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	¹ / ₂ x
	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.
 - $|4 + x^{3}|$

2. 18 less than twice a number 5

2n - 18

- 3. the product of q and seventeen
 - q · 17 = 17g
- 5. the total of 12 and six times a number
 - 12 + 6x

- $\frac{4}{5} \cdot \left(\omega 10 \right) = \frac{4}{5} \left(\omega 10 \right)$
- 4. four-fifths of the difference between w and 10 4 ~w-8
- 6. seventeen less than the cube of x

x³ - 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 a	\sim
What are the unknowns? the two number	s. ~ larger # , 5 maller #
Let the larger number $= x$,	
then, the smaller number = $\times -3$	Two unknowns in terms
then, the smaller number = $\times - \Im$	f two unknowns in terms of the same variable

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

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

Example 3. The sum of two numbers is 12 ...

What are the unknowns?

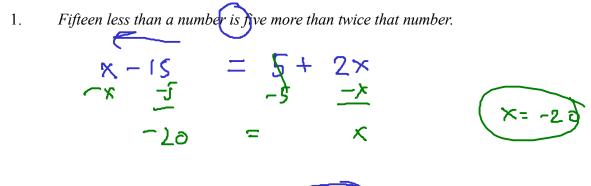
First # =
$$\chi$$
 first + second = 12
Second #= 12- χ + $(1) - \chi = (12)$

Objective: Translating and Solving Equations

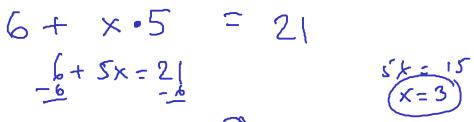
Translating equations is no more difficult than translating expressions. Some hints for translating equations:

- 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:



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



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

$$x - 3 = |+2x$$

 $x = -4$

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?

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

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

$$3x = 24 - 2x$$

$$-\frac{2x}{5x} = 24$$

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