**Lesson Title:** Substitution

**Unit Title:** Solving Systems of Linear Equations

**Teacher Candidate:** Emily Ivie

**Subject, Grade Level, and Date:** Algebra I, 9th grade, Lesson I

**Placement of Lesson in Sequence and Lesson Rationale**

These students have been taught how to solve systems of linear equations by graphing. Now they will learn how to solve systems of linear equations by substitution.

**Central Focus and Purpose**

The central focus and purpose for this learning segment is to understand when and how to use substitution to solve systems of linear equations, fluently solve systems of linear equations by substitution, and be able to explain their answer using vocabulary including: distribute, cancellation, ordered pair, and intersection. In this activity students will be able to solve systems of linear equations as well as be able to explain their answers. This will help students make sense of one of the three methods for solving linear equations.

**CCSS.MATH Content and Practice Standards**

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.*

**Prior Content Knowledge and Pre-Assessment**

These students have been taught how to solve systems of linear equations by graphing and are able to demonstrate this by completing the entry task in this lesson.

**Learning Target(s) and Plan for Clarifying Intending Learning:**

-I will be able to solve systems of linear equations by substitution.

-I can explain how to correctly set it up and solve a system of linear equations using substitution.

The learning target will be on the board and discussed during the lesson.

|  |  |
| --- | --- |
| **Strategy for using assessments to guide student learning** | |
| The formative assessment strategy, students will propose ideas and discuss their solutions in groups, and then they will share their ideas in groups with the teacher (monitoring the groups). This type of formative assessment will have students expand their math reasoning skills by working with the new process for solving systems of linear equations and reasoning with their classmates to find solutions. The teacher will lead a class discussion to review what was learned and revisit misconceptions. Classroom discussion is futile for students’ critical analysis of students work. | |
| **Success Criteria** (criteria for interpreting student success of the learning target) | **Plan for providing feedback and students’ monitoring of their own learning** |
| Students will exhibit their conceptual understanding and procedural fluency through group and whole class discussions. I will identify whether or not the learning targets have been met by answering these questions:  -Do the students show proof of understanding solving systems of equations by substitution?  -Can my students correctly solve for a system of linear equations by substitution? | Student will self-assess and peer-assess in their groups. When students discuss their ideas as a group to the class I will know whether they understand how to solve systems of linear equations by substitution. The teacher will make sure that the students have a chance to ask questions in a group setting or individual as they complete their individual assessment task at the end of the lesson. I will use these types of assessment as immediate feedback in order to self-reflect on my teaching of the system of linear equations unit. |

|  |  |  |
| --- | --- | --- |
| **Academic Language Demands** | | |
| **Language Function** | **Vocabulary & Symbols** | **Secondary Language Demand** |
| * The students will justify their thought process in solving a linear system of equations by substitution. | * Substitution * Distribution * Ordered Pair | **Mathematical Precision:**  Students must correctly manipulate equations to use substitution to solve for variables.  **Syntax:**  Students must be able to solve for the correct variable when using substitution.  **Discourse:**  The problems will be given to the students in groups where they will work together to solve systems of linear equations using substitution. |

|  |  |  |
| --- | --- | --- |
| **Language Support** (instructional and assessment strategies) | | |
| **Language Instruction** | **Guided Practice** | **Independent Practice** |
| Model and explain how to solve systems of linear equations using substitution. | Students will practice their knowledge using scratch paper to work through in-class examples. | After all the students have participated in the warm-up activity and classroom discussion, they will complete a couple in-class examples. Then students will complete the rest of the problems on their own. |

**Differentiation, Cultural Responsiveness, and Accommodation for Individual Differences**

To accommodate for a variety of student situations and differences in mathematical ability the students will work in groups to complete the worksheet and discuss the problems as a whole class. Working in groups will be beneficial to this particular classroom because many of the students enjoy working together to deepen their understanding of mathematical topics.

**Materials – Instructional and Technological Needs** (attach worksheets used)

We will need writing utensils, calculators, and paper.

|  |  |  |
| --- | --- | --- |
| **Instructional Plan** (detailed explanation for thing the lesson) | | |
| **Pacing** | **Teacher Activities** | **Student Activities** |
| 10 min | Warm Up Activity: Write 1 introduction problem on the white board.  Find the intersection point of the following system of equations:  y=x-2 and y=5  Go over answers as a class.  (7,5) | Have students write problems on individual papers  -From the warm up activity  Have class draw a graph of the equations y=x-2 and y=5  Discuss why we write our answer in an ordered pair. |
| 15 min | Substitution lecture, with examples: | Students will follow along and work through the example problems that I will do on the board. |
| 15 min | Put two additional problems on the projector. | Students will complete the problems in groups, of 2-4 people and discussing their problem solving approach. Students will then write the answers on their paper and once finished we will discuss solutions. |
| 10 min | Discuss any final questions the students might have. | Students will give feedback as to what can make this lesson better for next time and any possible things they are still confused about. |

**Rubric** for assessment of assignments – **Solving your system of linear equations using substitution and explaining your answer**

|  |  |
| --- | --- |
| 1. Created the correct graph during the entry task | On Target Developing Missing  3 1 0 |
| 1. Solved system of linear equations using substitution | On Target Developing Missing  3 1 0 |
| 1. Student justifies how to set up and solve system of linear equations using substitution | On Target Developing Missing  3 1 0 |

**Lesson Title:** Combination

**Unit Title:** Solving Systems of Linear Equations

**Teacher Candidate:** Emily Ivie

**Subject, Grade Level, and Date:** Algebra I, 9th grade, Lesson II

**Placement of Lesson in Sequence and Lesson Rationale**

These students have been taught how to solve systems of linear equations by graphing and substitution. Now they will learn how to solve systems of linear equations by combination.

**Central Focus and Purpose**

The central focus and purpose for this learning segment is to understand when and how to use combination to solve systems of linear equations, fluently solve systems of linear equations by combination, and be able to explain their answer using vocabulary including: distribute, cancellation, ordered pair, and intersection. In this activity students will be able to solve systems of linear equations as well as be able to explain their answers. This will help students make sense of one of the three methods for solving linear equations.

**CCSS.MATH Content and Practice Standards**

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.*

**Prior Content Knowledge and Pre-Assessment**

These students have been taught how to solve systems of linear equations by graphing and substitution. There will be no pre-assessment today.

**Learning Target(s) and Plan for Clarifying Intending Learning:**

-I will be able to solve systems of linear equations by combination.

-I can explain how to correctly set it up and solve a system of linear equations using combination.

The learning target will be on the board and discussed during the lesson.

|  |  |
| --- | --- |
| **Strategy for using assessments to guide student learning** | |
| The formative assessment strategy, students will propose ideas and discuss their solutions in groups, and then they will share their ideas in groups with the teacher (monitoring the groups). This type of formative assessment will have students expand their math reasoning skills by working with the new process for solving systems of linear equations and reasoning with their classmates to find solutions. The teacher will lead a class discussion to review what was learned and revisit misconceptions. Classroom discussion is futile for students’ critical analysis of students work. | |
| **Success Criteria** (criteria for interpreting student success of the learning target) | **Plan for providing feedback and students’ monitoring of their own learning** |
| Students will exhibit their conceptual understanding and procedural fluency through group and whole class discussions. I will identify whether or not the learning targets have been met by answering these questions:  -Do the students show proof of understanding solving systems of equations by combination?  -Can my students correctly solve for a system of linear equations by combination? | Student will self-assess and peer-assess in their groups. When students discuss their ideas as a group to the class I will know whether they understand how to solve systems of linear equations by combination. The teacher will make sure that the students have a chance to ask questions in a group setting or individual as they complete their individual assessment task at the end of the lesson. I will use these types of assessment as immediate feedback in order to self-reflect on my teaching of the system of linear equations unit. |

|  |  |  |
| --- | --- | --- |
| **Academic Language Demands** | | |
| **Language Function** | **Vocabulary & Symbols** | **Secondary Language Demand** |
| * The students will justify their thought process in solving a linear system of equations by combination. | * Combination * Cancellation * Distribution * Ordered Pair | **Mathematical Precision:**  Students must correctly manipulate equations to use combination to solve for variables.  **Syntax:**  Students must be able to solve for the correct variable when using combination.  **Discourse:**  The problems will be given to the students in groups where they will work together to solve systems of linear equations using combination. |

|  |  |  |
| --- | --- | --- |
| **Language Support** (instructional and assessment strategies) | | |
| **Language Instruction** | **Guided Practice** | **Independent Practice** |
| Model and explain how to solve systems of linear equations using combination. | Students will practice their knowledge using scratch paper to work through in-class examples. | After all the students have participated in the classroom discussion, they will complete a couple in-class examples. Then students will complete the rest of the problems on their own. |

**Differentiation, Cultural Responsiveness, and Accommodation for Individual Differences**

To accommodate for a variety of student situations and differences in mathematical ability the students will work in groups to complete the worksheet and discuss the problems as a whole class. Working in groups will be beneficial to this particular classroom because many of the students enjoy working together to deepen their understanding of mathematical topics.

**Materials – Instructional and Technological Needs** (attach worksheets used)

We will need writing utensils, calculators, and paper.

|  |  |  |
| --- | --- | --- |
| **Instructional Plan** (detailed explanation for thing the lesson) | | |
| **Pacing** | **Teacher Activities** | **Student Activities** |
| 25 min | Combination lecture, with examples: | Students will follow along and work through the example problems that I will do on the board. |
| 15 min | Put two additional problems on the projector. | Students will complete the problems in groups, of 2-4 people and discussing their problem solving approach. Students will then write the answers on their paper and once finished we will discuss solutions. |
| 10 min | Discuss any final questions the students might have. | Students will give feedback as to what can make this lesson better for next time and any possible things they are still confused about. |

**Rubric** for assessment of assignments – **Solving your system of linear equations using combination and explaining your answer.**

|  |  |
| --- | --- |
| 1. Created the correct set up for solving systems of equations using combination | On Target Developing Missing  3 1 0 |
| 1. Solved system of linear equations using combination | On Target Developing Missing  3 1 0 |
| 1. Student justifies how to set up and solve system of linear equations using combination | On Target Developing Missing  3 1 0 |

**Lesson Title:** Choose your own Adventure

**Unit Title:** Solving Systems of Linear Equations

**Teacher Candidate:** Emily Ivie

**Subject, Grade Level, and Date:** Algebra I, 9th grade, Lesson III

**Placement of Lesson in Sequence and Lesson Rationale**

These students have been taught how to solve systems of linear equations by graphing, combination, and substitution. Now they will get to use any of the three methods to solve a system of linear equations.

**Central Focus and Purpose**

The central focus and purpose for this learning segment is to understand when and how to use graphing, combination, and substitution to solve systems of linear equations. Also, students should be able to fluently solve systems of linear equations by any method learned and be able to explain their answer using vocabulary including: distribute, cancellation, ordered pair, and intersection. In this activity students will be able to solve systems of linear equations as well as be able to explain their answers. This will help students make sense of all three methods for solving linear equations.

**CCSS.MATH Content and Practice Standards**

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.*

**Prior Content Knowledge and Pre-Assessment**

These students have been taught how to solve systems of linear equations by graphing, substitution, and combination. There is no pre-assessment for this lesson.

**Learning Target(s) and Plan for Clarifying Intending Learning:**

-I will be able to solve systems of linear equations that are presented in the form of a word problem.

-I can explain how to correctly set it up and solve a system of linear equations using any method.

The learning target will be on the board and discussed during the lesson.

|  |  |
| --- | --- |
| **Strategy for using assessments to guide student learning** | |
| The formative assessment strategy, students will propose ideas and discuss their solutions in groups, and then they will share their ideas in groups with the teacher (monitoring the groups). This type of formative assessment will have students expand their math reasoning skills by working with their classmates to solving systems of linear equations and explain their reasoning to each other. The teacher will lead a class discussion to review what was learned and revisit misconceptions. Classroom discussion is futile for students’ critical analysis of students work. | |
| **Success Criteria** (criteria for interpreting student success of the learning target) | **Plan for providing feedback and students’ monitoring of their own learning** |
| Students will exhibit their conceptual understanding and procedural fluency through group and whole class discussions. I will identify whether or not the learning targets have been met by answering these questions:  -Do the students show proof of understanding solving systems of equations by any of the three methods?  -Can my students correctly solve for a system of linear equations by any of the three methods? | Student will self-assess and peer-assess in their groups. When students discuss their ideas as a group to the class I will know whether they understand how to solve systems of linear equations by any of the three methods. The teacher will make sure that the students have a chance to ask questions in a group setting or individual as they complete their individual assessment task at the end of the lesson. I will use these types of assessment as immediate feedback in order to self-reflect on my teaching of the system of linear equations unit. |

|  |  |  |
| --- | --- | --- |
| **Academic Language Demands** | | |
| **Language Function** | **Vocabulary & Symbols** | **Secondary Language Demand** |
| * The students will justify their thought process in solving a linear system of equations by substitution, graphing, or combination. | * Substitution * Distribution * Ordered Pair | **Mathematical Precision:**  Students must correctly manipulate equations to use any of the three methods to solve the problem.  **Syntax:**  Students must be able to solve for the correct variable and must be able to set up a word problem correctly.  **Discourse:**  The problems will be given to the students in groups where they will work together to solve systems of linear equations using either graphing, combination, or substitution. |

|  |  |  |
| --- | --- | --- |
| **Language Support** (instructional and assessment strategies) | | |
| **Language Instruction** | **Guided Practice** | **Independent Practice** |
| Model and explain how to solve systems of linear equations using graphing, substitution, or combination. | Students will practice their knowledge using scratch paper to work through in-class examples. | After all the students have participated in the classroom discussion, they will present, ask questions, and then complete an exit task. |

**Differentiation, Cultural Responsiveness, and Accommodation for Individual Differences**

To accommodate for a variety of student situations and differences in mathematical ability the students will work in groups to complete the worksheet and discuss the problems as a whole class. Working in groups will be beneficial to this particular classroom because many of the students enjoy working together to deepen their understanding of mathematical topics.

**Materials – Instructional and Technological Needs** (attach worksheets used)

We will need writing utensils, calculators, and paper.

|  |  |  |
| --- | --- | --- |
| **Instructional Plan** (detailed explanation for thing the lesson) | | |
| **Pacing** | **Teacher Activities** | **Student Activities** |
| 20 min | Explain the structure of the class today and assign the groups. Let students work with their groups after working alone for 10 minutes. | Students will work on the problem independently for 10 minutes, then collaborate with the groups for 20 minutes. |
| 20 min | Each group will have one person present | Students will respectfully listen to their classmates and follow along. If any students have a question about the process, they are welcome to ask at the end. |
| 10 min | Exit task | Students will be given an exit task to work on independently for the rest of class. |

**Rubric** for assessment of assignments – **Solving your system of linear equation and explain your answer**

|  |  |
| --- | --- |
| 1. Set up an applied word problem correctly | On Target Developing Missing  3 1 0 |
| 1. Solved system of linear equations using any of the three methods | On Target Developing Missing  3 1 0 |
| 1. Student justifies how to set up and solve system of linear equations | On Target Developing Missing  3 1 0 |