

Algebra 1

6.5

Solve systems of equations

Determine the best method to solve a system

Apply systems of equations

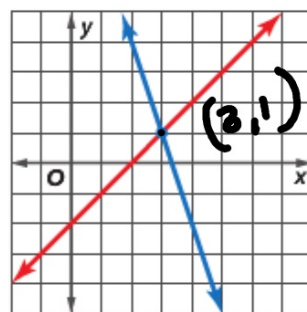
- ✓ solve by graphing
 - ✓ solve by substitution
 - ✓ solve by elimination
- whiteboards
- } algebra

(3,1)

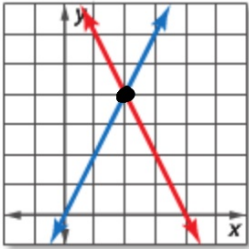
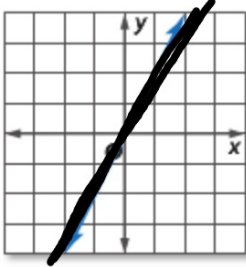
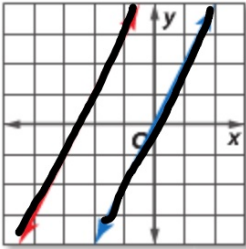
$$\begin{array}{r} x - 2 = -3x + 10 \\ +3x + 2 \quad +3x + 2 \\ \hline 4x = 12 \\ \frac{4}{4} \quad \frac{12}{4} \quad x = 3 \end{array}$$

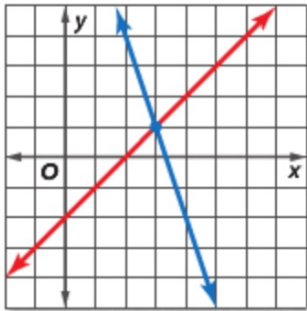
$$\begin{aligned} y &= -3 \cdot 3 + 10 \\ &= -9 + 10 \\ y &= 1 \end{aligned}$$

$$y = 1$$



Concept Summary Possible Solutions

Number of Solutions	exactly one	infinite	no solution
Terminology	consistent and independent	consistent and dependent	inconsistent
Graph			



$$y = -3x + 10$$
$$y = x - 2$$

Advantages:
Disadvantages:

Solve using substitution

$$y = x + 4$$
$$2x + y = 16$$

$$y = 4 + 4$$
$$y = 8$$

$$2x + x + 4 = 16$$

$$\begin{array}{r} 3x + 4 = 16 \\ -4 \quad -4 \\ \hline 3x = 12 \end{array} \quad (4, 8)$$

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

$$2 \cdot 4 + 8 = 16$$
$$\text{☺ } 8 + 8 = 16$$

Advantages:

Disadvantages:

$$x = 4$$

$$\Rightarrow (2; 1)$$

Solve using elimination:

$$\begin{array}{r} 9x - 24y = -6 \\ 3x + 4y = 10 \end{array} \xrightarrow{x-3}$$
$$\begin{array}{r} 3 \cdot 2 + 4 \cdot 1 = 10 \\ 6 + 4 = 10 \\ 9x - 24 \cdot 1 = -6 \end{array}$$

$$\begin{array}{r} 9x - 24 = -6 \\ +24 \quad +24 \\ \hline 9x = 18 \\ x = 2 \end{array}$$

Advantages:

Disadvantages:

$$\begin{array}{r} 9x - 24y = -6 \\ -9x - 12y = -30 \\ \hline -36y = -36 \\ y = 1 \end{array}$$

$$\begin{array}{r} -36y = -36 \\ \hline -36 \quad -36 \end{array}$$

$$y = 1$$

Two numbers add up to 12.

$$x + y = 12$$

$$x - y = 6$$

$$\begin{array}{r} 2x = 18 \\ \hline 2 \end{array}$$

$$x = 9$$

$$6, 6$$

$$7, 5$$

$$11, 1$$

$$10, 2$$

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

n

(guess and check)

What are ALL the possibilities?

The difference between the numbers is 6.



Two numbers have a sum of 94.

The difference between the numbers is 24.

90, 4
86, 8

1, 93
64, 30

$$\begin{aligned} \textcircled{x} + y &= 94 \\ x - y &= 24 \\ \hline 2x &= 118 \quad x = 59 \end{aligned}$$

$$\begin{aligned} 59 + y &= 94 \\ -59 & \quad -59 \\ \hline y &= 35 \end{aligned}$$

How to determine the best method?

Substitution

Elimination

$$\begin{cases} y = \\ x = \end{cases}$$

→ zero pairs

Whiteboards:

1. Determine the best method (substitution or elimination) to solve the system.
2. Explain your choice. " *We chose substitution because...*"
3. Solve the system.

10. $y = -2x - 3$
 $x + y = 9$

$$x + -2x - 3 = 9$$

7. $2x + 6y = -8$

$x - 3y = 8$

2 →

9. $5x + 8y = 1$
 $-2x + 8y = -6 \quad \xrightarrow{-1} \quad 2x + -8y = 6$

The sum of two numbers is 200. The difference of the two numbers is 18. What are the two numbers?

$$x + y = 200$$

$$x - y = 18$$

5. **SHOPPING** At a sale, Salazar bought 4 T-shirts and 3 pairs of jeans for \$181. At the same store, Jenna bought 1 T-shirt and 2 pairs of jeans for \$94. The T-shirts were all the same price, and the jeans were all the same price.

- Write a system of equations that can be used to represent this situation.
- Determine the best method to solve the system of equations.
- Solve the system.

$$39 \cdot 2 + 16 \cdot 2$$

$$78 + 32$$

$$64 + 117 = 181$$

$$4 \cdot T + 3 \cdot J = 181$$

$$1 \cdot T + 2 \cdot J = 94$$

$$t + 2 \cdot 39 = 94$$

$$t + 78 = 94$$

$$4t + 3j = 181$$

$$1t + 2j = 94$$

$$-4 \rightarrow -4t - 8j = -376$$

$$j = 39$$

$$-5j = -195$$

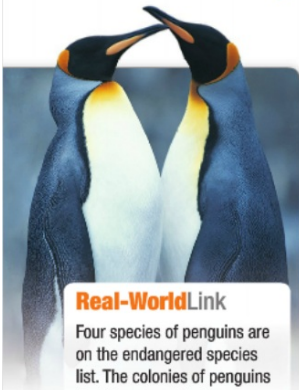
$$\frac{-5j}{-5} = \frac{-195}{-5}$$



13. **DVDs** Manuela has a total of 40 DVDs of movies and television shows. The number of movies is 4 less than 3 times the number of television shows. Write and solve a system of equations to find the numbers of movies and television shows that she has on DVD.



 **Real-World Example 2** Apply Systems of Linear Equations



Real-WorldLink

Four species of penguins are on the endangered species list. The colonies of penguins that live closest to human inhabitants are the most at risk for extinction.

Source: PBS

PENGUINS Of the 17 species of penguins in the world, the largest species is the emperor penguin. One of the smallest is the Galapagos penguin. The total height of the two penguins is 169 centimeters. The emperor penguin is 22 centimeters more than twice the height of the Galapagos penguin. Find the height of each penguin.