

## Using Formulas

Some people prefer to use formulas, such as this one. It may be easier and faster to memorize a formula than reason through the steps in a problem.

**What is the output in gallons per minute (gpm) if you spray 25 gallons per acre (gpa) at a speed of 8 miles per hour (mph)? Your sprayer has 15 inches between nozzles.**

Use the formula 
$$\text{GPM} = \frac{\text{GPA} \times \text{MPH} \times \text{Width (inches)}}{5,940}$$

First, where did the 5,940 come from? This is a conversion factor that combines all the numbers needed to convert gallons per acre, miles per hour, and inches to gallons per minute.

The formula  $\text{GPM} = (\text{GPA} \times \text{MPH} \times \text{W})/5,940$  has several constants: square feet per acre, feet in a mile, and time measured in minutes. MPH x W provides the square feet of coverage in an hour. You're looking for gallons per minute. 5,940 is a factor derived from the constants that convert square feet per hour (MPH x W) and gallons per hour into gallons per minute without having to go through the steps of finding sq ft per minute, determining the time to cover 43,560 sq ft, and computing the gallons per min based on the time involved.

The 5,940 "constant" converts units in one step, so you don't have the same calculations to deal with. Using 5,490 allows you to skip the math shown below:

$$\frac{43,560 \text{ sq ft}}{1 \text{ acre}} \times \frac{12 \text{ inches}}{1 \text{ foot}} \times \frac{1 \text{ mile}}{5,280 \text{ ft.}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} = 5,940$$

The formula you will use is much simpler, thanks to that constant:

$$\text{GPM} = \frac{25 \text{ gpa} \times 8 \text{ mph} \times 15 \text{ inches}}{5,940} = 0.5 \text{ gpm}$$

### Practice:

- 1. You want to drive your sprayer at a speed of 5 MPH. The boom has each nozzle spaced 20 inches apart, and you want to apply 10 gallons of solution per acre. What is the rate in gal. per minute?**
  
  
  
  
  
  
  
  
  
  
- 2. You want to drive your sprayer at a speed of 8 MPH. The boom has each nozzle spaced 15 inches apart, and you want to apply 10 gallons of solution per acre. What is the rate in gpm?**

**Answers:**

- 1. You want to drive your sprayer at a speed of 5 MPH. The boom has each nozzle spaced 20 inches apart, and you want to apply 10 gallons of solution per acre. What is the rate in gal. per minute?**

$$\text{GPM} = \frac{10 \text{ gpa} \times 5 \text{ mph} \times 20 \text{ inches}}{5,940} = 0.16835 \text{ gpm or about } 0.2 \text{ gpm}$$

- 2. You want to drive your sprayer at a speed of 8 MPH. The boom has each nozzle spaced 15 inches apart, and you want to apply 10 gallons of solution per acre. What is the rate in gpm?**

$$\text{GPM} = \frac{10 \text{ gpa} \times 8 \text{ mph} \times 15 \text{ inches}}{5,940} = 0.2020 \text{ gpm or about } 0.2 \text{ gpm}$$