

*Thanks for looking at our
'Word' problem examples*

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Tables of the types of 'word' problems
solved in Chapter 4.

Below the Tables

There are four sample problems presented.

They have three levels of difficulty

- Easier
- Moderate
- Harder

Scroll or page down for the table of problem
types and the four samples

For More Information on
Solving Math Problems
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Lists of Word Problems in Chapter 4

Easier Word Problems

Topic	Title
Coins	Coin Collection
Numbers	Mystery Number
Age	Brother and Sister
Average	She Needs an A
Interest	High Interest
Mixtures	Gold and Silver
Geometry	Corn Field
Geometry	Cylindrical Tank
Ratio/Proportion	The Shadow Knows
Two Unknowns	Hard Working Son
Mixture	Anti-Freeze
Time/Rate/Distance	As the Crow Didn't Fly
Geometry	Making a Box
Graphs/Functions	Cricket Thermometer
Per	High Cost of Gasoline
Geometry	Does He Have Enough Fence?
Interest	Stocks and Bonds
Time/Rate/Distance	Meeting Time and Place
Geometry	Squaring the Circle

Moderate Word Problem

Topic	Title
Coins	Money Bag
Numbers	Three Numbers
Age	Mother and Son
Two Unknowns	Sisters' Weights
Percent	Female Candidate
Time/Rate/Distance	Hybrid Car
Three Unknowns	Trip to Hardware store
Two Unknowns	Beading for Profit
Ratio/Proportions	Defective Parts
Geometry	Golden Goats
Mixtures	Chem Lab
Per	Snow on the Roof
Per Cent	Planting Oats
Average	Height of the Boys
Interest	Long Term Investment
Geometry	Size of Patio
Ratio/Proportion	Red, White, and Blue
Geometry	Circle the Square
Geometry	Incredible Silo
Per	Ocean Pressure
Time/Rate/Distance	Playing Catch-Up
Ratio/Proportion	New Dress Code and Homecoming Queen

Harder Word Problems

Topic	Title
Graph/Functions	Gwyneth's Secret Grandpa - I
Graph/Function	Gwyneth's Secret Grandpa - II
Geometry	Cyclist on a Schedule
Graph/Function	Pumpkin Lobbing Contest
Geometry	Hexagon
Ratio/Proportion	Tom Paints a Fence
Interest	Cascading Discounts
Geometry	Circle the Equilateral
Geometry	Barrels of Fun
Average	Used Books
Mixture	The 30% Solution
Graph/Function	Falling for Dummies
Time/Rate/Distance	Stop That Car
Geometry	Circle the Diamond
Graph/Function	Cold Coffee
Time/Rate/Distance	Run For Your Life
Geometry	Halving the Triangle
Geometry	Finding the Golden Ratio from Geometry

Easy 'Word' Example

Problem

The sum of three numbers is 57. Four times the smallest is five more than the largest. Three times the smallest is ten more than the middle number. What are the numbers?

Solution By Analysis

Phase 1: Preparation

+ Read the problem thoroughly - again.

"The sum of three numbers is 57. Four times the smallest is five more than the largest. Three times the smallest is ten more than the middle number. What are the numbers?"

+ Restate the information given clearly and completely.

Three Numbers

Sum is 57

3 times smallest is five more than middle number.

4 times smallest is 5 more than the largest

+ Write down what is to be found.

What are the three numbers?

Phase 2 - Translation to Symbolic Representation:

+ Draw the diagrams: None needed

+ Define the Symbols:

Let A = smallest number

B = middle number

C = largest number

+ Graphs of Data or Functions

None here

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

$$\text{Sum of the numbers: } A + B + C = 57 \quad (1)$$

Relation of smallest to middle:

$$4A = C + 5 \quad (2)$$

Relation of smallest to largest:

$$3A = B + 10 \quad (3)$$

Phase 3 - Application

+ Math exercise is to solve the system of three equations (1), (2), and (3) for the three unknowns A, B, and C.

+ Solving by substitution:

$$(2) \quad C = 4A - 5$$

$$(3) \quad B = 3A - 10$$

$$(1) \text{ (2) and (3): } A + 3A - 10 + 4A - 5 = 57$$

$$8A = 72$$

$$A = 9$$

$$B = 17$$

$$C = 31$$

Phase 4 Checking

$$\text{Sum: } 9 + 17 + 31 = 57 \quad \text{Checks}$$

Equations (2) and (3) also check.

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Moderate Word Problem Example

Problem

A farmer plans to plant thirty-seven acres in corn and seventy-four acres in wheat. The remainder of his field, which is ten per cent of the total, will be planted in oats. What is the total acreage the farmer has to plant?

Phase 1 - Preparation

+ Read the problem thoroughly - again.

“A farmer plans to plant thirty-seven acres in corn and seventy-four acres in wheat. The remainder of his field, which is ten per cent of the total, will be planted in oats. What is the total acreage the farmer has to plant?”

+ Restate the information given clearly and completely.

Amt in wheat = 74 acres

Amt in corn = 37 acres

Amt in oats = 10 %

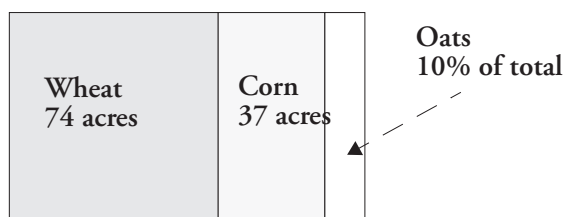
+ Write down what is to be found.

Find the total acreage

Phase 2 - Translation to Symbolic Representation:

Translate the given information into a Symbolic Representation of drawings, symbols, equations, graphs, and other as necessary.

+ Draw the diagrams . (Note: When a drawing is needed, it should usually be done first in this step Note that the drawing defines some symbols. Units, too.)



+ Graphs of Data or Functions

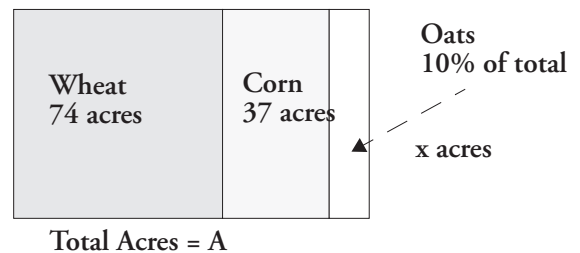
Not needed here.

+ Define the Symbols:

Let x = amt of acres in oats

Let A = total acreage

We can now add the symbols to the drawing:



+ Write what is to be found in symbols

Find Total Acres, A

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

$$\text{Fraction in oats} = 0.10 = x / A \quad (1)$$

$$\text{Total acres} = \text{wheat acres} + \text{corn acres} + \text{oats acres}$$

$$\text{Wheat acres} + \text{corn acres} + x = A \quad (2)$$

$$74 + 37 + x = A$$

$$111 + x = A \quad (2b)$$

Phase 3 - Application

+ Math exercise is to solve the system of two equations (1) and (2b) for the two unknowns x and A .

+ Solving: From (1) $x = 0.1 A$

$$\text{Substituting into (2b)} \quad 111 + 0.1 A = A$$

Thus the total acres, $A = 111 / 0.9 = 123.3$ acres

Phase 4 - Checking

$$\text{Amount in oats} = 0.1 (123.3) = 12.33 \text{ acres}$$

$$\text{Total} = 12.33 + 37 + 74 + 123.3 \text{ acres}$$

Annotated Moderate Example

Problem: A man's LDL cholesterol has risen 18.5% since his last physical, and is now at 206 mg/dl. (Milligrams per deciliter.) What was his LDL cholesterol at his last physical?

Solution by Analysis:

Phase 1 - Preparation: Know the problem thoroughly.

- Read the problem statement again

A man's LDL cholesterol has risen 18.5% since his last physical, and is now at 206 mg/dl. What was his LDL cholesterol at his last physical?

- Restate all the given information clearly

Increase in cholesterol since previous exam = 18.5%
Current cholesterol level = 206 mg/dl

- Write what is to be found using words

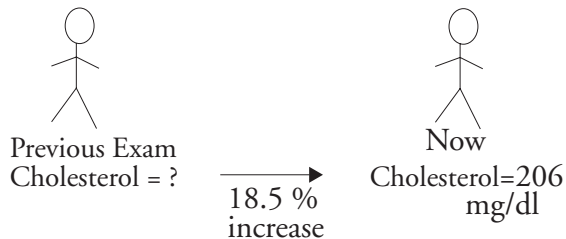
Find: Cholesterol level at previous physical.

Phase 2 - Translation to Symbolic Representation:

Translate the information given in words into a symbolic representation including drawings, defined symbols, equations and/or inequalities, graphs and/or tables, and anything else needed.

- Drawings

Comment. There's no farm field or geometric figures involved, but a drawing of some kind still is almost always useful in visualizing a problem. Sketches can show a sequence of events as described by the statement, or the relative size or position of objects, or actions that take place (such as pouring fluid out of or into a container.) In this example, the following little drawing makes the problem visually clear:



- Symbols

Comment. Okay, *what* symbols should be defined? The problem is about the cholesterol level. There's even a question mark in the drawing begging for a symbol definition. So an obvious one here is:

Let x = LDL cholesterol level at previous exam.

- Draw graphs that represent the data or functions given. Label axes clearly.

No graphs needed here.

- Express the unknowns in terms of the symbols.

The unknown to be found is x .

- Equations: Using the symbols defined, write the equations or inequalities that represent the relationships given by the words in the problem statement.

Comment: Look at the words, *think*, and *use* the symbol(s). Take the time needed, be careful and get the *right* equation. In this case, we should expect to find an equation in terms of cholesterol level.

Comment: Often, a word equation helps. Here:

Level at previous exam + 18.5% of level at previous exam = 206.

In symbols $x + 0.185x = 206$

Comment: Word equations are often important. In this problem a significant number of problem solvers get confused about what to do with the 18.5%. Some get a wrong answer by taking 18.5% of 206 (38.11) and subtracting that from 206. The problem statement for that action would be: "Cholesterol level at his previous exam is 18.5% less than his level now." And the word equation for this would be: Level at previous exam = Level Now - 18.5% of Level Now. This does not correspond to the actual problem statement or to the drawing we made — and it gets wrong answer.

Phase 3 - Application:

- State the math problem or exercise clearly. Solve equation (1) for x :

$$(1) \quad 1.185x = 206$$

- Solving gives $x = 206 / 1.185 = 173.8$ mg/dl

Phase 4 - Checking: Checking is an essential conclusion to the process. But the problem solver has to figure out how to do a proper check. You want to check more than just the accuracy of computations.

In this case, about all we can do is see if 173.8 plus 18.5% of 173.8 is indeed 206.

$$173.8 + (.185)(173.8) = 206 \quad \text{It checks.}$$

Harder 'Word' Example

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 mixture, 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*

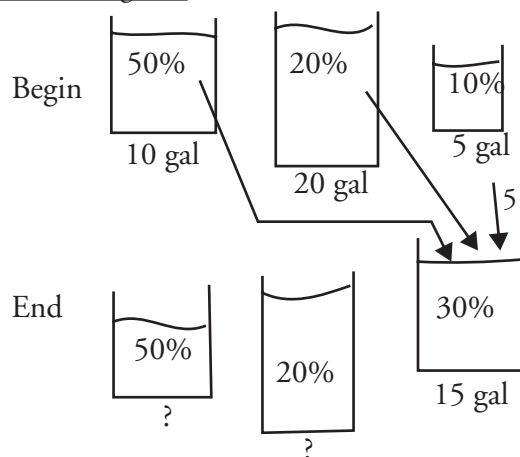
*Use ALL the 10% solution
Make 15 gal of 30% solution*

+ Write down what is to be found.

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

Phase 2 - Translation

+ Draw the diagrams

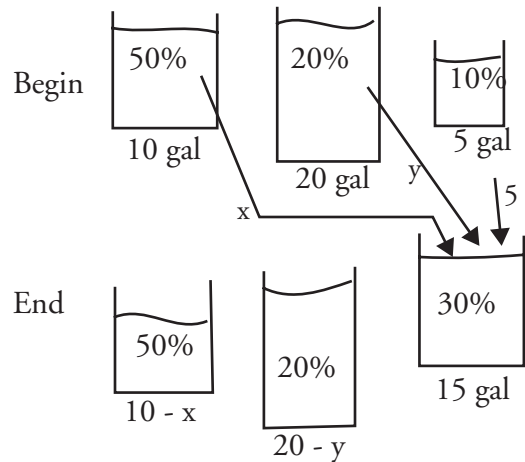


+ Define the Symbols:

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:*

$$\text{Vol} = x + y + 5 = 15 \quad \text{gal} \quad (1)$$

2. *Acid balance:*

$$\text{Acid in final mixture: } 15 (.3) = 4.5 \text{ gal}$$

$$\text{Consists of: } x (.5) + y (.2) + 5 (.10) = 4.5 \quad (2)$$

Phase 3 - Application

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

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

$$\text{from (2) } .5(10 - y) + .2y + 0.5 = 4.50$$

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

$$-.3y = -1.0 \quad y = 3.33 \quad \text{gal 20\% solution}$$

$$x = 6.67 \quad \text{gal 50\% solution}$$

Phase 4 - Checking

$$\text{Total Vol} = 2.5 + 7.5 + 5 = 15 \text{ gal} \quad \text{Checks}$$

Acid Amt, Gal =

$$= 3.33(.20) + 6.67(.5) + 5(.1) = 4.50 \text{ gal}$$

$$4.50 / 15 = .3 = 30\% \quad \text{Checks}$$