

7e - I will solve problems using systems of equations.

GFS

2 equations  $\rightarrow$  2 variables

Ralph and Joe work together at Wal-Mart. While talking about old age one day, they found the sum of their ages to be 128 years. Ralph discovered he is 34 years older than Joe. How old are they?

G: Sum of their ages is 128. Ralph is 34 yrs older than Joe.

F: Ralph's age =  $x = 81$   
 Joe's age =  $y = 47$

$$\begin{array}{l} \rightarrow x + y = 128 \\ \underbrace{\phantom{y + 34} = x} \\ y + 34 = x \end{array}$$

Check:

$$\begin{array}{l} 81 + 47 = 128 \\ 128 = 128 \checkmark \end{array} \quad \begin{array}{l} 47 + 34 = 81 \\ 81 = 81 \checkmark \end{array}$$

$$\begin{array}{r} y + 34 + y = 128 \\ 2y + 34 = 128 \\ \underline{-34 \quad -34} \\ 2y = 94 \\ \frac{2y}{2} = \frac{94}{2} \\ y = 47 \end{array}$$

$$\begin{array}{l} x = y + 34 \\ x = 47 + 34 \\ x = 81 \end{array}$$

Solu: Joe is 47 + Ralph is 81.

Lucy was cleaning her car out and found some change. She found \$2.05 in quarters and nickels. She has 11 more nickels than quarters. How many of each coin does she have?

G: She found \$2.05 in Q + N. She has 11 more N than Q.

F: # of Q = Q = 5  
# of N = N = 16

$$\begin{aligned} .25Q + .05N &= 2.05 \\ Q + 11 &= N \end{aligned}$$

check:

$$\begin{aligned} .25(5) + .05(16) &= 2.05 \\ 1.25 + .80 &= 2.05 \\ 2.05 &= 2.05 \checkmark \end{aligned}$$

$$\begin{aligned} 5 + 11 &= 16 \\ 16 &= 16 \checkmark \end{aligned}$$

$$\begin{aligned} .25Q + .05(Q + 11) &= 2.05 \\ .25Q + .05Q + .55 &= 2.05 \\ .3Q + .55 &= 2.05 \\ \underline{-.55 \quad -.55} & \\ .3Q &= 1.50 \end{aligned}$$

$$\begin{aligned} \frac{.3Q}{.3} &= \frac{1.50}{.3} \\ Q &= 5 \end{aligned}$$

$$\begin{aligned} 5 + 11 &= N \\ 16 &= N \end{aligned}$$

Solu: Lucy found 5Q + 16N.

Two numbers have a sum of 33 and a difference of 9. Find the two numbers.

G: Two #'s sum to 33 & have a difference of 9.

F: 1st # =  $x = 21$

2nd # =  $y = 12$

$$x + y = 33$$

$$x - y = 9$$

$$\begin{array}{r} 21 + y = 33 \\ -21 \phantom{+} \\ \hline \end{array}$$

$$y = 12$$

Check:

$$\begin{array}{l} 21 + 12 = 33 \\ 33 = 33 \checkmark \end{array}$$

$$\begin{array}{l} 21 - 12 = 9 \\ 9 = 9 \checkmark \end{array}$$

$$\begin{array}{r} 2x = 42 \\ \hline \end{array}$$

$$x = 21$$

Solu: The two # are 21 + 12.

Mary bought 4 candy bars and 3 cans of pop at Quik stop, she spent \$3.40. Sally bought 3 candy bars and 5 cans of pop at the same store, she spent \$4.20. How much does each candy bar and a can of pop cost at Quik stop?

G: Mary bought 4 candy bars + 3 cans of pop for \$3.40.  
Sally bought 3 candy bars + 5 cans of pop for \$4.20.

F: price of candy =  $x$   
price of pop =  $y$

$$\begin{array}{r} 5(4x + 3y = 3.40) = 20x + 15y = 17 \\ -3(3x + 5y = 4.20) = -9x - 15y = -12.6 \\ \hline \end{array}$$

$$\frac{11x}{11} = \frac{4.4}{11}$$

$$x = .40$$

Check:

$$\begin{array}{l} 4(.4) + 3(.6) = 3.40 \\ 1.6 + 1.8 = 3.40 \\ 3.40 = 3.40 \checkmark \end{array}$$

$$\begin{array}{l} 3(.4) + 5(.6) = 4.20 \\ 1.2 + 3 = 4.20 \\ 4.20 = 4.20 \checkmark \end{array}$$

$$\begin{array}{l} 4(.40) + 3y = 3.40 \\ 1.60 + 3y = 3.40 \\ -1.60 \quad -1.60 \\ \hline 3y = 1.80 \\ \frac{3y}{3} = \frac{1.80}{3} \\ y = .60 \end{array}$$

Solu: Can of pop is 60¢  
Candy bars cost 40¢.

At a spring concert, adult tickets cost \$4.00 each while student tickets cost \$2.50 each. A total of 125 tickets were sold, and the total income was \$413. How many of each type of ticket was sold?

G: Adult tickets cost \$4, student tickets cost \$2.50.  
125 tickets were sold, total income was \$413.

F: # of adult tickets =  $x$   
# of student tickets =  $y$

$$\begin{array}{r} 4x + 2.5y = 413 \\ -4(x + y = 125) = \\ \hline -4x - 4y = -500 \\ \hline \phantom{-4x} -1.5y = -87 \\ \phantom{-4x} \underline{-1.5} \quad \underline{-1.5} \\ y = 58 \end{array}$$

Check:

$$\begin{array}{l} 4(67) + 2.5(58) = 413 \\ 413 = 413 \checkmark \end{array}$$

$$\begin{array}{l} 67 + 58 = 125 \\ 125 = 125 \checkmark \end{array}$$

$$\begin{array}{r} x + 58 = 125 \\ \underline{-58 \quad -58} \\ x = 67 \end{array}$$

Solu: 67 adult tickets were sold +  
58 student tickets were sold.

6. Vasko was renting a high performance bike for his training. Bike A is \$25 per month and requires a down payment of \$500. Bike B is \$50 per month and requires a down payment of \$200. How many months would Vasko need to rent the bikes in order for the total costs to be the same (break even)?

G: Bike A: \$25/month + \$500 down payment

Bike B: \$50/month + \$200 down payment

F: # of months to break even costs

months =  $x$   
total cost =  $y$

$$\begin{aligned} y &= 25x + 500 \\ y &= 50x + 200 \end{aligned}$$

$$\begin{array}{r} 50x + 200 = 25x + 500 \\ -25x \quad -25x \\ \hline \end{array}$$

$$\begin{array}{r} 25x + 200 = 500 \\ -200 \quad -200 \\ \hline \end{array}$$

$$\begin{array}{r} 25x = 300 \\ \frac{25x}{25} = \frac{300}{25} \\ x = 12 \end{array}$$

check:

$$\begin{aligned} 800 &= 25(12) + 500 \\ 800 &= 800 \checkmark \end{aligned}$$

$$\begin{aligned} y &= 25(12) + 500 \\ y &= 300 + 500 \\ y &= 800 \end{aligned}$$

$$\begin{aligned} 800 &= 50(12) + 200 \\ 800 &= 600 + 200 \\ 800 &= 800 \checkmark \end{aligned}$$

Solu: In 12 months the costs would break even (\$800).

7. Dante is holding a local dance for the community. He pays \$125 to rent the local firehouse for the evening. He must also pay \$3 for insurance for every guest at the part. If Dante charges \$8 for entry to the dance, how many tickets must he sell in order to recover all the money he has to pay (break even)?

G: Pays \$125 for rent. \$3 for insurance per guest.  
He charges \$8 per person.

F: guests/tickets =  $x$   
expense/income =  $y$

$$y = 125 + 3x$$

$$y = 8x$$

$$\begin{array}{r} 8x = 125 + 3x \\ -3x \quad -3x \\ \hline 5x = 125 \\ \frac{5x}{5} = \frac{125}{5} \\ x = 25 \end{array}$$

Check:

$$200 = 125 + 3(25)$$

$$200 = 125 + 75$$

$$200 = 200 \checkmark$$

$$200 = 8(25)$$

$$200 = 200 \checkmark$$

$$y = 8(25)$$

$$y = 200$$

Solu: 25 people must attend to break even (\$200)



HW: worksheet