# 8.1 SOLVING SYSTEMS OF EQUATIONS GRAPHICALLY

PC20

**To be able to find the solution of a system of linear-quadratic equations or a system of quadratic-quadratic equations graphically and interpret that solution.**

**REVIEW:**

- **Solving** an equation means:

- A **SYSTEM OF EQUATIONS IS:**

- The **SOLUTION** to a systems of equations is:

**EX #1:** Given the system of equations y = -3x + 5 and $y = \frac{2}{3}x + 5$

a) What type of equations are these? Can you picture them?

b) What does the SOLUTION to this system represent on the graph?

c) Without actually drawing or solving anything algebraically, can you determine the solution?

We can't always visualize the solution to our questions. We will use a graphical method and two different algebraic methods to find the solution to the three different types of system:

- **Linear-linear systems:** Example: $y = 4x - 8$ and $y = 9x + 7$
- **Linear-quadratic system:** Example: $y = -3x + 5$ and $y = -7x^2 + 12x - 8$
- **Quadratic-quadratic systems:** Example: $y = -x^2 + 7x + 1$ and $y = 8x^2 + x - 4$

**The SOLUTION to a system of equations is the points where the graphs of the equations meet. What types of ways could a:**

**a) linear-linear system intersect and create solutions**

**b) linear-quadratic system intersect and create solutions**

**c) quadratic-quadratic system intersect and create solutions**

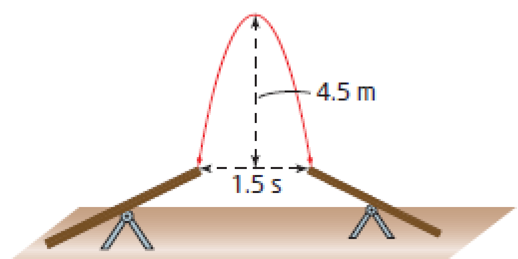
**EX #2:** Solve the following system graphically and verify your solution(s).

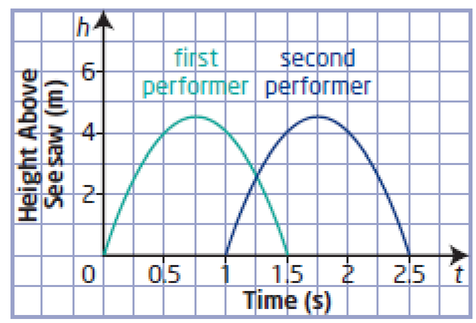
a) $X - y + 1 = 0$ $\quad\quad$ $x^2 - 6x + y + 3 = 0$

b) $2x^2 + 16x + y = -26$ $\qquad\qquad$ $x^2 + 8x - y = -19$

**EX #2:** At a circus performance, two performers are launched toward each other from two slightly offset seesaws. The first performer is launched, and 1 s later the second performeris launched in the opposite direction. They both perform a flip and give each other a high five in the air. The height above the seesaw versus time for each performer during the stunt is approximated by a parabola as shown. Their paths are shown on a coordinate grid.

**a)** Determine the system of equations that models the performers' height during the stunt.
**b)** Solve the system graphically using technology.
**c)** Interpret your solution with respect to this situation.




## 8.1 ASSIGNMENT (Graphing Calculator Allowed)

**8.1 FA: P435 #1, 2, 3, 4(only verify b), 5(only verify c), 6, 9, 13**
**8.1 ULA: P435 #6, 7, 8, at least one of:11/12/14, Any of: 10, 15, 16, 17, 20**

# 8.2 DAY 1: SOLVING SYSTEMS OF EQUATIONS USING SUBSTITUTION

PC20

**To be able to find the solution of a system of linear-quadratic equations or a system of quadratic-quadratic equations algebraically using the method of SUBSTITUTION.**

- When we don't have access to graphing technology, it is often more effective and accurate to solve a system algebraically rather than graphically by hand.
- Today we will review the method of SOLVING BY SUBSTITUTION that we learned in FPCM 10 and expand it to include quadratic equations

**STEPS:**

1. Number your equations 1 & 2. Identify what type of equation each is.
2. Isolate one of the variables in one of the equations. It is easiest (if possible) to isolate a variable that has a coefficient and/or an exponent of 1
3. Substitute what you have isolated in step 2 into the value of the same variable in the other equation
4. Solve the new equation from step 3
5. Substitute your solution(s) from step 4 into one of the original two equations to find the value(s) of the other variable
6. You may have 0, 1 or 2 solutions. Your solution(s) should each contain an x and a y value written as an ordered pair
7. Check each solution and write your final solution(s) as either a list of x and y values or as a solution set

**EX #1:** Solve the following system of equations:

a) $5x - y = 10$ $\quad\quad$ $x^2 + x = 2y = 0$

b) $6x^2 - x - y = -1$ $\qquad\qquad$ $4x^2 - 4x - y = -6$

**EX #2:** Determine two integers such that the sum of the smaller number and twice the larger number is 46. Also, when the square of the smaller number is decreased by three times the larger, the result is 93.

**EX #3:** Terri makes a good hit and the baseball travels on a path modelled by $h = -0.1x^2 + 2x$. Ruth is in the outfield directly in line with the path of the ball. She runs toward the ball and jumps to try to catch it. Her jump is modelled by the equation $h = -x2 + 39x - 378$. In both equations, $x$ is the horizontal distance in metres from home plate and $h$ is the height of the ball above the ground in metres.

**a)** Solve the system algebraically. Round your answer to the nearest hundredth.

**b)** Explain the meaning of the point of intersection. What assumptions are you making?

## 8.2 ASSIGNMENT #1(Graphing Calculator NOT Allowed)

**8.2 FA #1: P451 #2, 3, 9, 10**

**8.2 ULA #1: P451 #8, 19, 20, 21**

# 8.2 DAY 2: SOLVING SYSTEMS OF EQUATIONS USING ELIMINATION

**To be able to find the solution of a system of linear-quadratic equations or a system of quadratic-quadratic equations algebraically using the method of ELIMINATION.**

The goal of the ELIMINATION method is to *eliminate* one of the variables by adding the two equations together. You may have to multiply the equations by a number first in order to get the coefficients of those variables to be opposites

**EX #1:** Solve the following system of equations:

a) $5x - y = 10$ $\quad$ $x^2 + x = 2y = 0$

b) $6x^2 - x - y = -1$ $\quad$ $4x^2 - 4x - y = -6$

**EX #2:** Solve the systems using elimination:

a) $x^2-\frac{48}{9}x+\frac{1}{3}y+\frac{1}{3}=0$ $\quad$ $-\frac{5}{4}x^2-\frac{3}{2}x+\frac{1}{4}y-\frac{1}{2}=0$

b) $3x^2-x-y=2$ $\quad$ $6x^2-2x-2y=4$

## 8.2 ASSIGNMENT #2(Graphing Calculator NOT Allowed)

**8.2 FA #2: P451 #4, 5, 11, 13**

**8.2 ULA #2: P451 #7,16, 17, 18, 19, 20, 21**

# VIDEO LINKS THAT MAY AIDE IN UNDERSTANDING

## Section 8.1

- https://goo.gl/c3X2FF
- https://goo.gl/tbFJEL

## Section 8.2

- https://goo.gl/CM97Nh
- https://goo.gl/ve4LDG
- https://goo.gl/PE2gYg