

## 6.4 Elimination Part 2 (T6-3)

~ Solve a System by multiplying one or both equations to create opposites.

Look for OPPOSITES **YES** → Add Eq to eliminate

$$\begin{aligned} 2x + 3y &= 6 \\ -2x + 10y &= 15 \end{aligned}$$

NO →

ARE THERE any coefficients that are the same?

NO?

Are there any coefficients of 1 (invisible 1's)

**YES** → MULT 1 eq by -1 to make opposites

$$\begin{aligned} 2x + 3y &= 6 \\ 2x + 10y &= 15 \end{aligned}$$

NO

**YES** →  $2x + y = 23$   
 $3x + 2y = 37$

Multiply that equation so its the opposite of the other eq.

Multiply Both Equations to make opposites.

Ex 1

Coefficient  
of 1  
(invisible)

$$\begin{aligned} 2x + y &= 23 \\ 3x + 2y &= 37 \end{aligned}$$

Multiply top eq. by -2

$$-2(2x + y = 23)$$

Add

$$-4x - 2y = -46$$

$$+ 3x + 2y = 37$$

Solve

$$\begin{array}{r} -x \quad = -9 \\ -1 \quad = -1 \end{array}$$

$$x = 9$$

Solve

$$2(9) + y = 23$$

$$18 + y = 23$$

$$-18 \quad -18$$

$$y = 5$$

One Sol:  $(9, 5)$  \*

$$3(9) + 2(5) \neq 37$$

$$27 + 10 = 37$$

Your Turn

$$\begin{aligned} 2x - y &= -1 \\ 3x - 2y &= 1 \end{aligned}$$

$$-2(2x - y = -1)$$

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

$$3x - 2y = 1$$

$$-x = 3$$

$$x = -3$$

$(-3, -5)$

EX2

$$\begin{aligned} 4x + 3y &= -19 \\ 3x - 2y &= -10 \end{aligned}$$

Mult  
to  
make  
opp.

$$\begin{aligned} 2(4x + 3y &= -19) \\ 3(3x - 2y &= -10) \end{aligned}$$

NEW EQ:

$$8x + 6y = -38$$

$$9x - 6y = -30$$

$$\begin{array}{r} 17x \phantom{+ 6y} = -68 \\ \hline 17 \phantom{+ 6y} \phantom{=} 17 \end{array}$$

Add  
together

Solve

$$x = -4$$

$$4(-4) + 3y = -19$$

$$\begin{array}{r} -16 + 3y = -19 \\ +16 \phantom{+ 3y} +16 \end{array}$$

Solve

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

$$y = -1$$

$$\begin{array}{c} (-4, -1) \\ \times \phantom{y} \\ \phantom{x} y \end{array} \checkmark$$

verify

$$3(-4) - 2(-1) \stackrel{?}{=} -10$$

$$-12 + 2 = -10$$

$$\begin{aligned} -3(4x + 3y &= -19) \\ 4(3x - 2y &= -10) \end{aligned}$$

$$-12x - 9y = +57$$

$$12x - 8y = -40$$

Check HW #7 #11

$$7. \begin{cases} x + y = 2 \\ -3x + 4y = 15 \end{cases} \leftarrow \cdot \text{by } 3$$

$$-3x + 4y = 15$$

$$3x + 3y = 6$$

$$7y = 21$$

$$y = 3$$

$$(-1, 3)$$

$$11. \begin{cases} 2x + 5y = 11 \\ 4x + 3y = 1 \end{cases}$$

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

New EQ:

$$-8x - 20y = -44$$

$$8x + 6y = 2$$

$$(-2, 3)$$

# CH 6 BEST METHOD (WORD PROBLEMS)

Graphing vs Substitution vs Elimination

↓  
or Verification  
Estimation

↓  
variable alone  
★ variable w/ 1 coefficient

Already Opposites  
Variable w/ 1 coefficient  
• Multiplication looks best.

Determine the BEST CHOICE

1. 
$$\begin{array}{l} 2x + 3y = 23 \\ 4x + 2y = 34 \end{array} \quad \left. \vphantom{\begin{array}{l} 2x + 3y = 23 \\ 4x + 2y = 34 \end{array}} \right\} \text{Elimination (Mult top eq by } -2)$$

2. 
$$\begin{array}{l} 2x + 0.2y = 38.4 \\ x = 3.6y + 0.7 \end{array} \quad \left. \vphantom{\begin{array}{l} 2x + 0.2y = 38.4 \\ x = 3.6y + 0.7 \end{array}} \right\} \text{Substitution (x is alone)}$$

3. 
$$\begin{array}{l} 4x + y = 24 \\ 5x - y = 12 \end{array} \quad \left. \vphantom{\begin{array}{l} 4x + y = 24 \\ 5x - y = 12 \end{array}} \right\} \text{Elimination (already opp)}$$

$$ax + by = c$$

## 4-Step Method

1. Define variables
2. Write a system of Equations
3. Solve (showing all steps)
4. State solution in sentence form.

Define Variables

a: price of adults  
c: price of children

System

$$\begin{aligned} 1a + 2c &= 10 \\ 2a + 3c &= 17 \end{aligned}$$

Sentence

Adult tickets cost \$4.00 and children cost \$3.00.

**POOL PARTY** At the school pool party, Mr. Lewis bought 1 adult ticket and 2 child tickets for \$10. Mrs. Broom bought 2 adult tickets and 3 child tickets for \$17. What is the price of adult tickets and children's tickets?

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

Solve (substitution)

$$\begin{aligned} a + 2c &= 10 & a &= 10 - 2c \\ -2c & & -2c & \end{aligned}$$

$$\begin{aligned} 2(10 - 2c) + 3c &= 17 \\ 20 - 4c + 3c &= 17 \\ 20 - c &= 17 \\ -20 & & -20 \\ -c &= -3 \\ \underline{-1} & & \underline{-1} \\ c &= 3 \end{aligned}$$

$$\begin{aligned} 1a + 2(3) &= 10 \\ a + 6 &= 10 \\ -6 & & -6 \\ a &= 4 \end{aligned}$$

$$y = mx + b$$

CAR RENTAL Ace Car Rental rents a car for \$45 and \$0.25 per mile. Star Car Rental rents a car for \$35 and \$0.30 per mile. How many miles would a driver need to drive before the cost of renting a car at Ace Car Rental and renting a car at Star Car Rental were the same?

Define Var

X: miles driven  
y: total cost

Equations ↓

A  
S

$$y = 45 + 0.25X$$
$$y = 35 + 0.30X$$

Sentence

After 200 miles  
both companies  
cost \$95.00.

Solve (substitution)

$$45 + 0.25X = 35 + 0.30X$$

$$-0.25X \quad -0.25X$$

$$45 = 35 + 0.05X$$

$$-35 \quad -35$$

$$10 = 0.05X$$

$$0.05 \quad 0.05$$

$$X = 200 \text{ miles}$$

$$y = 45 + 0.25(200)$$

$$y = 45 + 50$$

$$y = 95 \text{ dollars}$$