**High School Algebra I**

[CCSS.MATH.HSA.REI.C.5](http://www.corestandards.org/Math/Content/HSA/REI/C/5/)  
Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

[CCSS.MATH.HSA.REI.C.6](http://www.corestandards.org/Math/Content/HSA/REI/C/6/)  
Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

[CCSS.MATH.HSA.REI.C.7](http://www.corestandards.org/Math/Content/HSA/REI/C/7/)  
Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically. For example, find the points of intersection between the line *y* = -3*x* and the circle *x*2 + *y*2 = 3.

CCSS.MATH.PRACTICE.MP1

Make sense of problems and persevere in solving them.

CCSS.MATH.PRACTICE.MP4

Model with mathematics.

[CCSS.MATH.PRACTICE.MP5](http://www.corestandards.org/Math/Practice/MP5/)

Use appropriate tools strategically.

**Solving Systems of Equations**

Savannah Lucero-Zey

This learning progression will be taught in a small town high school algebra I class with all ninth grade students.

. The Common Core State Standards (CCSS) domain and cluster for this learning progression is CCSS.MATH.CONTENT.HSA.REI.C. The main standard that the students are learning is HSA.REI.C.6. The math practices (MP) that will be used by students for this progression would be MP1, MP4, and MP5.

The textbook used in this class is the McDougall Litell Algebra I book.

While teaching this lesson, we assume the students have worked with general graphs and equations before. They also will have looked at systems and used the graph to find the intersection.

This progression will be split up into three tasks which would probably be split up into three different fifty minute classes. There is one student to be accommodated for and this student simply picks half the problems, as long as there are some from each section gone over and does them rather than doing the full set. There are no other necessary accommodations and no word problems for ELLs.

Task One: Learn to substitute one equation into another to solve.

**Task One: Substitution Method**

**Learning Target** I can find the ordered pair where two equations cross by using substitution.

[CCSS.MATH.HSA.REI.C.5](http://www.corestandards.org/Math/Content/HSA/REI/C/5/)  
Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

CCSS.MATH.PRACTICE.MP1

Make sense of problems and persevere in solving them.

CCSS.MATH.PRACTICE.MP4

Model with mathematics.

L.T. I can find the ordered pair where two equations cross by using substitution.

To begin this lesson, they will start with easier problems where they have one equation that is easy like y=x+4 and another that is more complicated such as 2x+3y=16. It will be taught that from here they can put the y= equation into the other.

It will definitely be made sure that when they distribute they have to remember the 3, and the negative if there is one. As the students practice, they will see that they end up coming out with a number that their x is equal to. From here, they will plug it back into one of the original equations and come out with a y. They need to put this into an ordered pair, which is the final solution for where the systems cross.

They will do some practice problems with their table partner that will be gone over as a class. From here, they will do homework problems from the book and ask the teacher or students around them when they run into troubles. They also have the choice to always plug it into their calculator to compare their answer and make sure they got it right.

Task Two: Learn to manipulate equations to be able to eliminate one of the variables and find a solution.

L.T. I can find the ordered pair where two equations cross by using elimination.

**Task Two: Elimination Method**

**Learning Target** I can find the ordered pair where two equations cross by using elimination.

[CCSS.MATH.HSA.REI.C.5](http://www.corestandards.org/Math/Content/HSA/REI/C/5/)  
Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

CCSS.MATH.PRACTICE.MP1

Make sense of problems and persevere in solving them.

CCSS.MATH.PRACTICE.MP4

Model with mathematics.

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For starters, the students will do some entry tasks that related to the tasks they did the day before. Then they will start with equations they do not have to manipulate but can simply subtract from one another such as 2x+3y=7 and 2x+7y=13. As a class it will be discussed how to do this without using substitution.

They will learn to subtract the entire equation, thus eliminating it and with simple algebra can find one part of the ordered pair. Then, they will plug it into the other and be able to find the whole ordered pair. Then it will be discussed how to multiply the entire equation in order to make the students be able to create equations that can be eliminated from each other such as 3x+2y=6 and 5x+4y=2 where you would multiply the entire top to be 6x+4y=12.

Again for this task, they will do some practice problems with their table partner that will be gone over as a class. From here, they will do homework problems from the book and ask the teacher or students around them when they run into troubles. They also can always compare to the graph.

Task Three: Interpret different answers in relation to the system.

Learning Target: I can tell whether a system has 0, 1, or infinite solutions.

The central focus of this assignment is using equations to find the number of solutions, if any to a system of equations. The purpose of this is to be able to determine whether or not there is a place where the equations intercept which is useful for application problems.

In this lesson, the students will be again reinforcing how to interpret and calculate the solution to a system by choosing substitution or elimination. It will be discussed that if they get an answer where x or y equals a number, they can then plug it into the other equation and find the solution to the problem. What will be new is how to interpret when they have one number equal to another number or a number equal to itself.

For something like 10=4, they will learn this means no solution and compare to a graph. For 7=7 or 0=0, they will learn there are infinite solutions and they are the same graph.

At the end of this lesson, they will do more problems from the book as homework. They will continue to practice and have a quiz on it the next day likely.

**Task Three: Solving**

**Learning Target** I can create new polynomial factors given a shortcut version of division.

**Hinge Question** What do different answers mean?

[CCSS.MATH.HSA.REI.C.6](http://www.corestandards.org/Math/Content/HSA/REI/C/6/)  
Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

[CCSS.MATH.PRACTICE.MP5](http://www.corestandards.org/Math/Practice/MP5/)

Use appropriate tools strategically.

CCSS.MATH.PRACTICE.MP4

Model with mathematics.