A STRATEGY FOR SOLVING WORD PROBLEMS

**Step 1.** Read the problem carefully. Attempt to state the problem in your own words and decide what the problem is looking for. Let \( x \) represent one of the unknown quantities in the problem.

**Step 2.** If necessary, write algebraic expressions for any other unknown quantities in the problem in terms of \( x \).

**Step 3.** Write a summary of the problem in formula form. Then write an equation in \( x \) based on your summary.

**Step 4.** Solve the equation and then write a sentence explaining the answer to the problem's question.

**Step 5.** Check your work. Remember to include the correct units in your answer. Ask yourself "Is my answer reasonable?"

Problem #1) Two of the most expensive movies ever made were *Titanic* and *Waterworld*. The cost to make *Titanic* exceeded the cost to make *Waterworld* by $25 million dollars. The combined cost to make the two movies was $375 million dollars. Find the cost of making each of these movies.

<table>
<thead>
<tr>
<th>Step 1.</th>
<th>Let ( x ) = the cost of making <em>Waterworld</em> in millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 2.</td>
<td>Then ( x + 25 ) = the cost of making <em>Titanic</em> in millions</td>
</tr>
</tbody>
</table>
| Step 3. | \[
\begin{align*}
\text{the cost of Waterworld} + \text{the cost of Titanic} &= \text{total cost} \\
\frac{x}{x} + \frac{(x + 25)}{375} &= 375
\end{align*}
\]
| Step 4. | \[
\begin{align*}
x + (x + 25) &= 375 \\
2x + 25 &= 375 \\
2x &= 350 \\
x &= 175
\end{align*}
\]  
*The cost of making Waterworld was $175 million dollars and the cost of making Titanic was $200 million dollars.*

| Step 5. | Check: \[
\begin{align*}
x + (x + 25) &= 375 \\
175 + (175 + 25) &\neq 375 \\
175 + 200 &= 375 \checkmark
\end{align*}
\] |
Problem #2.) A basketball court is a rectangle with a perimeter of 86 meters. The length is 13 meters more than the width. Find the width and length of the basketball court.

**Step 1.**  \( P > B = > 2 / A 3. > 2 / \) 

**Step 2.** \( x / 2 / 8 B \) 

**Step 3.** \( \# \hat{t} > 2 / A 3. > 2 \# \hat{t} > 2 / 6 / 81 > 2 \hat{t} = T / 37 / \hat{t} / < S \) 

**Step 4.** \( \# B \hat{t} \) 

**Step 5.** Check: \( \# B \hat{t} \) 

Problem #3) After a 20% reduction, you purchase a television for $320. What was the television's price before the reduction?

**Step 1.** \( P > B = > 2 / 9 < 3138 + 6: c / 3 - / 90 > 2 / 9 < 3138 + 6: / \) 

**Step 2.** \( x / 2 / 9 < 3138 + 6: c / 3 - / 7 : / 3 = \) 

**Step 3.** \( > 2 / 9 < 3138 + 6: c / 3 - / \) 

**Step 4.** \( \# B \) 

**Step 5.** Check: $ \# B \hat{t} \)
Problem #4) Suppose that you invested $25,000 part at 9% simple interest and the remainder at 12%. If the total yearly interest from these investments was $2,550, find the amount invested at each rate.

**Step 1.** Let \( x \) = principal invested at 9%

**Step 2.** Then \( 25,000 - x \) = principal invested at 12%

**Step 3.**

\[
\begin{align*}
\text{int. from investment \#1} & + \text{int. from investment \#2} = \text{total interest} \\
0.09x & + 0.12(25,000 - x) = 2,550.00
\end{align*}
\]

**Step 4.**

\[
0.09x + 0.12(25,000 - x) = 2,550.00
\]

\[
100[0.09x] + 100[0.12(25,000 - x)] = 100[2,550.00]
\]

\[
9x + 12(25,000 - x) = 255,000
\]

\[
9x + 300,000 - 12x = 255,000
\]

\[
-3x + 300,000 = 255,000
\]

\[
-3x = 255,000 - 300,000
\]

\[
-3x = -45,000
\]

\[
-3x = -45,000
\]

\[
x = 15,000
\]

$15,000 was invested at 9% and $10,000 was investe at 12%. ★

**Step 5.** Check:

\[
0.09x - 0.12(25,000 - x) = 2,550.00
\]

\[
0.09 \cdot 15,000 - 0.12 \cdot (25,000 - 15,000) = 2,550
\]

\[
0.09 \cdot 15,000 - 0.12 \cdot 10,000 = 2,550
\]

\[
1,350 + 1,200 = 2,550
\]

Problem #5) How many ounces of a 50% alcohol solution must be mixed with 80 ounces of a 20% alcohol solution to make a 40% alcohol solution?

**Step 1.** Let \( x \) = the number of ounces of 50% solution

**Step 2.** There is no step 2 in this problem...

**Step 3.**

\[
\text{alcohol in 50\% solution} + \text{alcohol in 20\% solution} = \text{alcohol in 40\% solution}
\]

\[
0.50x + 0.20 \cdot 80 = 0.40(x + 80)
\]

**Step 4.**

\[
0.50x + 0.20(80) = 0.40(x + 80)
\]

\[
100[0.50x] + 100[0.20(80)] = 100[0.40(x + 80)]
\]

\[
50x + 20(80) = 40(x + 80)
\]

\[
50x + 1,600 = 40x + 3200
\]
\[50x - 40x = 3,200 - 1,600\]
\[10x = 1,600\]
\[x = 160\]

160 ounces of the 50% alcohol solution must be mixed with 80 ounces of a 20% alcohol solution to make a 40% alcohol solution. ★

**Step 5.** Check:
\[0.50x + 0.20(80) = 0.40(x + 80)\]
\[0.50 \cdot 160 + 0.20(80) = 0.40(160 + 80)\]
\[80 + 16 = 0.40 \cdot 240\]
\[96 = 96\checkmark\]

Problem #6) Two cyclists, one averaging 10 miles per hour and the other 12 miles per hour, start from the same town at the same time. If they travel in opposite directions, after how long will they be 66 miles apart?

**Step 1.** Let \( t \) = the number of hours until the two cyclists are 60 miles apart

**Step 2.** There is no step 2 in this problem...

**Step 3.**
\[
\begin{align*}
\text{distance of cyclist 1} & \quad + \quad \text{distance of cyclist 2} = \text{total distance} \\
10t & \quad + \quad 12t & = \quad 66
\end{align*}
\]

**Step 4.**
\[10t + 12t = 66\]
\[22t = 66\]
\[t = 3\]

The two cyclists will be 66 miles apart in 3 hours. ★

**Step 5.** Check: 3 hours seems like a reasonable amount of time for the two cyclists to be 66 miles apart.
\[10t + 12t = 66\]
\[10 \cdot 3 + 12 \cdot 3 = 66\]
\[30 + 36 = 66\checkmark\]