

SOLVING SYSTEMS OF EQUATIONS BY ELIMINATION

USE THE ELIMINATION METHOD FOR SOLVING SYSTEMS WHEN YOU DON'T HAVE A GRAPH

STEPS FOR SOLVING BY ELIMINATION

1. **LINE UP** THE VARIABLES
2. **ADD** THE EQUATIONS.
3. **SOLVE** FOR THE FIRST VARIABLE (X OR Y)
4. **SUBSTITUTE** THE VARIABLE FROM STEP 3 AND SOLVE FOR THE OTHER VARIABLE.
5. **CHECK:** PLUG X AND Y INTO EQUATION.

WRITE FINAL ANSWER AS ORDERED PAIR

$(4, 0)$

EXAMPLE 1: THE "Y" CANCELS OUT

$$\begin{array}{r} 4x + 3y = 16 \\ + 2x - 3y = 8 \\ \hline 6x = 24 \\ \hline \frac{6x}{6} = \frac{24}{6} \end{array} \quad \begin{array}{l} \text{ADD} \\ \text{SOLVE} \end{array}$$

$x = 4$

← YOU NOW HAVE ONE VARIABLE. PLUG BACK INTO ORIGINAL EQUATION TO FIND THE OTHER VARIABLE

4x + 3y = 16 ORIGINAL EQUATION
 4(4) + 3y = 16 PLUGGED-IN X VALUE
 16 + 3y = 16 ~~16~~ DISTRIBUTE
 -16 -16
 $3y = 0$
 $\frac{3y}{3} = \frac{0}{3}$
 $y = 0$

WRITE FINAL ANSWER AS ORDERED PAIR

$(6, -1)$

EXAMPLE 2: THE "X" CANCELS OUT

$$\begin{array}{r} -x + 2y = -8 \\ + x + 2y = 4 \\ \hline 4y = -4 \\ \hline \frac{4y}{4} = \frac{-4}{4} \end{array} \quad \begin{array}{l} \text{ADD} \\ \text{SOLVE} \end{array}$$

$y = -1$

NOW YOU HAVE y. PLUG INTO ORIGINAL EQUATION TO FIND x

-x + 2y = -8 ORIGINAL EQUATION
 -x + 2(-1) = -8 PLUG IN y
 -x - 2 = -8 DISTRIBUTE
 +2 +2
 -x = -6
 $\frac{-x}{-1} = \frac{-6}{-1}$
 $x = 6$

EXAMPLE 3: THE VARIABLES ARE NOT LINED UP

$$\begin{array}{r} 3x + 2y = 7 \\ 4y - 3x = 5 \end{array}$$

$$\begin{array}{r} 3x + 2y = 7 \\ -3x + 4y = 5 \\ \hline 6y = 12 \\ \hline y = 2 \end{array}$$

MOVE THE SECOND EQUATION SO X IS UNDER X AND y IS UNDER y

NOW SOLVE

* X AND y ARE ALREADY ON THE LEFT SIDE SO DON'T CHANGE ANY SIGNS

$(1, 2)$

3x + 2(2) = 7
 3x + 4 = 7
 -4 -4
 3x = 3
 $x = 1$

EXAMPLE 4: THE VARIABLES ARE ON THE WRONG SIDE OF THE EQUAL

y = -x + 10
 +x + y = 10 ← ALWAYS WRITE X FIRST!
 x + y = 10

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

$$\begin{array}{r} x + y = 10 \\ 5x - y = 2 \\ \hline 6x = 12 \\ \hline x = 2 \end{array}$$

THE X IS ON THE RIGHT SIDE AND IT NEEDS TO BE ON THE LEFT. DO THE OPPOSITE AND MOVE IT

$(2, 8)$

2 + y = 10
 $y = 8$

IF YOU DO NOT HAVE VARIABLES THAT CANCEL OUT, YOU WILL NEED TO MULTIPLY TO GET TERMS THAT WILL CANCEL

FOR EXAMPLE: IF YOU WANT THE X TERM TO BE -4 MULTIPLY THE ENTIRE EQUATION (EVERY TERM)

$$-4(3y + x = -6)$$

$$-12y - 4x = 24$$

HOW TO FIGURE OUT WHICH NUMBER(S) TO MULTIPLY:

- 1) PICK A VARIABLE (X OR Y)
- 2) MULTIPLY EACH EQUATION BY THE OPPOSITE COEFFICIENT

If terms are positive/negative then your multiplication terms are BOTH POSITIVE

If terms are both the same sign then your multiplication terms need to be ONE POSITIVE and ONE NEGATIVE

TRY CANCELING OUT Y, USE 1 AND 3, THE COEFFICIENTS FOR THE Y VARIABLES

EXAMPLE 5: VARIABLES ARE POSITIVE/NEGATIVE

$$\begin{array}{l} 3(3x + y = 8) \\ 1(7x - 3y = 8) \end{array} \rightarrow$$

$$\begin{array}{l} 9x + 3y = 24 \\ 7x - 3y = 8 \end{array}$$

$$16x = 32$$

$$x = 2$$

$$9(2) + 3y = 24$$

$$\begin{array}{r} 18 + 3y = 24 \\ -18 \quad -18 \end{array}$$

$$\frac{3y}{3} = \frac{6}{3}$$

$$y = 2$$

$$(2, 2)$$

now y's cancel out!

TRY CANCELING OUT Xs, USE 5 AND 3. BUT ONE MUST BE NEGATIVE SO SOMETHING CANCELS OUT

EXAMPLE 6: BOTH VARIABLES ARE SAME SIGN

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

$$\begin{array}{l} -15x - 6y = 30 \\ 15x + 30y = 330 \end{array}$$

$$\frac{24y}{24} = \frac{360}{24}$$

$$y = 15$$

$$(-8, 15)$$

$$-15x - 6(15) = 30$$

$$\begin{array}{r} -15x - 90 = 30 \\ +90 \quad +90 \end{array}$$

$$\frac{-15x}{-15} = \frac{120}{-15}$$

$$x = -8$$

now x's will cancel!

WHITE BOARD PRACTICE!

$$\begin{array}{l} 3x - 9y = -30 \\ -3x - 4y = 4 \end{array}$$

$$(-4, 2)$$

$$\begin{array}{l} 4x + 3y = -13 \\ 7x - 2y = -1 \end{array}$$

$$(-1, -3)$$

$$\begin{array}{l} -6x = 3y - 9 \\ -5x - 3y = -4 \end{array}$$

$$(5, -7)$$

$$\begin{array}{l} -8x + 5y = 12 \\ x + 4y = 17 \end{array}$$

$$(1, 4)$$

$$\begin{array}{l} -3x + 30 = 8y \\ -8y - 8x = 0 \end{array}$$

$$(-6, 6)$$

$$\begin{array}{l} -9x + y = -2 \\ -x - y = 2 \end{array}$$

$$(0, -2)$$

THE CALCULATOR!

- MAKE SURE YOUR EQUATION IS LINED UP AS $ax + by = c$

(MEANING THE X AND Y ARE ON THE LEFT, AND THE CONSTANT NUMBER IS ON THE RIGHT)

- GO TO [2ND] SYS-SOLVE (THE TAN KEY)
- SELECT OPTION 1 2X2 LIN EQU
- TYPE IN THE COEFFICIENT FOR THE FIRST X, PRESS ENTER UNTIL YOU GET TO THE PLACE IN FRONT OF Y AND TYPE IN THAT COEFFICIENT. KEEP TYPING IN ALL NUMBERS OF YOUR EQUATION
- GO TO SOLVE AND PRESS ENTER... TA-DA!
- IF YOU WANT TO SWITCH YOUR FRACTION ANSWER INTO A DECIMAL, PRESS THE 'CHANGER' BUTTON RIGHT ABOVE THE ENTER KEY