Solve the system of equation using graphing (on the calculator), substitution, and elimination.
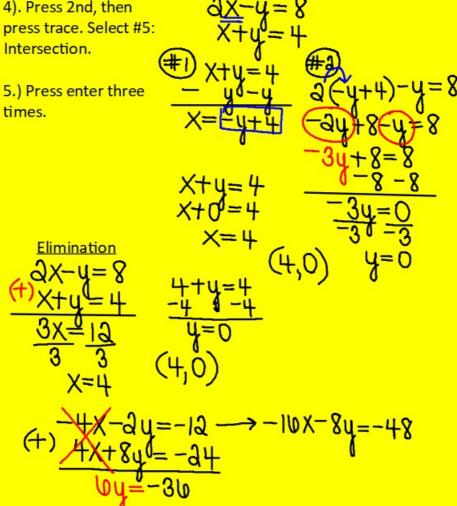
$$2x - y = 8$$
$$x + y = 4$$

Calculator Instructions

1) Make sure each equation is in $y = mx + b$ form.

2) Enter the top equation for Y_1 an the bottom equation for Y_2.

3) Press Graph.

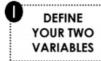4). Press 2nd, then press trace. Select #5: Intersection.

5.) Press enter three times.

Graphing

$$2x - y = 8$$
$$-2x \qquad -2x$$
$$\frac{-y}{-1} = \frac{-2x + 8}{-1 \quad -1}$$
$$\boxed{y = 2x - 8}$$

$$x + y = 4$$
$$-x \qquad -x$$
$$\boxed{y = -x + 4}$$

Substitution

$$2x - y = 8$$
$$x + y = 4$$

(#1)
$$x + y = 4$$
$$- \quad y \quad -y$$
$$\boxed{x = -y + 4}$$

(#2)
$$2(-y + 4) - y = 8$$
$$\boxed{-2y} + 8 \boxed{-y} = 8$$
$$-3y + 8 = 8$$
$$\underline{\quad -8 \; -8 \quad}$$
$$\frac{-3y}{-3} = \frac{0}{-3}$$
$$y = 0$$

$$x + y = 4$$
$$x + 0 = 4$$
$$x = 4$$

$$(4, 0)$$

Elimination

$$2x - y = 8$$
(+) $$x + y = 4$$
$$\frac{3x}{3} = \frac{12}{3}$$
$$x = 4$$

$$4 + y = 4$$
$$\underline{-4 \qquad -4}$$
$$y = 0$$
$$(4, 0)$$

(+) $$\cancel{-4x} - 2y = -12 \longrightarrow -10x - 8y = -48$$
$$\cancel{4x} + 8y = -24$$
$$6y = -36$$

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.

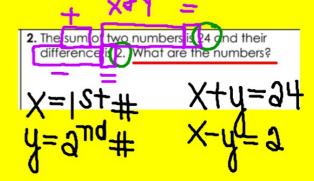**① DEFINE YOUR TWO VARIABLES** → **② WRITE A SYSTEM OF EQUATIONS** using the given information. → **③ SOLVE THE SYSTEM!** → **④ ANSWER IT!** Give exactly what the problem is asking for.

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

Only use each number ONE TIME!

$+$ $x+y$ $=$

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

$-$
$=$

$x = 1st \#$
$y = 2nd \#$

$x+y = 30$
$x-y = 12$

$+$ $x+y$ $=$

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

$-$
$=$

$x = 1st \#$
$y = 2nd \#$

$x+y = 24$
$x-y = 2$

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

$$X = 1^{st} \#$$
$$y = 2^{nd} \#$$
$$X - y = 9$$
$$X + 2y = 27$$

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

MATHinking

Circle the numbers

Underline the question

Box key words and use Math notation
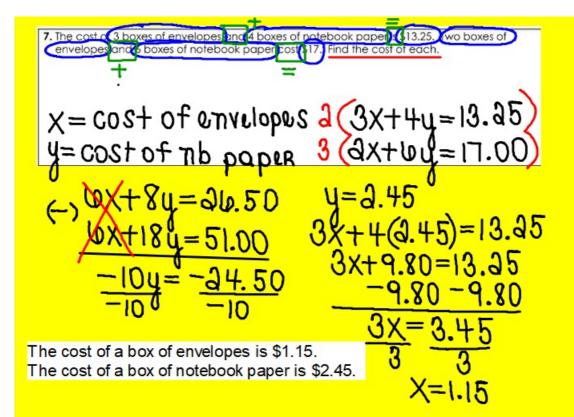
Eliminate extra info

Show 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?

$$X = 1^{st} \#$$
$$y = 2^{nd} \#$$

$$X + y = 25$$
$$X = 2y + 7$$

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 envelopes

$y = $ cost of nb paper

$$2(3x+4y=13.25)$$
$$3(2x+6y=17.00)$$

$$(-)\ 6x+8y=26.50$$
$$6x+18y=51.00$$
$$\overline{-10y=-24.50}$$
$$\frac{-10y}{-10}=\frac{-24.50}{-10}$$

$$y=2.45$$
$$3x+4(2.45)=13.25$$
$$3x+9.80=13.25$$
$$\underline{-9.80\ -9.80}$$
$$\frac{3x}{3}=\frac{3.45}{3}$$
$$x=1.15$$

The cost of a box of envelopes is $1.15.
The cost of a box of notebook paper is $2.45.

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

$y = $ cost of pencils

$$5(4x+5y=6.71)$$
$$4(5x+3y=7.12)$$

$$(-)\ 20x+25y=33.55$$
$$20x+12y=28.48$$
$$\overline{13y=5.07}$$
$$\frac{13y}{13}=\frac{5.07}{13}$$
$$y=0.39$$

$$4x+5(.39)=6.71$$
$$4x+1.95=6.71$$
$$\underline{-1.95\ -1.95}$$
$$\frac{4x}{4}=\frac{4.76}{4}$$
$$x=1.19$$

The cost of one pen is $1.19.
The cost of one pencil is $0.39.

11. A garden supply store sells two types of lawn mowers. The smaller mower costs $249.99 and the larger mower costs $329.99. If 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 = smaller LM
y = larger LM

$$249.99x + 329.99y = 8379.70$$
$$x + y = 30$$

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 = # of hotdogs
y = # of bags of pop.

$$2.25X + 1.75y = 83.50$$
$$X + y = 40$$

① $x + y = 40$
$-x \qquad -x$
_____
$y = -x + 40$

② $2.25X + 1.75(-X + 40) = 83.50$
③ $2.25X - 1.75X + 70 = 83.50$
$.50X + 70 = 83.50$
$-70 \quad -70$
_____
$\dfrac{.50X}{.50} = \dfrac{13.50}{.50}$
$X = 27$

$X + y = 40$
$27 + y = 40$
$-27 \qquad -27$
_____
$y = 13$

There were 27 hotdogs and 13 bags of popcorn purchased.

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?

X = adult tix

y = student tix

$3.50X + 2.50y = 937.50$

$X + y = 321$

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?

.05 + .25

X = # of nickels

y = # of quarters

$.05X + .25y = 4.90$

$X + y = 42$

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?

$x = \#\ of\ MC$

$y = \#\ of\ word\ prob.$

$2x + 5y = 100$

$x + y = 38$

Systems Word Problems Cheat Sheet

(17, 8)

($8.50, $6.50)   ($1.15, $2.45)   ($8.50, $6.50)

(14, 22)   (16, 4)   (321, 227)   ~~(15, 8)~~   (135, 186)

($1.19, $1.39)   ~~(3, 11)~~   ($0.26, $0.32)

~~(30, 8)~~   ~~(21, 9)~~

(24, 18)

(76, 24)   (10, 15)   ~~(18, 6)~~

(28, 14)   (27, 40)

(Answers to #1- 20)

At the movie theatre, the Clauton family bought 4 fountain drinks and 3 bags of popcorn and paid $22.50. The Hanks Family bought 5 fountain drinks and 2 bags of popcorn and paid $23.75. How much is a fountain drink?
→ X =

X = fountain drinks ($)
y = bag of popcorn ($)

$$4x + 3y = 22.50$$
$$5x + 2y = 23.75$$

$$8x + 6y = 45$$
$$(-)\ 15x + 6y = 71.25$$
$$\frac{-7x}{-7} = \frac{-26.25}{-7}$$
$$x = 3.75$$

Ryan works at the donut shop where he makes $10.25 per hour. He also works part time at the school bookstore where he makes $8.75 per hour. If he worked 20 total hours last week and made $196, how many hours did he work at the bookstore?
→ y =

X = hrs. at donut shop
y = hrs. at bookstore

$$10.25x + 8.75y = 196$$
$$x + y = 20$$

① $x + y = 20$
$$\frac{-y \quad -y}{x = -y + 20}$$

② $10.25(-y + 20) + 8.75y = 196$
$-10.25y + 205 + 8.75y = 196$
$-1.50y + 205 = 196$
$$\frac{-205 \quad -205}{\frac{-1.50y}{-1.50} = \frac{-9}{-1.50}}$$
$$y = 6$$

At the gym, Cara burns 12 calories per minute on the elliptical and 10 calories per minute on the treadmill. If she worked out for one hour and burned 676 calories, how many minutes did she spend on the elliptical?
→ X =

X = min. on elliptical
y = min. on treadmill

$$12x + 10y = 676$$
$$10(x + y = 60)$$

$$12x + 10y = 676$$
$$(-)\ 10x + 10y = 600$$
$$\frac{2x}{2} = \frac{76}{2}$$
$$x = 38$$