I. Use Systems of Equations to Solve Application Problems.  

A. Setting up the Problem.  

1) For **geometric** problems, draw a **picture** and label what is known.  
2) For problems involving **simple interest**, set up a table using $I = Prt$.  
3) For problems involving **travel**, set up a table using $d = rt$.  
4) For problems involving **mixtures**, set up a table using either $\text{Quantity} \times \text{Price} = \text{Value}$ or $\text{Quantity} \times \text{Strength} = \text{Amount of Substance}$.  
5) For other types of problems, let $x =$ one of the unknown quantities and $y =$ the other unknown. Write equations using what is known.  

B. Solving the Problem.  

1) If you want a **general idea** of the solution, or want to see the **entire picture**, use the graphing method.  
2) If you need an exact solution, use either the substitution method or the addition method.  
3) If one of the equations is written in terms of one of the variables, the substitution method might be easier than the addition method.  

**Example 1** Use systems of equations to solve each problem.  

a) Angles $A$ and $B$ are complementary. If angle $A$ is $34^\circ$ smaller than angle $B$, find the measure of each angle.  

b) Determine the dimensions of a rectangle having a perimeter of 184 millimeters and whose length is 24 millimeters greater than the width.
c) Admission to a community college basketball game is $5.00 for students and $12.00 for regular. At a recent game, 1750 people were admitted to the game. The receipts for admission totaled $12,313. How many student admissions and how many regular admissions were sold?

d) At a recent benefit for Valley Churches United, raffle tickets were sold at a price of $5.00 for adults and $1.00 for children. If a total of 143 tickets were sold for $487.00, how many of each type of ticket were sold?

e) VCU would like to have promotional flyers printed for their benefit concert. QuickPrint charges $0.05 per copy, plus a one-time setup fee of $10.00. Accuprint charges $0.04 per copy, plus a one time $25.00 setup fee. At what number of copies will the total cost be the same for the two companies?
f) John and Rosemary are considering Chaminade or Coconut Grove to rent for their wedding reception. Chaminade charges $800 plus $25 per person for food. Coconut Grove charges $200 plus $30 per person for food. How many people are needed for the total cost to be the same?

\[
\text{Chaminade: } 800 + 25p = 200 + 30p \\
\text{Solving for } p: \quad 600 = 5p \quad \Rightarrow \quad p = 120
\]

Thus, 120 people are needed for the total cost to be the same.

g) Two people travel in opposite directions on an interstate. They leave at the same time with one person traveling 10 mph faster than the other. Determine both speeds if they are 600 miles apart 5 hours later.

\[
\begin{align*}
\text{Traveler} & \quad \text{Rate} & \quad \text{Time} & \quad \text{Distance} \\
\hline
\text{Traveler 1} & \quad 50 & \quad 5 & \quad 250 \\
\text{Traveler 2} & \quad 40 & \quad 5 & \quad 200
\end{align*}
\]

h) Peanuts sell for $2.00 per pound, and cashews sell for $6.00 per pound. How many pounds of each should be used to obtain 10 pounds of a mixture that sells for $4.40 per pound?

**Table:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Price</th>
<th>Value of Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peanuts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cashews</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mixture</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\text{Let } x = \text{Pounds of Peanuts, then } 10 - x = \text{Pounds of Cashews} \\
\text{Price equation: } \quad 2x + 6(10 - x) = 4.4 \times 10 \quad \Rightarrow \quad 2x + 60 - 6x = 44 \quad \Rightarrow \quad 4x = 16 \quad \Rightarrow \quad x = 4
\]

Thus, 4 pounds of Peanuts and 6 pounds of Cashews should be used to obtain the mixture.