Warm Up

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

\[\begin{align*}
2x - y &= 8 \\
x + y &= 4
\end{align*}\]

**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.

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

5) Press enter three times.

**Graphing**

\[\begin{align*}
-2x - y &= 8 \\
2x &= 8 \\
y &= 2x - 8
\end{align*}\]

\[\begin{align*}
x + y &= 4 \\
-x &= 4 \\
y &= -x + 4
\end{align*}\]

**Substitution**

\[\begin{align*}
2x - y &= 8 \\
x + y &= 4
\end{align*}\]

\[\begin{align*}
x + y &= 4 \\
\frac{-y + 4}{x} &= 4
\end{align*}\]

\[x = -y + 4\]

\[\begin{align*}
2(-y + 4) - y &= 8 \\
-3y + 8 - y &= 8
\end{align*}\]

\[\begin{align*}
-3y &= 0 \\
y &= 0
\end{align*}\]

\[(4, 0)\]

**Elimination**

\[\begin{align*}
2x - y &= 8 \\
x + y &= 4
\end{align*}\]

\[\begin{align*}
3x &= 12 \\
x &= 4
\end{align*}\]

\[\begin{align*}
\frac{4 + y}{4} &= 4 \\
y &= 0
\end{align*}\]

\[(4, 0)\]

\[-4x - 2y &= -12 \\
-10x - 8y &= -48
\]

\[\begin{align*}
y &= -36
\end{align*}\]
What are the two items, objects, or categories the problem is focused on?

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

\[ x + y = 30 \]
\[ x - y = 12 \]

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

\[ x + y = 24 \]
\[ x - y = 2 \]
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.

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.

\[ x = 1^{st} \# \]
\[ x + y = 25 \]
\[ y = 2^{nd} \# \]
\[ x = 3y + 7 \]
7. The cost of 3 boxes of envelopes and 4 boxes of notebook paper is $13.25. Two boxes of envelopes and 3 boxes of notebook paper cost $17. Find the cost of each.

\[ \begin{align*}
 x &= \text{cost of envelopes} \quad \Rightarrow \quad 3x + 4y = 13.25 \\
y &= \text{cost of nb paper} \quad \Rightarrow \quad 2x + 3y = 17.00
\end{align*} \]

\[ \begin{align*}
 10x + 18y &= 51.00 \\
 -10y &= -24.50 \\
 -10 
\end{align*} \]

\[ \begin{align*}
 x &= 3.45 \\
 y &= 2.45 \\
 3x + 4(3.45) &= 13.25 \\
 3x + 9.80 &= 13.25 \\
 -9.80 &= -9.80 \\
 3x &= 3.45 \\
 \frac{3}{3} \\
 x &= 1.15
\end{align*} \]

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


\[ \begin{align*}
 x &= \text{cost of pens} \quad \Rightarrow \quad 4x + 5y = 6.71 \\
y &= \text{cost of pencils} \quad \Rightarrow \quad 5x + 3y = 7.12
\end{align*} \]

\[ \begin{align*}
 20x + 25y &= 33.55 \\
 20x + 12y &= 28.48 \\
 13y &= 5.07 \\
 \frac{13y}{13} &= \frac{5.07}{13} \\
 y &= 0.39
\end{align*} \]

\[ \begin{align*}
 4x + 5(0.39) &= 6.71 \\
 4x + 1.95 &= 6.71 \\
 -1.95 &= -1.95 \\
 4x &= 4.76 \\
 \frac{4x}{4} &= \frac{4.76}{4} \\
 x &= 1.19
\end{align*} \]

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 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.

\[ x = \text{smaller LM} \]
\[ y = \text{larger LM} \]
\[ 249.99x + 329.99y = 8379.70 \]
\[ x + y = 30 \]

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?

\[ x = \# \text{of hotdogs} \]
\[ y = \# \text{of bags of popcorn} \]
\[ 2.25x + 1.75y = 83.50 \]
\[ x + y = 40 \]

\[ \begin{align*}
   x + y &= 40 \\
   -x & \\
   y &= -x + 40 \\
\end{align*} \]

\[ \begin{align*}
   2.25x + 1.75(-x+40) &= 83.50 \\
   2.25x - 1.75x + 70 &= 83.50 \\
   0.50x + 70 &= 83.50 \\
   -70 & \\
   0.50x &= 13.50 \\
   \frac{50}{50} & \\
   x &= 27 \\
\end{align*} \]

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?

\[ \begin{align*}
    x &= \text{adult tickets} \\
    y &= \text{student tickets}
\end{align*} \]

\[ 3.50x + 2.50y = 937.50 \]

\[ x + y = 321 \]

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

\[ \begin{align*}
    x &= \# \text{ of nickels} \\
    y &= \# \text{ of quarters}
\end{align*} \]

\[ 0.05x + 0.25y = 4.90 \]

\[ x + y = 42 \]
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?

\[ x = \text{# of MC} \quad 2x + 5y = 100 \]
\[ y = \text{# of word prob.} \quad x + y = 38 \]
Systems Word Problems Cheat Sheet

\[(17, 8)\]
\[(8.50, 6.50)\] \[(1.15, 2.45)\] \[(8.50, 6.50)\]
\[(14, 22)\] \[(16, 4)\] \[(321, 227)\] \[(135, 186)\]
\[(1.19, 1.39)\] \[(24, 18)\] \[(76, 24)\] \[(10, 15)\]
\[(28, 14)\] \[(27, 40)\]

(Answers to #1-20)
At the movie theatre, the Coumar family bought fountain drinks and popcorn. The Banks family bought fountain drinks and bag of popcorn. How much is a fountain drink?

\[ 4x + 3y = 33.50 \]
\[ 5x + 3y = 33.75 \]

\[ \frac{8x + 6y = 45}{15x + 6y = 71.25} \]
\[ \frac{-7x = -26.25}{-7} \]
\[ x = 3.75 \]

Ryan works at the donut shop where he makes \$9.00 per hour. He also works part-time at the school bookstore where he makes \$10.25 per hour. He worked a total of 40 hours last week and made \$420. How many hours did he work at the bookstore?

\[ x + y = 40 \]
\[ -1.25x - 1.25y = -50 \]
\[ -0.25x - 0.25y = -9 \]
\[ -0.50x - 0.50y = -19 \]
\[ y = 65 \]

At the gym, Cara burns 12 calories per minute on the elliptical and 6 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?

\[ 10x + 10y = 676 \]
\[ 2x + 2y = 135 \]
\[ x = 38 \]

\[ x = \text{hrs. at donut shop} \]
\[ y = \text{hrs. at bookstore} \]

\[ 10.25x + 8.75y = 190 \]
\[ x + y = 40 \]

\[ 10.25(y + 40) + 8.75y = 190 \]
\[ 10.25y + 405 + 8.75y = 190 \]
\[ 19y + 405 = 190 \]
\[ -y = -105 \]
\[ y = 65 \]

\[ x = \text{min. on elliptical} \]
\[ y = \text{min. on treadmill} \]

\[ 13x + 10y = 676 \]
\[ (x + y = 40) \]