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Writing and Evaluating Expressions Guided Notes

Writing Expressions

Word problems use **expressions** that you can write with symbols. An **algebraic expression** has at least one variable. A **variable** is a letter or symbol that represents one or more numbers.

Writing algebraic expressions for words helps you solve word problems.

To translate a verbal phrase into an algebraic expression, the first step is to define a variable.

When you define a variable, you choose a variable to represent an unknown quantity.

Always look for the placement of commas in the verbal statements. They will help you decide how to properly group terms in your algebraic expression.

There are several different ways to describe expressions with words.

Operation	Addition $+$	Subtraction $-$	Multiplication $*$	Division $\div$	Power
Words	• added to • plus • sum • more than • increased by	• subtracted from • minus • difference • less than • decreased by • take away • taken from	• times • multiplied by • product • groups of	• divided by • divided into • quotient	• square of; squared • the cube of; cubed

Sample Problem 1: **Write an algebraic expression for the word expression.**

a. 12 divided by the sum of x and 2

12 divided by the sum of x and 2

$12 \div (x + 2)$

b. 9 more than 2 multiplied by z

9 more than 2 multiplied by z

$9 + 2 * z$ *or* $9 + 2z$

c. The sum of 6 multiplied by a and 8 multiplied by b

The sum of 6 multiplied by a and 8 multiplied by b

$6 * a + 8 * b$ *or* $6a + 8b$

d. 14 more than the difference of x and y

14 more than the difference of x and y

$14 + (x - y)$

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e. The quotient of m and 7 decreased by 10

The quotient of m and 7 decreased by 10

$$\frac{m}{7} - 10 \quad or \quad m \div 7 - 10$$

f. 5 times, a number increased by 6

5 times, a number increased by 6

$$5 * (x + 6)$$

Sample Problem 2: **Write an expression to match the words.**

a. If a car traveled for 6 hours at an average rate of r kilometers per hour, represent the distance it traveled.

$r = an\ average\ rate\ \left(\frac{km}{h}\right)$

$Distance\ (km)$ $6 * r$

b. Represent the total number of days in x weeks and 5 days.

$x - number\ of\ weeks$
$Every\ week\ has\ 7\ days$

$Total\ number\ of\ days$ $7x + 5$

c. After 12 centimeters had been cut from a piece of lumber, y centimeters were left.
Represent the length of the original piece of lumber.

$y - length\ of\ piece\ (cm)$

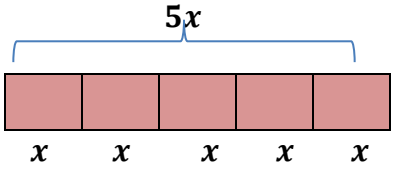
$Length\ of\ original\ piece\ (cm)$ $12 + y$

Modeling Algebraic Expressions

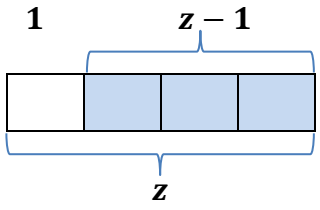
Algebraic expressions can also be represented with models.

Sample Problem 3: **Use a bar model to represent each expression.**

a. $5x$



b. $z - 1$



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Evaluating Expressions

To evaluate an expression follow these steps:

1. Substitute the value for the variable.
2. Then find the value of the expression following the order of operations.

Sample Problem 4: **Evaluate each of the following expressions when $x = 3$ and $y = 5$.**

a. $3x^2 - (2x + y) =$

$$
\begin{aligned}
&3x^2 - (2x + y) = \\
&= 3 * 3^2 - (2 * 3 + 5) = \\
&= 3 * 9 - (6 + 5) = \\
&= 27 - 11 = \\
&= 16
\end{aligned}
$$

b. $(3x - y)^2 + 2xy =$

$$
\begin{aligned}
&(3x - y)^2 + 2xy = \\
&= (3 * 3 - 5)^2 + 2 * 3 * 5 = \\
&= (9 - 5)^2 + 6 * 5 = \\
&= 4^2 + 30 = \\
&= 16 + 30 = \\
&= 46
\end{aligned}
$$

c. $2(\frac{3x}{9} + 2x - y) =$

$$
\begin{aligned}
&2(\frac{3x}{9} + 2x - y) = \\
&= 2(\frac{3 * 3}{9} + 2 * 3 - 5) = \\
&= 2 * (\frac{9}{9} + 6 - 5) = \\
&= 2 * (1 + 6 - 5) = \\
&= 2 * (7 - 5) = \\
&= 2 * 2 = \\
&= 4
\end{aligned}
$$