# MATHLISH

The most difficult part of word problems is converting from the language of English to the language of Mathematics. It is often difficult to go directly from written sentences to equations. This sheet presents "Mathlish", which is a mixture of English and Mathematics. Sometimes you cannot make the big jump directly from English to Mathematics, but you may be able to make the smaller jumps from English to Mathlish and then from Mathlish to Mathematics.


The following examples show the use of Mathlish. In each case, Mathlish is shown in dark print.

**Example 1**
A 22 inch rope is to be cut into two pieces so that one piece is 3 inches longer than twice the other. How long is each piece?

**length of short piece + length of long piece = 22 inches**
$x + y = 22$

**long piece = 3" more than 2 times short piece**
**long piece = 3 + 2 (short piece)**
$y = 3 + 2x$

**Example 2**
For a Saturday matinee, adult tickets cost $5.50 while children under 12 pay only $4.00. If 70 tickets are sold for a total of $310, how many of the tickets were adult tickets and how many were sold to children under 12?

*Note that we are concerned with both the number of tickets and the value of the tickets. The Mathlish must show this important distinction.*

**number of adult tickets + number of children's tickets = 70**
$x + y = 70$

**money from adult tickets + money from children's tickets = $310**
$5.50x + 4.00y = \$310$

**Example 3**
Dave is twice as old as Rick. Ten years ago the sum of their ages was 40. How old are they now.

*Note that we are concerned with their ages now and their ages ten years ago. The Mathlish must show clearly whether we are considering now or ten years ago.*

**Dave's present age = 2 times Rick's present age**
$y = 2x$

**Rick's previous age + Dave's previous age = 40**
$(x - 10) + (y - 10) = 40$

**Example 4**

A man has a collection of dimes and quarters with a total value of \$3.50. If he has seven more dimes than quarters, how many of each coin does he have?

*Note that we are concerned with both the number of the coins and the value of the coins. The Mathlish must clearly show which we mean.*

**value of dimes + value of quarters = \$3.50 dollars = 350 cents**
**10 times number of dimes + 25 times number of quarters = 350**
$10x + 25y = 350$

**has 7 more dimes than quarters**
**number of dimes = 7 more than number of quarters**
$x = 7 + y$

**Example 5**

Amy has \$10,000 to invest. She invests part at 6% and the rest at 7%. If she earns \$630 in interest for the year, how much does she have invested at each rate?

*Note that we are concerned with two different quantities: the money invested and the money earned each year. The Mathlish must clearly show which we mean.*

**money invested at 6% + money invested at 7% = \$10,000**
$x + y = 10{,}000$

**earnings from 6% investment + earnings from 7% investment = \$630**
**6% of x + 7% of y = 630**
$.06x + .07y = 630$

**Example 6**

A boat travels 54 miles up a river in the same amount of time it takes to travel 66 miles down the same river. If the current is 2 miles per hour (written as mph), what is the speed of the boat in still water?

*There are two things we must know to do this problem.*

1) *By definition, speed = distance / time, and so time = distance / speed.*

2) *The current increases the effective speed of the boat when the boat travels downstream (with the current). The current decreases the effective speed of the boat when the boat travels upstream (against the current). For example, if a boat's top speed in still water is 30 mph and the current is 5 mph, then the boat can go 35 mph downstream and 25 mph upstream.*

**time downstream = time upstream**

$$\frac{\text{distance down}}{\text{speed down}} = \frac{\text{distance up}}{\text{speed up}}$$

$$\frac{66}{\text{still water + current}} = \frac{54}{\text{still water - current}}$$

$$\frac{66}{s + 2} = \frac{54}{s - 2}$$