

## Objective: Solve Systems Application Problems

The difference of two numbers is 3. Their sum is 13. Find the numbers.

1



$$\begin{cases} x - y = 3 \\ x + y = 13 \end{cases}$$

---

$$2x = 16$$
$$\boxed{x = 8}$$

$$8 - y = 3$$
$$\boxed{y = 5}$$
$$\{5, 8\}$$

2

Flying to Kampala with a tailwind a plane averaged 158 km/h. On the return trip the plane only averaged 112 km/h while flying back into the same wind. Find the speed of the wind and the speed of the plane in still air.



## Slide 3

**3** The school that Stefan goes to is selling tickets to a choral performance. On the first day of ticket sales the school sold 3 senior citizen tickets and 1 child ticket for a total of \$38. The school took in \$52 on the second day by selling 3 senior citizen tickets and 2 child tickets. Find the price of a senior citizen ticket and the price of a child ticket.

$$3s + 2(14) = 52$$

$$3s + 28 = 52$$

$$3s = 24$$

$$s = 8$$

\$14 for a child

\$8 for a senior citizen

$$\begin{cases} 3s + 1c = 38 \\ 3s + 2c = 52 \end{cases}$$

$$3s + 2c = 52$$

$$\begin{array}{r} -3s - c = -38 \\ 3s + 2c = 52 \\ \hline c = 14 \end{array}$$

$$3s + 2c = 52$$

$$c = \$14$$

4 The state fair is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 8 vans and 8 buses with 240 students. High School B rented and filled 4 vans and 1 bus with 54 students. Every van had the same number of students in it as did the buses. Find the number of students in each van and in each bus.

$v = \# \text{ kids in a van}$

$b = \# \text{ kids in a bus}$

$$\begin{cases} 8v + 8b = 240 \\ (4v + 1b = 54) \cdot 2 \end{cases}$$

$$\begin{array}{r} 8v + 8b = 240 \\ -8v - 2b = -108 \\ \hline \end{array}$$

$$6b = 132$$

$$b = 22 \text{ kids per bus}$$

$$\begin{array}{r} 8b + 8v = 240 \\ 8(22) + 8v = 240 \\ 176 + 8v = 240 \end{array}$$

$$8v = 64$$

$$v = 8 \text{ kids per van}$$

5 The senior classes at High School A and High School B planned separate trips to New York City. The senior class at High School A rented and filled 1 van and 6 buses with 372 students. High School B rented and filled 4 vans and 12 buses with 780 students. Each van and each bus carried the same number of students. How many students can a van carry? How many students can a bus carry?



- 6 A rocket is launched from the ground and follows a parabolic path represented by the equation  $y = -x^2 + 10x$ . At the same time, a flare is launched from a height of 10 feet and follows a straight path represented by the equation  $y = -x + 10$ . Using the accompanying set of axes, graph the equations that represent the paths of the rocket and the flare, and find the coordinates of the point or points where the paths intersect.

$$\begin{cases} y = -x^2 + 10x \\ y = -x + 10 \end{cases} \quad \left| \begin{array}{l} -x^2 + 10x = -x + 10 \\ x^2 - x - 10x + 10 = 0 \\ x^2 - 11x + 10 = 0 \\ (x-10)(x-1) = 0 \\ x=10 \quad x=1 \end{array} \right.$$

$y = -x + 10$ $y = -10 + 10$ $y = 0$	$(10, 0)$	$y = -x + 10$ $y = -1 + 10$ $y = 9$ $(1, 9)$
--	-----------	---

7 The price of a stock,  $A(x)$ , over a 12-month period decreased and then increased according to the equation  $A(x) = 0.75x^2 - 6x + 20$ , where  $x$  equals the number of months. The price of another stock,  $B(x)$ , increased according to the equation  $B(x) = 2.75x + 1.50$  over the same 12-month period. Graph and label both equations on the accompanying grid. State all prices, to the *nearest dollar*, when both stock values were the same.

$$x = 2.77 \quad x = 8.89$$



▪ **EXAMPLE 9** Fitting a Parabola to Three Points

Determine  $a$ ,  $b$ , and  $c$  so that the points  $(-1, 5)$ ,  $(2, -1)$ , and  $(3, 13)$  are on the graph of  $f(x) = ax^2 + bx + c$ .



**9.**

**EXPLORATION 1 Mixing Solutions**

Aileen's Drugstore needs to prepare a 60-L mixture that is 40% acid using three concentrations of acid. The first concentration is 15% acid, the second is 35% acid, and the third is 55% acid. Because of the amounts of acid solution on hand, they need to use twice as much of the 35% solution as the 55% solution. How much of each solution should they use?

- 10. Manufacturing** Stewart's Metals has three silver alloys on hand. One is 22% silver, another is 30% silver, and the third is 42% silver. How many grams of each alloy is required to produce 80 grams of a new alloy that is 34% silver if the amount of 30% alloy used is twice the amount of 22% alloy used.



**11. Loose Change** Matthew has 74 coins consisting of nickels, dimes, and quarters in his coin box. The total value of the coins is \$8.85. If the number of nickels and quarters is four more than the number of dimes, find how many of each coin Matthew has in his coin box.