

6-4 Reteaching

Applications of Linear Systems

You can solve systems of linear equations by graphing, substitution, or elimination. Deciding which method to use depends on the exactness needed and the form of the equations.

Problem

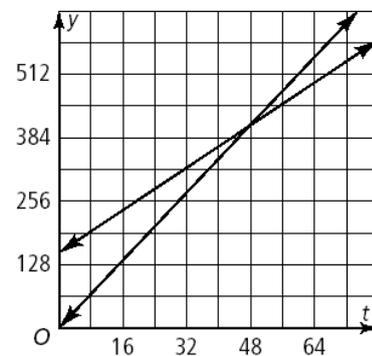
You just bought a coffee shop for \$153,600. The prior owner had an average monthly revenue of \$8600 and an average monthly cost of \$5400. If your monthly costs and revenues remain the same, how long will it take you to break even?

Write equations for revenue and costs, including the price you paid for the shop, after t months. Then solve the system by graphing.

$$y = 8600t \quad \text{Equation for revenue}$$

$$y = 5400t + 153,600 \quad \text{Equation for cost}$$

It appears that the point of intersection is where t is equal to 48 months. Substitute $t = 48$ into either equation to find the other coordinate (y), which is 412.8. Therefore, your breakeven point is after you have run the shop for 48 months, at which point your revenue and cost are the same: \$412,800.



Problem

A perfume is made from t ounces of 15% scented Thalia and b ounces of 40% Thalia. You want to make 60 oz of a perfume that has a 25% blend of the Thalia. How many ounces of each concentration of Thalia are needed to get 60 oz of perfume that is 25% strength of Thalia?

$$60(0.25) = 0.15t + 0.4b$$

Write your systems of equations:

$$60 = t + b$$

Solve the system by using substitution:

$$60(0.25) = 0.15t + 0.4b$$

Solve the second equation for t and substitute in the first equation.

$$15 = 0.15(60 - b) + 0.4b$$

Substitute $60 - b$ for t in the first equation.

$$15 = 9 - 0.15b + 0.4b$$

Distributive property

$$24 = b$$

Solve for b .

Substitute 24 for b in second equation to find that $t = 36$. The answer is (36, 24). The blend requires 36 oz of the 15% perfume and 24 oz of the 25% perfume.

Exercises

1. You have a coin bank that has 275 dimes and quarters that total \$51.50. How many of each type of coin do you have in the bank?

2. **Open-Ended** Write a break-even problem and use a system of linear equations to solve it.

3. You earn a fixed salary working as a sales clerk making \$11 per hour. You get a weekly bonus of \$100. Your expenses are \$60 per week for groceries and \$200 per week for rent and utilities. How many hours do you have to work in order to break even?

4. **Reasoning** Find A and B so that the system below has the solution $(1, -1)$.

$$Ax + 2By = 0$$

$$2Ax - 4By = 16$$

5. You own an ice cream shop. Your total cost for 12 double cones is \$24 and you sell them for \$2.50 each. How many cones do you have to sell to break even?

6. **Multi-Step** A skin care cream is made with vitamin C. How many ounces of a 30% vitamin C solution should be mixed with a 10% vitamin C solution to make 50 ounces of a 25% vitamin C solution?

- Define the variables.
- Make a table or drawing to help organize the information.

7. Your hot-air balloon is rising at the rate of 4 feet per second. Another aircraft nearby is at 7452 feet and is losing altitude at the rate of 30 feet per second. In how many seconds will your hot-air balloon be at the same altitude as the other aircraft?