SOLVING MIXTURE WORD PROBLEMS

Below are some definite steps you might regularly follow in solving problems. You may not use them all the time, and they may not remain in the same order, but they are basic to problem solving in math. Each step will be followed by an example.

Problem: Suppose a candy store has 40 pounds of candy that sells for $1.40 a pound but has not been selling well lately. The owner believes that the price may be too high, but he does not want to lose any profit. How much candy selling for $1 a pound should be mixed with the 40 pounds of $1.40 a pound of candy to make a mixture that will sell for $1.25 a pound?

1. Read through the problem once at a moderate speed to obtain an overall picture of the purpose of the problem. Find out what the problem is asking and determine what answers are required.

   Example: What answers are required? You want to know (as stated in the problem), "How much candy selling for $1 a pound should be used?" Note that the unit of the answer will be pounds.

2. Note relevant details that give you information on the problem. Symbolize what is given and what is required.

   Example: Let x = # of pounds of candy selling for $1/lb. Other relevant details include:
   - 40 lbs. of candy selling for $1.40/lb.
   - The total mixture sells for $1.25/lb.

3. Always try to diagram the problem no matter how basic the problem seems. This will help you visualize the problem.

   Example: FIG. 1

	x	=	
x lbs.	$1.00/lb.	**1x**	+
40 lbs.	$1.40/lb.	**56**	=
x + 40	$1.25/lb.	**1.25(x+40)**	

4. Estimate a reasonable answer to the problem.

   Example: If 40 lbs. of candy selling for $1/lb. is mixed with the 40 lbs. of candy selling for $1.40/lb., the total mixture would be worth $1.20/lb. Because the total mixture is worth more than $1.20/lb., less of the cheaper candy must be in the mixture, so your estimate should be less that 40 lbs. 30 lbs. would be a good estimate.

5. Formulate a tentative strategy for reading a conclusion. This can be a tedious process. Be sure to consider and exhaust all possibilities. If you have trouble with this step:

   a. Try to relate the problem to a type you've seen before.

   Example: If you have seen this type of problem before, you know the equation should be of the form:

   value of candy selling for $1/lb. + value of candy selling for $1.40/lb.
   =
   value of the total mixture

If you haven't seen this type of problem before, you may be able to guess this equation from the diagram in #3. If you're unable to get the form of the equation, go on to the next step.

b. From the given information, ascertain whether the problem can be solved directly or whether you will have to generate needed information. Work a part of the problem and relate it to the whole.

Example: This problem can be solved directly by using one equation. This step is good when the solution to a problem is obtained through a series of steps or equations.

c. Try to work a simpler case of the problem.

Example: For this example, this illustration may seem simple; however, it is a good demonstration of this step. How can you figure out the value of selling candy at a certain price per pound?

Using multiplication or division seems reasonable, but how do you decide which one? Make up a simple problem.

How much does 3 lbs. of candy selling for $2/lb. cost?

3 lbs. of candy selling for $2/lb. is worth $6.

How was the $6 obtained? Did you multiply or divide? You multiplied:

3 lb. x $2/lb. = $6.

You could make up a few more examples like this to be sure that it is correct to use multiplication.

Therefore:

value = (number of pounds) x (cost per pound)

You now know how to figure out value.

d. Work backwards. Ask yourself, "What do I need to know in order to write down the solution easily? And what need I know in order to know <u>that</u>?" And so on.

Example: This is not applicable to this problem because the problem can be solved directly by using one equation. This step is good when the solution to a problem is obtained by a series of steps.

e. If all else fails, generate any information you can from the given information.

Example: You might have tried 40 lbs. x $1.40/lb to get $56. This would have told you the total value of the candy selling for $1.40/lb. If you had been stuck, this might have gotten you onto the right track. Always try to be creative if you get to this step.

Using: Value + Value = Total Value
Value = (number of pounds) x (cost per pound)

Write the equation:

($1/lb.) x (xlb.) + ($1.40/lb.) x (40lb.) = ($1.25/lb.) x (x + 40)lb.

OR

1x + 1.40(40) = 1.25(x + 40) (look back to FIG.1)

6. Work through the procedure to obtain a solution.

Example: 1x + 1.40(40) = 1.25(x + 40)
1x + 56 = 1.25x + 50
-50 -50
1x + 6 = 1.25x
-1x -1x
6 = .25x
so x = 6/.25
x = 24

7. Check solution against (a.) prior estimate and (b.) the result of inserting the answer back into the problem. Check your work for accuracy.

Example:
a. 24 lbs. is close to 30 lbs.
b. $1/lb. x 24 lbs. = $24 (value of candy selling for $1/lb.)

$1.40/lb. x 40 lb. = $56 (value of candy selling for $1.40/lb.)
$1.25/lb. x 64 lb. = $80 (value of total mixture)

$24 + $56 = $80 So 24 is correct.

8. Organize the solution so that it reads in a clear, logical manner.

Example: The owner should use 24 lbs. of candy selling for $1/lb.

Problems:

1. A lab assistant needed 20 ounces of a 10% solution of sulfuric acid. If he has 20 ounces of a 15% solution, how much must he draw off and carefully replace with distilled water in order to reduce it to a 10% solution?

2. Mary needs a 50% solution of alcohol. How many liters of pure alcohol must she add to 10 liters of 40% alcohol to get the proper solution?

3. Jones has a 90% solution of boric acid in his pharmacy, which he reduces to the required strength by adding distilled water. How much solution and how much water must he use to get 2 quarts of 10% solution?

4. The Dingles have some friends drop in. They wish to serve sherry but do not have enough to serve all the same kind. So they mix some which is 20% alcohol with some which is 14% alcohol and have 5 quarts, which is 16% alcohol. How much of each kind of sherry did they have to mix?

Answers:
1. (20/3 ounces)
2. (2 liters)
3. (2/9, 16/9 quarts)
4. (5/3, 10/3 quarts)