

Medical Math

Math Lab Instructor Notes

- Course Level/Topic: Pre-algebra/Solving Equations
- Learning Goals:
 - Prealgebra solving equations by dividing both sides by the same amount.
 - Work with subscript notation
 - Substituting values into equations
 - Percents and rational fractions
- Prerequisite knowledge:
 - Substituting values into a formula
 - Multiplication property of equality
- Time Required:
 - 20 to 30 minutes
- Brief Description: Students use a formula to solve problems provided by Mesa College's Veterinary Program. This requires the use of subscript notation and the multiplication property of equality to solve. The equations are the simplest of linear equations however the application makes them more interesting.

Medical Math

Name(s): KEY

When doctors, nurses and veterinarians want particular dosage of medicine, they often have to dilute a “stock solution” with sterile water. Suppose, for example, that a patient needs a 30 milliliter injection of medicine that is 30% medicine. The “stock solution” of medicine may be 75% medicine. That’s too much! So they use sterile to dilute the stock solution. But how much should they use?

To find out how much of the stock solution and sterile water should be included in the injection, they must solve the following equation:

$$P_m \cdot A = P_s \cdot x$$

In this equation

P_m = the percent of medicine in the desired solution (expressed as a *whole number*)

A = the amount of the desired solution

P_s = the percent of medicine in the stock in percent form (not decimal form)

x = the amount of stock solution to include

Example:

A veterinarian needs 30 ml of a solution of that is 15% dextrose. The stock solution is 50% dextrose. How much of the solution should be stock solution and how much should be water?

For the formula $P_m \cdot A = P_s \cdot x$, we have the following values:

P_m = percent in desired solution = 15

A = amount of desired solution = 30

P_s = percent in stock solution = 50

x = the value we are looking for

So the equation becomes $15 \cdot 30 = 50 \cdot x$. Let's solve...

$$15 \cdot 30 = 50 \cdot x$$

$$450 = 50x$$

$$\frac{450}{50} = \frac{50x}{50}$$

$$9 = x$$

$$x = 9$$

So there should be 9 ml of stock solution in the desired solution. The rest of the 30 ml (in other words 21 ml) should be sterile water.

The following scenarios were provided to the Math Department by Mesa College's Medical Assisting Program. For each scenario, indicate how many ml of stock solution and how many ml of sterile water (saline solution) you will use to make the solution. In each case, show your work by writing down the formula $P_m \cdot A = P_s \cdot x$, then substituting in the know values, then solving the equation.

1. You need 30 ml of a 25% dextrose solution, using 50% stock solution.

$$\begin{array}{ll} P_m = 25 & x = 15\text{ml} \\ A = 30\text{ml} & \\ P_s = 50 & \text{saline solution} = 15\text{ml} \end{array}$$

2. You need 5000 ml of a 2% dextrose solution, using 50% stock solution.

$$\begin{array}{ll} P_m = 2 & x = 200\text{ml} \\ A = 5000 \text{ ml} & \\ P_s = 50 & \text{saline solution} = 4800\text{ml} \end{array}$$

3. You need 150 ml of a 9% saline solution, using 30% stock solution.

$$\begin{array}{ll} P_m = 9 & x = 45 \text{ ml} \\ A = 150 \text{ ml} & \\ P_s = 30 & \text{dextrose solution} = 105\text{ml} \end{array}$$

4. You need 250 ml of a 5% saline solution, using 75% stock solution.

$$\begin{array}{ll} P_m = 5 & x = 16\frac{2}{3} \text{ ml} \\ A = 250 \text{ ml} & \\ P_s = 75 & \text{dextrose solution} = 133\frac{1}{3} \text{ ml} \end{array}$$

5. You need 1000 ml of a 6% dextrose solution, using 90% stock solution.

$$\begin{array}{ll} P_m = 6 & x = 66\frac{2}{3} \text{ ml} \\ A = 1000 \text{ ml} & \\ P_s = 90 & \text{saline solution} = 933\frac{1}{3} \text{ ml} \end{array}$$