Writing Equations

Translating Verbal Phrases	
Addition	sum, plus, total, more than, increased by
Subtraction	difference, less than, minus, decreased by
Multiplication	times, product, multiplied by, of, twice, double, triple, etc.
Division	quotient, divided by, divided into, half, one-fourth, etc.
Equals	is, the same as

Example 1: The product of a number and 9 increased by 5 is 59. Write the equation and find the number.

Let n equal the number.   Define the variable.

$9n$ The product of a number and 9.

$9n + 5$ Increased by 5.

$9n + 5 = 59$ Is 59.

$9n + 5 - 5 = 59 - 5$ Subtract 5 from each side of the equation.

$9n = 54$ Simplify.

$\dfrac{9n}{9} = \dfrac{54}{9}$ Divide each side of the equation by 9.

$n = 6$ Simplify.

The number is 6.

Example 2: Nana Nielsen is 63 years old. Her age is 2 years less than 5 times the age of Nelly Nielsen. How old is Nelly?

Let a equal the age of Nelly.   Define the variable.

$5a$ Five times the age of Nelly.

$5a - 2$ 2 less than $5a$.

$5a - 2 = 63$ Nana is 63.

$5a - 2 + 2 = 63 + 2$ Add 2 to each side of the equation.

$5a = 65$ Simplify.

$\dfrac{5a}{5} = \dfrac{65}{5}$ Divide each side of the equation by 5.

$a = 13$ Simplify.

Nelly Nielsen is 13 years old.

Example 3: Mr. Green's Prius needed repairs. The mechanic charged $98 for parts plus $45 per hour for labor. If the bill totaled $458, how many hours of labor were required?

Let h equal the number of hours of labor.   Define the variable.

$45h$ $45 times the number of hours

$45h + 98$ Plus $98 for parts

$45h + 98 = 458$ Total bill is $458.

$45h + 98 - 98 = 458 - 98$ Subtract 98 from each side of the equation.

$45h = 360$ Simplify.

$\dfrac{45h}{45} = \dfrac{360}{45}$ Divide each side of the equation by 45.

$h = 8$ Simplify.

8 hours of labor were required to repair the car.

Example 4: The neighborhood candy store sold 336 candy items this week. Twice as many M&Ms were sold as Snickers, and three times as many Crunch bars were sold as Snickers bars. How many of each kind of candy were sold this week?

Let s equal the number of Snickers bars sold.   Define the variable.

M&Ms sold $= 2s$ The number of M&Ms sold is twice the number of snickers bars.

Crunch bars sold $= 3s$ The number of Crunch bars sold is three times the number of snickers bars.

$2s + 3s + s = 336$ The candy store sold 336 candy bars.

$6s = 336$ Simplify.

$$\frac{6s}{6} = \frac{336}{6}$$ Divide each side of the equation by 6.

$s = 56$ Simplify.

$2s = 2(56) = 112$ Number of M&Ms sold
$3s = 3(56) = 168$ Number of Crunch bars sold

56 Snickers bars , 112 M&Ms and 168 Crunch bars were sold.

Example 5: The answer to an equation is $x = -2$, write an equation that requires at least two steps to solve.

$x = -2$

$2x = 2(-2)$

$2x = -4$

$2x - 5 = -4 - 5$

$2x - 5 = -9$

The equation is $2x - 5 = -9$.

Example 6: The answer to an equation is $r = 8$. Write an equation that has parentheses on one side of the equation.

$r = 8$

$(r - 2) = 8 - 2$
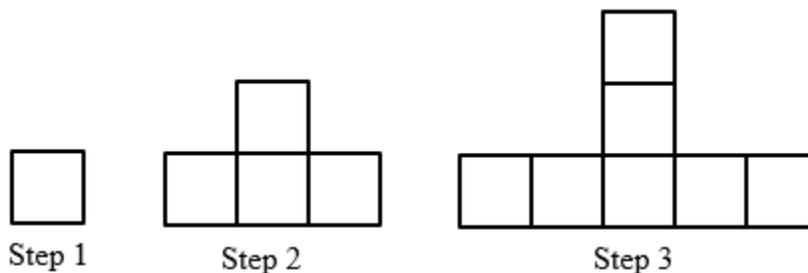
$(r - 2) = 6$

$\dfrac{(r - 2)}{3} = \dfrac{6}{3}$

$\dfrac{(r - 2)}{3} = 2$

$\dfrac{(r - 2)}{3} + 7 = 2 + 7$

$\dfrac{(r - 2)}{3} + 7 = 9$

The equation is $\dfrac{(r - 2)}{3} + 7 = 9$.

Example 7:

Step 1   Step 2   Step 3

Part a: Write a rule to predict the total number of tiles for any step.

Step	Number of Tiles
1	1
2	4
3	7
4	10
⋮	
10	28
n	$3n - 2$

The rule is $s = 3n - 2$. The number of tiles increases by three in each successive step. This is the 3n part of the rule. At step 0, the starting point, there would be -2 tiles because 1 – 3 = -2.

Part b: Andrew also came up with a rule for the pattern. His rule is $s = 1 + 3(n-1)$. Will his rule give you the same number of tiles at each step?

Andrew's rule says to take the step number and subtract one (to get the previous term), then multiply by three and finally add one. The equation simplifies to:

$$s = 1 + 3(n-1)$$
$$s = 1 + 3n - 3$$
$$s = 3n - 2$$

Which is the same rule.