

## Lesson 2 Working With Formulas

### Key Concepts

- You can move factors from one side of the equal sign to the other side in a diagonal manner
- Unknown factor must be alone and on top
- If there isn't a division line, the factor is considered on top
- When plugging numbers into a formula, they must be in the same units as the formula

Example 1:

Solve the formula for (x)

$$(x) (2) = (3) (6)$$

Example 2:

Solve the formula for (a)

$$(3) (10) = (5) (a)$$

Example 3:

Solve for (x)

$$\frac{10}{2} = \frac{25}{(x)}$$

## Working With Formulas

Example 4:

Solve the formula for (Dose, mg/L)

$$\text{lb/day} = (\text{Flow, MGD}) \times (\text{Dose, mg/L}) \times (8.34)$$

Example 5:

Find the chemical consumption in lb/day.

Plant flow is 2 CFS and chemical dose is 2.8 mg/L.

### Rearrange the detention time formula:

$$\text{Detention Time} = \frac{\text{Tank Volume}}{\text{Flow}}$$

1. Solve for tank volume

2. Solve for flow

### Rearrange the Lbs/day formula

$$\text{lb/day} = (\text{Flow, MGD}) \times (\text{Dose, mg/L}) \times (8.34)$$

3. Solve for flow

4. Solve for dose

**Rearrange the velocity formula:**

$$\text{Velocity} = \frac{\text{Distance}}{\text{Time}}$$

5. Solve for time

6. Solve for distance

**Rearrange the solids loading formula:**

$$\text{Solids loading, lb/day/sq.ft.} = \frac{\text{Solids Applied, lb/day}}{\text{Surface Area, sq ft}}$$

7. Solve for solids applied

8. Solve for surface area

**Rearrange the hydraulic loading formula:**

$$\text{Hydraulic loading, gpd/sq ft} = \frac{\text{Flow, gpd}}{\text{Surface Area, sq. ft}}$$

9. Solve for flow

10. Solve for Surface area

11. Find the chemical consumption in lb/day if plant flow is 1.5 CFS and chemical dose is 2.5 mg/L

$$\text{lb/day} = (\text{Flow, MGD}) (\text{Dose, mg/L}) (8.34)$$

## Working With Formulas

12. Find the detention time in minutes of a basin that has a volume of 15,000 ft<sup>3</sup> and a flow of 350 gpm.

$$\text{Detention Time} = \frac{\text{Volume, gal}}{\text{Flow, gpm}}$$

13. Find the detention time in minutes of a basin that has a volume of 40,000 gallons and a flow of 350 gpm.

$$\text{Detention Time} = \frac{\text{Volume, gal}}{\text{Flow, gpm}}$$