Toolbox for Solving Systems of Equations Problems

Salamanca High School – Math IIA
Grade: 9/10
10 Day Unit (Including Quizzes & Test)
Tools Required: TI-82 or TI-83 Graphing Calculator
Overall Unit Objective

The overall objective of this unit is to introduce students to seven methods for solving systems of equations problems and provide them with enough experiences to help them learn when to use which method. The seven methods are as follows:

- graphing on paper
- graphing on calculator
- substitution
- elimination
- manipulatives
- guess and check
- matrices.

Standards Addressed in this Unit

New York State Learning Standard 4: Modeling/Multiple Representation – model real-world problems with systems of equations and inequalities.

NCTM Algebra Standard for Grades 9-12: Represent and analyze mathematical situations and structures using algebraic symbols – write equivalent forms of equations, inequalities, and systems of equations and solve them with fluency – mentally or with paper and pencil in simple cases and using technology in all cases.

Resources


Materials and Equipment

- Handouts included in this report. Written in **bold** lettering when referenced.
- Scissors to cut out manipulatives.
- TI-82 or TI-83 Graphing Calculator
- New York Math A Semester 3 textbook listed above for assignments.
Day 1 Lesson Plan

Objective: Review previously taught methods of solving systems of equations: graphing, substitution, and elimination. Begin to get students thinking about when to use which method.

Activities:

- Fill in Review: Solving Systems of Equations sheet together. Discuss when to use which method.
- Students work together on Solve the Systems of Equations! sheet.
- Students finish Solve the Systems of Equations! sheet for homework and review for quiz.

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Answer Keys: (Fill-ins on sheets or problem answers in italics.)

Sheet: Review: Solving Systems of Equations

1. Graphing: Solve equations for y, graph, and find the point of intersection.
    3. Change window if necessary to see point of intersection.
    4. Press 2nd, Trace, 5:Intersection, Enter, Enter, Enter to find intersection.
3. Substitution: Solve for one variable and substitute into the other equation to find x or y. Substitute back into the original equation to find the remaining variable.
4. Elimination: If you do not have a match, multiply one or both equations to get one! Add (different sign match) or subtract (same sign match) equations and solve.

Solution to Ex.#1-4 : x = 2, y = -4  Solution to You Try #1-4: x = 3, y = -2

Sheet: Solve the Systems of Equations!

Solutions:

1. x = -3, y = -8
2. x = 9, y = 2
3. x = 7, y = 1
4. x = 4, y = 9
5. x = 1, y = 3
6. x = 4, y = -2
7. x = 2, y = -3
8. x = 4, y = -2
9. x = 3, y = -2
10. x = 2, y = -1
11. x = 2, y = 1
12. x = 2, y = -4
** We have learned 4 different ways to solve a problem with 2 equations and 2 unknowns!  **

1. **Graphing (on graph paper):**

   Ex. 1)
   - \( X - Y = 6 \)
   - \( 2X + Y = 0 \)
   - insert grid
   - You  \( 2X + Y = 4 \)
   - Try 1) \( 2X + 2Y = 2 \)
   - insert grid

2. **Graphing Calculator:**

   1. ___________________________________________________________________
   2. ___________________________________________________________________
   3. ___________________________________________________________________
   4. ___________________________________________________________________

   * Check Ex. 1 and You Try 1 on calc!

3. **Substitution:**

   Ex 3)
   - \( X - Y = 6 \)
   - \( 2X + Y = 0 \)
   - You  \( 2X + Y = 4 \)
   - Try 3) \( 2X + 2Y = 2 \)

4. **Elimination:**

   Ex 4)
   - \( X - Y = 6 \)
   - \( 2X + Y = 0 \)
   - You  \( 2X + Y = 4 \)
   - Try 4) \( 2X + 2Y = 2 \)
Solve the Systems of Equations!    Name_________________________ Date_____

Directions: Solve the following systems of equations by any method. If you use your calculator, write down the steps. Check your answers on a separate sheet of paper.

1. \[ y = 3x + 1 \]
   \[ 2x + y = -14 \]

7. \[ 5x - 3y = 19 \]
   \[ 2x + 3y = -5 \]

2. \[ y = x - 7 \]
   \[ x + y = 11 \]

8. \[ 3x - 2y = 16 \]
   \[ 7x + 2y = 24 \]

3. \[ y = x - 6 \]
   \[ 4x + 3y = 31 \]

9. \[ 4x - 3y = 18 \]
   \[ 2x + y = 4 \]

4. \[ x + y = 13 \]
   \[ y = x + 5 \]

10. \[ 3x + 7y = -1 \]
    \[ 2x + 3y = 1 \]

5. \[ 4x + 3y = 13 \]
   \[ 5x - 3y = -4 \]

11. \[ 2x + 5y = 9 \]
    \[ x + 3y = 5 \]

6. \[ 2x - y = 10 \]
   \[ 3x + y = 10 \]

12. \[ 5x - 2y = 18 \]
    \[ 3x + y = 2 \]
Day 2 Lesson Plan

Objective: Check students’ understanding of solving systems of equations by graphing, substitution, and elimination before moving to word problems.

Activities:

- Check answers to Solve the Systems of Equations! sheet.
- Answer any questions on graphing, substitution, or elimination.
- Quiz: Solving Systems by Any Method!
  - Students will be given Coin Problems sheet to cut out when they are finished with quiz. They will complete this for homework if not done in class and store pieces in an envelope for the next class.

Answer Key: Quiz: Solve Systems by Any Method

1. $X = 4, Y = -5$
2. $X = 7, Y = 3$
3. $X = 5, Y = 5$
4. $X = 2, Y = 5$
Directions: Solve the following systems of equations by any method. You will receive 1 point for your work (write calculator steps if you use calculator), 1 point for the correct X, 1 point for the correct Y, and 1 point for each check. Grids on back for graphing by hand – write “see back” under problem if you use grid on back to solve it. Box your answers!

1. \( Y = X - 9 \) \quad 3X + Y = 7

2. \( 2Y - X = -1 \) \quad 2Y + 3X = 27

3. \( 6X - 3Y = 15 \) \quad 2X + Y = 15

4. \( 2X + Y = 9 \) \quad Y = 3X - 1
**Coin Problems:** Cut out the coins to help solve the problems. **Cutting Hint:** Cut them out in columns and then put 4 columns in a pile and carefully cut into individual pieces. Do the same with the other 4 columns.
Day 3 Lesson Plan

Objective: Use manipulatives to introduce coin problems and then transfer learning to algebra process.

Activities:

- **Do Now: Coin Problems** - Solve 4 coin problems with paper coin manipulatives.
- Look at same problems using algebra. Complete **Solving Coin Problems** sheet.
- Practice at home in textbook, p. 419 #1-4.

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Answer Keys: (fill-ins on sheet in italics)

**Do Now: Coin Problems!**

1. 7 nickels, 21 quarters
2. 11 pennies, 19 nickels
3. 7 nickels, 2 quarters
4. 7 dimes, 11 quarters

* Example problems on next sheet are the same as these!

**Solving Coin Problems**

1. Choose a different variable to represent the number of each coin.
2. Translate the words into two equations. Write money as cents.
3. Solve the system of equations.
4. Check answers in original equations.

Note: You may use guess and check on the Math A. Show one above and one below the answer!

Answers to Problems:

Ex. 1: N=7, Q=21
You Try 1: P=220, D=11
Ex. 2: P=11, N=19
You Try 2: P=82, D=93
Ex. 3: N=7, Q=2
You Try 3: N=9, H=12
Ex. 4: D=7, Q=11
You Try 4: D=12, Q=28
Do Now: Coin Problems!  
Name_______________________  Date______

Directions: Use your paper coins to solve the following problems.

1. The number of quarters that Tina has is 3 times the number of nickels. She has $5.60 in all. How many coins of each type does she have?
   _____ Nickels   _____ Quarters

2. Sam has 8 more nickels than pennies. He has $1.06 total. How many coins of each type does he have?
   _____ Pennies   _____ Nickels

3. Ben has 85 cents. He has 5 less quarters than nickels. How many of each type of coin does he have?
   _____ Nickels   _____ Quarters

4. John has 18 coins in dimes and quarters. Their total value is $3.45. How many coins are there of each type?
   _____ Dimes   _____ Quarters
Solving Coin Problems

Example 1: The number of quarters that Tina has is 3 times the number of nickels. She has $5.60 in all. How many coins of each type does she have?

Step 1: _____________________________________________________________

Step 2: _____________________________________________________________

Step 3: _____________________________________________________________

Step 4: _____________________________________________________________

Note: _____________________________________________________________

You Try 1: The number of pennies that you have is 20 times the number of dimes. You have $3.30 in all. How many coins of each type do you have?

Example 2: Sam has 8 more nickels than pennies. He has $1.06 total. How many coins of each type does he have?
You Try 2: Lucy has 11 more dimes than pennies. She has $10.12 total. How many of each type of coin does she have?

Example 3: Ben has 85 cents. He has 5 less quarters than nickels. How many of each type of coin does he have?

You Try 3: Roy has $6.45 in coins. He has 3 less nickels than half-dollars. How many of each type of coin does he have?

Example 4: John has 18 coins in dimes and quarters. Their total value is $3.45. How many coins are there of each type?

You Try 4: Jasmine has 40 coins in dimes and quarters. Their total value is $8.20. How many coins are there of each type?
Day 4 Lesson Plan

Objective: Extend the lesson on solving coin problems to mixture problems.

Activities:

- Check p.419 #1-4.
- Introduce mixture problems. Complete Solving Mixture Problems sheet.
- Practice in Book: p.420 #5-7, finish for homework.

Answer Key: (fill-ins on sheet in italics)

Solving Mixture Problems

Step 1: Assign variables to the unknowns.
Step 2: Translate the words to two equations.
Step 3: Solve the system of equations.
Step 4: Check answers in the original equations.
Note: You can do guess & check on the Math A Exam – show one below and one above the answer.

Answers:

Example 1: 65 adults, 85 children
You Try 1: 7 adults, 8 children
You Try 2: 8 tapes, 14 CDs
Example 1: The owner of a movie theater was counting money from one day’s ticket sales. He knew that a total of 150 tickets were sold. Adult tickets cost $7.50 each and children’s tickets cost $4.75 each. If the total receipts for the day were $891.25, how many of each kind of ticket were sold?

Step 1:_________________________________________________________________________________

Step 2:_________________________________________________________________________________

Step 3:_________________________________________________________________________________

Step 4:_________________________________________________________________________________

Note:___________________________________________________________________________________

You Try 1: Fifteen people attended a party. The cook prepared 2 pounds of food for each adult and 1.25 pounds of food for each child. The cook prepared a total of 24 pounds of food. How many children and how many adults attended the party?

You Try 2: Top Tunes sells CDs for a single price and sells tapes for a single price. Joe bought 3 CDs and 2 tapes for $58. Jane bought 1 CD and 4 tapes for $46. Determine the selling price for 1 CD and for 1 tape.
Day 5 Lesson Plan

Objective: Practice solving coin and mixture problems in groups.

Activities:

- Check p.420 #5-7.
- Divide students into groups and work on Coin & Mixture Problems sheet.
- Individual groups will put solutions on board or overhead and present them to the class.
- Students will correct their papers so they can review for quiz next class.

Answer Key:

Coin & Mixture Problems

1. 9 nickels, 5 quarters
2. 8 dimes, 28 nickels
3. Students - $3.50, Adults - $7.50
4. 11 nickels, 12 dimes
5. 8 nickels, 4 dimes
6. 180 students, 300 adults
7. 83 adults, 512 students
8. 90 boys, 160 girls
1. Wendy has some quarters and nickels. She has 4 more nickels than quarters. The total value of the coins is $1.70. How many of each type of coin does Wendy have?

2. The total value of some nickels and dimes is $2.20. There are 36 coins in all. How many of each type of coin?

3. The total cost of concert tickets for two adults and four students is $29. A student ticket costs four dollars less than an adult ticket. Find the cost of each kind of ticket.

4. Kisha has $1.75 in nickels and dimes. She has 23 coins in all. How many of each type of coin?
5. Juan has $0.80 in nickels and dimes. He has twice as many nickels as dimes. How many nickels and how many dimes does he have?

6. Attendance at a basketball game was 480 people. The number of adults attending was five thirds the number of students attending. How many adults attended?

7. Tickets for the school play sell for $3 for a student and $5 for an adult. One night, 595 people bought tickets. The school took in $1951. How many adult tickets and how many student tickets were sold?

8. There are 250 students in the freshman class. The number of girls is 20 fewer than twice the number of boys. How many boys and how many girls are in the class?
Day 6 Lesson Plan

Objective: Check understanding of coin and mixture problems.

Activities:

- Do Now: Coin and Mixture Problem Practice. (overhead)
- Quiz: Coin & Mixture Problems
- Match the Problems to the Equations (finish for homework)

Answer Key:

Do Now: Coin & Mixture Problem Practice

Answers: 1. 12 nickels, 23 quarters
2. 55 bags of chips, 145 bags of popcorn

Quiz: Coin & Mixture Problems

1. 12 nickels, 18 dimes
2. 90 children, 200 adults
3. 9 quarters, 18 dimes

Match the Problems to the Equations

1. D X = weekly charge, Y = charge per mile
2. H X = speed, Y = distance
3. C X = # of twenty ton bins, Y = # of 15 ton bins
4. G X = singles, Y = couples
5. B X = money in 15% stocks, Y = money in 6% stocks
6. F X = # of nickels, Y = # of dimes
7. A X = diameter of Earth, Y = diameter of Mars
8. E X = Joel’s age, Y = Joel’s father’s age
Do Now: Coin & Mixture Problem Practice!

1. Angelo has $6.35 in quarters and nickels. He has 11 more quarters than nickels. How many of each type of coin does he have?

2. You sold 200 bags of popcorn and chips for a school fundraiser. Chips sold for 50 cents a bag and popcorn was 60 cents a bag. You collected $114.50, but forgot to keep track of how many of each you sold. Find the number of bags of chips and popcorn you sold.
Quiz: Coin & Mixture Problems  
Name____________________ Date____ Score:____/15

Directions: Show all work. **If you guess and check show work and answers for three guesses – one above the actual answer, one below the actual answer, and the actual answer. Box the correct answer.**  
5 points each: 1 point for legend, 1 point for equations, 1 point for work, 2 points for answers.

1. Lacy has some nickels and dimes totaling $2.40. She has 30 coins in all. How many of each does she have?

2. Jason’s Theatre charges $9 for adult tickets and $5 for children’s tickets. One night the theatre sold 290 tickets and took in $2250. How many of each type of ticket were sold?

3. Shane has $4.05 in quarters and dimes. He has twice as many dimes as quarters. How many quarters and how many dimes does he have?
Match the Problems to the Equations  

Directions: Match each problem with the correct system of equations. Write the letter of the correct equations in the third column and fill in the correct equations in the fourth. Define the variables in the fifth.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Equations</th>
<th>Correct Equations</th>
<th>Legend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Davis Rent-A-Car charges a fixed amount per weekly rental plus a charge for each mile driven. A one-week trip of 520 miles costs $250, and a two-week trip of 800 miles costs $440. Find the <strong>weekly charge</strong> and the <strong>charge per mile</strong>.</td>
<td>A</td>
<td>X = 2Y – 482 (\text{X}/2) + (\text{Y}/2) = 6059</td>
<td>Example:  (X = ) weekly charge (Y = ) charge per mile</td>
</tr>
<tr>
<td>2. Marcia flew her ultralight plane to Maine against a head wind of 15km/h in 2h 20min. The return trip under the same conditions took 1h 24 min. Find the <strong>plane’s speed</strong> in no wind and the <strong>distance</strong> to her destination in Maine.</td>
<td>B</td>
<td>0.15X + 0.06Y = 930 (X + Y = 8000)</td>
<td>X = (Y = )</td>
</tr>
<tr>
<td>3. A grain-storage warehouse has 30 bins total. Some bins hold <strong>20 tons</strong> and others hold <strong>15 tons</strong> each. How many of each type bin are there if the capacity of the warehouse is 510 tons?</td>
<td>C</td>
<td>X + Y = 30 (20X + 15Y = 510)</td>
<td>X = (Y = )</td>
</tr>
<tr>
<td>4. Tickets for the homecoming dance cost $20 for a <strong>single</strong> ticket or $35 for a <strong>couple</strong>. Ticket sales totaled $2280 and 128 people attended. How many tickets of each type were sold?</td>
<td>D</td>
<td>X + 520Y = 250 (2X + 800Y = 440)</td>
<td>X = (Y = )</td>
</tr>
<tr>
<td>5. A financial planner want to invest $8000 in stocks earning <strong>15%</strong> annually and the rest in bonds earning <strong>6%</strong> annually. In order to get an annual return of $930 at those current rates, how much should he invest in each?</td>
<td>E</td>
<td>3X = Y + 5 ((X – 5) + Y = 50)</td>
<td>X = (Y = )</td>
</tr>
<tr>
<td>6. Shara’s piggy bank contains 75 coins, all nickels and dimes, worth $5.95. How many <strong>dimes</strong> and how many <strong>nickels</strong> are in her bank?</td>
<td>F</td>
<td>X + Y = 75 (5X + 10Y = 595)</td>
<td>X = (Y = )</td>
</tr>
<tr>
<td>7. The diameter of the Earth is approximately 482 miles less than twice the diameter of the planet Mars. The sum of the radii of <strong>Mars</strong> and <strong>Earth</strong> is 6059. Find the <strong>diameters</strong> of both.</td>
<td>G</td>
<td>20X + 35Y = 2280 (X + 2Y = 128)</td>
<td>X = (Y = )</td>
</tr>
<tr>
<td>8. Five years from now, <strong>Joel’s father’s age</strong> will be 3 times Joel’s present age. The sum of <strong>Joel’s age</strong> 5 years ago and his father’s present age is 50. How old is each now?</td>
<td>H</td>
<td>((140/60)(X – 15) = Y) ((84/60)(X + 15) = Y)</td>
<td>X = (Y = )</td>
</tr>
</tbody>
</table>
Day 7 Lesson Plan

Objective: Introduce matrices as a way to solve systems of equations.

Activities:

- Check Match the Problems to Equations.
- Introduce entering matrices into the calculator with Warm Up 16 from TI-83 Easy Warm Ups Algebra Two by David P. Lawrence. (materials received during summer course)
- Use Warm Up 17 to practice matrix algebra on the calculator.
- Use Warm Up 19 to introduce using matrices to solve systems of equations.
- Write systems of equations on Match the Problems to Equations in Ax + By form and solve using matrices. Finish for homework.

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Answer Key:

Match the Problems to the Equation

1. \[ X + 520Y = 250 \]
   \[ 2X + 800Y = 440 \]
   \[ X = \$120 \]
   \[ Y = \$0.25/\text{mile} \]

2. \[ (140/60)X + -1Y = 35 \]
   \[ 1.4X + -1Y = -21 \]
   \[ X = 60 \text{ km/hr} \]
   \[ Y = 105 \text{ km} \]

3. \[ 1X + 1Y = 30 \]
   \[ 20X + 15Y = 510 \]
   \[ X = 12 \text{ twenty-ton bins} \]
   \[ Y = 18 \text{ fifteen-ton bins} \]

4. \[ 20X + 35Y = 2280 \]
   \[ 1X + 2Y = 128 \]
   \[ X = 16 \text{ singles} \]
   \[ Y = 56 \text{ couples} \]

5. \[ 0.15X + 0.06Y = 930 \]
   \[ 1X + 1Y = 8000 \]
   \[ X = \$5000 \text{ in 15\% stocks} \]
   \[ Y = \$3000 \text{ in 6\% stocks} \]

6. \[ 1X + 1Y = 75 \]
   \[ 5X + 10Y = 595 \]
   \[ X = 31 \text{ nickels} \]
   \[ Y = 44 \text{ dimes} \]

7. \[ 1X + -2Y = -482 \]
   \[ 1X + 1Y = 12118 \]
   \[ X = 7918 \text{ miles – Earth’s diameter} \]
   \[ Y = 4200 \text{ miles – Mars’ diameter} \]

8. \[ 3X + -1Y = 5 \]
   \[ 1X + 1Y = 55 \]
   \[ X = 15 \text{ years – Joel’s age} \]
   \[ Y = 40 \text{ years – Joel’s father’s age} \]
Solve Problems with Matrices!

Directions: Write the equations in $Ax + By$ form and solve using matrices.

<table>
<thead>
<tr>
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<td>1. Davis Rent-A-Car charges a fixed amount per weekly rental plus a charge for each mile driven. A one-week trip of 520 miles costs $250, and a two-week trip of 800 miles costs $440. Find the <strong>weekly charge</strong> and the <strong>charge per mile</strong>.</td>
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<td>$\underline{x} + \underline{y} = \underline{C}$</td>
<td>$Y =$</td>
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Day 8 Lesson Plan

Objective: Practice using matrices to solve systems of equations that were previously solved by other methods.

Activities:

- Work on Solve the Systems of Equations with Matrices! in groups.
- Have students check their answers from previous handouts/quizzes in their binders:
  #1-12: Solve the Systems of Equations
  #13-16: Quiz: Solving Systems by Any Method
  #17-24: Solving Coin Problems

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Answer Key:

1. x = -3, y = -8
2. x = 9, y = 2
3. x = 7, y = 1
4. x = 4, y = 9
5. x = 1, y = 3
6. x = 4, y = -2
7. x = 2, y = -3
8. x = 4, y = -2
9. x = 3, y = -2
10. x = 2, y = -1
11. x = 2, y = 1
12. x = 2, y = -4
13. x = 4, y = -5
14. x = 7, y = 3
15. x = 5, y = 5
16. x = 2, y = 5
17. N=7, Q=21
18. P=220, D=11
19. P=11, N=19
20. P=82, D=93
21. N=7, Q=2
22. N=9, H=12
23. D=7, Q=11
24. D=12, Q=28
Solve the Systems of Equations with Matrices!

Directions: Solve the following systems of equations using matrices. Remember to change equations to $Ax + By = C$ form before entering them into the matrices!

1. \[ \begin{align*}
y &= 3x + 1 \\
2x + y &= -14
\end{align*} \]

2. \[ \begin{align*}
y &= x - 7 \\
x + y &= 11
\end{align*} \]

3. \[ \begin{align*}
y &= x - 6 \\
4x + 3y &= 31
\end{align*} \]

4. \[ \begin{align*}
x + y &= 13 \\
y &= x + 5
\end{align*} \]

5. \[ \begin{align*}
4x + 3y &= 13 \\
5x - 3y &= -4
\end{align*} \]

6. \[ \begin{align*}
2x - y &= 10 \\
3x + y &= 10
\end{align*} \]

7. \[ \begin{align*}
5x - 3y &= 19 \\
2x + 3y &= -5
\end{align*} \]

8. \[ \begin{align*}
3x - 2y &= 16 \\
7x + 2y &= 24
\end{align*} \]

9. \[ \begin{align*}
4x - 3y &= 18 \\
2x + y &= 4
\end{align*} \]

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

11. \[ \begin{align*}
2x + 5y &= 9 \\
x + 3y &= 5
\end{align*} \]

12. \[ \begin{align*}
5x - 2y &= 18 \\
3x + y &= 2
\end{align*} \]
13. \( y = x - 9 \)  
\( 3x + y = 7 \)

14. \( 2y - x = -1 \)  
\( 2y + 3x = 27 \)

15. \( 6x - 3y = 15 \)  
\( 2x + y = 15 \)

16. \( 2x + y = 9 \)  
\( y = 3x - 1 \)

17. \( Q = 3N \)  
\( 25Q + 5N = 560 \)

18. \( P = 20D \)  
\( P + 10D = 330 \)

19. \( N = P + 8 \)  
\( P + 5N = 106 \)

20. \( D = P + 11 \)  
\( P + 10D = 1012 \)

21. \( Q = N - 5 \)  
\( 5N + 25Q = 85 \)

22. \( N = H - 3 \)  
\( 5N + 50H = 645 \)

23. \( D + Q = 18 \)  
\( 10D + 25Q = 345 \)

24. \( D + Q = 40 \)  
\( 10D + 25Q = 820 \)
Day 9 Lesson Plan

Objective: Use system of equations toolbox to set up Math A problems.

Activities:

• Students will work together on Lab: Set Up Math A Systems of Equations Problems which requires them to define variables, set up equations, choose method of solution, and give a reason for their choice. The lab will be due by the end of class.
• Students will be told to review their notes and make sure they are able to use their system of equations toolbox to solve 6 of the 10 problems as a test the next day.

Answer Key: Lab: Set Up Math A Systems of Equations Problems

Note: Methods and reasons not listed as they will vary. Variables chosen will be different too!

1. M = Mary’s material (yards)  A = Amy’s material (yards)
   M + A = 20 – 2         M = 3A

2. A = # of adults       C = # of children
   A + C = 148            12A + 9C = 1410

3. A = # of adult tickets C = # of children tickets
   A + C = 150            7.5A + 4.75C = 891.25

4. B = # of balcony tickets M = # of main floor tickets
   B = M + 100            4B + 12M = 3056

5. N = # of nickels      D = # of dimes
   N = 2D                5N + 10D = 420

6. S = hourly cost of sprayer G = hourly cost of generator
   6S + 6G = 90           4S + 8G = 100

7. T = # of t-shirts     C = # of caps
   T = 3C                5T + 2.5C = 210

8. A = # advance tickets D = # door tickets
   A = 2D                A + D = 600          Total = 25A + 32D

9. P = pizza price       C = cola price
   3P + 2C = 6           2P + 3C = 5.25

10. G = # of grasshoppers C = # of crickets
    G + C = 561           G = 2C
Directions: Read each question, define variables, write equations, state the method you will use to solve the problem, and the reason. You will receive 1 point for variables/equations and 1 point for method/reason.

1. Mary and Amy had a total of 20 yards of material from which to make costumes. Mary used three times more material to make her costume than Amy used, and 2 yards of material was not used. How many yards of material did Amy use for her costume?

2. A group of 148 people is spending five days at a summer camp. The cook ordered 12 pounds of food for each adult and 9 pounds of food for each child. A total of 1,410 pounds of food was ordered. Find the total number of adults and children in the group.

3. The owner of a movie theater was counting the money from 1 day’s ticket sales. He knew that a total of 150 tickets were sold. Adult tickets cost $7.50 each and children’s tickets cost $4.75 each. If the total receipts for the day were $891.25, how many of each kind of ticket were sold?

4. There were 100 more balcony tickets than main-floor tickets sold for a concert. The balcony tickets sold for $4 and the main-floor tickets sold for $12. The total amount of sales for both types of tickets was $3,056. Find the number of balcony tickets that were sold.

5. Ben had twice as many nickels as dimes. Altogether, Ben had $4.20. How many nickels and how many dimes did Ben have?
6. Ramon rented a sprayer and a generator. On his first job, he used each piece of equipment for 6 hours at a total cost of $90. On his second job, he used the sprayer for 4 hours and the generator for 8 hours at a total cost of $100. What was the hourly cost of each piece of equipment?

7. The ninth graders at a high school are raising money by selling T-shirts and baseball caps. The number of T-shirts sold was three times the number of caps. The profit they received for each T-shirt sold was $5.00 and the profit on each cap was $2.50. If the students made a total profit of $210, how many T-shirts and how many caps were sold?

8. A total of 600 tickets were sold for a concert. Twice as many tickets were sold in advance than were sold at the door. If the tickets sold in advance cost $25 each and the tickets sold at the door cost $32 each, how much money was collected for the concert?

9. Tanisha and Rachel had lunch at the mall. Tanisha ordered three slices of pizza and two colas. Rachel ordered two slices of pizza and three colas. Tanisha’s bill was $6.00 and Rachel’s bill was $5.25. What was the price of one slice of pizza? What was the price of one cola?

10. Arielle has a collection of grasshoppers and crickets. She has 561 insects in all. The number of grasshoppers is twice the number of crickets. Find the number of each type of insect that she has.
Day 10 Lesson Plan

Objective: Check students understanding of solving systems of equations word problems.

Activities:

- Students will be given back corrected Lab: Set Up Math A Systems of Equations Problems
- Each student will pick 6 problems to do individually as a test on this unit. Work will be done on separate paper and attached to the original lab. Each question will be scored on a 4 point rubric for a total of 24 points. The score will be converted to a total out of 40 test points.

Answer Key: Math A Systems of Equations Problems

1. 4.5 yards
2. 26 adults, 122 children
3. 65 adult tickets, 85 students tickets
4. 266 balcony tickets
5. 42 nickels, 21 dimes
6. $5 for sprayer, $10 for generator
7. 36 t-shirts, 12 caps
8. $16,400
9. $1.50 for slice of pizza, $0.75 for cola
10. 374 grasshoppers, 187 crickets