Translating Words into Mathematical Symbols

Learning algebra is a little like learning another language. Rather than using words, algebra uses symbols to make statements about things. In algebra, we often use letters to represent numbers.

Since algebra uses the same symbols as arithmetic for adding, subtracting, multiplying and dividing, you're already familiar with the basic vocabulary.

In this lesson, you'll learn some important new vocabulary words, and you'll see how to translate from plain English to the "language" of algebra.

The first step in learning to "speak algebra" is learning the definitions of the most commonly used words.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Word Expression</th>
</tr>
</thead>
</table>
| **Addition** | Add
Added to
The Sum of
More Than
The Total of
Plus |
| **Subtraction** | Subtract
Subtract From
The Difference Between
Less
Less Than
Decreased by
Diminished by
Take Away
Reduced by
Minus |
| **Multiplication** | Multiply
Times
The Product of
Multiply by
Times as Much
Of |
| **Division** | Divide
Divided by
The Quotient of
The Ratio of
Equal Amounts of
Per |
### Examples:

<table>
<thead>
<tr>
<th>Word Expression</th>
<th>Algebraic Expression</th>
<th>Word Expression</th>
<th>Algebraic Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add $x$ to $y$</td>
<td>$x + y$</td>
<td>3 Multiply by $m$</td>
<td>$3m$</td>
</tr>
<tr>
<td>$y$ added to $7$</td>
<td>$y + 7$</td>
<td>7 Times $x$</td>
<td>$7x$</td>
</tr>
<tr>
<td>The Sum of $a$ and $b$</td>
<td>$a + b$</td>
<td>The Product of $x$ and $y$</td>
<td>$xy$</td>
</tr>
<tr>
<td>$m$ More Than $n$</td>
<td>$m + n$</td>
<td>5 Multiplied by $y$</td>
<td>$5y$</td>
</tr>
<tr>
<td>$p$ increased by 10</td>
<td>$p + 10$</td>
<td>One-fifth of $x$</td>
<td>$\frac{1}{5}x$</td>
</tr>
<tr>
<td>The Total of $q$ and 10</td>
<td>$q + 10$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Plus $x$</td>
<td>$9 + x$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subtract $x$ from $y$</td>
<td>$y - x$</td>
<td>Divide $x$ by 6</td>
<td>$\frac{x}{6}$</td>
</tr>
<tr>
<td>From $x$, subtract $y$</td>
<td>$x - y$</td>
<td>7 Divided by $x$</td>
<td>$\frac{7}{x}$</td>
</tr>
<tr>
<td>The Difference between $x$ and $7$</td>
<td>$x - 7$</td>
<td>The Quotient of $y$ and 5</td>
<td>$\frac{y}{5}$</td>
</tr>
<tr>
<td>$10$ Less $m$</td>
<td>$10 - m$</td>
<td>The Ratio of $u$ to $v$</td>
<td>$\frac{u}{v}$</td>
</tr>
<tr>
<td>$10$ Less Than $m$</td>
<td>$m - 10$</td>
<td>The Square of $y$</td>
<td>$y^2$</td>
</tr>
<tr>
<td>$x$ Decreased by 11</td>
<td>$x - 11$</td>
<td>The Cube of $K$</td>
<td>$K^3$</td>
</tr>
<tr>
<td>$8$ Diminished by $w$</td>
<td>$8 - w$</td>
<td>$x$ raised to the fourth power</td>
<td>$x^4$</td>
</tr>
<tr>
<td>$y$ Take Away $z$</td>
<td>$y - z$</td>
<td>$y$ doubled</td>
<td>$2y$</td>
</tr>
<tr>
<td>$p$ Reduced by 6</td>
<td>$p - 6$</td>
<td>Twice $x$</td>
<td>$2x$</td>
</tr>
<tr>
<td>$x$ Minus $y$</td>
<td>$x - y$</td>
<td>Half of $x$</td>
<td>$\frac{1}{2}x$</td>
</tr>
</tbody>
</table>

Ex 1) Work with a partner. Match each phrase with an expression.

- The product of a number and three $n \div 3$
- The quotient of 3 and a number $4p$
- 4 times a number $n \cdot 3$
- A number divided by 3 $2m$
- Twice a number $3 \div n$
Ex 2) Complete the following table

<table>
<thead>
<tr>
<th>Variable Expression</th>
<th>Meaning with Words</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x + 4$</td>
<td>$x$ plus 4</td>
<td>Addition</td>
</tr>
<tr>
<td>$y - 75$</td>
<td>$y$ minus 75</td>
<td>Subtraction</td>
</tr>
<tr>
<td>$3 \div z$ or $\frac{3}{z}$</td>
<td>$3$ divided by $z$</td>
<td>Division</td>
</tr>
<tr>
<td>$6n$, $6 \cdot n$, $(6)(n)$</td>
<td>$6$ multiplied by $n$</td>
<td>Multiplication</td>
</tr>
</tbody>
</table>

Ex 3) Translate the following **Word Expression into Algebraic Expression**

1. Ten more than $x$  
   \[ x + 10 \]

2. A number added to 5  
   \[ x + 5 \]

3. A number increased by 13  
   \[ n + 13 \]

4. 5 less than 10  
   \[ 10 - 5 \]

5. A number decreased by 7  
   \[ n - 7 \]

6. Difference between $x$ and 3  
   \[ x - 3 \]

7. Difference between 3 and $x$  
   \[ 3 - x \]

8. Twice a number  
   \[ 2n \]

9. Ten percent of $x$  
   \[ 0.10 \cdot x \]

10. Ten times $x$  
    \[ 10x \]

11. Quotient of $x$ and 3  
    \[ \frac{x}{3} \]

12. Quotient of 3 and $x$  
    \[ \frac{3}{x} \]

13. Five is three more than a number  
    \[ 5 = 3 + x \]

14. A number $y$ minus 75  
    \[ y - 75 \]

15. The quotient of 3 and a number $z$  
    \[ \frac{3}{z} \]

16. The sum of 18 and 35  
    \[ 18 + 35 \]

17. 25 less than a number $b$  
    \[ b - 25 \]

18. A number $x$ divided by 4  
    \[ \frac{x}{4} \]

19. Nine times the difference of a number and 4  
    \[ 9(x - 4) \]

20. Five times the sum of $x$ and 2  
    \[ 5(x + 2) \]

**Self-Reflection:** How can I organize the clue words to help my brain remember when to add, subtract, multiply, or divide? (Answer in a short paragraph on a separate piece of paper)
Writing Equations

Once you've learned to translate phrases into expressions and sentences into equations, you are ready to dive into word problems.

First we need to know how to write equations.

<table>
<thead>
<tr>
<th><strong>Equals</strong></th>
<th><strong>Word Expression</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Is Equal to</td>
</tr>
<tr>
<td></td>
<td>The same As</td>
</tr>
<tr>
<td></td>
<td>Is</td>
</tr>
<tr>
<td></td>
<td>Are</td>
</tr>
<tr>
<td></td>
<td>The result of</td>
</tr>
<tr>
<td></td>
<td>Will be</td>
</tr>
<tr>
<td></td>
<td>Yields</td>
</tr>
</tbody>
</table>

**Examples:** Write the following equations (Do not solve)

1) Five is three more than a number

\[ 5 = 3 + n \]

2) The product of two times a number is 10

3) One half a number is 10

4) Five times the sum of x and 2 is 9

5) Ten subtracted from 10 times a number that is that number plus 5

6) The sum of 5x and 10 is equal to the product of x and 15

7) The sum of two consecutive integers is 11

8) The sum of three consecutive integers

**Assignments:** On a separate piece of paper please work on Algebra with Pizzazz Worksheet page 10 and page 30.