

Your Name

Mrs. T

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Notes

Objective: To be able to determine the solution types of a system of equations as well as what the solutions are using elimination.

Life Lesson: If a solution works for you and it works for some one else then it works for both of you and is THE solution to your problem.

Skill: This method is why standard form is really important.

Many real world problems can be solved by a system of equations and if you are good at them then you can bust it out to easily find the solution. The more variables that you must solve for the more equations you need to solve them with, and they can be linear, quadratic, cubic, or anything.

Using Elimination when Multiplication is needed

*Use when every variable has coefficients and none match

- Step 1: Put both equations in standard form number in front of x or y, a/b
- Step 2: Multiply both entire sides by a number that will make one of the variables eliminated when added.
- Step 3: Add the equations together (x's with x's and y's with y's and constants with constants)
- Step 4: Solve for the variable that is left
- Step 5: Substitute the solved variable in to one of the original equations to solve for the other.
- Step 6: Write answer as a coordinate

ex. $2x + 3y = 6$

① $x + 2y = 5$

② $-2(x + 2y) = -2(5)$

② $-2x - 4y = -10$

① $+ 2x + 3y = 6$

$-y = -4$

$-1 \quad -1$

$y = 4$

Step 5

$x + 2y = 5$

$x + 2(4) = 5$

$x + 8 = 5$

$x = -3$

Step 6

$(-3, 4)$

ex. $3a - b = 2$

① $a + 2b = 10$

② $-3(a + 2b) = -3(10)$

② $-3a - 6b = -30$

① $+ 3a - b = 2$

$-7b = -28$

$-7 \quad -7$

$b = 4$

Step 5

$a + 2b = 10$

$a + 2(4) = 10$

$a + 8 = 10$

$-8 \quad -8$

$a = 2$

Step 6

$(a, b) \rightarrow (2, 4)$

$4c - 6d = 22$

$2c - 4d = 10$

$-2(2c - 4d) = -2(10) - 2$

$-4c + 8d = -20$

$+ 4c - 6d = 22$

$2d = 2$

$d = 1$

$4c - 6(1) = 22$

$4c - 6 = 22$

$+6 \quad +6$

$4c = 28$

$\frac{4c}{4} = \frac{28}{4}$

$c = 7$

$(7, 1)$

$$\begin{array}{r}
 -2(2x - 1y) = (-1)(-2) \\
 + 3x - 2y = 1 \\
 \hline
 -4x + 2y = 2 \\
 \hline
 -1x = 3 \\
 \hline
 -1 \quad -1 \\
 \hline
 x = -3 \\
 \hline
 2x - y = -1 \\
 2(-3) - y = -1 \\
 -6 - y = -1 \\
 +6 \quad +6 \\
 \hline
 -y = 5 \\
 \hline
 -1 \quad -1 \\
 \hline
 y = -5 \\
 \hline
 \boxed{(-3, -5)}
 \end{array}$$

$$\begin{array}{r}
 3(5x - 2y) = (-10)3 \\
 3x + 6y = 66
 \end{array}$$

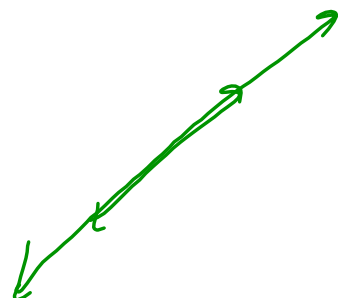
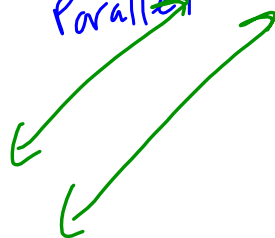
$$\begin{array}{r}
 7x + 4y = -4 \\
 5x + 8y = 28
 \end{array}$$

★ $4c - 6d = 22$ $\rightarrow 4c - 6d = 22$

$$\begin{array}{r}
 +4c - 6d = 22 \\
 -2(2c - 3d) = (10)(-2) \rightarrow -4c + 6d = -20 \\
 \hline
 0 + 0 = 2 \\
 0 = 2 \\
 \text{False Statement} \\
 \boxed{\text{No Solution}} \\
 \text{Parallel}
 \end{array}$$

★ Turn into Standard Form

$$\begin{array}{r}
 x = 2y + 6 \\
 -2y - 2y \rightarrow x - 2y = 6 \\
 -2(.5x - y) = 3 \rightarrow -x + 2y = -6 \\
 \hline
 x - 2y = 6 \\
 -x + 2y = -6 \\
 \hline
 0 + 0 = 0 \\
 0 = 0 \\
 \text{True Statement} \\
 \boxed{\text{Infinitely Many Solutions}} \\
 \text{Same line}
 \end{array}$$



Sometimes, you need to multiply both equations by different numbers to get to their Least Common Multiple

Multiply
to LCM

★

~~4: 4, 8, 12, 16, 20~~
~~6: 6, 12, 18, 24~~

$$\begin{array}{r} 3(4x + 5y) = (6)(3) \rightarrow 12x + 15y = 18 \\ -2(6x - 7y) = (-20) \rightarrow -12x + 14y = -40 \end{array}$$

$$\begin{array}{r} 6x - 7y = -20 \\ \frac{29y = 58}{29} \quad \frac{29}{29} \\ \hline y = 2 \end{array}$$

$$6x - 7(2) = -20$$

$$\begin{array}{r} 6x - 14 = -20 \\ +14 \quad +14 \\ \hline 6x = -6 \\ \frac{6x}{6} = \frac{-6}{6} \\ x = -1 \end{array}$$

$$(-1, 2)$$

$$3(5x + 3y) = (-10)(3)$$

$$-5(3x + 5y) = (-6)(-5)$$

$$\begin{array}{r} 15x + 9y = -30 \\ -15x - 25y = 30 \\ \hline \end{array}$$

$$\begin{array}{r} -16y = 0 \\ -16 \quad -16 \\ \hline y = 0 \end{array}$$

$$5x + 3y = -10$$

$$5x + 3(0) = -10$$

$$5x + 0 = -10$$

$$\begin{array}{r} 5x = -10 \\ \frac{5x}{5} = \frac{-10}{5} \\ x = -2 \end{array}$$

$$(-2, 0)$$

$$-5(2x + 3y) = (10)(-5)$$

$$2(5x + 2y) = (-8)(2)$$

$$\begin{array}{r} -10x - 15y = -50 \\ +10x + 4y = -16 \\ \hline \end{array}$$

$$\begin{array}{r} -11y = -66 \\ -11 \quad -11 \\ \hline y = 6 \end{array}$$

$$2x + 3y = 10$$

$$2x + 3(6) = 10$$

$$2x + 18 = 10$$

$$\begin{array}{r} 2x = -8 \\ \frac{2x}{2} = \frac{-8}{2} \\ x = -4 \end{array}$$

$$(-4, 6)$$

Summary

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Virtue: If a solution works for you and it works for some one else then it works for both of you and is THE solution to your problem.

Skill: This method is why standard form is really important.

Many real world problems can be solved by a system of equations and if you are good at them then you can bust it out to easily find the solution. The more variables that you must solve for the more equations you need to solve them with, and they can be linear, quadratic, cubic, or anything.

Assignment: Workbooks 5-4

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Use elimination to solve each system of equations.

1. $x + y = -9$
 $5x - 2y = 32$

2. $3x + 2y = -9$
 $x - y = -13$

3. $2x + 5y = 3$
 $-x + 3y = -7$

4. $2x + y = 3$
 $-4x - 4y = -8$

5. $4x - 2y = -14$
 $3x - y = -8$

6. $2x + y = 0$
 $5x + 3y = 2$

7. $5x + 3y = -10$
 $3x + 5y = -6$

8. $2x + 3y = 14$
 $3x - 4y = 4$

9. $2x - 3y = 21$
 $5x - 2y = 25$

10. $3x + 2y = -26$
 $4x - 5y = -4$

11. $3x - 6y = -3$
 $2x + 4y = 30$

12. $5x + 2y = -3$
 $3x + 3y = 9$

13. Two times a number plus three times another number equals 13. The sum of the two numbers is 7. What are the numbers?

14. Four times a number minus twice another number is -16 . The sum of the two numbers is -1 . Find the numbers.

Determine the best method to solve each system of equations. Then solve the system.

15. $2x + 3y = 10$
 $5x + 2y = -8$

16. $8x - 7y = 18$
 $3x + 7y = 26$

17. $y = 2x$
 $3x + 2y = 35$

18. $3x + y = 6$
 $3x + y = 3$

19. $3x - 4y = 17$
 $4x + 5y = 2$

20. $y = 3x + 1$
 $3x - y = -1$

Homework Answers 5-4:

1. (2,-11) 2. (-7,6) 3. (4,-1)
4. (1,1) 5. (-1,5) 6. (-2, 4)
7. (-2, 0) 8. (4,2) 9. (3,-5)
10. (-6, -4) 11. (7,4) 12. (-3,6)
13. 8,-1 14. -3, 2 15. Elim. (-4,6)
16. Elim. (4,2) 17. Sub. (5,10)
18. Elim. No Sol. 19. Elim. (3,-2)
20. Sub. Inf. Many Sol.

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11. (1,1) 12. (2,1) 13. (8,3)
14. (19,16) 15. (-7,-12) 16. (-17, 5)
17. (5, -3) 18. (1,2)
19. They subtracted $5x$ and x instead of adding them, $5x + x$ is $6x$, not $4x$.
20. The right side of the second equation did not get multiplied by -4 ; $-4x + 8y = 52$