**Unit 6- Systems of Equations and Inequalities \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Lesson 8.2 Solving Systems of Equations Algebraically**

Specific Outcome 1. Solve, algebraically and graphically, problems that

involve systems of linear-quadratic and quadratic-quadratic equations in two variables.

**Example 1: Solve a System of Linear- Quadratic Equations Algebraically**

1. Solve the following system of equations.

5x – y = 10

X2 + x – 2y = 0

1. Verify your solution.

**Method 1: Substitution**

**Method 2: Elimination**

**Your Turn:**

Solve the following system of equations.

3x + y = -9

4x2 – x + y = -9

**Example 2: Model a Situation With a System of Equations**

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.

**a)** Write a system of equations that relates to the problem.

**b)** Solve the system algebraically.

**Your Turn:**

Determine two integers that have the following relationships: Fourteen more than twice the first integer gives the second integer. The second integer increased by one is the square of the first integer.

**a)** Write a system of equations that relates to the problem.

**b)** Solve the system algebraically.

**Example 3:** **Solve a problem Involving a Linear-Quadratic System**

A Canadian cargo plane drops a crate of emergency supplies to aid-workers on the ground. The crate drops freely at first before a parachute opens to bring the crate gently to the ground. The crate’s height, *h*, in metres, above the ground *t* seconds after leaving the aircraft is given by the following two equations.

*h* = -4.9*t*2 + 700 represents the height of the crate during free fall.

*h* = -5*t* + 650 represents the height of the crate with the parachute open.

**a)** How long after the crate leaves the aircraft does the parachute open? Express your answer to the nearest hundredth of a second.

**b)** What height above the ground is the crate when the parachute opens? Express your answer to the nearest metre.

**c)** Verify your solution.

**Your Turn:**

Suppose the crate’s height above the ground is given by the following two equations.

*h* = -4.9*t*2 + 900

*h* = -4*t* + 500

**a)** How long after the crate leaves the aircraft does the parachute open?

Express your answer to the nearest hundredth of a second.

**b)** What height above the ground is the crate when the parachute opens?

Express your answer to the nearest metre.

**c)** Verify your solution.

**Example 4: Solve a system of Quadratic- Quadratic Equations Algebraically**

**a)** Solve the following system of equations.

3*x*2 - *x* - *y* - 2 = 0

6*x*2 + 4*x* - *y* = 4

**b)** Verify your solution.

**Your Turn:**

**a)** Solve the system algebraically. Explain why you chose the method that you did.

6*x*2 - *x* - *y* = -1

4*x*2 - 4*x* - *y* = -6

**b)** Verify your solution.

**Example 5: Solve a Problem Involving a Quadratic-Quadratic System**

During a basketball game, Ben completes an impressive “alley-oop.” From one side of the hoop, his teammate Luke lobs a perfect pass toward the basket. Directly across from Luke, Ben jumps up, catches the ball and tips it into the basket. The path of the ball thrown by Luke can be modelled by the equation *d*2 - 2*d* + 3*h* = 9, where *d* is the horizontal distance of the ball from the centre of the hoop, in metres, and *h* is the height of the ball above the floor, in metres.

The path of Ben’s jump can be modelled by the equation 5*d*2 - 10*d* + *h* = 0, where *d* is his horizontal distance from the centre of the hoop, in metres, and *h* is the height of his hands above the floor, in metres.

**a)** Solve the system of equations algebraically. Give your solution to the nearest hundredth.

**b)** Interpret your result. What assumptions are you making?

**Your Turn:**

Terri makes a good hit and the baseball travels on a path modelled by

*h* = -0.1*x*2 + 2*x*. 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* = -*x*2 + 39*x* - 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?

**Key Ideas**

Solve systems of linear-quadratic or quadratic-quadratic equations algebraically by using either a substitution method or an elimination method.

**To solve a system of equations in two variables using substitution,**

- isolate one variable in one equation

- substitute the expression into the other equation and solve for the remaining variable

- substitute the value(s) into one of the original equations to determine the corresponding value(s) of the other variable

- verify your answer by substituting into both original equations

**To solve a system of equations in two variables using elimination,**

- if necessary, rearrange the equations so that the like terms align

-if necessary, multiply one or both equations by a constant to create equivalent equations with a pair of variable terms with opposite coefficients

- add or subtract to eliminate one variable and solve for the remaining variable

- substitute the value(s) into one of the original equations to determine the corresponding value(s) of the other variable

- verify your answer(s) by substituting into both original equations

Assignment :Pg's 451- 456 #'s 1,3 a,c,e, 4, 6,8,12,15,16, 20,22