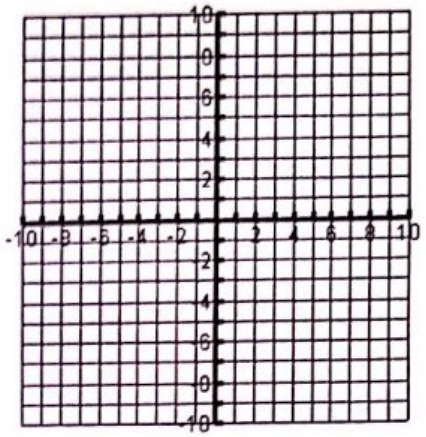
NOTES: What do you know about solving systems of equations?

1. What is a system of equations?	2. Three possible solutions for a system of equations:	3. Three ways to solve a system of equations:
two or more equations working together	-one solution -two or more -no solution	- graphing - substitution - eliminate

4. Solve by graphing:

$x + y = 10$

$x - y = 4$



5. Solve by substitution:

$3x + y = -9$

$-3x - 2y = 12$

6. Solve by elimination:

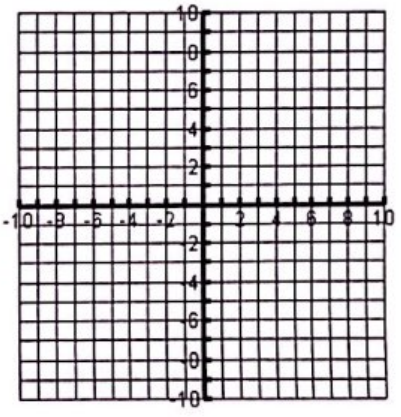
$2x + 4y = -4$

$3x + 5y = -3$

7. Solve by graphing:

$y > \frac{2}{3}x + 2$

$y < \frac{2}{3}x - 1$



Method 1: Graphing

- Solve each equation for y.
- Enter the first equation into Y_1.
- Enter the second equation into Y_2.
- Use the **INTERSECT** option to find where the two graphs intersect (the answer).
  2nd TRACE (CALC) #5 intersect
  Move spider close to the intersection.
  Hit **ENTER** 3 times.

EX1: Solve $4x - 6y = 12$
$2x + 2y = 6$

$4x - 6y = 12$
$-4x \quad -4x$
$\frac{-6y}{-6} = \frac{-4x+12}{-6}$ → $y = \frac{2}{3}x - 2$

$2x + 2y = 6$
$-2x \quad -2x$
$\frac{2y}{2} = \frac{-2x+6}{2}$ → $y = -x + 3$

(3, 0)

EX2: There are 25 bikes and trikes at the park. The bikes and trikes have 60 wheels in all. How many bikes and trikes are in the park?

x: bike
y: trike

$x + y = 25$
$-x \quad -x$
$y = -x + 25$

$2x + 3y = 60$
$-2x \quad -2x$
$\frac{3y}{3} = \frac{-2x+60}{3}$ → $y = -\frac{2}{3}x + 20$

(15, 10)
15 bikes
10 trikes

You try!! Solve by graphing. (You can do these by hand or with a calculator!)

1. $-3x + 2y = 8$
   $x + 2y = -8$

$y = \frac{3x+8}{2}$

$y = \frac{-x-8}{2}$

(-4, -2)

2. $-2x + 4y = 6$
   $4x - 8y = 12$

$y = \frac{2x+6}{4}$

$y = \frac{-4x+12}{-8}$

no solution

3. $2x - y = 3$
   $6x - 3y = 9$

$y = \frac{-2x+3}{-1}$

$y = \frac{-6x+9}{-3}$

infinite solutions

4. $y = (x+3)^2$
   $y = -2x + 9$

(0, 9)
(-8, 25)

5. $9y - x = 41$
   $y = |x+1|$ ← math num abs(

$y = \frac{x+41}{9}$

(-5, 4)
(4, 5)

6. $y + 6 = |x+5|$
   $\frac{1-y}{3} = \left|\frac{1}{4}x\right|$

$y = -6 + |x+5|$
$y = -3\left|\frac{1}{4}x\right| + 1$

(-6.86, -4.14)
(1.14, 0.14)

Method 2: Substitution

- Solve one of the equations for either $x =$ or $y =$
- Replace this value in the other equation
- Solve this new equation
- Place this numerical value into either of the ORIGINAL equations in order to solve for the other variable
- Write solution as a POINT

EX3: $2x - 3y = -2$
$4x + y = 24$

$4x + y = 24$
$-4x \quad -4x$
$y = -4x + 24$

$2x - 3(-4x + 24) = -2$
$2x + 12x - 72 = -2$
$+72 \quad +72$
$\frac{14x}{14} = \frac{70}{14}$
$x = 5$

$4(5) + y = 24$
$-20 + y = 24$
$-20 \quad -20$
$y = 4$

(5, 4)

EX4: $x + 3y = -9$
$5x + 8y = 11$

$x + 3y = -9$
$-3y \quad -3y$
$x = -3y - 9$

$5(-3y - 9) + 8y = 11$
$-15y - 45 + 8y = 11$
$+45 \quad +45$
$-7y = 56$
$\frac{-7y}{-7} = \frac{56}{-7}$
$y = -8$

$x + 3(-8) =$
$x = 15$

(15, -8)

EX5: Jake's Surf Shop rents surfboards for $6.00 plus $3.00 per hour. Rita's rents them for $9.00 plus $2.50 per hour.

a. After how many hours of surfing will the rental fee be the same for both surf shops?

x: hours
y: cost

$y = 6 + 3x$ ← Jake's
$y = 9 + 2.5x$ ← Rita's

$6 + 3x = 9 + 2.5x$
$-6 \quad -2.5x \quad -6 \quad -2.5x$
$\frac{1}{2}x = 3$
$x = 6$

6 hours

b. You only want to surf for 2 hours; which surf shop should you go to?

$y = 6 + 3(2)$
$y = \$12$

Jake's!

$y = 9 + 2.5(2)$
$y = \$14$

You try!! Solve using substitution.

1. $x - 2y = 13$
   $3x + 2y = 15$

(7, -3)

2. $4x + 5y = -14$
   $8x + 10y = -20$

no solution

Method 3: Elimination

Basic Goal: Add the two equations together so that the x or y is eliminated.

- Arrange equations so variables, equal signs, and constants line up vertically.
- Multiply one or both equations by a value so that one variable in the 1st equation has the opposite coefficient in the other equation.
- Add the two equations.
- Solve for the remaining variable.
- Substitute solution from step 4 into either equation and solve for the remaining variable.

EX6: $x - 2y = 12$
$5y = 6x - 23$

$-6x \quad -6x$

$(x - 2y = 12)(6) \rightarrow 6x - 12y = 72$
$-6x + 5y = -23 \rightarrow +(-6x + 5y = -23)$

$-7y = 49$
$\frac{-7y}{-7} = \frac{49}{-7}$
$y = -7$

$x - 2(-7) = 12$
$-14 \quad -14$
$x = -2$

$(-2, -7)$

EX7: A jar filled with nickels and quarters contains a total of 55 coins. The value of all the coins in the jar is $6.95. How many quarters are in the jar?

n: nickels
q: quarters

$(n + q = 55)(0.25) \rightarrow 0.25n + 0.25q = 13.75$
$0.05n + 0.25q = 6.95 \rightarrow -0.05n + 0.25q = -6.95$

$34 + q = 55$
$-34 \quad -34$
$q =$ 21 quarters

$\frac{0.2n}{0.2} = \frac{6.8}{0.2}$
$n = 34$

You try!! Solve using elimination.

1. $2x + 8y = 6$
   $-5x - 20y = -15$

2. $5x + 4y = -14$
   $3x + 6y = 6$

3. The Algebra 2 classes took 60 minutes to answer a combination of 20 multiple-choice and extended-response questions. The class took 2 minutes to answer each multiple choice question and 6 minutes to answer each extended-response question. How many of each type of questions was on the test?