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Variables and Expressions

Unit 1 Lesson 1

Students will be able to:

write mathematical expressions for verbal expressions, and vice versa.

Key Vocabulary:

- Variables
- Algebraic Expression
- Factors
- Product
- Power
- Base
- Exponent

VARIABLES are symbols used to represent unspecified numbers or values. Any letter can be used as a variable.

$x,$ $y,$ $z,$ $a,$ $r,$ $d,$ s

ALGEBRAIC EXPRESSION consists of one or more numbers and variables along with one or more arithmetic operation.

$$6y, \qquad 7x - 3, \qquad 9 + \frac{r}{s}, \qquad k \cdot 5j, \qquad 5ab \div 3cd$$

Various ways to represent a product of x and y:

$$xy, \qquad x \cdot y, \qquad x(y), \qquad (x)y, \qquad (x)(y)$$

In each expression above, the quantities being multiplied are called **factors**, and the result is called the **product**.

Translating Verbal Expression into Algebraic Expression:

Addition	Subtraction	Multiplication	Division
Plus	Minus	Times	Divided
Sum of	Difference between/of	Product of	Quotient of
More than	Less than	Multiplied by	Ratio of
Increased by	Decreased by		Per
Combined	Fewer than		Out of
Together			percent
Total of			
Added to			

Translating Verbal Expression into Algebraic Expression:

Example: three more than a number x

Verbal Expression:	three	more than	a number x
Algebraic Expression:	3	$+$	x

Sample Problem 1: Write each expression algebraically.

a. The product of 8 and a number x
b. The difference between 16 and x squared
c. The sum of 7 and m
d. x divided by three
e. Four times eight plus n

Sample Problem 1: Write each expression algebraically.

a. The product of 8 and a number x $= 8x$

b. The difference between 16 and x squared $= 16 - x^2$

c. The sum of 7 and m $= 7 + m$

d. x divided by three $= \frac{x}{3}$

e. Four times eight plus n $= 4(8 + n)$

POWER is an expression that represents repeated multiplication of the same factor.

$$x^n$$

where:

x = base

n = exponent, which corresponds to the number of times the base is used as a factors

POWER is an expression that represents repeated multiplication of the same factor.

Symbol	Words	Meaning
2^1	2 to the first power	2
2^2	2 to the second power	$2 \cdot 2$
2^3	2 to the third power	$2 \cdot 2 \cdot 2$
2^4	2 to the fourth power	$2 \cdot 2 \cdot 2 \cdot 2$
2^5	2 to the fifth power	$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
$2n^6$	2 times n to the sixth power	$2 \cdot n \cdot n \cdot n \cdot n \cdot n \cdot n$
x^n	x to the nth power	$x \cdot x \cdot x \cdot x \cdot x \cdot \ldots \cdot x$

POWER is an expression that represents repeated multiplication of the same factor.

Example: 2^6

Power: 2^6 $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ $2^6 = 64$

Base: 2

Exponent: 6

6 factors of 2

Sample Problem 2: Find each value.

A. 3^2

B. 4^3

C. 5^2

D. 6^2

E. 2^4

Sample Problem 2: Find each value.

$$\textit{A.}\quad 3^2 = 3 \cdot 3 = 9$$

$$\textit{B.}\quad 4^3 = 4 \cdot 4 \cdot 4 = 64$$

$$\textit{C.}\quad 5^2 = 5 \cdot 5 = 25$$

$$\textit{D.}\quad 6^2 = 6 \cdot 6 = 36$$

$$\textit{E.}\quad 2^4 = 2 \cdot 2 \cdot 2 \cdot 2 = 16$$

Translating Algebraic Expression into Verbal Expression:

Example: $4m$

Algebraic Expression: $\underbrace{4}\quad\underbrace{\cdot}\quad\underbrace{m}$

Verbal Expression: four times a number m

The product of 4 and m

Sample Problem 3: Write a verbal expression for each algebraic expression.

A. $3 - t$

B. $y + 9$

C. $\frac{6}{s}$

D. $4z$

E. $21d - 3$

Sample Problem 3: Write a verbal expression for each algebraic expression.

A. $3 - t$ = the difference between 3 and t

B. $y + 9$ = the sum of y and 9

C. $\frac{6}{s}$ = the ratio between 6 and s

D. $4z$ = the product of 4 and z

E. $21d - 3$ = the difference between 21 times d and 3