

Solve the system of equation using graphing (on the calculator), substitution, and elimination.

$$2x - y = 8$$

$$x + y = 4$$

Graphing

$$\begin{array}{r} 2x - y = 8 \\ -2x \quad -2x \\ \hline -y = -2x + 8 \\ -1 \quad -1 \quad -1 \\ \hline y = 2x - 8 \end{array}$$

$$\begin{array}{r} x + y = 4 \\ -x \quad -x \\ \hline y = -x + 4 \\ (4, 0) \end{array}$$

Substitution

$$\begin{array}{l} y = -x + 4 \\ 2x - (-x + 4) = 8 \\ 2x + x - 4 = 8 \\ 3x - 4 = 8 \\ 3x = 12 \\ x = 4 \\ y = -(4) + 4 \\ y = 0 \end{array} \quad (4, 0)$$

Elimination

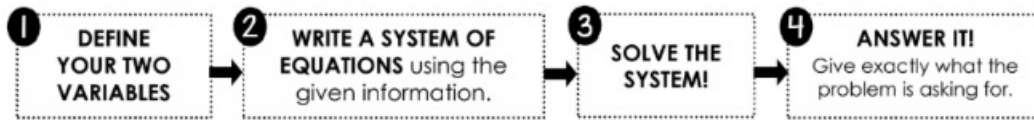
$$\begin{array}{r} (+) \quad 2x - y = 8 \\ \quad x + y = 4 \\ \hline \quad 3x = 12 \\ \quad 3 \quad 3 \\ \hline \quad x = 4 \\ (4, 0) \end{array}$$

Calculator Instructions

- 1) Make sure each equation is in  $y = mx + b$  form.
- 2) Enter the top equation for  $Y_1$  and the bottom equation for  $Y_2$ .
- 3) Press Graph.

# SYSTEMS OF EQUATIONS Applications

Many real world problems can be modeled and solved using a system of equations. Use the process below to solve these problems.



What are the two items, objects, or categories the problem is focused on?

Only use each number ONE TIME!

1. The sum of two numbers is 30 and their difference is 12. Find the two numbers.

$$\begin{aligned} X &= 1^{\text{st}} \# & X + Y &= 30 \\ Y &= 2^{\text{nd}} \# & X - Y &= 12 \end{aligned}$$

$$\begin{aligned} (+) \quad X + Y &= 30 \\ X - Y &= 12 \\ \hline 2X &= 42 \\ \frac{2X}{2} &= \frac{42}{2} \end{aligned}$$

$$\begin{aligned} X + Y &= 30 & X &= 21 \\ 21 + Y &= 30 & (21, 9) \\ Y &= 9 \end{aligned}$$

2. The sum of two numbers is 24 and their difference is 2. What are the numbers?

$$\begin{aligned} X &= 1^{\text{st}} \# & X + Y &= 24 \\ Y &= 2^{\text{nd}} \# & X - Y &= 2 \end{aligned}$$

$$\begin{aligned} X - Y &= 2 \\ + Y &+ Y \\ \hline X &= Y + 2 \end{aligned}$$

$$\begin{aligned} (Y + 2) + Y &= 24 \\ 2Y + 2 &= 24 \\ \frac{2Y + 2}{2} &= \frac{24}{2} \\ \frac{2Y}{2} &= \frac{22}{2} \end{aligned}$$

$$\begin{aligned} Y &= 11 \\ X &= Y + 2 & (13, 11) \\ X &= 11 + 2 \\ X &= 13 \end{aligned}$$

3. The difference between two numbers is 9.  
 The first number plus twice the other number  
 is 27. Find the two numbers.

$$\begin{aligned} X &= 1^{\text{st}} \# & X - Y &= 9 \\ Y &= 2^{\text{nd}} \# & X + 2Y &= 27 \end{aligned}$$

4. The sum of two numbers is 36. Twice the first number minus the second is 6. Find the numbers.

## MATHinking

- C**ircle the numbers
- U**nderline the question
- B**ox key words and use Math notation
- E**liminate extra info
- S**how your work to solve the problem

5. The sum of two numbers is 20. The difference between three times the first number and twice the second is 40. Find the two numbers.

6. The sum of two numbers is 25. One number is twice the second number plus seven. What are the two numbers?

$$\begin{aligned} X &= 1^{\text{st}} \# & X + Y &= 25 \\ Y &= 2^{\text{nd}} \# & X &= 2Y + 7 \end{aligned}$$

$$(2Y + 7) + Y = 25$$

$$\begin{array}{r} 3Y + 7 = 25 \\ \underline{-7 \quad -7} \\ 3Y = 18 \end{array}$$

$$\begin{array}{r} 3Y = 18 \\ \underline{3 \quad 3} \\ Y = 6 \end{array}$$

$$\begin{aligned} X &= 2(6) + 7 \\ X &= 19 \end{aligned}$$

$$(19, 6)$$

7. The cost of 3 boxes of envelopes and 4 boxes of notebook paper is \$13.25. Two boxes of envelopes and 6 boxes of notebook paper cost \$17. Find the cost of each.

$X =$  cost of one box of envelopes

$$\begin{cases} 2(3x + 4y = 13.25) \\ 3(2x + 6y = 17) \end{cases}$$

$Y =$  cost of one box of nb paper

$$\begin{aligned} 6x + 8y &= 26.50 \\ 6x + 18y &= 51 \\ \hline -10y &= -24.50 \\ \hline y &= 2.45 \end{aligned}$$

(1.15, 2.45)

$$\begin{aligned} 2x + 6(2.45) &= 17 \\ 2x + 14.70 &= 17 \\ \hline -14.70 & \quad -14.70 \\ \hline 2x &= 2.30 \\ \hline x &= 1.15 \end{aligned}$$

9. Gabby and Sydney bought some pens and pencils. Gabby bought 4 pens and 5 pencils for \$6.71. Sydney bought 5 pens and 3 pencils for \$7.12. Find the cost of each.

$X =$  cost of pens

$$\begin{cases} 4x + 5y = 6.71 \\ 5x + 3y = 7.12 \end{cases}$$

$Y =$  cost of pencils

11. A garden supply store sells two types of lawn mowers. The smaller mower cost \$249.99 and the larger mower cost \$329.99. 30 total mowers were sold and the total sales for a given year was \$8379.70. find how many of each type were sold.

$X = \# \text{ of smaller mowers}$   
 $Y = \# \text{ of larger mowers}$

$$X + Y = 30$$

$$249.99X + 329.99Y = 8379.70$$

$Y = \# \text{ of larger mowers}$

13. A group of 40 children attended a baseball game on a field trip. Each child received either a hot dog or bag of popcorn. Hot dogs were \$2.25 and popcorn was \$1.75. If the total bill was \$83.50, how many hotdogs and bags of popcorn were purchased?

$X = \# \text{ of hotdogs}$   
 $Y = \# \text{ of popcorns}$

$$X + Y = 40$$

$$2.25X + 1.75Y = 83.50$$

$$\textcircled{1} Y = -X + 40$$

$$2.25X + 1.75(-X + 40) = 83.50$$

$$2.25X - 1.75X + 70 = 83.50$$

$$.50X + 70 = 83.50$$

$$\begin{array}{r} .50X + 70 = 83.50 \\ -70 \quad -70 \\ \hline .50X = 13.50 \end{array}$$

$$\begin{array}{r} .50X = 13.50 \\ \cdot .50 \quad \cdot .50 \\ \hline X = 27 \end{array}$$

$$X = 27$$

$$27 + Y = 40$$

$$Y = 13$$

15. Adult tickets for the school musical sold for \$3.50 and student tickets sold for \$2.50. On a given night, 321 tickets were sold for \$937.50. How many of each kind of ticket were sold?

.05   .25

17. Mary has a collection of nickels and quarters for a total value of \$4.90. If she has 42 coins total, how many of each kind are there?

=  
 $x = \# \text{ of nickels}$   
 $y = \# \text{ of quarters}$

$$\begin{aligned}x + y &= 42 \\ .05x + .25y &= 4.90\end{aligned}$$

**19.** Your math teacher tells you that the next test is worth 100 points and contains 38 problems. Multiple-choice questions are worth 2 points each and word problems are worth 5 points. How many of each type of question are there?

## Systems Word Problems Cheat Sheet

$(\$8.50, \$6.50)$        ~~$(19, 6)$~~   
 ~~$(\$1.15, \$2.45)$~~        $(\$8.50, \$6.50)$

$(14, 22)$      $(16, 4)$      $(321, 227)$      $(15, 6)$      $(135, 186)$

$(\$1.19, \$0.39)$        $(13, 11)$        $(\$0.26, \$0.32)$

$(30, 8)$        ~~$(21, 9)$~~

$(24, 18)$        $(76, 24)$        $(10, 15)$        ~~$(13, 11)$~~

$(28, 14)$        ~~$(27, 13)$~~

(Answers to #1- 20)