Section 5.4 Systems of Linear Equations and Problem Solving

Before Class:

☐ Read the objective on page 324.

☐ Write the four steps to solving word problems using a system of two equations.

1.

2.

3.

4.

During Class:

☐ Write your class notes. Neatly write down all examples shown as well as key terms or phrases with definitions. If not applicable or if you were absent, watch the Lecture Series (DVD) for this section and do the same (write down the examples shown as well as key terms or phrases). Insert more paper as needed.

<table>
<thead>
<tr>
<th>Class Notes/Examples</th>
<th>Your Notes</th>
</tr>
</thead>
</table>

Answers: 1) Understand the problem. 2) Translate the problem into two equations. 3) Solve the system of equations. 4) Interpret the results.
(Insert additional paper as needed.)

Class Notes (continued) | Your Notes
Section 5.4 Systems of Linear Equations and Problem Solving

Practice:

☐ Complete any incomplete exercises below. Check and correct your work using the answers and references at the end of this section.

Review this example:
1. Find two numbers whose sum is 37 and whose difference is 21.

UNDERSTAND. Read and reread the problem. Let \( x \) = first number, and \( y \) = second number.

TRANSLATE.
\[
\begin{align*}
x + y &= 37 \\
x - y &= 21
\end{align*}
\]

SOLVE. Solve the system \[
\begin{cases}
x + y &= 37 \\
x - y &= 21
\end{cases}
\]

The coefficients of the variable \( y \) are opposites. Solve by the addition method.
\[
\begin{align*}
2x &= 58 \\
x &= \frac{58}{2} = 29
\end{align*}
\]

Let \( x = 29 \) in the first equation to find \( y \).
\[
\begin{align*}
x + y &= 37 \\
29 + y &= 37 \\
y &= 8
\end{align*}
\]

INTERPRET. The solution of the system is \((29, 8)\).

Check: Notice that the sum of the 29 and 8 is 37 and their difference is 21.

The numbers are 29 and 8.

Your turn:
2. Two numbers total 83 and have a difference of 7. Find the two numbers.
Section 5.4 Systems of Linear Equations and Problem Solving

**Review this example:**

3. Eric needs 10 liters of a 20% saline solution (salt water). The only mixtures on hand are a 5% saline solution and a 25% saline solution. How much of each solution should he mix to produce the 20% solution?

**UNDERSTAND.** Read and reread the problem. Let \( x = \) number of liters of 5% solution, and \( y = \) number of liters of 25% solution.

<table>
<thead>
<tr>
<th>Concentration Rate</th>
<th>Liters of Solution</th>
<th>Liters of Pure Salt</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Solution</td>
<td>5%</td>
<td>( x )</td>
</tr>
<tr>
<td>Second Solution</td>
<td>25%</td>
<td>( y )</td>
</tr>
<tr>
<td>Mixture Needed</td>
<td>20%</td>
<td>10</td>
</tr>
</tbody>
</table>

**TRANSLATE.**

\[ x + y = 10 \]
\[ 0.05x + 0.25y = (0.20)(10) \]

**SOLVE.** Solve the system by the addition method.

\[ \begin{align*}
-25x - 25y &= -250 \\
5x + 25y &= 200 \\
-20x &= -50 \\
x &= 2.5
\end{align*} \]

Let \( x = 2.5 \) in the first equation of the original system and solve for \( y \):  
\[ x + y = 10 \]
\[ 2.5 + y = 10 \]
\[ y = 7.5 \]

**INTERPRET.**

Eric needs to mix 2.5 liters of 5% saline solution with 7.5 liters of 25% saline solution.

**Your turn:**

4. Doreen Schmidt is a chemist with Gemco Pharmaceutical. She needs to prepare 12 ounces of a 9% hydrochloric acid solution. Find the amount of a 4% solution and the amount of a 12% solution she should mix to get this solution.

<table>
<thead>
<tr>
<th>Concentration Rate</th>
<th>Ounces of Solution</th>
<th>Ounces of Pure Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.04</td>
<td>( x )</td>
<td>0.04x</td>
</tr>
<tr>
<td>0.12</td>
<td>( y )</td>
<td>?</td>
</tr>
<tr>
<td>0.09</td>
<td>12</td>
<td>?</td>
</tr>
</tbody>
</table>

**Answer Text Ref Video Ref Answer Text Ref Video Ref**

1. 29 and 8 Ex 1, p. 324 2. 33 and 50 Sec 5.4, Ex 11

3. 5% solution: 2.5 L; 25% solution: 7.5 L 4. 12% solution: 7.5 oz; 4% solution: 4.5 oz

**Next, insert your homework.** Make sure you attempt all exercises asked of you and show all work, as in the exercises above. Check your answers if possible. Clearly mark any exercises you were unable to correctly complete so that you may ask questions later. DO NOT ERASE YOUR INCORRECT WORK. THIS IS HOW WE UNDERSTAND AND EXPLAIN TO YOU YOUR ERRORS.