Example 3.1 — Corn Field

ANALYSIS PROCESS - ANNOTATED	WHAT THE PROBLEM-SOLVER DOES

Process - Analysis

Read the problem!

"A rectangular corn field is four times longer than it is wide. Its perimeter is 3000 feet. What is the area of the field?"

Phase 1 - Preparation: Know the problem *thoroughly*

+ Read the problem - again.

Comment: Yes, we *actually* re-read it word for word! *Every* word. Slowly and carefully, too.

"A rectangular field is four times longer than it is wide. Its perimeter is 3000 feet. What is the area of the field?"

+ Restate the information given clearly and completely.

Comment: It's okay to use your own words here but be *clear and complete.* When you need to look back at this, you want it to be a help.

Rectangular field - 4 times longer than wide
Perimeter - 3000 feet.

+ In words, write down what is to be found.

To find: *Area of the field*

Phase 2 - Translation to Symbolic Representation:

+ Draw the diagrams.

Comment: If a drawing can be made from the problem statement, then make it now, at least as much as is possible. Be careful to interpret the words and translate them correctly.

length = x = 4 y ft.

Corn Field

Perimeter = 3000 feet

width = y ft

Note that the drawing defines some symbols. Units, too.

Comment: It cannot be emphasized too much how important such a drawing is to getting a solution, a *correct* solution, to this and other kinds of problems.

Comment: Drawings involving geometric shapes can be freehand, but neat — and big — and should be approximately to scale. Math problems should be worked on graph paper (e.g., quarter inch); this makes doing sketches much easier. The field above looks about four times as long as wide.

Comment: Drawings should include any labels or dimensions that are obvious from the problem statement. This drawing shows that the corn field perimeter is 3000 feet.

Example 13.10 — The 30% Solution

Problem

A man has 10 gallons of a 50% sulphuric acid solution, 20 gallons of a 20% solution, and 5 gallons of a 10% solution. He wants to use up all the 10% solution and make 15 gallons of 30% solution. How much of each solution should he use?

Solution by Analysis

+ Read the problem thoroughly - again.

"A man has 10 gallons of a 50% sulphuric acid mixtue, and 20 gallons of a 20% solution, and 5 gallons of a 10% solution. He wants to use up all the 10% solution and make 15 gallons of 30% solution. How much of each solution should he use?"

+ Restate the information given clearly and completely.

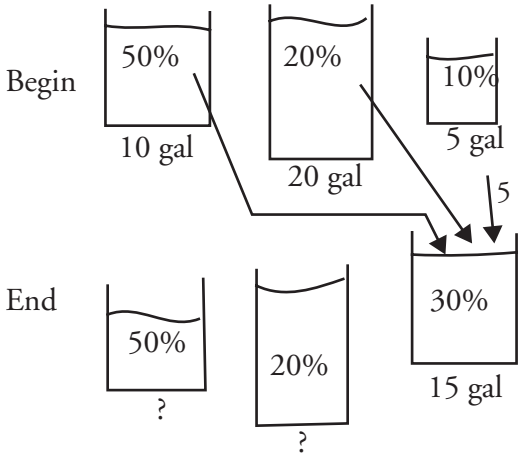
On hand: 10 gal of 50% mixture
20 gal of 20% solution
5 gal of 10% solution
Use ALL the 10% solution
Make 15 gal of 30% solution

+ Write down what is to be found.

Find Amt of 50% and 20% solution to use.

Phase 2 - Translation

+ Draw the diagrams

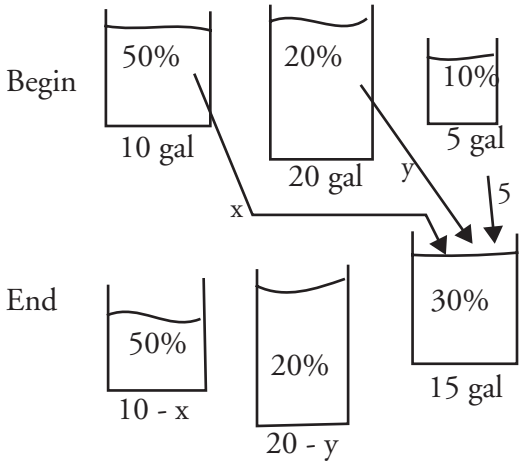


+ Define the Symbols:

Let x = amt of 50% solution to use, gal

Let y = amt of 20% solution to use, gal.

Add symbols to drawing:



+ **To Find**: x and y

+ **Equations:** The problem statement provides information for two equations:

1. *Total volume balance:*

Vol = x + y + 5 = 15 gal *(1)*

2. *Acid balance:*

Acid in final mixture: 15 (.3) = 4.5 gal

Consists of: x (0.5) + y (0.2) + 5 (.10) = 4.5 *(2)*

Phase 3 - Application

+ The math exercise now is to solve eqns (1) and (2) for x and y.

+ Doing it: from (1) x = 10 - y

from (2) .5 (10 - y) + .2 y + 0.5 = 4.50

5 - .5 y + .2 y +0.5 = 4.50

- .3 y = -1.0 y = 3.33 gal 20% solution

x = 6.67 gal 50% solution

Phase 4 - Checking

Total Vol = 2.5 + 7.5 + 5 = 15 gal *Checks*

Acid Amt, Gal =
= 3.33(.20) + 6.67 (.5) + 5 (.1) = 4.50 gal

4.50 / 15 = .3 = 30% *Checks*