

# Objective

Students will be able to solve systems of equations by graphing.

Make sure to bring your graphing calculator to class tomorrow

# System of Two Linear Equations

A system of two linear equations in two variables  $x$  and  $y$  consists of two equation.

$$Ax + By = C$$

$$Dx + Ey = F$$

A solution of a system of linear equations in two variables is an ordered pair  $(x, y)$  that satisfies each equation. Solutions correspond to points where the graphs of the equations in a system intersect.

Graph the linear system and estimate the solution. Then check the solution algebraically.

$$4x + y = 8$$

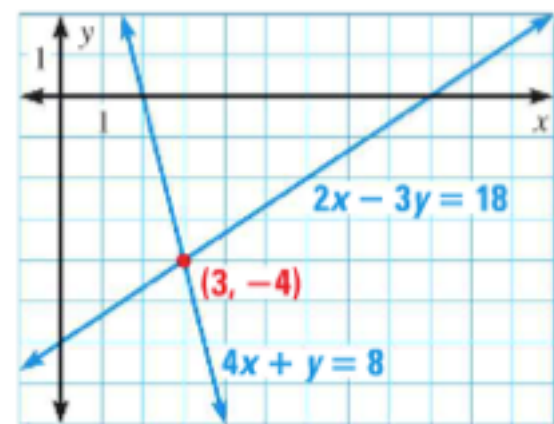
$$2x - 3y = 18$$

**Step 1:** Graph each line on the same coordinate plane

**Step 2:** If the lines intersect on the graph, estimate the point of intersection (the solution to the system)

It appears these lines intersect at  $(3, -4)$

**Step 3:** Check to see if  $(3, -4)$  is a solution algebraically by plugging in the point into both equations and seeing if it produces a true statement



# Classifying Systems

A system that has at least one solution is consistent. If a system has no solution, the system is inconsistent. A consistent system that has exactly one solution is independent, and a consistent system that has infinitely many solutions is dependent.

What is the classification of the example problem in the slide before?

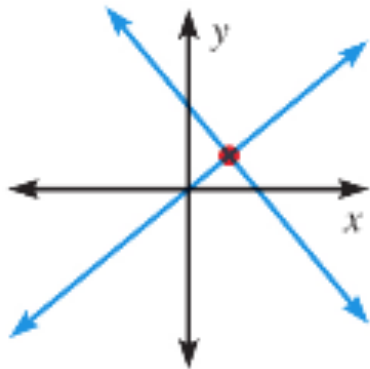
consistent and independent

# Classifying Systems Contin.

## Number of Solutions of a Linear System

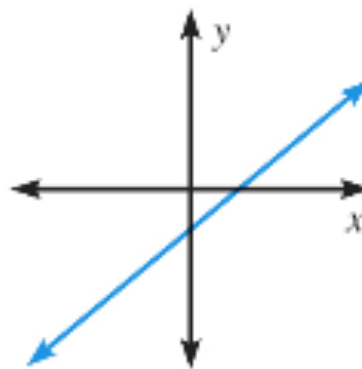
The relationship between the graph of a linear system and the system's number of solutions is described below.

### Exactly one solution



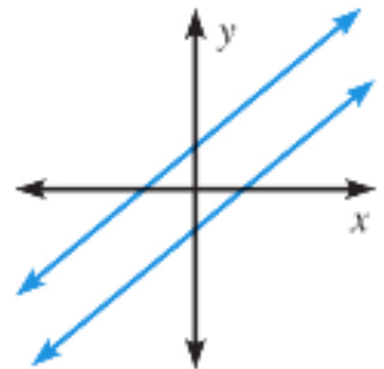
Lines intersect at one point; consistent and independent

### Infinitely many solutions



Lines coincide; consistent and dependent

### No solution



Lines are parallel; inconsistent

# Homework

p.156: 9-11, 19-20, 31

**GRAPH AND CHECK** Graph the linear system and estimate the solution. Then check the solution algebraically.

9.  $y = -3x - 2$   
 $5x + 2y = -2$

10.  $y = -3x - 13$   
 $-x - 2y = -4$

11.  $x - 7y = 6$   
 $-3x + 21y = -18$

**SOLVE AND CLASSIFY** Solve the system. Then classify the system as *consistent and independent*, *consistent and dependent*, or *inconsistent*.

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

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

**GRAPH AND CHECK** Graph the system and estimate the solution(s). Then check the solution(s) algebraically.

31.  $y = |x + 2|$   
 $y = x$

# Objectives

Students will be able to solve systems of equations by substitution.

Students will be able to solve application problems or real world problems by using substitution.

Quest over Systems of Equations on Monday– No Calculator!!!

# Solving Linear Equations by Substitution

**Step 1:** **Solve** one of the equations for one of its variables.

**Step 2:** **Substitute** the expression from Step 1 into the other equation and solve for the other variable.

**Step 3:** **Substitute** the value from Step 2 into the revised equation from Step 1 and solve.

\*check your solution by substituting into original equations or by graphing in calculator



# Example

Solve the system using the substitution method.

$$2x + 5y = -5$$

$$x + 3y = 3$$

$$1) \quad x = -3y + 3$$

$$2) \quad 2(-3y + 3) + 5y = -5$$

$$-6y + 6 + 5y = -5$$

$$-y = -11$$

$$y = 11$$

$$3) \quad x = -3(11) + 3$$

$$x = -33 + 3$$

$$x = -30$$

$$(-30, 11)$$

# You Try

Solve the system using the substitution method.

$$\begin{aligned} 1) \quad & 2x + 5y = 7 \\ & x + 4y = 2 \end{aligned}$$

(6, -1)

$$\begin{aligned} 2) \quad & 3x + y = 16 \\ & 2x - 3y = -4 \end{aligned}$$

(4, 4)

# Application Problems

1) Mary has 8 more songs on her iPod than Tyler. Together, they have 112 songs. How many songs does each person have on their iPod?

M- number of songs on Mary's iPod

T- number of songs on Tyler's iPod

$$T + 8 = M$$

$$M + T = 112$$

$$M = 60, T = 52$$



Mary has 60 songs on her iPod and Tyler has 52 songs on his iPod

# Application Problems

2) A test has twenty questions worth 100 points total. The test consists of True/False questions worth 3 points each and multiple choice questions worth 11 points each. How many multiple choice questions are on the test? How many True/False questions are on the test?

M- number of multiple choice questions

T- number of True/False questions

$$M + T = 20$$

$$11M + 3T = 100$$

$$M = 5, T = 15$$

**Multiple Choice Question:**

If you choose an answer to this question at random what is the chance you will be correct?

A	B	C	D
25%	50%	0%	25%

The test has 15 True/False and 5 multiple choice questions

# Application Problems

3) The Ohio State University scored a total of 80 points in a basketball game against M\*ch\*gan. Ohio State made a total of 37 two-point and three-point baskets. How many two-point baskets did Ohio State make? How many three-point baskets did the Ohio State make?

GO BUCKS!

X- number of two-point baskets OSU made

Y- number of three-point baskets OSU made

$$X + Y = 37$$

$$2X + 3Y = 80$$

$$X = 31, Y = 6$$

OSU scored 31 two-point baskets and 6 three-point baskets



# Application Problems

4) Bob ate 10 carrots and 7 Hershey's kisses and the total calories were 263. Fred ate 4 carrots and 8 Hershey's kisses and the total calories were 230. How many calories are in a carrot and a Hershey's kiss?

C- number of calories in a carrot

H- number of calories in a Hershey's kiss

$$10C + 7H = 263$$

$$4C + 8H = 230$$

$$C = 9.5, H = 24$$



There are 9.5 calories in a carrot and 24 calories in a Hershey's kiss

# Homework

Finish the application problems by solving with substitution

p.164: 5, 6, 9-11

**SUBSTITUTION METHOD** Solve the system using the substitution method.

5. 
$$\begin{aligned} 6x - 2y &= 5 \\ -3x + y &= 7 \end{aligned}$$

6. 
$$\begin{aligned} x + 4y &= 1 \\ 3x + 2y &= -12 \end{aligned}$$

9. 
$$\begin{aligned} 3x + 2y &= 6 \\ x - 4y &= -12 \end{aligned}$$

10. 
$$\begin{aligned} 6x - 3y &= 15 \\ -2x + y &= -5 \end{aligned}$$

11. 
$$\begin{aligned} 3x + y &= -1 \\ 2x + 3y &= 18 \end{aligned}$$

# Objectives

Students will be able to solve systems of equations by elimination.

Students will be able to solve application problems or real world problems by using elimination.

Quest over Systems of Equations on Monday– No Calculator!!!



# Solving Linear Equations by Elimination

**Step 1:** **Multiply** one or both of the equations by a constant to obtain coefficients that differ only in sign for one of the variables.

**Step 2:** **Add** the revised equations from Step 1. Combining like terms will eliminate one of the variables. Solve for the remaining variable.

**Step 3:** **Substitute** the value obtained from Step 2 into either of the original equations and solve for the other variable.

\*check your solution by substituting into original equations or by graphing in calculator

# Example

Solve the system using the elimination method.

$$3x - 7y = 10$$

$$6x - 8y = 8$$

1)  $(3x - 7y = 10) \cdot (-2)$  2)  $-6x + 14y = -20$

$$\underline{6x - 8y = 8}$$

$$6y = -12$$

$$y = -2$$

3)  $3x - 7(-2) = 10$   
 $x = -4/3$

$$(-4/3, -2)$$

# You Try

Solve the system using the elimination method.

$$\begin{array}{l} 1) \ 4x - 2y = -16 \\ \quad -3x + 4y = 12 \end{array}$$

$$(-4, 0)$$

$$\begin{array}{l} 2) \ 3x - 4y = -10 \\ \quad 6x + 3y = -42 \end{array}$$

$$(-6, -2)$$

# Application Problems

1) Jim runs a food cart and during a busy outdoor festival he sold \$7343.75 worth of food. He sells hot dogs for \$2.95 and steak sandwiches for \$9.95. If he sold a total of 985 items that day, how many of each item did he sell?

H- number of hot dogs

S- number of steak sandwiches

$$2.95H + 9.95S = 7343.75$$

$$H + S = 985$$

$$S = 634, H = 351$$

Jim sold 351 hotdogs and 634 steak sandwiches



# Homework

Finish application problems WS

p.164: 18, 19, 21-23

**ELIMINATION METHOD** Solve the system using the elimination method.

18.  $4x - 3y = 10$   
 $8x - 6y = 20$

19.  $5x - 3y = -3$   
 $2x + 6y = 0$

21.  $2x + 5y = 14$   
 $3x - 2y = -36$

22.  $7x + 2y = 11$   
 $-2x + 3y = 29$

23.  $3x + 4y = 18$   
 $6x + 8y = 18$