**High School: Algebra**

*Reasoning with Equations and Inequalities*

The learning progression will be used in a 9th grade high school class. The common core standards that this progression will be aligned to are HSA.REI.C.5, HSA.REI.C.6 and HSA.REI.C.7. Mathematical practices MP1: Make sense of problems and persevere in solving them, MP3: Construct viable argument and critique reasoning of others and MP5: Use appropriate tools strategically will be aligned to the learning progression as well.

Students have just finished working with linear functions and this progression will be using this knowledge to construct a new concept and mathematical process. The students will be able do deepen their learning of what a linear function is and how it compares to other functions. The students will be practicing variable manipulation as they solve systems of linear equations. The students will also be working with real life problems solving systems of equations using three different processes.

To aid students they will be working in groups which will all them to critique each others work and also aid in understanding because of the ability to ask their peers questions. The students also will be taught using many different teaching styles. The first lesson is a discovery lesson where they will be creating linear equations to fit the model. Then they will be taught with direct instruction with group work during work time. They also will be learning three different methods to solving system of equations so they can check their own work and will be able to self evaluate.

*Reasoning with Equations and Inequalities*

**Solve systems of equations.**

Students will be building of previous knowledge from the previous unit. Students will first be doing a discovery lesson that will require them to model a car with linear equation. There will be parameters on the equation they can make. For example students will have a range on the slope they can choose for the equation and also a range of the y-intercepts they can choose. If a student chooses a large slope then they must use a small intercept and if they choose a large intercept they must choose a small slope. Students will be using the equation they create to race people in races of different lengths. They will see that certain equations perform better in different race lengths. They will also see that some

equations will cross or in the problem they will pass the other car they are racing. This will be how we transition into systems of equations. This will be the day one activity of the 5-day lesson. This will allow students to attend to constructing argumentsMP3 because they will be discovering their own equation and constructing arguments on why they think that there equation will be the best in the given race.

Once students have a better understanding of linear equations students will be introduced to systems of equations. They will be learning the process to solving systems of equations which include substitution, combination and graphing.

The first process that the students will learn is by substitution. The students will be given instruction of the process as well as numerous examples. The students will then engage in a scavenger activity where they must find answers around the room to a set of problems. The students will then be given more opportunities to practice the process by solving different kinds of problems out of the assigned class book. The students will also learn another process called combination where they will be multiplying an equation by a constant to rid a variable from an equation by adding the equations together or subtracting the equations. These two processes are similar and connecting the two processes will help students remember and understand each one. The students will have to use the appropriate process depending on what the question in asking or what process would best fit finding a solutionMP5.

After the students have an understanding of how to solve the problems algebraically the students will learn to find intersections graphically. This skill will be used so students can check their own work. This skill will also teach students technology fluency and they will learn more functions of the calculator then just basic calculation. **CCSS.MATH.PRACTICE.**

**MP3** Construct viable argument and critique reasoning of others.

**Benchmark**: First lesson:

Given two linear equations that model a cars speed. After time *t* which car traveled the farthest?

**CCSS.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.**

**MP5**Use appropriate tools strategically will be aligned to the learning progression as well.

**Benchmark** Given two linear equations solve the system using substitution and combination?

**CCSS.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.

After students learn all three way to solve systems of equations they will then be introduced into a new concept that will include non linear equations. The students will be given a problem that will require them to use problem solving skills and use their previously learned knowledgeMP1. The students will be given a linear equation paired with a quadratic equation. This will be done in groups so that students have an opportunity to share and use ideas on how to solve the problem. The students will be applying previous knowledge as well as understanding that there is more to systems then just linear equations. This will provide a strong foundation for the understanding of how equations work and how algebra can help solve them.

**CCSS.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

**Summative Assessment**

Student will display the knowledge of solving linear systems of equations using all three processes of substitution, combination and graphing and also be able to solve a system that is not all linear.