

2.4 Solving Systems of Equations Using Substitution and Elimination

A. Solve using substitution:

1. $y = 0.2x + 10$

$4x + 5y = 35$

$4x + 5(0.2x + 10) = 35$ $y = 0.2(3) + 10$

$4x + x + 50 = 35$

$5x + 50 = 35$

$5x = -15$

$x = 3$

$(3, 10.6)$

2. $a - 4b = 2$

$3a + 3b = 3$

$a = 4b + 2$

$3(4b + 2) + 3b = 3$

$12b + 6 + 3b = 3$

$15b + 6 = 3$

$15b = -3$ $b = -\frac{1}{5}$

$a - 4(-\frac{1}{5}) = 2$

$a + \frac{4}{5} = 2$

$a = \frac{6}{5}$ or $(1.2, -0.2)$

$(\frac{6}{5}, -\frac{1}{5})$

B. Solve using elimination:

3. $\begin{cases} 2x + 5y = 8 \\ 10x + 25y = 10 \end{cases}$

$\begin{array}{r} 2x + 5y = 8 \\ -10x - 25y = -40 \\ \hline 0 = -30 \end{array}$

$0 = -30$

no solution

4. $\begin{cases} 3x - 3y = 4 \\ 4x - 5y = -2 \end{cases}$

$\begin{array}{r} 3x - 3y = 4 \\ 3(4x - 5y) = -6 \\ \hline -12x + 12y = -16 \\ + 12x - 15y = -6 \\ \hline -3y = -22 \end{array}$

$-12x + 12y = -16$

$+ 12x - 15y = -6$

$-3y = -22$

$y = \frac{22}{3}$

$(\frac{26}{3}, \frac{22}{3})$

$3x - 3(\frac{22}{3}) = 4$

$3x - 22 = 4$

$3x = 26$

$x = \frac{26}{3}$

C. Read each problem carefully. Define your variables and write a system of equations. Solve your system using substitution or elimination.

5. The admission fee at a small fair is \$1.50 for children and \$4.00 for adults. On a certain day, 2200 people enter the fair and \$5050 is collected. How many children and how many adults attended?

$1.5x + 4y = 5050$

$x + y = 2200$

$x = \# \text{ children}$

$y = \# \text{ adults}$

$\begin{array}{l} 1500 \text{ children} \\ 700 \text{ adults} \end{array}$

$1.5x + 4y = 5050$

$\begin{array}{r} 1.5x + 4y = 5050 \\ -4x - 4y = -8800 \\ \hline -2.5x = -3750 \end{array}$

$-2.5x = -3750$

$x = 1500$

$y = 700$

6. A landscaping company placed two orders with a nursery. The first order was for 13 bushes and 4 trees, and totaled \$487. The second order was for 6 bushes and 2 trees, and totaled \$232. The bill does not list the per-item price. What is the cost of one bush and of one tree?

$x = \# \text{ bushes}$

$y = \# \text{ trees}$

$13x + 4y = 487$

$6x + 2y = 232$

$\begin{array}{r} 13x + 4y = 487 \\ + -12x - 4y = -464 \\ \hline x = 23 \end{array}$

$13(23) + 4y = 487$

$4y = 188$

$y = 47$

$\begin{array}{l} 23 \text{ bushes} \\ 47 \text{ trees} \end{array}$

7. A movie theater sells tickets for \$9.00 each. Senior citizens receive a discount of \$3.00. One evening the theater sold 636 tickets and took in \$4974 in revenue. How many tickets were sold to senior citizens? How many were sold to "moviegoers" who were not senior citizens?

$x = \# \text{ senior citizens}$

$y = \# \text{ not senior citizens}$

$x + y = 636$

$6x + 9y = 4974$

$y = -x + 636$

$6x + 9(-x + 636) = 4974$

$6x - 9x + 5724 = 4974$

$-3x = -750$

$x = 250$

$y = 386$

$\begin{array}{l} 250 \text{ senior citizens} \\ 386 \text{ others} \end{array}$