Verbal Problems

Objective: To translate a verbal expression into a variable expression.

Addition	added to	6 added to y	y + 6
	more than	8 more than x	x + 8
	the sum of	the sum of x and z	x + z
	increased by	t increased by 9	t + 9
	the total of	the total of 5 and a number	5 + n
Subtraction	minus	x minus 2	x - 2
	less than	7 less than a number	n - 7
	decreased by	m decreased by 3	m - 3
	difference between	the difference between y and 4	y - 4
Multiplication	times	10 times a number	10n
	of	one half of x	½x
	the product of	the product of y and z	yz
	multiplied by	y multiplied by 11	11y
	twice	twice a number	2n
Division	divided by	x divided by 12	x/12
	the quotient of	the quotient of y and z	y/z
Power	the square of	the square of a number	n^2
	the cube of	the cube of t	t^3
	to the __ power	x to the eighth power	x^8

Part I - Translating into variable expressions...

1. Fourteen more than the cube of x.

$14 + x^3$

2. 18 less than twice a number

$2n - 18$

3. the product of q and seventeen

$q \cdot 17 = 17q$

4. four-fifths of the difference between w and 10

$\frac{4}{5} \cdot (w - 10) = \frac{4}{5}(w - 10)$

$\frac{4}{5}w - 8$

5. the total of 12 and six times a number

$12 + 6x$

6. seventeen less than the cube of x

$x^3 - 17$

Objective: Representing Two Unknowns in terms of a Single Variable.

Many times, it's helpful to express two different unknowns in terms of a single variable. A few examples to demonstrate. When solving problems that contain multiple unknowns, it's always beneficial to explicitly state, in algebraic terms, how the unknowns are represented.

Example 1. A number is three less than another number ...

What are the unknowns? the two numbers. → larger # , smaller #

Let the larger number = x,

then, the smaller number = $x-3$ } two unknowns in terms of the same variable

Example 2. I have twice as many nickels as quarters ...

What are the unknowns? # of nickels, # of quarters...

# of nickels = $2x$

# of quarters = x

Example 3. The sum of two numbers is 12 ... (1)

What are the unknowns?

First # = x

Second # = $12-x$

First + Second = 12

$x + (12) - x = (12)$

Objective: Translating and Solving Equations

Translating equations is no more difficult than translating expressions. Some hints for translating equations:

1. find the equal sign first. This will be indicated by the phrase "is", or "is the same as", etc...
2. translate the **easier** side of the equation next.
3. translate the other side.
4. solve the resulting equation.

For example, translate and solve:

1. *Fifteen less than a number is five more than twice that number.*

$x - 15 = 5 + 2x$

$-x \quad -5 \quad -5 \quad -x$

$-20 = x$

$x = -20$

2. *Six more than the product of x and five is equal to twenty-one.*

$6 + x \cdot 5 = 21$

$6 + 5x = 21$

$-6 \quad -6$

$5x = 15$

$x = 3$

3. *The difference between a number and three is one more than twice that number.*

$x - 3 = 1 + 2x$

$x = -4$

4. Recall, from the previous page, example 3: "*The sum of two numbers is 12 ...*", what if *3 times the first number is equal to 2 times the second*?

$3 \cdot x = 2 \cdot (12 - x)$

$3x = 2(12 - x)$

$3x = 24 - 2x$

$-2x \quad +2x$

$5x = 24$

$x = \frac{24}{5} = 4.8$

~~$x = \frac{12}{5} = 2.4$~~