

Warm-up 10-22

Solve the following systems of equations

1. $y = 2$
 $y = 6x - 11$

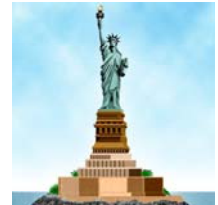
2. $y = 4x - 10$
 $y = 2x - 2$



3. The state fair is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 8 vans and 8 buses with 240 students. High School B rented and filled 4 vans and 1 bus with 54 students. Every van had the same number of students in it as did the buses. Find the number of students in each van and in each bus.

Warm-up 10-21

Solve the following systems of equations



1. $y = 2$
 $y = 6x - 11$
 (2.17, 2)

2. $y = 4x - 10$
 $y = 2x - 2$
 (4, 6)

3. The state fair is a popular field trip destination. This year the senior class at High School A and the senior class at High School B both planned trips there. The senior class at High School A rented and filled 8 vans and 8 buses with 240 students. High School B rented and filled 4 vans and 1 bus with 54 students. Every van had the same number of students in it as did the buses. Find the number of students in each van and in each bus.

y - vans
 x - buses

$$\begin{array}{r} 8y + 8x = 240 \\ 4y + x = 54 \\ \hline -x \quad -x \end{array}$$

$$y = -\frac{1}{4}x + \frac{54}{4}$$

$$\frac{4y}{4} = \frac{-x}{4} + \frac{54}{4}$$

$$\begin{array}{r} 8y + 8x = 240 \\ -8x \quad -8x \\ \hline 8y = -8x + 240 \\ \frac{8y}{8} = \frac{-8x}{8} + \frac{240}{8} \\ y = -x + 30 \end{array}$$

(22, 8)

$y = -0.25x + 13.5$

22 on each bus
 8 on each van

Today's Goal

I can...

- solve a system of equations by using the Elimination.

$$\begin{array}{r} 8x - 3y = 12 \\ 2x + 3y = 18 \\ \hline 10x = 30 \\ \hline \frac{10x}{10} = \frac{30}{10} \end{array}$$

$$x = 3$$

$$(3, 4)$$

$$\begin{array}{r} 2(3) + 3y = 18 \\ 6 + 3y = 18 \\ \hline -6 \quad -6 \\ \hline 3y = 12 \\ \hline \frac{3y}{3} = \frac{12}{3} \\ y = 4 \end{array}$$

$$-3x - 3y = 18$$

$$2x + 3y = -2$$

Section 5.3 ~ Solving Systems by Elimination

The process of adding two equations together in such a way as to "eliminate" one variable in order to solve for the other



Example:

$$\begin{array}{r} 5x - 2y = -15 \\ 3x + 2y = 39 \end{array}$$

$$\frac{8x}{8} = \frac{24}{8}$$

$$x = 3$$

$$5(3) - 2y = -15$$

$$\begin{array}{r} 15 - 2y = -15 \\ -15 \quad -15 \end{array}$$

$$\begin{array}{r} -2y = -30 \\ -2 \quad -2 \end{array}$$

$$(3, 15) \quad y = 15$$

$$3x + 2y = 39$$

$$3(3) + 2(15) = 39$$

$$9 + 30 = 39$$

$$39 = 39 \checkmark$$

Step 1: Put both equations in Standard Form ($ax + by = c$)

Step 2: Draw a line under the equations in order to add the equations

Step 3: If neither of the variables cancel out, multiply one or both equations by a number in order to cancel out a variable

Step 4: Solve for the remaining variable

Step 5: Substitute the value into one of the original equations

Step 6: Solve for the remaining variable

Step 7: Write the solution as an ordered pair

Step 8: Check your answer.

$$\begin{array}{r}
 9 - y = 10 \\
 \underline{-9} \quad \underline{-9} \\
 (-1) - y = 1(-1) \\
 y = -1
 \end{array}$$

$$\begin{array}{r}
 x + y = 8 \\
 x - y = 10 \\
 \hline
 2x = 18 \\
 \frac{2x}{2} = \frac{18}{2} \\
 x = 9
 \end{array}$$

$$\begin{array}{l}
 (4, 4) \\
 (5, 3) \\
 4 - 4 = 10 \quad \times \\
 5 - 3 = 10 \quad \times
 \end{array}$$

$$\begin{array}{l}
 (9, -1) \\
 9 + -1 = 8 \\
 8 = 8
 \end{array}$$

Example 2:

Solve the following by Elimination. You should check your answers.

$$\begin{aligned} -1(8x + y = -16) \\ -3x + y = -5 \end{aligned}$$

$$\begin{aligned} y &= -8x - 16 \\ y &= 3x - 5 \end{aligned}$$

$$\begin{aligned} -8(-1) - (-8) &= 16 \\ 8 + 8 &= 16 \\ 16 &= 16 \checkmark \end{aligned}$$

$$\begin{aligned} -8x - y &= 16 \\ -3x + y &= -5 \end{aligned}$$

$$\begin{aligned} -11x &= 11 \\ -11 & \quad -11 \\ \hline x &= -1 \end{aligned}$$

$$\begin{aligned} -3(-1) + y &= -5 \\ +y &= -5 \\ -3 & \quad -3 \\ \hline y &= -8 \end{aligned}$$

$(-1, -8)$

You Try!

Solve the following by Elimination. You should check your answers.

$$\begin{array}{r} 8x + 5y = -15 \\ -3x - 5y = -5 \end{array}$$

$$\frac{5x}{5} = \frac{-20}{5}$$

$$x = -4$$

$$\begin{array}{r} 12 - 5y = -5 \\ -3(-4) - 5y = -5 \\ -12 - 5y = -5 \\ +12 \quad +12 \\ \hline -5y = 7 \\ \frac{-5y}{-5} = \frac{7}{-5} \\ y = -\frac{7}{5} \end{array}$$

$$\begin{array}{r} 8(4) + 5(-\frac{7}{5}) = -15 \\ 32 - 7 = -15 \\ 25 = -15 \quad \times \end{array}$$

$$\begin{array}{r} 8(-4) + 5(\frac{17}{5}) = -15 \\ -32 + 17 = -15 \\ -15 = -15 \quad \checkmark \end{array}$$

$$\begin{array}{r} 12 - 5y = -5 \\ -12 \quad -12 \\ \hline -5y = -17 \\ \frac{-5y}{-5} = \frac{-17}{-5} \\ y = \frac{17}{5} \end{array}$$

You Try!

Solve the following by Elimination. You should check your answers.

$$\begin{array}{r} 8x + 5y = -15 \\ -3x - 5y = -5 \\ \hline \end{array}$$

$$\frac{5x}{5} = \frac{-20}{5}$$

$$\underline{x = -4}$$

$$\begin{array}{r} 8(-4) + 5y = -15 \\ -32 + 5y = -15 \\ \hline +32 \qquad \qquad +32 \end{array}$$

$$\frac{5y}{5} = \frac{17}{5}$$

$$y = 3.4$$

$$\textcircled{(-4, 3.4)}$$

Example 3:

Solve the following by Elimination.

$$\begin{array}{r} 3x - 10y = 6 \\ -2(5x - 5y = 10) \\ \hline -10x + 10y = -20 \\ 3x - 10y = 6 \\ \hline -7x = -14 \\ \frac{-7x}{-7} = \frac{-14}{-7} \\ x = 2 \end{array}$$

$$\begin{array}{l} 3x - 10y = 6 \\ 5x - 5y = 10 \end{array}$$

Example 3:
Solve the following by Elimination.

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

$$\begin{array}{r} 3x - 10y = 6 \\ -10x + 10y = -20 \\ \hline -7x = -14 \\ \frac{-7x}{-7} = \frac{-14}{-7} \end{array}$$

$$x = 2$$

$$\begin{array}{r} 3x - 10y = 6 \\ 5x - 5y = 10 \end{array}$$

$$2(2x - 3y = 17)$$

$$5x + 6y = 20$$

$$\begin{array}{r} 5x + 6y = 20 \\ 4x - 6y = 34 \\ \hline 9x = 54 \end{array}$$

$$\frac{9x}{9} = \frac{54}{9}$$

$$x = 6$$

Solve the following by Elimination. You may check your answers.

$$1. \begin{cases} (-4x - 2y = 14) \cdot 7 \\ (-10x + 7y = -25) \cdot 2 \end{cases}$$

$$\begin{array}{r} -28x - 14y = 98 \\ -20x + 14y = -50 \\ \hline -48x = 48 \quad x = -1 \end{array}$$

$$2. \begin{cases} (5x + 4y = -14) \cdot 6 \\ (3x + 6y = 6) \cdot -4 \end{cases}$$

$$\begin{array}{r} 30x + 24y = -84 \\ -12x - 24y = -24 \\ \hline 18x = -108 \\ \frac{18x}{18} = \frac{-108}{18} \\ x = -6 \end{array}$$

Solve the following by Elimination. You may check your answers.

$$\begin{array}{l}
 1. \begin{cases} -4x - 2y = 14 \\ -10x + 7y = -25 \end{cases} \\
 \begin{array}{r}
 -28x - 14y = 98 \\
 -20x + 14y = -50 \\
 \hline
 -48x = 48 \\
 \frac{-48x}{-48} = \frac{48}{-48} \\
 x = -1
 \end{array}
 \end{array}$$

$$\begin{array}{l}
 2. \begin{cases} 5x + 4y = -14 \\ 3x + 6y = 6 \end{cases} \\
 \begin{array}{r}
 30x + 24y = -84 \\
 -12x - 24y = -24 \\
 \hline
 18x = -108 \\
 \frac{18x}{18} = \frac{-108}{18} \\
 x = -6
 \end{array}
 \end{array}$$

Solve the following by Elimination. You may check your answers.

$$1. \begin{cases} -4x - 2y = 14 \\ -10x + 7y = -25 \end{cases}$$

$$2. \begin{cases} -4x - 2y = 14 \\ -10x + 7y = -25 \end{cases}$$

$$\begin{array}{r} -28x - 14y = 98 \\ -20x + 14y = -50 \\ \hline \end{array}$$

$$\frac{-48x}{-48} = \frac{48}{-48}$$

$$x = -1$$

$$2. \begin{cases} 5x + 4y = -14 \\ 3x + 6y = 6 \end{cases}$$

$$5. \begin{cases} 5x + 4y = -14 \\ 3x + 6y = 6 \end{cases}$$

$$-15x - 12y = 42$$

$$15x + 30y = 30$$

$$\frac{18y}{18} = \frac{72}{18}$$

$$y = 4$$

Warm-up 10-21

3. The state fair is a popular field trip destination. This year, the junior class at High School A and the senior class at High School B planned trips there. The senior class at High School A rented and filled 8 vans and 8 buses with 240 students. High School B rented and filled 4 vans and 1 bus with 54 students. Every van had the same number of students in it as did the buses. Find the number of students in each van and in each bus.



y - vans
x - buses

$$\begin{array}{r} 8y + 8x = 240 \\ -2(4y + 1x = 54) \end{array}$$

$$\begin{array}{r} 8y + 8x = 240 \\ -8y - 2x = -108 \\ \hline \end{array}$$

$$\frac{6x}{6} = \frac{132}{6} \quad x = 22$$

$$\begin{array}{r} 8y + 8x = 240 \\ -8(4y + 1x = 54) \end{array}$$

$$\begin{array}{r} 8y + 8x = 240 \\ -32y - 8x = -432 \\ \hline -24y = -192 \\ \frac{-24y}{-24} = \frac{-192}{-24} \\ y = 8 \end{array}$$



Sam spent \$24.75 to buy 12 flowers for his girlfriend. The bouquet contained roses and daisies. How many roses and daisies did Sam buy?

Recreation Casey wants to buy a gym membership. One gym has a \$150 joining fee and costs \$35 per month. Another gym has no joining fee and costs \$60 per month.

- a. In how many months will both gym memberships cost the same? What will that cost be? **6 months; \$360**
- b. If Casey plans to cancel in 5 months, which is the better option for him? Explain. **The second Gym; Gym one's service costs \$325, while Gym two's costs only \$300**

$$150 + 35x = y$$

$$60x = y$$

Landscaping The gardeners at Middleton Place Gardens want to plant a total of 45 white and pink hydrangeas in one flower bed. In another flower bed, they want to plant 120 hydrangeas. In this bed, they want 2 times the number of white hydrangeas and 3 times the number of pink hydrangeas as in the first bed. Use a system of equations to find how many white and how many pink hydrangeas the gardeners should buy altogether.

45 white; 120 pink

$$w + p = 45$$

$$2w + 3p = 120$$



Fitness Rusty burns 5 Calories per minute swimming and 11 Calories per minute jogging. In the morning, Rusty burns 200 Calories walking and swims for x minutes. In the afternoon, Rusty will jog for x minutes. How many minutes must he jog to burn at least as many Calories y in the afternoon as he did in the morning? Round your answer up to the next whole number of minutes.

34 minutes

$$200 + 5x = y$$

$$11x = y$$



Homework

Workbook pg. 86