Bellringer

Solve each system of equations by adding or subtracting.

1. $\begin{cases} x + 5y = 8 \\ 2x - 5y = 1 \end{cases}$

2. $\begin{cases} 2x + y = 7 \\ -2x - 4y = -16 \end{cases}$

3. $\begin{cases} 3x + 7y = 47 \\ -4x + 7y = 19 \end{cases}$

4. $\begin{cases} x + 3y = -23 \\ -x + 4y = -26 \end{cases}$

8.4 Solving Systems by Elimination with Multiplication

8.EE.8b
Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6.

8.EE8c
Solve real world and mathematical problems leading to two linear equations in two variables

Solving a System by Multiplication and Adding/Subtracting

Step1: Make sure equations are in same order

Step2: Decide which variable to eliminate (Make it easy on yourself)

Step3: Multiply one equation (sometimes both) by a constant so that you can eliminate by adding or subtracting

- Must find LCM

Step4: Rewrite equation

Step5: Begin using Elimination Method

☆ Remember ☆

- Opposite expressions $\Rightarrow$ add to eliminate
- Same expressions $\Rightarrow$ subtract to eliminate

EXAMPLE 1

Solve the system of equations by multiplying and adding.

$$\begin{cases} 2x + 10y = 2 \\ 3x - 5y = -17 \end{cases}$$

$2x+10y=2$

$2(3x-5y=-17)$

$6x-10y=-34$

$+\ 2x+10y=2$

$\frac{8x}{8}=\frac{-32}{8}$

$\boxed{x=-4}$

$2(-4)+10y=2$

$-8+10y=2$

$+8 \quad +8$

$\frac{10y}{10}=\frac{10}{10}$

$\boxed{y=1}$

LCM

$x <$ 2: 2, 4, 6, 8, 10
3: 3, 6, 9, 12

$y <$ 5: 5, 10
10: 10

$(-4, 1)$

Check

$2(-4)+10(1)=2$

$-8+10=2$

$2=2$ ✓

$3(-4)$

ADDITIONAL EXAMPLE 1

Solve the system of equations by multiplying and adding.

$$\begin{cases} 2x + 5y = 8 \\ -x + 3y = 7 \end{cases}$$

LCM:

1: 1, 2, 3

2: 2, 4

$2x+5y=8$

$2(-x+3y=7)$

$-2x+6y=14$

$+\ 2x+5y=8$

$11y=22$

$\frac{11y}{11}=\frac{22}{11}$

$y=2$

$2x+5(2)=8$

$2x+10=8$

$-10\ \ -10$

$\frac{2x}{2}=\frac{-2}{2}$

$x=-1$

$(-1, 2)$

Check

$2(-1)+5(2)=8$

$-2+10=8$

$8=8$ ✓

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

$1+6=7$

$7=7$ ✓

YOUR TURN **Solve each system of equations by multiplying and adding.**

4. $\begin{cases} 5x + 2y = -10 \\ 3x + 6y = 66 \end{cases}$

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

$3x+6y=66$

$-15x+-6y=30$

$+\ 3x+6y=66$

$-12x=96$

$\frac{-12x}{-12}=\frac{96}{-12}$

$x=-8$

$5(-8)+2y=-10$

$-40+2y=-10$

$+40 \quad +40$

$\frac{2y}{2}=\frac{30}{2}$

$y=15$

$(-8, 15)$

5. $\begin{cases} 4x + 2y = 6 \\ 3x - y = -8 \end{cases}$

6. $\begin{cases} -6x + 9y = -12 \\ 2x + y = 0 \end{cases}$

EXAMPLE 2

Solve the system of equations by multiplying and subtracting.

$$\begin{cases} 6x + 5y = 7 \\ 2x - 4y = -26 \end{cases}$$

$(-3, 5)$

$6x + 5y = 7$

$3(2x - 4y = -26)$

$-12y + -5y$

$6x - 12y = -78$

$-\ 6x + 5y = 7$

$-17y = -85$

$\frac{-17y}{-17} = \frac{-85}{-17}$

$y = 5$

$6x + 5(5) = 7$

$6x + 25 = 7$

$-25 \quad -25$

$\frac{6x}{6} = \frac{-18}{6}$

$x = -3$

ADDITIONAL EXAMPLE 2

Solve the system of linear equations by multiplying and subtracting.

$$\begin{cases} 4x + y = -8 \\ 2x + 3y = 6 \end{cases}$$

$4x + y = -8$

$2x + 3y = 6$

★ Which would be easier... Substitution or elimination?

YOUR TURN **Solve each system of equations by multiplying and subtracting.**

7. $\begin{cases} 3x - 7y = 2 \\ 6x - 9y = 9 \end{cases}$

8. $\begin{cases} -3x + y = 11 \\ 2x + 3y = -11 \end{cases}$

9. $\begin{cases} 9x + y = 9 \\ 3x - 2y = -11 \end{cases}$

Chapter 8 Quiz

Solve each system of linear equations by using graphing, substitution, **or** elimination

1. $y = -x - 3$
   $y - 2 = -6x$

2. $4x + 6y = 24$
   $y = -2x$

3. $x - 2y = 6$
   $5x - 2y = -2$

4. $2x + 3y = 24$
   $3x + 4y = 35$

5. $4x - y = 8$
   $6x + y = 2$

6. You want to board you cats and dogs for vacation. Pet Hotel charges $42.50 to board a cat and $64.00 for a dog. Your total cost for Pet Hotel will be $277.00. Animal Spa charges $35.50 to board a cat and $50.50 for a dog. Your total cost to board at Animal Spa would be $222.50. Based on this information, how many dogs and cats do you have?