

Algebra 1 6.3

Solve systems of equations by elimination
system of equations

solve (x,y) *Where do the two lines intersect?*

★ substitution method *cut + paste*
zero pair
additive inverse = *opposite* $2x + -2x$
addition property of equality 0
whiteboards

Quiz 6.1-6.2
Tues.

$$\begin{array}{r}
 5 = 5 \\
 +2 \quad +2 \\
 \hline
 7 = 7
 \end{array}$$

addition property

So if they are equal, is it OK to add the same thing to both sides?

$$\begin{array}{r}
 x - 3 = 9 \\
 +3 \quad +3 \\
 \hline
 x = 12
 \end{array}$$

Smato

$$\begin{array}{r}
 9 = 9 \\
 -5 \quad -5 \\
 \hline
 4 = 4
 \end{array}$$

$$\begin{array}{l}
 5 = 5 \\
 x - 6 = 8 \\
 3x - 6y = 3
 \end{array}$$

Make
zero
pairs

Example 1 Elimination Using Addition

Use elimination to solve the system of equations.

$(5, 2)$

$$\begin{aligned} 3 \cdot 5 - 6 \cdot 2 &= 3 \\ 15 - 12 &= 3 \\ \text{"} \end{aligned}$$

$$\begin{aligned} 4x + 6y &= 32 \\ 3x - 6y &= 3 \end{aligned}$$

$$\begin{aligned} 4 \cdot 5 + 6y &= 32 \\ 20 + 6y &= 32 \\ -20 & \quad -20 \end{aligned}$$

Are they equal?
So...OK to add same
thing to both sides...

$$\begin{aligned} \frac{7x}{7} &= \frac{35}{7} \\ x &= 5 \end{aligned} \qquad \begin{aligned} \frac{6y}{6} &= \frac{12}{6} \\ y &= 2 \end{aligned}$$

$$-4 \cdot 0 + 3 \cdot -1 = -3$$

Guided Practice

$$0 + -3 = -3$$

$$(0, -1)$$

1A. $-4x + 3y = -3$

→ $4x - 5y = 5$

$$\begin{array}{r} -2y = 2 \\ \hline -2 \quad -2 \\ y = -1 \end{array}$$

$$4x - 5 \cdot -1 = 5$$

$$\begin{array}{r} 4x + 5 = 5 \\ \hline -5 \quad -5 \\ \hline 4x = 0 \\ \hline \frac{4}{4} \quad \frac{0}{4} \\ x = 0 \end{array}$$

$$1B. 4y + 3x = 22 \leftarrow$$

$$\rightarrow 3x - 4y = 14$$

$$\text{ii) } \begin{aligned} 3 \cdot 6 - 4 \cdot 1 &= 14 \\ 18 - 4 &= 14 \end{aligned}$$

$$\frac{6x}{6} = \frac{36}{6}$$

$$x = 6$$

$$(6, 1)$$

$$4y + 3 \cdot 6 = 22$$

$$\begin{array}{r} 4y + 18 = 22 \\ -18 \quad -18 \\ \hline \end{array}$$

$$\frac{4y}{4} = \frac{4}{4}$$

$$y = 1$$

$$\text{ii) } \begin{aligned} 4 \cdot 0 - 5 \cdot (-1) &= 5 \\ 0 + 5 &= 5 \end{aligned}$$

How can I make $(0, -1)$
a zero pair?

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

$$4x - 5y = 5$$

$$-4x + 3 \cdot (-1) = -3$$

$$\begin{array}{r} -4x + -3 = -3 \\ +3 \quad +3 \\ \hline \end{array}$$

$$-4x = 0$$

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

$$y = -1$$

$$\begin{array}{r}
 8x + 5 \cdot 6 = 38 \\
 8x + 30 = 38 \\
 \underline{-30 \quad -30} \\
 8x = 8 \\
 \frac{8x}{8} = \frac{8}{8} \\
 x = 1
 \end{array}$$

$$\begin{array}{r}
 8x + 5y = 38 \\
 -8x + 2y = 4 \\
 \hline
 7y = 42 \\
 \frac{7y}{7} = \frac{42}{7} \\
 y = 6
 \end{array}$$

$$(1, 6)$$

$$\begin{array}{l}
 -8 \cdot 1 + 2 \cdot 6 = 4 \\
 -8 + 12 = 4 \quad \text{!}
 \end{array}$$

$$\begin{array}{r}
 a + b = 4 \\
 a - b = 8 \\
 \hline
 2a = 12
 \end{array}$$

$$\begin{array}{l}
 (c, d) \\
 (a, b) \\
 (6, -2)
 \end{array}$$

Define your variables: x = first number y = second number

Example 2 Write and Solve a System of Equations



Negative three times one number plus five times another number is -11 .
Three times the first number plus seven times the other number is -1 .
Find the numbers.

Multiplication property of equality

$$5 = 5$$

How can I make
a zero pair?

Guided Practice

3. Solve the system of equations.

$$\begin{array}{l} 8b + 3c = 11 \\ 8b + 7c = 7 \end{array}$$

(b, c)

$(\frac{7}{4}, -1)$

$$-8b + -3c = -11$$

$$8b + 7c = 7$$

$$\begin{array}{r} 4c = -4 \\ \hline 4 \quad -4 \\ c = -1 \end{array}$$

~~$$-16b + -16c = -18$$~~

$$8b + 3(-1) = 11$$

$$\begin{array}{r} 8b + -3 = 11 \\ \quad +3 \quad +3 \end{array}$$

$$\begin{array}{r} 8b = 14 \\ \hline 8 \quad 8 \end{array}$$

ordered pairs
(b, c)

rearrange first

Standardized Test Example 3

Solve the system of equations.

$$2t + 5r = 6$$

$$9r + 2t = 22$$

1. $5m - p = 7$
 $7m - p = 11$

Goal: make zero pair

2. $8x + 5y = 38$
 $-8x + 2y = 4$