

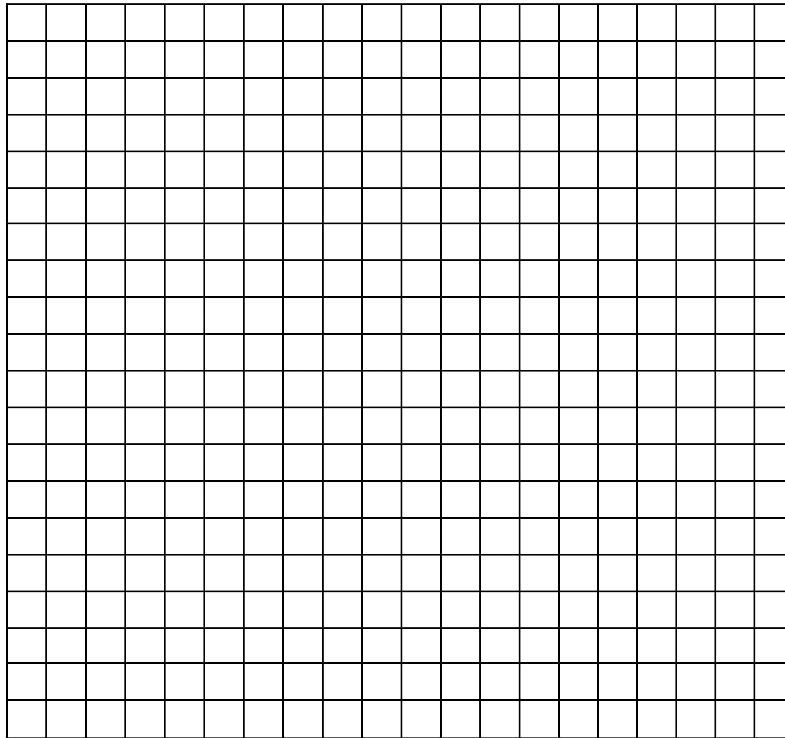
Worksheet 6-6: Applications of Solving Linear Systems

1. Galaxy Video and Game Rentals rents a game machine for \$10 and video games for \$3 each. Universal Video and Game Rentals rents a game machine for \$7 and video games for \$4 each. The total rental cost, y , in dollars, for one game machine plus x video games from either store can be compared using the following equations:

Galaxy: $y = 10 + 3x$

Universal: $y = 7 + 4x$

- (a) Graph the two equations on the same set of axes.



- (c) When will the total rental cost be the same for both stores?

- (d) When will the total rental cost of Galaxy be higher than that of Universal?

- (e) When will the total rental cost of Universal higher than that of Galaxy?

2. Office Depot ordered 80 cases of envelopes costing a total of \$1109. The order contained boxes of legal size envelopes costing \$14.95/box, and boxes of letter size envelopes costing \$11.95/box.

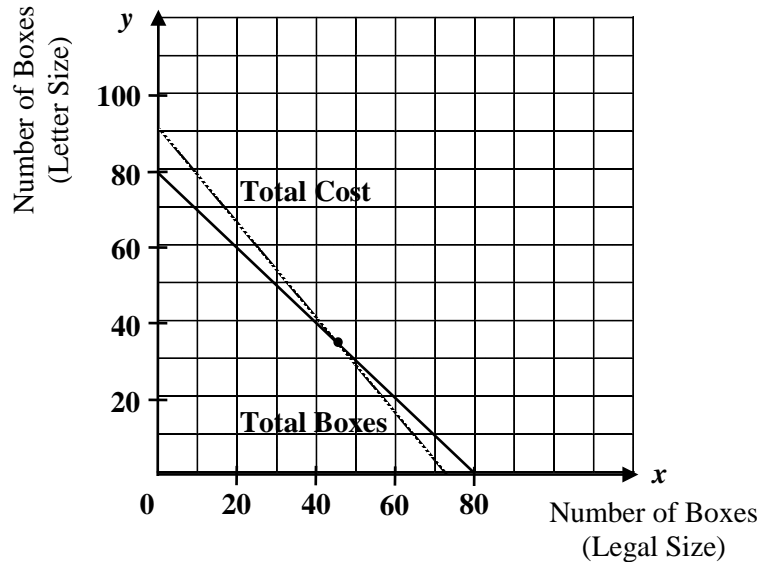
The total number of boxes ordered and the total cost of the boxes are represented by the following system of equations:

Total Boxes: $x + y = 80$

Total Cost: $14.95x + 11.95y = 1109$

where x is the number of boxes of legal sized envelopes and y is the number of boxes of letter size envelopes.

Examine the graph of the system to **approximate** the solution.



How many boxes of each type of envelopes were actually ordered?

In the business community, when the revenue (money earned) and costs (money spent) are equal, there is no profit or loss. This is called the “break-even point”.

If fewer units than the break-even point are produced and sold, the business will lose money.

If more units than the break-even point are produced and sold, the business will make a profit.

3. The student council is selling T-shirts. The cost of the T-shirts includes an \$800 design and set-up charge plus \$4 per T-shirt. The shirts will sell for \$20 each. The cost and revenue can be represented by the following equations:

$$\text{Cost:} \quad d = 800 + 4t$$

$$\text{Revenue:} \quad d = 20t$$

Where t is the number of T-shirts and d is an amount in dollars

- (a) Solve the system of equations by substitution.

- (b) How many T-shirts does the student council need to sell to break even?

- (c) How much money will the student council have raised if 200 T-shirts are made and sold?

4. Julia's annual salary in dollars, S , can be represented by the equation $S = 30500 + 500n$, where n is the number of years she has worked for the company. Aysha works for another company. Her annual salary can be represented by the equation $S = 26000 + 1000n$.

Use the method of elimination to determine after how many years the two women will have the same salary and what that salary will be?

5. KC Fitness Club charges a flat fee of \$25 per month plus \$5 per visit. Workout Zone charges a flat fee of \$35 per month plus \$3 per visit. For how many visits per month is the total cost the same for both fitness clubs? (Hint: Write an equation for each club then solve.)

Let Statements:

6. Rachelle is an economist. She evaluates the effect of changing the price on the supply and demand for a product. The selling price in dollars, y , of a product is related to the number of units sold, x , according to these equations:

$$\text{Demand (D): } y + 0.4x = 10$$

$$\text{Supply (S): } y = 0.6x + 2$$

Solve this system algebraically. What does the solution represent?

7. Kevin is selling T-shirts to raise money for diabetes research. The supplier charges a \$210 design fee plus \$3 per T-shirt. Kevin plans to sell the T-shirts for \$10 each. In order to **break even**, how many T-shirts does Kevin need to sell?

Let Statements:

8. Jemma is making 120 kg of a new blend of coffee that will sell for \$15/kg. The blend is made from two kinds of coffee: one that sells for \$18/kg, and another that sells for \$10/kg. How many of each type of coffee should Jemma use to make the new blend?

9. Naomi invests \$3000 in two funds. The education savings plan pays interest at a rate of 7% per year and the guaranteed investment certificate (GIC) pays interest at 5% per year. At the end of the year, she has earned \$190 in interest. How much did Naomi invest at each rate?

Let Statements:

- 10.** Students hold a car wash to raise money for a school trip to New York. They charge \$7 per car and \$10 per van. If they earned \$457 for washing a total of 52 cars and vans, how many cars and how many vans did they wash?

Let Statements:

- 11.** Harry drives 400 km in 5.5 hours. For the first part of his trip, his average speed is 80 km/h. For the second part of his trip, his average speed is 60 km/h. How far does Harry drive at 60 km/h?

Let Statements:

12. Charlie has a jar of coins. He tells his sister that the jar has 45 quarters and dimes altogether, and the total value of the coins is \$6.30. Find the number of each type of coin in the jar.

Let Statements:

13. Joshua invests \$8000 for his children's education. He invests part of the money in a high-risk bond that pays 5% interest per year, and the rest of the money in a low-risk bond that pays 3.25% interest per year. After one year, he has a total of \$312.50 in interest. How much did Joshua invest at each rate?

Let Statements:

- Answers:** 1. (b) renting 3 games, (c) renting < 3 games, (d) renting > 3 games; 2. 35 boxes (letter)/45 boxes (legal); 3. (a) (50, 1000), (b) 50, (c) Cost = \$1600, Revenue = \$4000, Raised \$2400; 4. 9 years, Salary = \$35000; 5. $y = 25 + 5x$, $y = 35 + 3x$, 5 visits; 6. (8, 6.8), when the price is \$6.80, S = D and 8 units are sold; 7. $C = 210 + 3n$, $C = 10n$, 30 t-shirts; 8. $x + y = 120$, $18x + 10y = 1800$, \$18/kg = 75 kg, \$10/kg = 45 kg; 9. $e + g = 3000$, $0.07e + 0.05g = 190$, \$2000 in 7%, \$1000 in 5%; 10. $c + v = 52$, $7c + 10v = 457$, 21 cars, 31 vans; 11. $\frac{x}{80} + \frac{y}{60} = 5.5$, $80x + 60y = 400$, 280 km at 80 km/h, 120 km at 60 km/h; 12. $q + d = 45$, $0.25q + 0.1d = 6.3$, 12 quarters, 33 dimes; 13. $h + l = 8000$, $0.05h + 0.0325l = 312.5$, \$3000 at 5%, \$5000 at 3.25%