Model Problem #1: *The sum of two numbers is 10. Three times the larger decreased by twice the smaller is 15. Find the numbers.*

Let x = smaller number
y = larger number ⟸ If we use two variables, we must write two equations.

Equation 1: $x + y = 10$ (this comes from the first sentence)
Equation 2: $3y - 2x = 15$ (this comes from the second sentence)

***Now you can solve it using any method you would like. Remember, you have graphing, substitution or the addition method to choose from.

Solve using substitution: $y = 10 - x$ (get one variable alone)

$3y - 2x = 15$
$3(10 - x) - 2x = 15$
$30 - 3x - 2x = 15$
$30 - 5x = 15$

$y = 10 - x$
$y = 10 - 3$
$y = 7$

Feb 8-9:59 AM

Model Problem #2: *The larger of two numbers is one less than three times the smaller. If three times the larger is five more than eight times the smaller, find the numbers.*

Let x = smaller number
y = larger number ⟸ If we use two variables, we must write two equations.

Equation 1: $y = 3x - 1$ (this comes from the first sentence)
Equation 2: $3y = 8x + 5$ (this comes from the second sentence)

Solve using substitution: $y = 3x - 1$ (get one variable alone)

$3y = 8x + 5$
$3(3x - 1) = 8x + 5$
$9x - 3 = 8x + 5$
$9x - 9x - 3 - 5 = 8x - 9x + 5 - 5$
$-8 = -1x$
$x = 8$

$y = 3x - 1$
$y = 3(8) - 1$
$y = 24 - 1$
$y = 23$

Answer: **The numbers are 23 and 8.**

Feb 8-10:00 AM

1) Find two numbers whose sum is 9 and the smaller is seven less than the larger number. Solve by graphing.

Hint: Let y = smaller number = 1

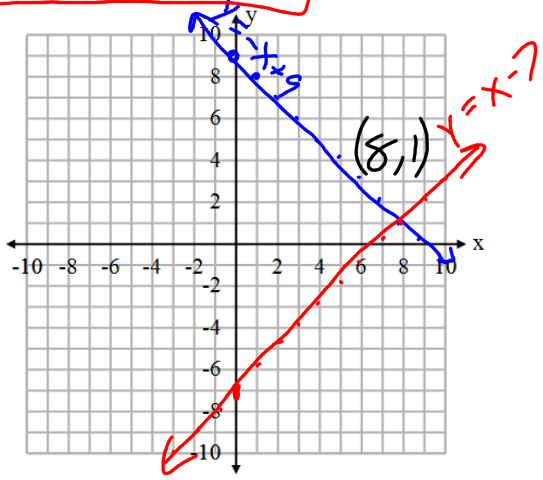
x = larger number = 8

$x + y = 9$

$-x \quad -x$

$y = -x + 9$

$y = x - 7$



Feb 8-10:01 AM

2) The sum of two numbers is 36. Their difference is 24. Find the numbers.

Let x = smaller # = 6

y = larger # = 30

$x + y = 36$

$y - x = 24$

$+\ y + x = 36$

$\frac{2y}{2} = \frac{60}{2}$

$y = 30$

$x + y = 36$

$x + 30 = 36$

$-30 \quad -30$

$x = 6$

Feb 8-10:01 AM

3) The sum of two numbers is 77. The larger number is 3 more than the smaller number. Find the numbers.

Let x = larger # = 40
y = smaller # = 37

$x + y = 77$
$x = y + 3$

$x + y = 77$
$y + 3 + y = 77$
$2y + 3 = 77$
$-3 \quad -3$
$\frac{2y}{2} = \frac{74}{2}$
$y = 37$

$x = y + 3$
$x = 37 + 3$
$x = 40$

Feb 8-10:02 AM

4) The difference between two numbers is 34. The larger exceeds 3 times the smaller by 4. Find the numbers.

Let x = smaller # = 15
y = larger # = 49

$y - x = 34$
$-(y + 3x = 4)$
$2x = 30$
$\frac{2x}{2} = \frac{30}{2}$
$x = 15$

$y - x = 34$
$y - 15 = 34$
$+15 \quad +15$
$y = 49$

Feb 8-10:02 AM

5) The larger of two numbers is 13 more than the smaller. If the larger is decreased by twice the smaller, the result is nine. Find the numbers.

Let y = larger = 17
x = smaller = 4

$y = x + 13$

$y - 2x = 9$

$x + 13 - 2x = 9$

$-x + 13 = 9$

$-13 \quad -13$

$\frac{-x}{-1} = \frac{-4}{-1}$

$x = 4$

$y = x + 13$

$y = 4 + 13$

$y = 17$

$17 - 8 = 9$

Feb 8-10:02 AM

6) The sum of two numbers is 13. If twice the larger is increased by 2, the result is equal to 5 times the smaller number. Find the numbers.

Let x = larger = 9
y = smaller = 4

$x + y = 13$

$-y \quad -y$

$x = 13 - y$

$2x + 2 = 5y$

$2(13 - y) + 2 = 5y$

$26 - 2y + 2 = 5y$

$28 = 7y$

$y = 4$

$x = 13 - 4$

$x = 9$

Jan 31-8:17 AM

VI. Problem Solving with Systems – Number Problems

A. Model Problem – The sum of two numbers is 10. Three times the larger decreased by twice the smaller is 15. Find the numbers

3 · n

2 · (10 − n) = 15

Using One Variable

Let n = 1st # (larger) = 7

10 − n = 2nd # (smaller) = 3

3n − 2(10 − n) = 15

3n − 20 + 2n = 15

5n − 20 = 15

+20 +20

5n/5 = 35/5

n = 7

Ck

21

−6

15

Using Two Variables

Let n = larger = 7

x = smaller = 3

$n^2 + x^2 = 10^2$

3n − 2x = 15

2n + 2x = 20

+ 3n − 2x = 15

5n/5 = 35/5

n = 7

n + x = 10

7 + x = 10

x = 3

May 7-9:34 AM

4) *The difference between two numbers is 34. The larger exceeds 3 times the smaller by 4. Find the numbers.*

y − 3 ·

x = 4

Let x = smaller # = 15

y = larger # = 49

y − x = 34

3x + 4 − x = 34

2x + 4 = 34

−4 −4

2x = 30

x = 15

3x + 4 = y

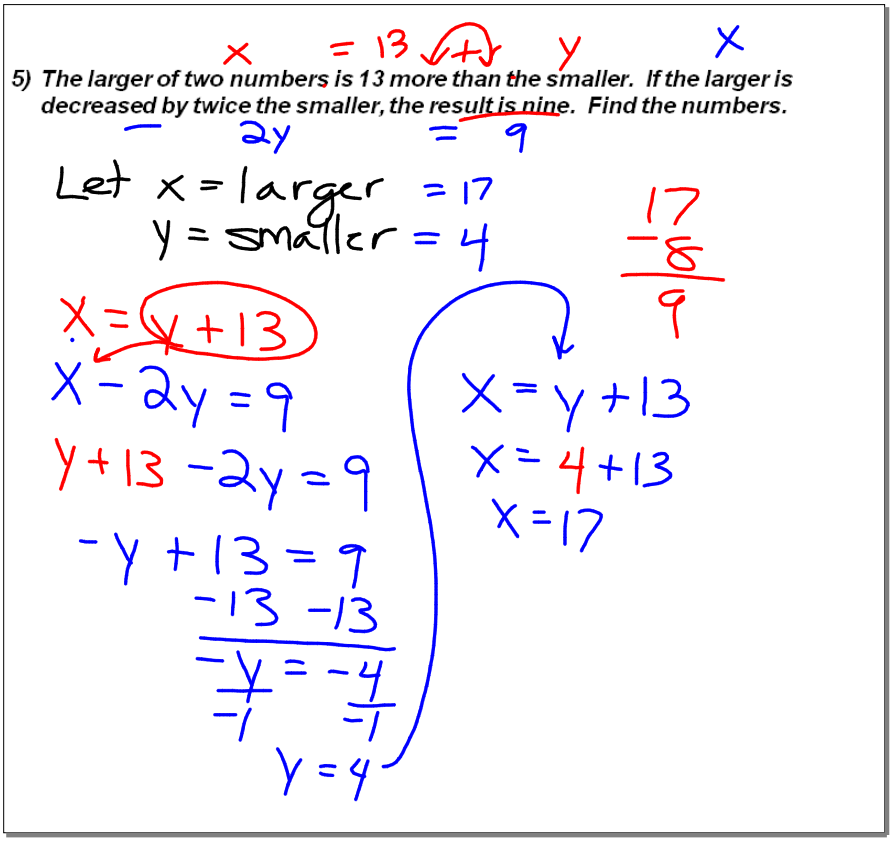
y − x = 34

y − 15 = 34

+15 +15

y = 49

Mar 19-9:59 AM


x = 13 + y
x
5) The larger of two numbers is 13 more than the smaller. If the larger is decreased by twice the smaller, the result is nine. Find the numbers.
− 2y = 9
Let x = larger = 17
y = smaller = 4
17
−8
9
X = y + 13
X − 2y = 9
y + 13 − 2y = 9
− y + 13 = 9
−13 −13
−y = −4
−1 −1
y = 4
X = y + 13
X = 4 + 13
X = 17

Mar 19-9:59 AM