticide per 1,000 sq. ft. How many ounces do you need for 10,000 sq. ft.?***

2. ***How many pounds would that be? 1 pound = 16 ounces.***

3. ***The label says to apply 5 pounds of granular herbicide per acre. How many pounds would you need to treat 20 acres?***

Answers:

1. ***The label says to apply 12 ounces of granular insecticide per 1,000 sq. ft. How many ounces do you need for 10,000 sq. ft.?***

$$\frac{12 \text{ ounces}}{1{,}000 \text{ sq ft}} \times 10{,}000 \text{ sq ft} = 120 \text{ ounces}$$

2. ***How many pounds would that be? 1 pound = 16 ounces.***

$$120 \text{ ounces} \times \frac{1 \text{ lb}}{16 \text{ ounces}} = 7.5 \text{ lbs.}$$

3. ***The label says to apply 5 pounds of granular herbicide per acre. How many pounds would you need to treat 20 acres?***

$$\frac{5 \text{ lb}}{1 \text{ acre}} \times 20 \text{ acres} = 100 \text{ lbs}$$

Next, we'll use a method called **Unit Cancellation**. You will set up the problem so that the units of measurement (inches, feet, seconds, ounces, gallons, etc.) cancel each other out. This is the opposite of the Cross multiplication process. The problem (***at a rate of 2 pounds per acre, how much do you need to treat 40 acres***) is set up as follows, with a unit (acre) on top for one of the fractions and on the bottom for the other.

$$40 \text{ acres} \times \frac{2 \text{ pounds}}{1 \text{ acre}} = \text{N pounds}$$

You know you set it up right if you can cancel one unit on the top, and the same unit on the bottom. The unit that is left is what your answer will be.

$$40 \text{ ~~acres~~} \times \frac{2 \text{ pounds}}{1 \text{ ~~acre~~}} = \text{N pounds}$$

After setting it up, do the multiplication and division: 40 times 2 divided by 1 = 80.

We can use unit cancellation to solve many problems or answer many questions, by using the relationship of one unit to another. For example, 12 inches = 1 foot. When you are working through a problem, always write the units. This will help you set up the units as fractions or ratios, and tells you whether to multiply or divide. A nice feature of unit cancellation is that you can convert from one unit to another to another in one problem.

Convert 15 yards to inches, knowing that 1 yard = 3 feet, and 1 foot = 12 inches.

$$\frac{15 \text{ yards}}{1} \times \frac{3 \text{ feet}}{1 \text{ yard}} \times \frac{12 \text{ inches}}{1 \text{ foot}} = \text{N inches}$$

This is set up correctly, because you can cancel out units (top and bottom), giving the answer in inches:

$$\frac{15 \cancel{\text{yards}}}{1} \times \frac{3 \cancel{\text{feet}}}{1 \cancel{\text{yard}}} \times \frac{12 \text{ inches}}{1 \cancel{\text{foot}}} = 540 \text{ inches}$$

The label says to apply 12 ounces of granular insecticide per 1,000 sq. ft. How many pounds do you need for 10,000 sq. ft? 1 pound = 16 ounces.

$$10{,}000 \text{ sq. ft} \times \frac{12 \text{ ounces}}{1{,}000 \text{ sq. ft}} \times \frac{1 \text{ pound}}{16 \text{ ounces}} = \text{N pounds} \quad (7.5 \text{ pounds})$$

Practice:

1. ***The label says to apply 20 pounds per acre. How much should you apply to 4,356 sq. ft?***

2. ***The label says to apply 8 ounces of granular pesticide per acre. How many ounces should you apply to 15 acres? How many pounds?***

3. **The label says to apply 1.5 pounds of granular pesticide per 1,000 sq. ft. What is the rate in pounds per acre? How many pounds should you apply to 20 acres?**

Answers:

1. ***The label says to apply 20 pounds per acre. How much should you apply to 4,356 sq. ft?***

$$\frac{20 \text{ lbs}}{1 \text{ acre}} \times \frac{1 \text{ acre}}{43{,}560 \text{ sq ft}} \times 4{,}356 \text{ sq. ft.} = 2 \text{ lbs}$$

2. ***The label says to apply 8 ounces of granular pesticide per acre. How many ounces should you apply to 15 acres? How many pounds?***

$$\frac{8 \text{ ounces}}{1 \text{ acre}} \times 15 \text{ acres} = 120 \text{ ounces}$$

$$120 \text{ ounces} \times \frac{1 \text{ lb}}{16 \text{ ounces}} = 7.5 \text{ lb}$$

You could combine this into one equation to solve for pounds:

$$\frac{8 \text{ ounces}}{1 \text{ acre}} \times 15 \text{ acres} \times \frac{1 \text{ lb}}{16 \text{ ounces}} = 7.5 \text{ lbs}$$

3. **The label says to apply 1.5 pounds of granular pesticide per 1,000 sq. ft. What is the rate in pounds per acre? How many pounds should you apply to 20 acres?**

$$\frac{1.5 \text{ pounds}}{1{,}000 \text{ sq ft}} \times \frac{43{,}560 \text{ sq ft}}{1 \text{ acre}} = 65.3 \text{ pounds per acre}$$

$$\frac{65.3 \text{ pounds}}{1 \text{ acre}} \times 20 \text{ acres} = 1{,}306 \text{ pounds}$$

You could combine this into one equation to solve for total pounds needed:

$$\frac{1.5 \text{ pounds}}{1{,}000 \text{ sq ft}} \times \frac{43{,}560 \text{ sq ft}}{1 \text{ acre}} \times 20 \text{ acres} = 1{,}306.8 \text{ pounds}$$