1. Learning Context:

School district: Logan City School District

Name of school: Logan High School

Title 1 school? No

Demographics of school:

According to data on datagateway.schools.utah.gov, 1641 students are enrolled at Logan High School with 386, 442, 401, and 412 within grades 9, 10, 11, and 12 respectively. There are 86 teachers. Regarding ethnicity, there are 17 American Indian students, 67 Asian students, 33 Black students, 1,028
Caucasian students, 460 Hispanic students, 17 Multi Race students, and 19 Pacific Islander students enrolled. Regarding gender, there are 811 female students and 830 male students.

Logan High School has a lot of diversity. In a meeting with the administrators of Logan High including the principal Kenneth Auld, assistant principal Jim Peacock, and assistant principal Roxanne Sharr, we talked about the diversity among the students and the district’s goals to meet the unique needs of our school by meeting the unique needs of all the students. In this meeting, I learned that nearly 35% of students are Latino, about 40% of students are in the ethnic minority, and about half of the students are socio-economically disadvantaged.

These statistics are confirmed by similar statistics on the datagateway.shools.utah.gov website. It states that 48.4% of students are economically disadvantaged and 37.4% of students are in the ethnic minority. It also adds that 7.4% of students are English Language Learners and 10.7% of students are in special education with special needs.

**Description of school climate:**

According to the administration of Logan High, there is an extreme focus right now to help students who are failing or dropping out of school. They informed us that this last semester, Fall 2017, 1,149 Fs were given to about 500 students.

There are student body officers for each class. There is one principal and two assistant principals. Parents have access to their students’ grades online. Parents are encouraged to attend the semiannual parent teacher conferences as well as to contact their student’s teachers as needed. There is a school-wide dress code. Individual teachers set up expectations for their classrooms.

My cooperating teachers are Michael Boam and Nichole Terveen. With Mr. Boam, we teach Innovations classes. The school climate in that section of the school is quite unique from the traditional style classrooms. Students are enrolled in an online curriculum with which they are expected to seek help from the teachers at school.
With Mrs. Terveen, we teach traditional classes with a mixture of direct instruction, group activities, and individual work. To keep students and parents informed of assignments and announcements, we send out reminders via text using the app “Remind.”

Grade level: 9, 11, 12.

Learning environment:

In the Innovations classroom, the classroom management plan is to set the clear expectations that in the classroom students are to be working, use clean language, and show respect. The tables are arranged in groups and students can work where they feel comfortable in the classroom. The format is for students to work on online assignments and go to the teacher’s room with whom they need instruction or help with a lesson or assignment.

In the traditional math classrooms with Mrs. Terveen, the seating arrangement is groups for students to work in teams. The classroom management plan is to not use cell phones, be respectful, and listen to each other. If there is a problem, we talk to the student. If it happens again, then we talk to the parents. Further actions would involve the administration. The classroom is a safe environment for students to learn, make mistakes, and ask questions.

Subject matter of lessons: Math 1, Chapter 6, Systems of Equations

Total number of students: 25

Students with special needs and short explanation of the needs:

Student ID is being tested for special needs. He has trouble retaining information, so he needs one-on-one review time before quizzes and extra time on homework. He also is allowed a calculator.

With IEPs:

1 - Student RE has a specific learning disability. She is allowed to use a calculator, have extended time on assignments. She also needs one-on-one review time before quizzes and in work time.

Students who receive speech/language services: none
English language learners:

2. ID is an ELL, but scored a 5 in proficiency on the UALPA in 2012. Also, JH is an ELL, but scored a 5 in proficiency on the UALPA in 2011.

Gifted and talented: none

Other (e.g., 504 plans--please specify): none

Students’ prior knowledge for these lessons:

Students have learned in previous chapters this school year to solve single variable equations, write equations of lines, and graph linear equations. From reviewing the scores on assignments for these subjects, and by looking at the quizzes concerning these topics, I am confident that many students are prepared to expand their knowledge and learn to solve systems of equations. I noticed that a few students EV, ID, and JO, not only failed quarter one and two of Math 1 (we are now in quarter three) but are currently failing many of their other classes as well.

Students’ background and interest for these lessons:

Students have done algebraic skills in the past, as evidenced by their work on the quizzes addressing writing the equations of lines. But, often times I recognized that students would forget the algebraic processes that they learned. I think leading students into seeing where two lines cross as the solution will be interesting as long as it is connected to a real problem.

How did your knowledge of these students and assessment of their prior knowledge inform your lesson planning?

Students have learned to solve equations for one variable before, but most have trouble with it. Therefore, I knew that I needed to review this in depth before teaching to solve more complicated literal equations. Also, because I noticed that retention of the algebraic steps is lacking, I decided for my lesson to create a problem worked out with steps labeled and written out in depth for students to model their work after and go back to when stuck.
2. Focus Students:

I have chosen to focus on the learning of two students in Secondary Math 1 in 3rd period on B day. For this analysis, they will be known as student 1, RG and student 2, ID.

**Description of Student 1, RG:**

**Prior Learning:**

I learned from Mrs. Terveen, my cooperating teacher, that RG has understood and participated with the prior chapters in Secondary Math 1. By looking at his previous coursework and grades, it is clear that RG understands the previous topics of Secondary Math 1, including setting up and solving linear equations, identifying triangle properties, collecting and analyzing data, and writing equations for arithmetic and geometric sequences.

**Academic Ability:**

For the first semester of his Freshman year, RG earned a 3.643 GPA, and in Secondary Math 1 he got a B+ first term and A second term. Unexcused absences first term and second term were two each.

**Personal Background:**

He is a non-Hispanic 14-year-old male and he has parents who are supportive. He is involved in school activities and is president of the Freshman class.

**Other Relevant Characteristics:**

Student RG participates in class by willingly contributing answers to questions in class discussions and actively working with his team during group time. I found out by talking to Mrs. Terveen, my cooperating teacher who has worked with RG for over a semester, by observing him in class, collecting artifacts from his prior work, and by looking at his school records online that he is a student who needs less support in the classroom.

**Influence of all these Characteristics on my Teaching:**
My knowledge of student RG’s background helped me to place RG as a strong learner in a team with some other students in the class who need more support so that he can explain topics and help his teammates. When planning each lesson, I think of more challenging questions for students to think about and I discuss them with the class. I do not expect everyone to understand completely. Also, these challenging ideas will not appear on quizzes or tests, but the questions are designed to help students like RG expand their learning and stay engaged.

For example, when teaching the algebraic process of solving multivariable equations, the higher end thinkers will engage in a discussion about how solutions relate to points on a line. This is an idea that is challenging, because the connection between solutions and the graph of a line is hard for many students to see. Then, I will walk the higher end thinkers through the process of checking their answers. This is a challenging and additional step, but by checking their answers students can be confident that their answers are correct. While I will show every student this process, I expect the higher end thinkers to pay closer attention and put this skill into practice.

**Description of Student 2, ID:**

**Prior Learning:**

ID is retaking Secondary Math 1 for the second year. The curriculum of Secondary Math 1 covers linear equations, triangle properties, data collection and analysis, sequences, triangle congruency proofs, exponential equations, and inequalities. Last year he did not earn credit for math, and this last semester he did not pass math. However, he has been introduced to these topics.

**Academic Ability:**

By looking at his school records I learned about ID’s academic background. ID is a tenth grader in a ninth-grade math class with a Cumulative GPA of 1.144. Unexcused absences first term and second term of this school year were 9 and 13 respectively.
Personal Background:

ID is a 15-year-old Hispanic tenth grader. He speaks Spanish but has been proficient in English for over 6 years. Outside of school, I learned that ID loves to play soccer. At parent teacher conferences, I met his parents who only speak Spanish. They told me that ID is going to try to get his grades up so that he can play soccer on the high school team. By talking with ID, I learned that he plays many sports outside of school, including basketball, baseball, and soccer, but his favorite is soccer.

Other Relevant Characteristics:

Student ID is a student who needs strong support in the classroom. Although he does not have an IEP or 504 plan, Mrs. Terveen notified me that he is going to be tested to see if he needs special education supports in the classroom. From observations and by talking with Mrs. Terveen I have found out that ID does not speak much with his classmates in team work or in group discussions.

Influence of all these Characteristics on my Teaching:

My knowledge of ID’s background helped me to place ID on a team with a strong learner to help him. Also, whenever there is team work, I, Mrs. Terveen or an aide sits at his table and individually helps him, and a couple other students who need support, work through the problems. I also began teaching vocabulary at the beginning of every lesson to help students better grasp the jargon of mathematics. I am working to include some soccer problems into the lesson to engage ID more fully in discussions in class.
3. Lesson Plans

Lesson Plan 1 – 6.1.1: Manipulating Equations and Solving for Variables

Subject and grade Level: Chapter 6, Section 1 of the Integrated Core for Secondary Math 1, 9th grade

Approximate time: 60 minutes

Rationale for methods

In SCED 4200 at Utah State University, “Language, Literacy, and Learning in the Content Areas”, I learned the importance of frontloading academic vocabulary at the beginning of new units and individual lessons. It helps English language learners, students with special needs, and all students in the classroom to be aware of key terms and understand the technical definitions in addition to colloquial definitions. Therefore, at the beginning of the new unit, Chapter 6 Systems of Equations, I had the students review the list of important words they will need in Chapter 6. They did this by putting plus signs next to words they felt they knew well and minus signs next to words they felt they don’t know. Then, I guided instruction to learn three key vocabulary words. For this unit, we are using Frayer Models to list simple definitions, characteristics, examples and nonexamples of the vocabulary words.

In the class “Methods of Teaching Mathematics,” MATH 4500, I learned that an effective way of teaching algebraic skill is to list explicitly the steps and have them readily accessed by students. The steps are therefore listed in the guided notes for the students. Then, as we walk through a problem already worked out, we refer to each step of the process. For teaching this skill, I use the “I do, We do, You do” method of gradual release of responsibility, an evidence based effective teaching practice. I show how to do a problem, then have students work with their teams to solve a few practice problems, and then the homework assignment allows students to practice on their own.

Content standards

- A-SSE.1a. Interpret parts of an expression, such as terms, factors, and coefficients.
• A-SSE.1b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret $P(1 + r)^n$ as the product of $P$ and a factor not depending on $P$.

• A-CED.1. Create equations and inequalities in one variable [including ones with absolute value (California Addition)] and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

• A-CED.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm’s law $V = IR$ to highlight resistance $R$.

• A-REI.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

• A-REI.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

**Academic language/vocabulary objectives**

1. The language skill: Students will make sense of word problems, make predictions, determine the course of action to pursue, and explain the steps to find solutions. In doing this they will reason abstractly and quantitatively. They will also construct viable arguments and critique the reasoning of others.

2. The discipline-specific vocabulary: single-variable equation, multi-variable equation, linear equation/line, rewrite, variables, model, slope, $y$-intercept, slope-intercept form, standard form, solve/solution

**Required materials, resources, and technology**

The needed resources are:

• Chapter 6 Vocabulary Packets, which include the Frayer models for students to fill out and understand important vocabulary
6.1.1 guided notes, which provide an outline for student note-taking

A Smart Board Presentation, that provides space to fill in the guided notes as a model

White board markers and erasers and the cards with equations, for the whiteboard activity described below. Students will use their whiteboard tables as writing space.

Technology tools: iPad and Apple TV, for displaying student work during the whiteboard activity. When a team has a correct solution worked out, I will take a picture of their work and display it on the Smart TV. Then the partnership whose work is displayed will explain how they came to their solution, and all students will follow along and note any differences or similarities in their work. We will discuss solutions that are different but also correct.

Lesson objectives

Students will understand the meaning of “variables”, “single-variable equations,” and “multi-variable equations.” (Communication and Comprehension) Utah Core Standards: A-SSE.1a, A-SSE.1b

Students will work with multi-variable equations and be able to change the form of the equation (for instance from y-intercept form to standard form). They will be able to solve an equation for a particular variable. (Algebraic Skill) Utah Core Standards: A-REI.1, A-REI.3, A-CED.1, A-CED.4.

Instructional Procedures

First, I will pass out Vocabulary packets that list the key terms for Chapter 6. I will instruct students to draw plus signs next to words they feel they know well and minus signs next to words they feel they do not know very well. Then, we will use Frayer Models to define “variables,” “single-variable equations,” and “multi-variable equations.”

Next, students will review with their teams the answer to problem 6-1 (which asks about identifying slope and y-intercept from an equation of a line).
We will complete problem 6-2 in teams and as a class. For parts a and b, students will work with their team to predict the slope and y-intercept of a line of which the equation is written in standard form and draw the line using a table of points. As a class, I will model, and students will write along with me the algebraic steps of solving for y to put the equation in slope-intercept form. I will ask “Why is it valuable to change the form of the equation into the y= form?” We will write a pros and cons list that shows that the benefit of changing the form of the equation is to easily identify the slope and y-intercept of the line so that drawing the line is easier. The disadvantage is that it takes work.

For the higher end thinkers, I will ask “What really is a line?” We will discuss that a line is the set of all solutions to a linear equation. Any point on the line is a solution to the equation. Any solution to the equation is a part of the line. We will note that rewriting the equation does not change any of the solutions.

Referring to the list of steps of the algebraic process of solving an equation for a particular variable, I will model a practice problem slowly, step by step. Students will have this problem worked out on their guided notes labeled with each step number. Teams will work on two practice problems using the list of steps.

Next, we will do a white board activity in which the students are paired and are tasked to solve multi-variable equations for specific variables. Partner A will write only what Partner B instructs them to write as they solve the problem together. All groups in the class will work on the same problem at the same time. Once a few groups have come to the answer, I will take a picture of one of the correct solutions, display it on the TV, and instruct the partnership to explain how they came to their solution. We will discuss alternate answers that are equivalent. Then the partners will switch roles and continue.

Finally, I will pass out a homework assignment that gives students practice for solving many linear equations for variables of interest.

**Adaptations/Accommodations**
The accommodations for students ID, RE, and JG will be allowing them and everyone to use a calculator if needed, pairing each of the students who need more support with a student who can explain the process to them, and checking in on each of them as a teacher and giving them individual help as needed. The higher end thinkers will engage in the discussion about how solutions relate to points on a line. Also, I will walk the higher end thinkers through the process of checking their answers. While I will show every student this process, I expect the higher end thinkers to pay closer attention and put this skill into practice.

Assessment

I will evaluate students’ beginning level of understanding by measuring student achievement on the quiz “Writing Equations” that will be given the class period prior this lesson. This quiz asks students to write equations of lines and understand slope and y-intercept. This is the starting point of learning to solve equations for particular variables.

I will evaluate whether or not students are meeting the objectives formatively by looking at their homework (because it is not graded but scored on participation) and summatively by measuring student achievement on the bell ringer next class period that asks them to solve equations. There will be a quiz on solving equations that will provide evidence of student achievement of unit objectives.
Chapter 6: Solving Systems of Equations

Symbols that represent numbers usually are lowercase letters

Variables

\[ 2x + 5 \]
\[ y = 4.8 - 1 \]
\[ a \div c = 4 \]
January 19, 2018

**Single Variable Equation**

- An equation with only one variable.
- Solutions are numbers.
- Can have 0, 1, 2, or more solutions.

**Examples**

- \( 4x - x = 6x \)
- \( (x + 4)^2 = 7x^2 \)
- \( x = 4 \)

**Multi-Variable Equations**

- An equation with more than one variable.
- Can have 0, 1, 2, or more solutions.

**Examples**

- \( y = 7x - 5 \)
- \( 4x + 8b = c \)
- \( x^2 + x = 1 \)
- \( x + y + z = \)

Open books to page 303 and work through problem 6-1 with your team to refresh your memory about \( y = mx + b \).
6-2:

a) The linear equation $-6x+2y=10$ is written in standard form. With your team, predict what the slope and y-intercept is.

b) Make a table and graph the line. With the graph, write an equivalent equation of the line.

\[ y = \frac{5}{2} x + 5 \]
\[ y = 3x + 5 \]

What does it mean to rewrite an equation?

- The equation doesn't change, just the form.
- The equation has the same exact solutions as before.

<table>
<thead>
<tr>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>easily identify slope and y-intercept</td>
<td>takes some work</td>
</tr>
<tr>
<td>easily graph</td>
<td></td>
</tr>
</tbody>
</table>

How do we rewrite equations to "solve" for a specific variable?

Problem Solving Steps:
1. Simplify both sides of the equation. Combine like terms.
2. Identify which variable you want to isolate.
3. Isolate all instances of the variable term on one side of the equation so that all other constants or variables are on the opposite side of the equation. In this step, you will only use the inverse of addition and subtraction.
4. Use the variable term to write the variable with a coefficient of 1. In this step, you will use multiplication and/or division.
5. Check your solution by substituting the value of the variable into the original equation.
White Board Challenge

Directions:

With your partner, designate one person to be the blue partner and one to be the yellow partner.

1st turn:

Blue will have the marker and yellow will be the voice. Blue will write down the equation on the whiteboard. Yellow will tell their partner how to solve the problem. Blue can only write down what yellow tells them to write. When most people have solved the problem, we will walk through the solution.

Next turn: switch roles.

Blue: Part a) Solve for $b$: $A = 5b$

\[ A = \frac{b}{b} \]

Yellow: Part a) Solve for $y$: $3x + 6y = 24$

\[ -\frac{3x}{6} \quad -\frac{3x}{6} \]

\[ 6y = -\frac{3x + 24}{6} \]

\[ y = -\frac{1}{2}x + 4 \]
Blue Part b) Solve for \( x \): \( x(2x - 1) = 2x^2 + 5x - 12 \)

\[
\begin{align*}
2x^2 - x &= 2x^2 + 5x - 12 \\
-x &= 5x - 12 \\
-5x &= 6x \\
\frac{-21x}{-6} &= \frac{-12}{-6} \\
x &= 2
\end{align*}
\]

Yellow Part d) Solve for \( x \): \( 2 - 3(2x - 1) = -6x + 5 \)

\[
\begin{align*}
2 - 6x + 3 &= -6x + 5 \\
+6x &= +6x \\
5 &= 5
\end{align*}
\]

Infinite solutions, all real numbers

Blue Part c) Solve for \( x \): \( 25x + z = 30x + 3y + 10 \)

\[
\begin{align*}
10x + 2z &= 30x + 3y + 10 \\
-2z &= -2z \\
10x &= 30x + 3y + 10 - 2z \\
-20x &= 3y + 10 - 2z \\
\frac{-20x}{-20} &= \frac{3y + 10 - 2z}{-20} \\
x &= \frac{3y + 10 - 2z}{-20}
\end{align*}
\]

Yellow Part g) Solve for \( x \): \( 5(-2 + x) = 35 \)

\[
\begin{align*}
-15 + 5x &= 35 \\
+15 &= +15 \\
5x &= 50 \\
\frac{5x}{5} &= \frac{50}{5} \\
x &= 10
\end{align*}
\]
Blue Part 1) Solve for $x$: \(4(x + 1) = (2x - 3)(2x + 3)\)
\[
\begin{align*}
4x^2 + 4 &= 4x^2 + 10x - 6x - 15 \\
-4x^2 &= 4x^2 \\
+4 &= 10x - 6x - 15 \\
19 &= 4x \\
\frac{19}{4} &= x
\end{align*}
\]

Yellow Part b) Solve for $m$: \(m = \frac{F}{a}\)
\[
\begin{align*}
\frac{ma}{a} &= \frac{F}{a} \\
m &= \frac{F}{a}
\end{align*}
\]

Blue Part i) Solve for $b$: \(ab - 2 = 3c\)
\[
\begin{align*}
\frac{ab}{a} &= \frac{3c + 2}{a} \\
b &= \frac{3c + 2}{a}
\end{align*}
\]

Yellow Part i) Solve for $w$: \(2(w - 3) = 1 - (w + 4)\)
\[
\begin{align*}
2w - 6 &= 1 - w - 4 \\
2w - w &= -3 - w \\
+3 &= -w \\
2w &= -3 \\
-2w + 3 &= w
\end{align*}
\]
Solving Literal Equations

Solve each equation for the indicated variable.

1) \[ z = y + \frac{m}{x}, \text{ for } x \]
   \[ z - y = \frac{m}{x} \]
   \[ x = \frac{m}{z - y} \]

2) \[ z = b + am, \text{ for } a \]
   \[ z - b = a \]
   \[ \frac{z - b}{m} = \frac{a}{m} \]
   \[ a = \frac{z - b}{m} \]

3) \[ z = y - xm, \text{ for } x \]
   \[ z - y = -xm \]
   \[ \frac{z - y}{m} = x \]

4) \[ a - c = r - d, \text{ for } a \]
   \[ a = r - c + d \]

5) \[ g = b + a - c, \text{ for } a \]
   \[ g - b = a - c \]
   \[ a = g + c \]

6) \[ \frac{g - b}{c} = d + r, \text{ for } a \]
   \[ x = \frac{d + r}{c} \]

7) \[ \frac{k}{x} = \frac{yw}{x}, \text{ for } x \]
   \[ k = \frac{yw}{x} \]

A) \[ x = \frac{k}{yw} \]
B) \[ x = \frac{yw}{k} \]
C) \[ x = \frac{k}{yw} \]
D) \[ x = \frac{yw}{k} \]

8) \[ c - x = r + d - y, \text{ for } x \]
   \[ A) x = c - r - d - y \]
   \[ B) x = c - r - d + y \]
   \[ C) x = c + r + d - y \]
   \[ D) x = -d - y - c \]

Rewrite the equation in \( y = mx + b \) form.

9) \[ 11x + y = 6 \]
   \[ y = 6 - 11x \]

10) \[ 4x - y = -5 \]
    \[ y = 4x - 5 \]

11) \[ 3x + 7y = -7 \]
    \[ 7y = -3x - 7 \]

12) \[ x - 2y = -8 \]
    \[ -2y = -x - 8 \]
Quiz 2 Writing Equations

Write the slope-intercept form of the equation of each line.

1) \( y = \frac{3}{2}x + 1 \)

2) \( y = \frac{5}{3}x \)

Write the slope-intercept form of the equation of each line given the slope and y-intercept.

3) Slope = -1, y-intercept = 3
   \[ y = -1x + 3 \]

4) Slope = \( \frac{4}{3} \), y-intercept = -2
   \[ y = \frac{4}{3}x - 2 \]

Write the slope-intercept form of the equation of the line through the given point with the given slope.

5) through: (5, 1), slope = -\( \frac{1}{5} \)
   \[ y = -\frac{1}{5}x + 6 \]

6) through: (4, 4), slope = \( \frac{9}{4} \)
   \[ y = \frac{9}{4}x + 6 \]

Write the slope-intercept form of the equation of the line through the given points.

7) through: (0, -5) and (-2, -2)
   \[ m = \frac{-2 + 5}{-2 - 0} = \frac{3}{2} \]

8) through: (-4, -4) and (0, 0)
   \[ m = \frac{0 - (-4)}{0 - (-4)} = 1 \]

9) through: (-1, -5) and (4, 4)
   \[ m = \frac{4 + 5}{4 + 1} = \frac{9}{5} \]

10) through: (-3, 5) and (3, -2)
    \[ m = \frac{-2 - 5}{3 + 3} = \frac{-7}{6} \]
Solving Literal Equations

Solve each equation for the indicated variable.

1) \( z = y + \frac{m}{x} \), for \( x \)
2) \( z = b + \frac{aw}{y} \), for \( a \)
3) \( z = y - \frac{m}{x} \), for \( x \)
4) \( a - c = r - d \), for \( a \)
5) \( g = b + a - c \), for \( a \)
6) \( ac = d + r \), for \( ac \)
7) \( \frac{k}{x} = \frac{y}{m} \), for \( x \)

A) \( x = \frac{-k}{ym} \)
B) \( x = \frac{ym}{k} \)
C) \( x = \frac{k}{ym} \)

D) \( x = kywv \)

8) \( c - x = r + d - y \), for \( x \)

A) \( x = -c - r - d - y \)
B) \( x = c - r - d + y \)
C) \( x = c + r + d - y \)
D) \( x = -d - y + c - r \)

Rewrite the equation in \( y = mx + b \) form.

9) \( 11x + y = 6 \)

\( y = 11x + 6 \)

\( y = -4x + 5 \)

10) \( 4x - y = -5 \)

\( y = 4x + 5 \)

11) \( 3x + 7y = -7 \)

\( y = -\frac{3}{7}x - 1 \)

12) \( x - 2y = -8 - \frac{x}{2} \)

\( y = \frac{3x}{2} \)
Question 1

Brad was given the equation $4x + 3y = 0$. He needs to solve the equation for $y$.
What is the first step that Brad should do?

Correct!

- subtract $4x$ from both sides
- add $4x$ and $3y$ together
- divide by 4
- divide by 3
- subtract $3y$ from both sides

Additional Comments:

Question 2

If you where to solve the equation $2 \cdot (2v + y) = (3v + 6) \cdot (6y - 5)$ for the variable $v$, what would your answer look like?

Correct!

- The answer would be a different equation.
- The answer would be a single number.
- The answer would be the exact same equation that you started with.
- There is no answer.
Question 3

If you were to solve the equation $3m (6 + m) = 3m^2 + 7m - 9$ for the variable $m$, what would your answer look like?

- The answer would be a single number.
- The answer would be a different equation.
- The answer would be the exact same equation.
- There is no answer.

Question 4

Solve the following equation for the variable $y$.

$$7x - 3y = 18$$

Correct!

- $y = \frac{7}{3}x - 6$
- $y = -\frac{1}{3}x - 6$
- $y = -6x - \frac{1}{3}$
- $y = 6x - \frac{1}{3}$

Additional Comments:

Fudge Points: 

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 6 out of 8
Quiz 2 Writing Equations

Write the slope-intercept form of the equation of each line.

1) $y = 2x - 4$

2) $y = 8x + 9$

Write the slope-intercept form of the equation of each line given the slope and y-intercept.

3) Slope = -1, y-intercept = -4
   $y = -x - 4$

4) Slope = 0, y-intercept = -3
   $y = 0x + -3$

Write the slope-intercept form of the equation of the line through the given point with the given slope.

5) through: (4, 2), slope = $\frac{1}{4}$
   $y = \frac{1}{4}x + b$

6) through: (-3, 2), slope = $-\frac{7}{3}$
   $y = -\frac{7}{3}x + 1$

Write the slope-intercept form of the equation of the line through the given points.

7) through: (1, 1) and (0, -1)
   $y = \frac{0}{1} = 0$

8) through: (0, 1) and (-1, 5)
   $y = \frac{5 - 1}{0 - (-1)} = \frac{4}{1} = 4$

9) through: (0, 1) and (2, 5)
   $y = \frac{5 - 1}{2 - 0} = \frac{4}{2} = 2$

10) through: (0, 2) and (-2, 4)
    $y = \frac{4 - 2}{-2 - 0} = \frac{-2}{-2} = 1$
Solving Literal Equations

Solve each equation for the indicated variable.

1) \( \frac{z + y}{x} = \frac{m}{x} \) for \( x \)
   \[ x = \frac{m(z + y)}{z} \]

2) \( \frac{z}{y} = \frac{m}{y} \) for \( a \)
   \[ a = \frac{z}{m-y} \]

3) \( \frac{z}{y} = \frac{m}{x} \) for \( x \)
   \[ x = \frac{mz}{y} \]

4) \( b + c + d + e \) for \( a \)
   \[ a = -b - c - d - e \]

5) \( g = h + a - c \) for \( a \)
   \[ a = g - h + c \]

6) \( \sqrt{a + b + c + d} \) for \( a \)
   \[ a = b + c + d - \frac{c}{d} \]

7) \( \frac{k}{y} = \frac{m}{w} \) for \( x \)
   \[ x = \frac{m}{w} \cdot \frac{1}{y} \]
   A) \( x = \frac{k}{y} \)
   B) \( x = \frac{m}{w} \)
   C) \( x = \frac{k}{y} \)
   D) \( x = k \cdot \frac{1}{y} \)

8) \( c = x + d + y \) for \( x \)
   \[ x = c - d - y \]
   A) \( x = c - d - y \)
   B) \( x = c - r - d + y \)
   C) \( x = c + r + d - y \)
   D) \( x = -d - y + c - r \)

Rewrite the equation in \( y = mx + b \) form.

9) \( 4x + y = 6 \)
   \[ -4x \]
   \[ y = 6 - 4x \]

10) \( 4x - y = -5 \)
    \[ -4x \]
    \[ y = 5 + 4x \]

11) \( 3x + 2y = -7 \)
    \[ -3x \]
    \[ y = \frac{-7 - 3x}{2} \]

12) \( 8x + 2y = -12 \)
    \[ -8x \]
    \[ y = 4 + 0.5x \]
ID Bell Ringer 3

Score for this quiz: 2 out of 8
Submitted Feb 1 at 11:10am
This attempt took less than 1 minute.

**Question 1**

Brad was given the equation $4x + 3y = 0$. He needs to solve the equation for $y$.

What is the first step that Brad should do?

- subtract $4x$ from both sides
- add $4x$ and $3y$ together
- divide by 4
- divide by 3
- subtract $3y$ from both sides

Additional Comments:

**Question 2**

If you were to solve the equation $2(2v + y) = (3v + 6)(6y - 5)$ for the variable $v$, what would your answer look like?

- The answer would be a different equation.
- The answer would be a single number.
- The answer would be the exact same equation that you started with.
- There is no answer.
Question 3

If you were to solve the equation $3m(6 + m) = 3m^2 + 7m - 9$ for the variable $m$, what would your answer look like?

- The answer would be a single number.
- The answer would be a different equation.
- The answer would be the exact same equation.
- There is no answer.

Question 4

Solve the following equation for the variable $y$.

$$7x - 3y = 18$$

- $y = \frac{7}{3}x - 6$
- $y = -\frac{1}{3}x - 6$
- $y = -6x - \frac{1}{3}$
- $y = 6x - \frac{1}{3}$

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 2 out of 8
Lesson Plan 2 – 6.2.1 and 6.2.2: Solving Systems of Equations by Equal Values and by Substitution

**Subject and grade Level:** Chapter 6, Section 2 of the Integrated Core for Secondary Math 1, 9th grade

**Approximate time:** 60 minutes

**Rationale for methods**

This lesson is set up to encourage inquiry-based learning, where students will have to work with their teams and struggle through setting up and solving equations. They will be able to see if their solution is correct by plugging in their solution into both equations and verifying that both equations are true.

The general pattern of the lesson is a form of experimentalism and gradual release of responsibility. After students try out some problems on their own, then the teacher or students who understand it model the process for the class. After the guided notes, students have time to work on their homework with their teammates. Then, they work on their own at home to finish.

**Content standards**

- N-Q.2. Define appropriate quantities for the purpose of descriptive modeling.
- A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
- A-SSE.1b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret P(1 + r)^n as the product of P and a factor not depending on P.*
- A-CED.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*
- F-LE.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
**Academic language/vocabulary objectives**

1. **The language skill:** Students will make sense of word problems, translate equations from word problems to algebraic sentences, and write solution sentences that describe the meaning of the solution to each problem.

2. **The discipline-specific vocabulary:** solution, linear equation, rewrite, equal values method, substitution method.

**Required materials, resources, and technology**

The needed resources are:

- Chapter 6 vocabulary packets, for filling out the Frayer models for new vocabulary
- 6.2.1 and 6.2.2 guided notes, which provides an outline for student note-taking
- The smart board presentation that provides space for the teacher to fill in the guided notes
- Worksheets “Equal Value and Substitution Methods” for homework

**Lesson objectives**

Students will write algebraic equations from a given scenario in a word problem

*(Comprehension and Communication)* **Utah Core Standards:** N-Q.2, A-CED.1, F-LE.1b

Students will solve systems of equations by the equal values method and the substitution method *(Algebraic Skill)* **Utah Core Standards:** A-REI.6, A-SSE.1b

**Instructional Procedures**

First, we will review vocabulary important to the lesson. Specifically, using the Frayer models in the vocabulary packet, we will define and list characteristics, examples, and nonexamples of “solution,” “linear equation,” and “rewrite.” Throughout the lesson, we will address the meaning of “equal values method” and “substitution method.”
Next, I will pass out the guided notes that works through three problems from the CPM Integration 1 textbook. We will read the problem aloud as a class and underline and circle important terms that give us clues for our equations. We will define two variables. Then, teams will have time to conjecture two equations relating to the problem. After one group has one correct equation, I will have that group explain the process of coming up with the equation. Then, I will give a hint for the second equation and give teams more time to conjecture. After a few minutes, if some group has the correct equation, they will explain it, otherwise I will review how to come up with the second equation. Then I will model and remind students how to solve the equation by equal values method. Students will write and follow along as I write on the smart board. Finally, we will write a solution statement together as a class.

The next problem, we will again read and discussion the word problem. Then, teams will have time to come up with two equations. Again, we will discuss as a class how certain groups came up with their equations. Then, teams will have time to solve the system by equal values method.

Finally, we will read and discuss the happy birthday problem. Students will see that the equal values method is more work, and then we will learn the substitution method as an easier alternate method of solving.

Then, students will have time to start the homework with team help and then finish it for homework.

**Adaptations/accommodations**

The accommodations for students ID, RE, and JG will be allowing them and everyone to use a calculator if needed, pairing each of the students who need more support with a student who can explain the process to them, and checking in on each of them as a teacher and giving them individual help as needed. The higher end thinkers will engage in checking their solutions in both original equations to verify that they reached the correct solution.
Assessment

I will evaluate students’ beginning level of understanding by measuring student achievement on the homework that will be given the class period prior this lesson which addresses setting up two equations and finding a similar solution to both.

I will evaluate whether or not students are meeting the objectives formatively by looking at their homework (because it is not graded but scored on participation) and summatively by measuring student achievement on the bell ringer next class period that asks them to solve systems of equations by equal value method and by the substitution method.
**Definition**

The number or numbers that when substituted into an equation or inequality "make it true."

**Facts/Characteristics**

- Equations can have 0, 1, 2, or more solutions.
- Check a solution by plugging it into the equation to make sure it is true.

**Examples**

- \( x = 4 \) is a solution to \( 3x - 2 = 10 \) because \( 3(4) - 2 = 10 \).
- All real numbers are solutions to \( x + 2 = x + 2 \) because every real number is equal to itself.
- \( (0, 1) \) is a solution to \( y = 2x + 1 \) since \( 1 = 2(0) + 1 \).

**Non-Examples**

- \( x = 0 \) is not a solution to \( 3x - 2 = 10 \) because \( 3(0) - 2 \neq 10 \).
- \((0, 8)\) is not a solution to \( y = 2x + 1 \), the point is not on the line.

---

**Definition**

An equation with at least one variable of degree one and no variables of degree greater than one.

**Facts/Characteristics**

- Graph is a line.
- Solutions to the equation are points on the line.

**Examples**

- \( y = 3x + 2 \)
- \( y = 3 \)
- \( x = 4 \)
- \( y = x + 2 \)

**Non-Examples**

- \( y = x^2 \)
- \( y = x^3 + 3x^2 + 5x + 7 \)
- \( y = x^5 \)
- \( 16 = 10 + 6 \)
Definition

Write an equivalent expression in a different way

Examples

4x + 2y = 5 can be rewritten as
y = -2x + 4

Rewrite

Facts/Characteristics

- can use:
  - distributive property
  - combine like terms
  - add 0
  - multiply by 1

Non-Examples

4x + 2y = 5
cannot be rewritten as
y = 5 - 4x (not equivalent)
**EQUAL VALUES METHOD**
(A form of substitution)

**6-44 System of Equations**

Let $x =$ minutes that pool has been filled
Let $y =$ total gallons of water

Team Sunshine Equation $y = 30 + 8x$
Team Breeze Equation $y = 180 - 5x$

When will they have the same amount of water in each pool?

Method:

\[
\begin{align*}
\frac{30 + 8x}{30 + 5x} &= \frac{180 - 5x}{30 + 5x} \\
\frac{13x}{13} &= \frac{150}{13} \\
x &= \frac{150}{13} \times 11.54 \approx 12 \text{ minutes}
\end{align*}
\]

Answer Statement:
In about 12 minutes, there will be the same amount of water in Team Sunshine & Team Breeze pools.

How much water will be in pools?

Work: $y = 30 + 8(12) = 126$ gallons

Answer Statement: At about 12 minutes, both pools will have 126 gallons.

**6-46 Mixing Candy**

Let $t =$ # bags of taffy
Let $c =$ # bags of caramels

Write two equations:
1) $t = 5 + c$
2) $8t + 16c = 400$

Method:

Rewrite 2) $8t + 16c = 400$

\[
\begin{align*}
st &= 400 - 16c \\
t &= \frac{400}{8} - 2c \\
t &= 50 - 2c \\
3c &= 45 \\
c &= 15
\end{align*}
\]

Answer Statement: Ariel bought 15 bags of caramel.
SOLVING A SYSTEM OF EQUATION BY SUBSTITUTION

Solve the system below using the equal values method

\[
\begin{align*}
y &= -x - 7 \\
5y + 3x &= -13 \\
-3x &= -3x \\
y &= -\frac{3}{5}x - \frac{13}{5}
\end{align*}
\]

\[
\begin{align*}
-\frac{3}{5}x &= -\frac{7}{5} \\
+\frac{2}{5}x &= \frac{7}{5}
\end{align*}
\]

\[
\begin{align*}
5(-\frac{3}{5}x) &= \frac{12}{5} \\
-2x &= \frac{22}{5}
\end{align*}
\]

\[
\begin{align*}
x &= -11
\end{align*}
\]

Avoiding the mess:

\[
\begin{align*}
y &= -x - 7 \\
5y + 3x &= -13
\end{align*}
\]

\[
\begin{align*}
5(-x - 7) + 3x &= -13 \\
-5x - 35 + 3x &= -13
\end{align*}
\]

\[
\begin{align*}
-2x - 35 &= -13 \\
+35 &= +35
\end{align*}
\]

\[
\begin{align*}
-2x &= 22
\end{align*}
\]

\[
\begin{align*}
x &= -11
\end{align*}
\]

6-59 Happy Birthday!

Let \( r \) = the number of red marbles

Let \( g \) = the number of green marbles

Write two equations:

1) \( g = 2r \)

2) \( 84 = g + r \)

Find the number of red and green marbles by using the substitution method.

\[
\begin{align*}
84 &= (2r) + r \\
84 &= 3r \\
28 &= r
\end{align*}
\]

\[
\begin{align*}
84 &= g + 28 \\
84 &= 9 + 28 \\
84 &= 36
\end{align*}
\]

Answer Statement:

The number of red marbles is 28 and the number of green marbles is 36.

Determine if the given answers are solutions to the system of equations without solving the system.

<table>
<thead>
<tr>
<th>( x - 2y = 4 )</th>
<th>Answer: (6, 1)</th>
<th>( x + 2y = 14 )</th>
<th>Answer: (-4, 9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = -\frac{1}{2}x + 4 )</td>
<td>( 1 = -\frac{1}{2}(6) + 4 )</td>
<td>( -x + 3y = 26 )</td>
<td>( -4 + 3(9) = 26 )</td>
</tr>
<tr>
<td>( 6 - 2(1) = 4 )</td>
<td>( 6 - 2 = 4 \sqrt{ } )</td>
<td>( 6 + 2(9) = 14 )</td>
<td>( 4 + 36 = 26 )</td>
</tr>
<tr>
<td>( 1 = 1 )</td>
<td>( 1 = 1 )</td>
<td>( 14 = 14 )</td>
<td>( 14 = 14 )</td>
</tr>
<tr>
<td>True</td>
<td>True</td>
<td>True</td>
<td>False</td>
</tr>
</tbody>
</table>
SM1

Equal Value and Substitution Method WS

Solve each system of equations using the equal values method. Be sure to write your answer as a coordinate pair.

1) \[ y = -6x - 4 \]
   \[ y = 2x - 4 \]
   
   \[
   \begin{align*}
   -6x - 4 & = 2x - 4 \\
   -8x & = 0 \\
   x & = 0
   \end{align*}
   \]
   \[
   \begin{align*}
   y & = -6(0) - 4 \\
   y & = -4
   \end{align*}
   \]
   \[
   (0, -4)
   \]

2) \[ y = x - 9 \]
   \[ y = -5x + 15 \]
   
   \[
   \begin{align*}
   x - q & = -5x + 15 \\
   x + q & = 6x - 9 \\
   2x + q & = 24 \\
   x & = 4 \\
   \end{align*}
   \]
   \[
   (4, -5)
   \]

3) \[ y = -6x - 12 \]
   \[ y = -4x - 8 \]
   
   \[
   \begin{align*}
   -6x - 12 & = -4x - 8 \\
   -2x & = -4 \\
   x & = 2
   \end{align*}
   \]
   \[
   \begin{align*}
   y & = -6(2) - 12 \\
   y & = -24
   \end{align*}
   \]
   \[
   (-2, 0)
   \]

4) \[ y = 6x - 7 \]
   \[ y = 2x - 3 \]
   
   \[
   \begin{align*}
   6x - 7 & = 2x - 3 \\
   4x & = -4 \\
   x & = -1
   \end{align*}
   \]
   \[
   \begin{align*}
   y & = 6(-1) - 7 \\
   y & = -13
   \end{align*}
   \]
   \[
   (-1, -1)
   \]

Solve each system of equations using the substitution method. Be sure to write your answer as a coordinate pair.

5) \[ y = -3x - 7 \]
   \[ -7x - 5y = 19 \]
   
   \[
   \begin{align*}
   -7x - 5(-3x - 7) & = 19 \\
   -7x + 15x + 35 & = 19 \\
   8x & = 19 \\
   x & = \frac{19}{8}
   \end{align*}
   \]
   \[
   \begin{align*}
   y & = -3\left(\frac{19}{8}\right) - 7 \\
   y & = -\frac{61}{8}
   \end{align*}
   \]
   \[
   \left(-\frac{2}{1}, -\frac{1}{1}\right)
   \]

6) \[ 6x - 6y = -18 \]
   \[ y = 2x + 11 \]
   
   \[
   \begin{align*}
   6x - 6(2x + 11) & = -18 \\
   6x - 12x - 66 & = -18 \\
   -6x & = 48 \\
   x & = -8
   \end{align*}
   \]
   \[
   \begin{align*}
   y & = 2(-8) + 11 \\
   y & = -5
   \end{align*}
   \]
   \[
   (-8, -5)
   \]
7) \(-8x - y = 24\)
\[ y = 7x + 21 \]
\[-8x - (7x + 21) = 24 \]
\[-8x - 7x - 21 = 24 \]
\[ -15x = 45 \]
\[ x = -3 \quad (-3, 0) \]
\[ y = 7(-3) + 21 = 0 \]

Solve each equation below for \(y\).

8) \(y = 4x + 10\)
\[-3x + 3y = 21 \]
\[-3x + 3(4x + 10) = 21 \]
\[-3x + 12x + 30 = 21 \]
\[9x = -9 \quad y = 4(-1) + 10 \]
\[x = -1 \quad y = 6 \]

9) \(3x + y = -4\)
\[-3x \quad -3x \]
\[ y = -3x - 4 \]

10) \(2x - 3y = 9\)
\[-3y = \frac{9 - 2x}{-3} \]
\[y = -3 + \frac{2}{3}x \quad \text{or} \quad y = \frac{2}{3}x - 3 \]

11) \(x - 4y = -4\)
\[-4y = \frac{-4 - x}{-4} \]
\[ y = 1 + \frac{1}{4}x \quad \text{or} \quad y = \frac{1}{4}x + 1 \]

12) \(2x + y = 0\)
\[ y = -2x \]
RG Bell Ringer 5

Score for this quiz: 4 out of 7
Submitted Feb 7 at 11:42am
This attempt took 5 minutes.

Question 1

The Fabulous Footballers scored an incredible 55 points during last night’s game. Interestingly, the number of field goals was one more than twice the number of touchdowns. The Fabulous Footballers earned seven points for each touchdown and three points for each field goal.

Which of the following set of equations will represent the story above?

Correct Answer

- $f = 2t + 1$
- $7t + 3f = 55$
- $t = 2f + 1$
- $3t + 7f = 55$

You Answered

- $f = 2t + 1$
- $3t + 7f = 55$
Question 2

For the sequence 5, 25, 125, 625, ...

What kind of sequence is it? [Select] 

What is the fifth term? [Select] 

What is the multiplier of the sequence? [Select] 

Answer 1:
Correct!
geometric

Answer 2:
'ou Answered
15625
correct Answer
3125

Answer 3:
Correct!
5
Question 3

Solve the following equation.

$$3(x + 9) - 7x = 19$$

Enter only numbers for your answer.

Correct! 

2

Correct Answers

2

Additional Comments:

Fudge Points: 

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 4 out of 7
Equal Value and Substitution Method WS

Solve each system of equations using the equal values method. Be sure to write your answer as a coordinate pair.

1) \( y = -6x - 4 \)
\[
\begin{align*}
-6x - 4 &= 2x - 4 \\
-6x &= 2x + 4 \\
-8x &= 4 \\
-4 &= 4 \\
x &= \frac{-4}{-8} \\
x &= \frac{1}{2}
\end{align*}
\]
\[
\begin{align*}
y &= \frac{1}{2}
\end{align*}
\]
\[
\begin{align*}
(0, -4)
\end{align*}
\]

2) \( y = x - 9 \)
\[
\begin{align*}
x - 9 &= -5x + 15 \\
x - 9 &= 5x - 15 \\
x - 9 - 5x + 15 &= 5x - 15 - 5x + 15 \\
6x &= 6 \\
x &= 1 \\
y &= 1 - 9 \\
y &= -8
\end{align*}
\]
\[
\begin{align*}
(6, -8)
\end{align*}
\]

3) \( y = -6x - 12 \)
\[
\begin{align*}
x - 6x - 12 &= 4x - 3 \\
x - 12 &= 14x - 3 \\
x - 12 - 14x + 3 &= 14x - 3 - 14x + 3 \\
-13x &= 9 \\
x &= \frac{-9}{-13} \\
x &= \frac{9}{13}
\end{align*}
\]
\[
\begin{align*}
y &= -6x - 12 \\
y &= -6 \cdot \frac{9}{13} \\
y &= \frac{-54}{13}
\end{align*}
\]
\[
\begin{align*}
\left(\frac{9}{13}, \frac{-54}{13}\right)
\end{align*}
\]

4) \( y = 6x - 7 \)
\[
\begin{align*}
x - 6x - 7 &= 2x - 3 \\
x - 7 &= 2x - 3 \\
x - 7 - 2x + 3 &= 2x - 3 - 2x + 3 \\
-3x &= 4 \\
x &= \frac{-4}{-3} \\
x &= \frac{4}{3}
\end{align*}
\]
\[
\begin{align*}
y &= 6x - 7 \\
y &= 6 \cdot \frac{4}{3} \\
y &= 8
\end{align*}
\]
\[
\begin{align*}
\left(\frac{4}{3}, 8\right)
\end{align*}
\]

Solve each system of equations using the substitution method. Be sure to write your answer as a coordinate pair.

5) \( y = -3x - 7 \)
\[
\begin{align*}
-7x - 5y &= 19 \\
-7x - 5(-3x - 7) &= 19 \\
-7x + 15x + 35 &= 19 \\
8x &= -16 \\
x &= \frac{-16}{8} \\
x &= -2
\end{align*}
\]
\[
\begin{align*}
y &= -3x - 7 \\
y &= -3(-2) - 7 \\
y &= 6 - 7 \\
y &= -1
\end{align*}
\]
\[
\begin{align*}
(-2, -1)
\end{align*}
\]

6) \( 6x - 6y = -18 \)
\[
\begin{align*}
6x &= -18 - 6y \\
y &= \frac{-18 - 6x}{-6} \\
y &= \frac{3x}{2}
\end{align*}
\]
\[
\begin{align*}
(2, 3/2)
\end{align*}
\]
7) \(-8x - y = 24\)  
7) \(y = 7x + 21\)  
\(-8x - y = 24\)  
\(+8x\)  
\(-y = 24 + 8x\)  
\(y = -24 - 8x\)  
\(-8x - 7x + 21 = 24\)  
\(\times = -0.2\)  
\(-15x + 21 = 24\)  
\(\frac{3}{21} = -1.5\)  
\(-15x = 3\)  
\(\frac{15}{x} = 3\)  
Solve each equation below for \(y\).

8) \(y = 4x + 10\)  
8) \(-3x + 3y = 21\)  
\(-3x + 3(y + 10) = 21\)  
\(-3x + 12x + 30 = 21\)  
\(9x + 30 = 21\)  
\(-30 - 3x\)  
\(\frac{9x}{3} = -9\)  
\(x = -1\)

9) \(3x + y = -4\)

\(3x + y = -4\)  
\(-3x\)  
\(y = -4 - 3x\)

10) \(2x - 3y = 9\)

\(2x - 3y = 9\)  
\(-2x\)  
\(-3y = 9 - 2x\)  
\(-\frac{3}{2}x\)  
\(y = \frac{-3 + \frac{3}{2}x}{3}\)

11) \(x - 4y = -4\)

\(x - 4y = -4\)  
\(-x\)  
\(-4y = 4 - x\)  
\(y = \frac{4 - x}{4}\)  
\(y = 1 + 4x\)

12) \(2x + y = 0\)

\(2x + y = 0\)  
\(-2x\)  
\(y = 0 - 2x\)
RG Bell Ringer 7

Score for this quiz: 4 out of 5
Submitted Feb 13 at 11:44am
This attempt took 2 minutes.

<table>
<thead>
<tr>
<th>Question 1</th>
<th>2 / 2 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider the system</td>
<td></td>
</tr>
<tr>
<td>$y = -3x + 4$</td>
<td></td>
</tr>
<tr>
<td>$y = 3x - 2$</td>
<td></td>
</tr>
<tr>
<td>If $x = 1$, then what would be the value of $y$?</td>
<td></td>
</tr>
<tr>
<td>Enter numbers only.</td>
<td></td>
</tr>
<tr>
<td>Correct!</td>
<td>1</td>
</tr>
<tr>
<td>Correct Answers</td>
<td>1</td>
</tr>
<tr>
<td>Additional Comments:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 2</th>
<th>1 / 1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which method should you use to solve the system?</td>
<td></td>
</tr>
<tr>
<td>$y = -6x + 7$</td>
<td></td>
</tr>
</tbody>
</table>
$y = \frac{3}{4}x + 15$

Substitution Method

- Equal Values Method

Question 3

Which method should you use to solve the system?

$3x + 5y = 9$
$y = \frac{1}{2}x + 8$

Correct!

- Substitution Method

Equal

Additional Comments:

Question 4

0 / 1 pts
If a system of equations that has been graphed has an answer of 'no solution', what type of lines were on the graph?

- Perpendicular Lines
- They are the same line
- Two lines with different slopes

Correct Answer: Parallel Line

Additional Comments:

Fudge Points: 

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 4 out of 5

Update Scores
ID Bell Ringer 5

Score for this quiz: 3 out of 7
Submitted Feb 7 at 11:41am
This attempt took 3 minutes.

**Question 1**

0 / 2 pts

The Fabulous Footballers scored an incredible 55 points during last night’s game. Interestingly, the number of field goals was one more than twice the number of touchdowns. The Fabulous Footballers earned seven points for each touchdown and three points for each field goal.

Which of the following set of equations will represent the story above?

- \( t = 2f + 1 \)
- \( 7t + 3f = 55 \)

Correct Answer:

- \( f = 2t + 1 \)
- \( 7t + 3f = 55 \)

You Answered:

- \( t = 2f + 1 \)
- \( 3t + 7f = 55 \)

- \( f = 2t + 1 \)
- \( 3t + 7f = 55 \)
Question 2

For the sequence 5, 25, 125, 625, ...

What kind of sequence is it? [Select]

What is the fifth term? [Select]

What is the multiplier of the sequence? [Select]

Answer 1: geometric

Correct!

Answer 2: 3125

Correct!

Answer 3: 5

Correct!

Question 3

0 / 2 pts
Solve the following equation.

\[ 3(x + 9) - 7x = 19 \]

Enter only numbers for your answer.

You Answered: 66

Correct Answers: 2

Additional Comments:

Fudge Points: 

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 3 out of 7
Equal Value and Substitution Method WS

Solve each system of equations using the equal values method. Be sure to write your answer as a coordinate pair.

1) \[ y = -6x - 4 \]
\[ y = 2x - 4 \]
\[ -6x - 4 = 2x - 4 \]
\[ -8x - 4 = -4 \]
\[ -8x = 0 \]
\[ x = 0 \]
\[ y = -4 \]
\[ (0, -4) \]

2) \[ y = x - 9 \]
\[ y = -5x + 15 \]
\[ x - 9 = -5x + 15 \]
\[ 6x = 24 \]
\[ x = 4 \]
\[ y = -5 \]
\[ (4, -5) \]

3) \[ y = -6x - 12 \]
\[ y = -4x - 8 \]
\[ -6x - 12 = -4x - 8 \]
\[ -2x = 4 \]
\[ x = -2 \]
\[ y = 0 \]
\[ (-2, 0) \]

4) \[ y = 6x - 7 \]
\[ y = 2x - 3 \]
\[ 6x - 7 = 2x - 3 \]
\[ 4x = 4 \]
\[ x = 1 \]
\[ y = -7 \]
\[ (1, -7) \]

Solve each system of equations using the substitution method. Be sure to write your answer as a coordinate pair.

5) \[ y = -3x - 7 \]
\[ -7x - 5y = 19 \]
\[ -7x - 5(-3x - 7) = 19 \]
\[ -7x + 15x + 35 = 19 \]
\[ 8x + 35 = 19 \]
\[ 8x = -16 \]
\[ x = -2 \]
\[ y = -1 \]
\[ (-2, -1) \]

6) \[ 6x - 6y = -18 \]
\[ y = 2x + 11 \]
\[ 6x - 6(2x + 11) = -18 \]
\[ -2x - 66 = -18 \]
\[ -2x = 48 \]
\[ x = -24 \]
\[ y = -17 \]
\[ (-24, -17) \]
7) \(-8x - y = 24\)
\[ y = 7x + 21 \]

\[
\begin{align*}
-8x - 7x + 21 &= 24 \\
-15x + 21 &= 24 \\
-15x &= 3 \\
\hline
x &= \frac{3}{15} \\
\hline
x &= \frac{1}{5} \\
\hline
\end{align*}
\]
\[ y = 7 \left( \frac{1}{5} \right) + 21 \]
\[ y = \frac{7}{5} + 21 \]
\[ y = \frac{7 + 105}{5} \]
\[ y = \frac{112}{5} \]
\[ y = 22.4 \]

\(y = 42\)

\((3, 42)\)

8) \(y = 4x + 10\)
\(-3x + 3y = 21\)

\[
\begin{align*}
-3x + 3(4x + 10) &= 21 \\
-3x + 12x + 30 &= 21 \\
9x + 30 &= 21 \\
9x &= -9 \\
\hline
x &= -1 \\
\hline
\end{align*}
\]
\[
\begin{align*}
y &= \frac{-9}{9} \\
\hline
y &= -1 \\
\hline
\end{align*}
\]
\((-1, 10)\)

9) \(\frac{3x + 1}{x} = -2\)

\[
\begin{align*}
y &= -3x - 4 \\
\hline
\end{align*}
\]

10) \(2x - 3y = 9\)
\(-2x + y = -3\)

\[
\begin{align*}
-7y &= -2x + 9 \\
\hline
y &= \frac{2x + 9}{7} \\
\hline
\end{align*}
\]

11) \(x - 4y = -4\)
\(-x\)

\[
\begin{align*}
-4y &= x - 4 \\
\hline
y &= \frac{x - 4}{-4} \\
\hline
\end{align*}
\]

12) \(2x + y = 0\)
\(-2x\)

\[
\begin{align*}
y &= 2x + 0 \\
\hline
\end{align*}
\]
ID Bell Ringer 7

Score for this quiz: 1 out of 5
Submitted Feb 13 at 11:42am
This attempt took 3 minutes.

<table>
<thead>
<tr>
<th>Question 1</th>
<th>0 / 2 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider the system</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>$y = 3x - 2$</td>
<td></td>
</tr>
<tr>
<td>If $x = 1$, then what would be the value of $y$?</td>
<td></td>
</tr>
<tr>
<td>Enter numbers only.</td>
<td></td>
</tr>
<tr>
<td>You Answered</td>
<td></td>
</tr>
<tr>
<td>Correct Answers</td>
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Additional Comments:  

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\[ y = \frac{3}{4}x + 15 \]

**You Answered**
- Substitution Method

**Correct Answer**
- Equal Values Method

**Additional Comments:**

**Question 3**

Which method should you use to solve the system?

\[ 3x + 5y = 9 \]

\[ y = \frac{1}{2}x + 8 \]

**You Answered**
- Equal

**Correct Answer**
- Substitution Method

**Additional Comments:**

**Question 4**

\[ 1 \quad / 1 \text{ pts} \]
If a system of equations that has been graphed has an answer of ‘no solution’ what type of lines were on the graph?

- Perpendicular Lines
- They are the same line
- Parallel Line
- Two lines with different slopes

Correct!

Additional Comments:

Fudge Points: 

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 1 out of 5
Lesson Plan 3 – 6.3.1: Solving Systems of Equations Using Four Different Methods

**Subject and grade Level:** Chapter 6, Section 3 of the Integrated Core for Secondary Math 1, 9th grade

**Approximate time:** 70 minutes

**Rationale for methods**

I decided to use a game to address the objective of solving systems of equations by graphing, equal values method, and substitution method. This allowed students to be intrinsically motivated to “win the game” and engage in the fun activity, which practice would help students cement in their minds the algebraic processes. Students receive immediate feedback from whether or not the lines crossed their stickers and allow them to evaluate where the mistake was.

For the second part of the lesson, I explicitly teach the elimination method using the gradual release of responsibility. In this way, students see a model of the correct process, practice it with support, and then work through problems by themselves with the homework.

**Content standards**

- A-REI.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.
- A-REI.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

**Academic language/vocabulary objectives**

1. The language **skill**: students will discuss and collaborate with teammates to problem solve and analyze their solutions.

2. The discipline-specific **vocabulary**: equal value method, substitution method, graphing method, linear equation, elimination method

**Required materials, resources, and technology**

Required materials are:
- The cards with team missions outlined, for the “War on Make-Believe Cities” activity
- Graph paper for each team to graph the linear equations during the “War on Make-Believe Cities” activity
- A Smart Board presentation for teaching the elimination method
- A worksheet for students to show work during the activity and to take notes when learning the elimination method

Lesson objectives


Students will determine when it is advantageous to use the equal values, substitution, graphing or elimination method to solve systems of equations. (Comprehension and Communication)

Instructional Procedures

First, we will play a game called “The War of the Make-Believe Cities.” Students will be put in pairs. Each student will get a work page and each partnership will get a card with their mission and a graph that represents their make-believe city. I will model how to complete the three missions. Once all three systems of equations are solved by the equal values method or substitution method, the students will place stickers on the coordinates of the three solutions. Then, the students will have time to place their three stickers.

Once the groups are done with part one, I will collect all the graphs and redistribute them to different teams. Then, I will model how to complete part two. Each system of equations should be drawn on the graph. One partner from each group will have one colored pencil and draw the first line from each mission and the other partner will draw the second line from each mission. Students will note how many stickers are right at the intersection point of two different colored lines. These stickers are
the successful ones. If they don’t line up, then the students know something either went wrong in the algebraic part one or in the graphing part two.

To sum up after the game, we will talk about how the forms of the equations indicate whether to use the equal values method or substitution method. We will define these terms explicitly and have students talk in their teams about the process for each method. Also, we will discuss how graphing lines are easiest when the equation is in slope-intercept form, but equations in other forms can be drawn as well after rearranging the equation.

Then, I will introduce the method of Elimination. I will show them one example of adding the equations, then have them work on one as a group. Then, I will show them an example of subtracting the equations and have them work on one as a group. Finally, students will be shown various systems of equations and we will discuss what strategy we would use to solve.

Lastly, students will be handed their homework which is a practice sheet of using all four methods to solve systems of equations. They will have about ten to fifteen minutes to start working with teacher and group support before they take it home.

**Adaptations/accommodations**

The accommodations for students ID, RE, and JG will be allowing them and everyone to use a calculator if needed as always, pairing each of the students who need more support with a student who can explain the process to them, and checking in on each of them as a teacher and giving them individual help as needed. The higher end thinkers will engage in explaining to their teammates how to solve the systems or graph and will learn at a higher level by so doing.

**Assessment**

I will evaluate students’ beginning level of understanding by measuring student achievement on the quiz “Solving Equations” that will have been given a prior class period. This quiz asks students to
solve single variable equations and multi-variable equations. This is the starting point of learning to solve systems of multiple equations.

I will evaluate whether or not students are meeting the objectives formatively by looking at their homework (because it is not graded but scored on participation) and summatively by measuring student achievement on the bell ringer next class period that asks them to solve a number of systems of equations and asks which method is advantageous according to the form of the equations. There will also be a quiz on solving systems of equations that will provide evidence of student achievement of unit objectives.
War of the Make-Believe Cities

Your Mission: Bomb Gotham City — the fictional American city that is home to Batman

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = -2x - 6 \]
\[ y = 3x - 1 \]

Mission 2
\[ y = -4x - 3 \]
\[ y = -3x - 3 \]

Mission 3: (Use Substitution Method)
\[ -x - y = 0 \]
\[ y = 2x - 6 \]

War of the Make-Believe Cities

Your Mission: Bomb Bikini Bottom — a town in the middle of nowhere, according to Squidward, on SpongeBob SquarePants.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = -3x - 5 \]
\[ y = 4x + 2 \]

Mission 2
\[ y = -4x + 7 \]
\[ y = 2x + 1 \]

Mission 3: (Use Substitution Method)
\[ y = -2x - 2 \]
\[ -3x - 3y = 6 \]

War of the Make-Believe Cities

Your Mission: Bomb Metro City — the town of the great Megamind, “metrocity is ours!”

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = 2x + 3 \]
\[ y = -4x - 3 \]

Mission 2
\[ y = 2x - 9 \]
\[ y = 3x - 12 \]

Mission 3: (Use Substitution Method)
\[ 4x - 2y = 8 \]
\[ y = 3x - 4 \]

War of the Make-Believe Cities

Your Mission: Bomb Smallville — Where Superman landed on earth as an infant and was raised under an ordinary human identity in Kansas.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = -3x - 9 \]
\[ y = 3x + 9 \]

Mission 2
\[ y = x + 1 \]
\[ y = 2x + 1 \]

Mission 3: (Use Substitution Method)
\[ y = -3x - 5 \]
\[ -2x - 4y = 10 \]
War of the Make-Believe Cities

Your Mission: Bomb Central City — Home of the fictional crimefighter the Flash.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

<table>
<thead>
<tr>
<th>Mission 1</th>
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<tbody>
<tr>
<td>( y = -3x - 4 )</td>
<td>( y = 2x + 9 )</td>
</tr>
<tr>
<td>( y = -4x - 5 )</td>
<td>( y = -2x - 3 )</td>
</tr>
</tbody>
</table>

Mission 3: (Use Substitution Method)

\[
\begin{align*}
4x - y &= -4 \\
y &= -4x + 4
\end{align*}
\]

War of the Make-Believe Cities

Your Mission: Bomb Kamar-Taj — A village hidden high in the Himalayas, where Doctor Strange learns magic from the Ancient One.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>( y = -3x - 9 )</td>
<td>( y = x + 1 )</td>
</tr>
<tr>
<td>( y = 3x + 9 )</td>
<td>( y = 2x + 1 )</td>
</tr>
</tbody>
</table>

Mission 3: (Use Substitution Method)

\[
\begin{align*}
y &= -3x - 5 \\
-2x - 4y &= 10
\end{align*}
\]

War of the Make-Believe Cities

Your Mission: Bomb Danville — Home of Phineas and Ferb.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

<table>
<thead>
<tr>
<th>Mission 1</th>
<th>Mission 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y = -2x - 2 )</td>
<td>( y = -2x + 1 )</td>
</tr>
<tr>
<td>( y = 2x + 6 )</td>
<td>( y = 4x + 1 )</td>
</tr>
</tbody>
</table>

Mission 3: (Use Substitution Method)

\[
\begin{align*}
-2x - 2y &= -8 \\
y &= x
\end{align*}
\]
War of the Make-Believe Cities

Your Mission: Bomb Bedrock — the fictional prehistoric city, which is home to the characters of *The Flintstones* (1960).

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1

\[ y = x + 1 \]
\[ y = -2x - 2 \]

Mission 2

\[ y = x + 2 \]
\[ y = 4x - 1 \]

Mission 3: (Use Substitution Method)

\[ y = 3x - 5 \]
\[ -4x - 2y = -10 \]

War of the Make-Believe Cities


Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1

\[ y = -3x - 6 \]
\[ y = x + 6 \]

Mission 2

\[ y = -3x - 1 \]
\[ y = 2x - 6 \]

Mission 3: (Use Substitution Method)

\[ y = 2x - 7 \]
\[ 2x - 4y = 10 \]

War of the Make-Believe Cities

Your Mission: Bomb Hogsmeade — the only settlement in Britain inhabited solely by magical beings, and is located to the northwest of Hogwarts.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1

\[ y = -4x + 9 \]
\[ y = x - 6 \]

Mission 2

\[ y = 3x + 1 \]
\[ y = -3x + 1 \]

Mission 3: (Use Substitution Method)

\[ y = 2x - 9 \]
\[ -3x - 2y = -10 \]

War of the Make-Believe Cities

Your Mission: Bomb Ponyville — a town in Equestria, the main setting of the series *My Little Pony: Friendship is Magic*.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1

\[ y = x - 2 \]
\[ y = -4x + 8 \]

Mission 2

\[ y = 3x + 7 \]
\[ y = -2x - 8 \]

Mission 3: (Use Substitution Method)

\[ y = -2x - 1 \]
\[ -3x + 2y = 5 \]
War of the Make-Believe Cities

Your Mission: Bomb Kakariko Village - a fictional village of The Legend of Zelda Series

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = -4x + 1 \]
\[ y = x - 4 \]

Mission 2
\[ y = -2x + 2 \]
\[ y = x + 2 \]

Mission 3: (Use Substitution Method)
\[ y = 3x \]
\[ -4x - y = -7 \]

War of the Make-Believe Cities

Your Mission: Bomb Sesame Street - The setting of the tv show Sesame Street that combines live action, sketch comedy, animation and puppetry.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = 2x + 1 \]
\[ y = 4x + 3 \]

Mission 2
\[ y = -2x + 3 \]
\[ y = 3x - 2 \]

Mission 3: (Use Substitution Method)
\[ y = 4x + 3 \]
\[ 2x - 3y = -9 \]

War of the Make-Believe Cities

Your Mission: Bomb Coruscant — a fictional planet and city in the Star Wars universe.

Determine where you will place your three bombs by solving the three systems of equations using equal values or substitution. Your solutions will be coordinate pairs. Plant three bombs at these coordinate pairs.

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = -3x - 1 \]
\[ y = -2x - 1 \]

Mission 2
\[ y = x - 3 \]
\[ y = -3x + 1 \]

Mission 3: (Use Substitution Method)
\[ y = 2x + 5 \]
\[ 4x - 4y = -8 \]

Mission 1 & Mission 2: (Use Equal Values Method)

Mission 1
\[ y = -3x - 3 \]
\[ y = 2x + 2 \]

Mission 2
\[ y = -4x \]
\[ y = -3x + 1 \]

Mission 3: (Use Substitution Method)
\[ y = 4x - 7 \]
\[ -4x - 4y = 8 \]
March 19, 2018

War of Make-Believe Cities!

Example:
My Mission: Bomb the Emerald City - the capital city of the land of Oz in Wizard of Oz

Mission 1 (Use Equal Values Method)

\[
\begin{align*}
&y = 3x + 5 \\
&y = 4x + 5 \\
&3x + 5 = 4x + 5 \\
&-3x + 5 = 4x + 5 \\
&-4x = 0 \\
&x = 0 \\
&y = -3(0) + 5 = 5 \\
&\text{Solution: } (0, 5)
\end{align*}
\]

The Emerald City

\[
\begin{align*}
&y = 3x + 5 \\
&y = 4x + 5 \\
&y = 5
\end{align*}
\]

Was I successful? Yes

Why is it best to use Equal Values? \[y = \text{intercept} \]

Why is it best to use Substitution? \[y = \text{standard form} \]

February 19, 2018

War of Make-Believe Cities!

Example:
My Mission: Bomb the Emerald City - the capital city of the land of Oz in Wizard of Oz

Mission 1 (Use Equal Values Method)

\[
\begin{align*}
&y = 3x + 5 \\
&y = 4x + 5 \\
&3x + 5 = 4x + 5 \\
&-3x + 5 = 4x + 5 \\
&-4x = 0 \\
&x = 0 \\
&y = -3(0) + 5 = 5 \\
&\text{Solution: } (0, 5)
\end{align*}
\]

The Emerald City

\[
\begin{align*}
&y = 3x + 5 \\
&y = 4x + 5 \\
&y = 5
\end{align*}
\]

Was I successful? Yes

Why is it best to use Equal Values? \[y = \text{intercept} \]

Why is it best to use Substitution? \[y = \text{standard form} \]
Which should we use for this system?

\[ x - 3y = 7 \]
\[ 2x + 2y = 4 \]

Elimination by adding both in standard form:
\[ \begin{align*}
    x - 3y &= 7 \\
    -x + 2y &= -4
\end{align*} \]
\[ \begin{align*}
    y &= 3 \\
    x &= 2
\end{align*} \]
\((-2, 3)\)

Elimination:
\[ \begin{align*}
    2x + 3y &= 0 \\
    3x - 2y &= 6
\end{align*} \]
\[ \begin{align*}
    x &= 3 \\
    y &= 0
\end{align*} \]
\((3, 0)\)

Elimination:
\[ \begin{align*}
    y + 3z &= -1 \\
    2y + z &= 10
\end{align*} \]
\[ \begin{align*}
    y &= 5 \\
    z &= -3
\end{align*} \]
\((5, -3)\)

Elimination:
\[ \begin{align*}
    x + 2y &= 4 \\
    x - 2y &= 6
\end{align*} \]
\[ \begin{align*}
    x &= 5 \\
    y &= 1
\end{align*} \]
\((5, 1)\)
What should we do?

\[4x + 3y = 6\]
\[-2x - y = 3\]

elimination
by
adding

What should we do?

\[3x + 2y = 5\]
\[2x + 3y = 7\]

elimination
by
subtracting

What should we do?

\[2x + y = 3\]
\[3x - y = 1\]

equal values
method

What should we do?

\[-x - 3y = -7\]
\[x + 4y = 0\]

elimination
by
adding
February 19, 2018

What should we do?

\[-4x - y = 8\]
\[-x - y = -1\]

Elimination by subtracting

What should we do?

\[y - 2x = 7\]
\[ax = 0 \rightarrow x = -1\]

Substitution
**Key**

**Systems of Equations Practice 1**

Solve each system by graphing.

1) \[ \begin{align*}
    y &= -x - 3 \\
    y &= -6x + 2
\end{align*} \]

2) \[ \begin{align*}
    y &= 7x + 3 \\
    y &= x - 3
\end{align*} \]

   \( (1, -4) \) \hspace{2cm} \( (-1, -4) \)

Solve each system using equal values method.

3) \[ \begin{align*}
    y &= -3x + 2 \\
    y &= -6x + 8
\end{align*} \]

\[ -3x + 2 = -6x + 8 \]
\[ +3x \]
\[ 2 = -6x + 8 \]
\[ +6x \]
\[ 3x = 6 \]
\[ x = 2 \]

\( \frac{2x}{3} \times \frac{1}{2} = \frac{3}{2} \)

\( (2, -4) \)

4) \[ \begin{align*}
    y &= -3x - 14 \\
    y &= -7x - 22
\end{align*} \]

\[ -3x - 14 = -7x - 22 \]
\[ +7x \]
\[ 4x = -8 \]
\[ 4 \]
\[ x = -2 \]

\( y = -3(-2) - 14 = -8 \)

\( (-2, -8) \)

Solve each system by substitution.

5) \[ \begin{align*}
    y &= x + 2 \\
    6x - 2y &= 20
\end{align*} \]

\( 6x - 2(x + 2) = 20 \)
\( 6x - 2x - 4 = 20 \)
\( 4x - 4 = 20 \)
\[ +4 \]
\[ 4x = 24 \]
\[ \frac{4x}{4} \]
\( x = 6 \)

\( y = 6 + 2 = 8 \)

\( (6, 8) \)

6) \[ \begin{align*}
    y &= -3x - 23 \\
    -5x - 3y &= -3
\end{align*} \]

\[ -3x - 3(3x - 23) = -3 \]
\[ -3x - 9x + 69 = -3 \]
\[ -12x + 69 = -3 \]
\[ -12 \]
\[ x = -4 \]

\( -12x = -4 \)
\[ -4 \]

\( y = 3(-4) - 23 = -5 \)

\( (6, -5) \)
Solve each system by elimination.

7) \(9x - \frac{y}{3} = 16\)\
   \(3x + \frac{y}{2} = -4\)

\[
\begin{align*}
12x - \frac{y}{3} &= 12, \\
\frac{12y}{12} &= \frac{12}{12}, \\
x &= 1 \\
\end{align*}
\]

\((1, -7)\)

8) \(-10x - 3y = -27\)\
   \(+ 2x + 3y = 3\)

\[
\begin{align*}
-8x &= -24, \\
\frac{-8x}{-8} &= \frac{-24}{-8}, \\
x &= 3 \\
\end{align*}
\]

\(2(3) + 3y = 3\)\
\(-6 + 3y = 3\)\
\(3y = 3\)\
\(y = 1\)

\((3, -1)\)

9) \(-4x + 9y = -22\)\
   \(+ 9x - 9y = 27\)

\[
\begin{align*}
\frac{5x}{5} &= \frac{5}{5}, \\
x &= 1 \\
\end{align*}
\]

\(9(1) - 9y = 27\)\
\(-9 - 9y = 9\)\
\(-9y = 18\)\
\(-9y = -8\)\
\(y = -2\)

\((1, -2)\)

10) \(9x - 3y = -24\)\
    \(-8x - 3y = 23\)

\[
\begin{align*}
-1x &= -1, \\
x &= 1 \\
\end{align*}
\]

\(9(1) - 3y = 24\)\
\(-9 - 3y = 24\)\
\(-3y = 33\)\
\(-3y = -3\)\
\(y = -10\)

\((1, -5)\)

11) \(-2x + 10y = -30\)\
    \((-3x - 6y = 18)\)

\[
\begin{align*}
\frac{10y}{10} &= \frac{-48}{10}, \\
y &= -3 \\
\end{align*}
\]

\(-7x + 10(-3) = -30\)\
\(+ 35 + 30\)

\(x = -5\)

\((0, -3)\)

12) \(7x - 8y = 14\)\
    \((-7x + 3y = 21)\)

\[
\begin{align*}
\frac{5y}{5} &= \frac{35}{5}, \\
y &= 7 \\
\end{align*}
\]

\(7x + 8(7) = 114\)\
\(7x = -42\)\
\(x = -6\)

\((-6, 7)\)
Quiz 3 Solving Equations

Solve each equation for $x$.

1) $-7 = 4x - 3$
   
   $-7 + 3 = 4x - 3 + 3$
   
   $-4 = 4x$
   
   $\frac{-4}{4} = \frac{4x}{4}$
   
   $-1 = x$

2) $-8x + 8 = -8$
   
   $-8x + 8 + 8 = -8 + 8$
   
   $-8x = 0$
   
   $\frac{-8x}{-8} = \frac{0}{-8}$
   
   $x = 0$

3) $-\frac{1}{2} + \frac{1}{2}x = 4$
   
   $-\frac{1}{2} + \frac{1}{2}x + \frac{1}{2} = 4 + \frac{1}{2}$
   
   $\frac{1}{2}x = \frac{9}{2}$
   
   $x = 9$

4) $\frac{3}{4} = -\frac{2}{3}x + 2$
   
   $\frac{3}{4} - 2 = -\frac{2}{3}x + 2 - 2$
   
   $\frac{-5}{4} = -\frac{2}{3}x$
   
   $\frac{-5}{4} \cdot \frac{-3}{2} = \frac{-2}{3}x \cdot \frac{-3}{2}$
   
   $\frac{15}{8} = x$

5) $3(2x + 2) = -9$
   
   $6x + 6 = -9$
   
   $6x = -9 - 6$
   
   $6x = -15$
   
   $\frac{6x}{6} = \frac{-15}{6}$
   
   $x = -2.5$

6) $3(-2 + x) + 2x = 14$
   
   $-6 + 3x + 2x = 14$
   
   $-6 + 5x = 14$
   
   $5x = 20$
   
   $x = 4$
Score for this quiz: 3 out of 4  
Submitted Feb 21 at 11:39am  
This attempt took 4 minutes.

<table>
<thead>
<tr>
<th>Question 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>What method should you use to solve the systems below?</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>$y = -2x + 4$</td>
</tr>
<tr>
<td>$y = 5x - 3$</td>
</tr>
<tr>
<td>[ Select ]</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>$x = 4 - 2y$</td>
</tr>
<tr>
<td>$3x - 2y = 4$</td>
</tr>
<tr>
<td>[ Select ]</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>$3x + y = 1$</td>
</tr>
<tr>
<td>$4x + y = 2$</td>
</tr>
<tr>
<td>[ Select ]</td>
</tr>
</tbody>
</table>
Question 2

Solve the system using a method of your choice.

\[ 5m + 2n = -10 \]
\[ 3m + 2n = -2 \]

\[ m = -6 \quad n = 10 \]

Answer 1:

You Answered

Correct Answer
-4

Correct Answer
-4
You Answered: 10
Correct Answer: 5

Additional Comments:

Fudge Points: 

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 3 out of 4

Update Scores
Homework

Systems of Equations Practice 1

Solve each system by graphing.

1) \( y = -x - 3 \)
   \( y = -6x + 2 \)

2) \( y = 7x + 3 \)
   \( y = x - 3 \)

Solve each system using equal values method.

3) \( y = -3x + 2 \)
   \( y = -6x + 8 \)

4) \( y = -3x - 14 \)
   \( y = -7x - 22 \)

Solve each system by substitution.

5) \( y = x + 2 \)
   \( 6x - 2y = 20 \)

6) \( y = 3x - 23 \)
   \( -3x - 3y = -3 \)

RG
Solve each system by elimination.

7) \[9x - y = 16 \]
\[3x + y = -4\]
\[12x = 12\]
\[x = 1\]
\[3x - y = -4\]
\[\frac{-3x}{3} = \frac{-3}{3}\]
\[y = -3\]
\[(1, -3)\]

8) \[-10x - 3y = -27\]
\[2x + 3y = 3\]
\[\frac{-8x + y = 24}{-8}\]
\[\frac{x + y = 6}{2}\]
\[x = -6\]

9) \[-4x + 9y = -22\]
\[9x - 9y = 27\]
\[-5x + y = 5\]
\[\frac{-5x}{5} = \frac{-5}{5}\]
\[x = 1\]
\[-4 + 9y = 22\]
\[\frac{4y}{4} = \frac{22}{4}\]
\[y = -2\]
\[(1, -2)\]

10) \[9x - 3y = 24\]
\[-8x + 3y = 23\]
\[x = 1\]
\[-3y = 24\]
\[\frac{-3y}{-3} = \frac{24}{-3}\]
\[y = -8\]
\[(1, -8)\]

11) \[-7x + 10y = -30\]
\[+7x + 6y = 18\]
\[16y = -48\]
\[y = -3\]

12) \[7x + 8y = 14\]
\[-7x + 3y = 21\]
\[5y = 35\]
\[y = 7\]
Quiz #3 Solving Equations

Solve each equation for x.

1) \(20 = 2x + 10\)
   \[\frac{10}{2} = \frac{2x}{2} \Rightarrow x = 5\]

2) \(-6x - 1 = -25\)
   \[\frac{-6x}{-1} = \frac{-25}{-1} \Rightarrow x = 12\frac{1}{2}\]

3) \(\frac{-4}{5} = -2x - \frac{3}{5}\)
   \[\frac{4}{5} + \frac{3}{5} = -2x \Rightarrow x = 2\]

4) \(\frac{1}{2} + \frac{1}{3} = \frac{1}{2} \cdot \frac{3}{7}\)
   \[\frac{1}{2} + \frac{1}{3} = \frac{3}{7}\]

5) \(4(-1 + x) = -40\)
   \[-4 + 4x = -40 \Rightarrow 4x = -36 \Rightarrow x = -9\]

6) \(-2(-3 + x) + 3x = 9\)
   \[6 + 6x = 9 \Rightarrow 6x = 3 \Rightarrow x = \frac{1}{2}\]
Solve each equation for the indicated variable.

7) \(5y - x = 10\), for \(y\)  
Don't know how to solve it.

8) \(k + x = w - v\), for \(x\)  
Don't know how to solve it.

Below, two problems are worked out. Circle which step has the mistake and in a sentence or two explain what mistake was made. You do not have to find the correct solution.

9) \(3(m + 7) = 15\)

\[
\begin{align*}
3m + 7 &= 15 \\
-7 &\quad -7 \\
3m &= 8 \\
\frac{3}{3} m &= \frac{8}{3} \\
\therefore m &= \frac{8}{3}
\end{align*}
\]

EXPLAIN

10) \(2a - 6 = 28\)

\[
\begin{align*}
2a - 6 &= 28 \\
-6 &\quad -6 \\
a &= 14 \\
a &= 20
\end{align*}
\]
**ID Bell Ringer 9**

Score for this quiz: 3 out of 4  
Submitted Feb 21 at 11:38am  
This attempt took 2 minutes.

<table>
<thead>
<tr>
<th>Question 1</th>
<th>3 / 3 pts</th>
</tr>
</thead>
</table>

What method should you use to solve the systems below?

\[
y = -2x + 4 \\
y = 5x - 3
\]

\[
x = 4 - 2y \\
3x - 2y = 4
\]

\[
3x + y = 1 \\
4x + y = 2
\]
Question 2

Solve the system using a method of your choice.

\[5m + 2n = -10\]
\[3m + 2n = -2\]

\[m = 2\]
\[n = 0\]

Answer 1:

You Answered

Correct Answer

Correct Answer

Answer 2:

Equal Values

Substitution

Elimination

Additional Comments:
You Answered: 0
Correct Answer: 5

Additional Comments:

Fudge Points: ~

You can manually adjust the score by adding positive or negative points to this box.

Final Score: 3 out of 4

Update Scores
SM1

Systems of Equations Practice 1

Solve each system by graphing.

1) \[ \begin{align*}
y &= -x - 3 \\
y &= -6x + 2 \\
x &= 1 \\
y &= -4
\end{align*} \]

2) \[ \begin{align*}
y &= 7x + 3 \\
y &= x - 3 \\
x &= -1 \\
y &= -4
\end{align*} \]

Solve each system using equal values method.

3) \[ \begin{align*}
y &= -3x + 2 \\
y &= -6x + 8 \\
-3x + 2 &= -6x + 8 \\
3x &= -6 \\
x &= -2 \\
y &= -1 \quad (2, -1)
\end{align*} \]

4) \[ \begin{align*}
y &= -3x - 14 \\
y &= -7x - 22 \\
-3x - 14 &= -7x - 22 \\
4x &= 8 \\
x &= 2 \\
y &= -3(2) - 14 \\
y &= -8 \quad (-2, -6)
\end{align*} \]

Solve each system by substitution.

5) \[ \begin{align*}
y &= x + 2 \\
6x - 2y &= 20 \\
6x - 2(x + 2) &= 20 \\
6x - 2x - 4 &= 20 \\
4x &= 24 \\
x &= 6 \\
y &= 8
\end{align*} \]

6) \[ \begin{align*}
y &= 3x - 23 \\
-3x - 3y &= -2 \\
-3x - 3(3x - 23) &= -2 \\
-3x - 9x + 69 &= -2 \\
-12x &= -71 \\
x &= \frac{71}{12} \\
y &= 3x - 23 \\
y &= 3 \left( \frac{71}{12} \right) - 23 \\
y &= -3 \\
x &= \frac{71}{12} \quad (\frac{71}{12}, -3)
\end{align*} \]
Solve each system by elimination.

7) \[9x - y = 16\]
   \[3x + y = -4\]
   \[\begin{align*}
   \gamma &= -16 + 9\gamma \\
   \gamma &= -7
   \end{align*}\]
   \[\begin{align*}
   3x + 9y &= -4 \\
   12x - 4y &= -16
   \end{align*}\]
   \[\begin{align*}
   12x + 12y &= 12 \\
   x &= \frac{1}{5}
   \end{align*}\]

8) \[-10x - 3y = -27\]
   \[2x + 3y = 3\]
   \[\begin{align*}
   10x + 3y &= 27 \\
   2x + 3y &= 3
   \end{align*}\]
   \[\begin{align*}
   12x &= 24 \\
   x &= 2
   \end{align*}\]

9) \[-4x + 9y = -22\]
   \[9x - 9y = 27\]
   \[\begin{align*}
   9x - 9y &= 27 \\
   \frac{9x}{9} - \frac{9y}{9} &= \frac{27}{9}
   \end{align*}\]
   \[\begin{align*}
   \frac{x}{2} + \frac{y}{1} &= \frac{27}{9} \\
   \frac{x}{2} + \frac{y}{1} &= \frac{3}{1}
   \end{align*}\]
   \[\begin{align*}
   18x + 18y &= 54 \\
   18x + 18y &= 18
   \end{align*}\]
   \[\begin{align*}
   18x &= 36 \\
   x &= 2
   \end{align*}\]

10) \[9x - 3y = 24\]
    \[8x - 3y = 23\]
    \[\begin{align*}
    \frac{9x}{3} - \frac{3y}{3} &= \frac{24}{3} \\
    \frac{9x}{3} - \frac{3y}{3} &= \frac{23}{3}
    \end{align*}\]
    \[\begin{align*}
    3x - y &= 8 \\
    3x - y &= \frac{23}{3}
    \end{align*}\]
    \[\begin{align*}
    3x &= \frac{23}{3} + \frac{3}{3}
    \end{align*}\]
    \[\begin{align*}
    x &= \frac{26}{9}
    \end{align*}\]

11) \[-7x + 10y = -30\]
    \[-7x - 6y = 18\]
    \[\begin{align*}
    \frac{-7x}{7} + \frac{10y}{7} &= \frac{-30}{7} \\
    -7x - 6y &= 18
    \end{align*}\]
    \[\begin{align*}
    \frac{-7x}{7} + \frac{10y}{7} &= \frac{-30}{7} \\
    \frac{-7x}{7} + \frac{10y}{7} &= \frac{-30}{7}
    \end{align*}\]
    \[\begin{align*}
    -7x &= -18 \\
    x &= \frac{18}{7}
    \end{align*}\]

12) \[7x + 8y = 14\]
    \[7x + 3y = 21\]
    \[\begin{align*}
    \frac{7x}{7} + \frac{8y}{7} &= \frac{14}{7} \\
    7x + 3y &= 21
    \end{align*}\]
    \[\begin{align*}
    \frac{7x}{7} + \frac{8y}{7} &= \frac{14}{7} \\
    \frac{7x}{7} + \frac{8y}{7} &= \frac{14}{7}
    \end{align*}\]
    \[\begin{align*}
    7x &= 14 \\
    x &= 2
    \end{align*}\]

\[\begin{align*}
(0, -3)
\end{align*}\]
4. Reflection

Reflection and Evaluation of Lesson 1: 6.1.1 “Manipulating Equations and Solving for Variables”

**Analyze student learning:**

**Student 1: RG**

**Prior Knowledge**

Attached is RG’s attempt at the quiz “Writing Equations,” which gives an indicator of his prior knowledge. He got 8 points out of 14, or 57%. Even though his score is low, from looking at his work, it is clear that RG did not understand the directions and only completed part of the work. For instance, on problems 5 and 6, RG calculated the correct value of b, but did not write the equation in slope-intercept form. Also, on problems 7-10, he correctly calculated the slope, but did not finish by solving for b and writing the equation in slope-intercept form. RG’s responses to problems 1-4 indicate that he understands slope-intercept form and his responses to problems 5-6 indicate that he understands how to solve for a single variable, b.

**Performance During the Lesson**

Student 1, RG attended class and participated with his team throughout the lesson. He actively took notes on the guided notes and answered questions in the class discussions. Attached is the homework “Solving Literal Equations” that RG turned in the next class period. Homework is used for formative feedback to identify common misconceptions and errors. He correctly computed 5/12 of the problems. Some common errors he did were dividing two terms by a variable, but not all terms and subtracting a variable that is multiplying x instead of dividing by it to solve for x.

Attached is RG’s response to the bell ringer 3. Questions 2 and 3 align with the first lesson objective; students understand the meaning of variables, single-variable equations, and multivariable
equations. Since RG answered one correctly and one incorrectly, I am uncertain if RG achieved this objective. I will need to measure and evaluate again to be sure. Questions 1 and 4 test the second objective; students will be able to solve an equation for a particular variable. RG correctly answered these questions and there is some evidence that RG achieved this objective.

Based on the formative and summative feedback, I will make sure to give students more practice with solving literal equations. I will show the class the common mistakes I am seeing and ask them to identify why it is wrong. This will help RG identify what he is doing wrong and help him correct how he is doing it.

**Student 2: ID**

**Prior Knowledge**

Attached is ID’s attempt at the quiz “Writing Equations,” which gives an indicator of his prior knowledge. He got 2 points out of 14, or 14%. This score is very low. From looking at his work, it is clear that he does not understand the definition of or the algebraic process to find the slope or y-intercept of a line. He did not attempt to solve for b, so I am not sure his ability of solving for a variable in a single-variable equation. This work tells me that ID will need a lot of support when we extend solving for a variable in a single-variable equation to solving for a variable in a multi-variable equation.

**Performance During the Lesson**

ID wrote notes during the class discussion, but when required to work in groups, he sat quietly and just wrote down what his team told him to do. He needed teacher support during the whiteboard activity, and I walked him through how to solve a few problems individually. He made mistakes solving for individual variables, for instance, dividing before subtracting or not doing the same operation to both sides of the equation. The next class period, ID did not turn in the homework on time.

Attached is ID’s response to bell ringer 3. Questions 2 and 3 align with the first lesson objective; students understand the meaning of variables, single-variable equations, and multivariable equations. ID
only got one of these right, but as they were multiple choice, I am not sure if he understands the format of solutions, objective 1. I will need to measure and evaluate again to be sure. Questions 1 and 4 test the second objective, that students will be able to solve an equation for a particular variable. ID did not answer either correctly, so I conclude that ID did not achieve the second lesson objective.

A few days after the lesson ID came in after school to work on missing homework. He was motivated to improve his grade because he needed higher grades to try out for the soccer team. I worked with him individually on the worksheet “Solving Literal Equations,” and he caught on very quickly. He was able to complete the homework (11/12) correctly with help. After the lesson, it was clear that ID did not achieve the learning objectives, but after working with him individually, there is evidence that ID achieved the lesson’s learning objectives.

Based on my observations and my measurements of ID’s work, I believe that ID needs one-on-one support when learning algebraic procedures. Therefore, when he comes to class in the future, I will have him work with an aide during work time on algebraic objectives so that the procedures are solidified in his mind.

**Analyze teaching effectiveness:**

Here I will describe the instructional decisions I made before and during instruction. Since teams were able to quickly and accurately answer the problem about the slope and y-intercept of a linear equation, I decided that we did not need to review linear equations before moving on. Therefore, I decided to instruct teams to go on and answer the next question they were assigned. Many teams were stumped on how to make a prediction, so I announced to the class that a prediction is just a guess. Most teams made a table and graphed the line without help. But then I realized that many teams still struggled writing an equation in slope-intercept form by looking at a graph. Therefore, I identified a team that correctly did so and had one person from the team come up and explain how to get the slope and y-intercept from the graph.
It was confusing for students that I wrote the pros and cons list on the smart board, but there was not a place to write it on their guided notes. I think it would be worthwhile for students to write this down, so in the future I would include this in their notes.

In addition, during the whiteboard activity, when I identified that ID and a few other students struggled repeatedly, I made sure to come over and individually help and direct them. In the future, I would like to pair these students, especially ID, with an individual aide to be his partner.

One problem I encountered was that some partners during the whiteboard activity never switched places, because in a couple of cases the student did not understand the work. ID did not feel comfortable writing because he was afraid of doing it wrong. Some students were not willing to explain in more detail what their partners needed to do and therefore took the marker and showed them.

What worked well was that the game got lots of students to be engaged. It was helpful for students to listen to their classmates explain their work. It was useful to use the apple tv functionality to show student work for the whole class to evaluate. Student RG was one of the students who explained his work to the class, and explaining helped him learn the steps on a deeper level. Having an example labeled with the algebraic steps helped students understand the procedure.

Based on ID’s performance, I would add aides (or students who are willing to explain) for this lesson to individually help a few students like ID. I will give more opportunities for students like RG to show and explain their work, because it solidifies their understanding. This is what I will do in the future.
Reflection and Evaluation of Lesson 2: 6.2.1/6.2.2 “Solving Systems of Equations by Equal Values and by Substitution”

Analyze student learning:

Student 1: RG

Prior Knowledge

Attached is RG’s attempt at bell ringer 5. Question 1 addresses whether students can accurately choose the correct set of equations to represent the given story. RG answered incorrectly, so I can infer that RG needs more practice setting up equations given scenarios, one of the objectives of the lesson. RG did well on the class work of graphing two lines and seeing that the point where they cross is the solution, so I believe he is ready to learn how to algebraically find the solution of two lines using the equal values and substitution methods, objective 2 of the lesson.

Performance During the Lesson

Attached is RG’s homework “Equal Value and Substitution Method.” He correctly completed problems 1-4, using the equal values method. However, he encountered problems on 5-8 using the substitution method. A common error he has is not putting parentheses around the expression that is substituting for the variable. Also attached is RG’s bell ringer 7. He correctly answered questions 1-3 which tested the lesson objectives of equal value and substitution method computations. I conclude that RG still needs help with the substitution method, and I will make sure in future lessons to review substitution and to call attention to common errors that are happening.

Student 2: ID

Prior Knowledge

Attached is ID’s attempt at bell ringer 5. Question 1 addresses whether students can accurately choose the correct set of equations to represent the given story. ID answered incorrectly, so I can infer that he needs more practice setting up equations given scenarios, one of the objectives of the lesson. ID
was absent for the class work of graphing two lines and seeing that the point where they cross is the solution, so I believe he will need more support understanding what the solution of an equation is to be ready to algebraically find the solution of two lines using the equal values and substitution methods.

**Performance During the Lesson**

Attached is ID’s homework “Equal Value and Substitution Method,” which he turned in a few days late. He correctly completed 3 out of 4 of the problems, using the equal values method, only missing one because of a small computational error. However, on problems 5-8 using the substitution method, ID got two right, one wrong because of a computation error, and another wrong because he forgot parentheses, just like RG. Also attached is ID’s bell ringer 7. He did not correctly answer questions 1-3 which tested the lesson objectives of equal value and substitution method computations. I conclude that RG still needs help with the equal values and substitution method, and I will make sure in future lessons to provide work time in which I can individually go over the processes with him.

**Analyze teaching effectiveness:**

Here I will describe the instructional decisions I made before and during instruction. Instead of having students come up with the equations for problem 6-45 in their teams, I decided to take the class through the process of writing the equations. I did this, because students struggled exceedingly on problem 6-44 coming up with the equations. I decided that in the future, we will have a lesson that focuses on writing equations from scenarios, but for now, I wanted my class to understand and focus on the algebraic processes of the equal values and substitution methods.

Having the lesson go back and forth from whole group discussions to team work was successful because students had a chance to engage, try things out, and have the help of their teammates and then have the whole class discussion to give them immediate feedback as to whether they were solving it correctly.
I realized quickly at the beginning that it was not going to work for students to come up with equations from scenarios, but that they would need to readdress this later. In the future, I would model how to come up with all the equations of all the example problems and in teams have students use the methods to solve the systems. I think that they need more practice algebraically before addressing the conceptional idea again.

Based on RG’s and ID’s achievement of the equal values part of the lesson objective, I would spend less time on equal values and more on substitution, since they both struggled with that part. I would alter this unit in the future to really dive into substitution and examine the common errors that students make, like forgetting the parentheses. I would include a section in the lesson where students would be given many incorrect examples and they would need to identify and explain the mistakes. This is what I would do in the future based on my focus students’ achievements of the lesson objectives.
Reflection and Evaluation of Lesson 3: 6.3.1 “Solving Systems of Equations Using Four Different Methods”

Analyze student learning:

Student 1: RG

Prior Knowledge

Attached is RG’s attempt at Quiz 3 “Solving Equations,” on which he got 11 out of 12. Solving one variable equations is essential prior knowledge for solving systems of equations. Based on this and the fact that he has been present, participating, and turning in homework for this unit, I am confident that RG is prepared to solve equations by the four methods.

Performance During the Lesson

Attached is RG’s bell ringer 9. He achieved the second lesson objective as evidenced by getting 3 points out of 3 for choosing which of the methods is appropriate for solving each system. Attached is also RG’s homework “Systems of Equations Practice 1.” Each of the four methods for solving systems of equations is addressed. From the homework, it is clear that RG understands how to do problems using the equal values and substitution method with 4 out of 4 correct. He is picking up solving by elimination, doing 5 out of 6 of the problems correctly. He does not know how to graph lines and find the solution; he got 0 out of 2 correct. Therefore, RG has achieved about three fourths of the first lesson objective. In the future, I will spend time with the class reviewing graphing lines.

Student 2: ID

Prior Knowledge

Attached is ID’s attempt at Quiz 3 “Solving Equations,” on which he got 2 out of 12. Since solving one variable equations is essential prior knowledge that ID is lacking for solving systems of equations, ID is going to need a lot of support for this lesson.

Performance During the Lesson
Attached is ID’s bell ringer 9. He achieved the second lesson objective as evidenced by getting 3 points out of 3 for choosing which of the methods is appropriate for solving each system. Attached is also ID’s homework “Systems of Equations Practice 1.” Each of the four methods for solving systems of equations is addressed. ID got 10 out of 12 correct but struggled on the graphing method of solving. Therefore, again, in the future, I will create a review lesson of solving systems by graphing. Students need more practice with this method.

**Analyze teaching effectiveness:**

Here I will describe the instructional decisions I made before and during instruction. Instead of giving students all the directions at once, I decided to split the activity into small portions for better student understanding. First, students solved the systems algebraically. Only when they finished did I pass out the graphs and stickers for students to plot their solutions.

Here I paused to review how to graph lines by identifying the slope and y-intercept. It is evident from RG and ID’s achievement and my assessment of other students’ data that my short review here was not sufficient. I see that students really struggle with graphing. This is something students should have learned to do units before, but many students still need a lot of help. Therefore, to better help students achieve the lesson objectives, in the future I will spend 10 to 15 minutes on practicing graphing lines as a class.