

Section 1.1 Evaluate Expressions

Goal

Evaluate algebraic expressions, use exponents, and follow order of operations.

Variable

A letter used to represent one or more variables
 x, y, a, b, \dots

Algebraic Expression (Variable Expression)

An expression that consists of numbers, variables, and operations

Does not have an equal sign

$$4a^2 + 3a - 6$$

$$10z + 2$$

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Power

An expression that represents repeated multiplication of the same factor

$$6^4 = 6 \cdot 6 \cdot 6 \cdot 6$$

Base

The number or expression that is used as a factor in a repeated multiplication

Exponent

The number or variable that represents the number of times the base of a power is used as a factor

base \rightarrow 6^4 \leftarrow exponent

Evaluating Algebraic Expressions

Know that letters can stand for numbers so, in order to evaluate an algebraic expression you...

1. Substitute the number for the variable
2. Perform the operation
3. Simplify the result

Example 1: Evaluate each expression

a. $7p - 5$ when $p = 8$

$$7(8) - 5$$

$$56 - 5$$

$$(51)$$

b. $3y + 4y$ when $y = 2$

$$3(2) + 4(2)$$

$$6 + 8$$

$$(14)$$

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Example 2: Evaluate the expression

You are ordering a skateboard and a helmet from an online store. The total weight of the two items can be represented by $s + h$, where s is the weight of the skateboard and h is the weight of the helmet. Find the total weight if the helmet weighs 1.3 pounds and the skateboard weighs 5.4 pounds.

$$s + h$$

$$5.4 + 1.3$$

$$(6.7)$$

Example 3: Evaluate each power

a. x^3 when $x = 3$

$$3^3 = 3 \cdot 3 \cdot 3 = (27)$$

b. $2n + n^2$ when $n = -1$

$$2(-1) + (-1)^2$$


$$-2 + 1 = (-1)$$

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Area and Volume

Exponents are used in certain formulas. Recall...

Shape - Square	Perimeter	Area	Volume
	$P = 4s$	$A = s^2$	Cube $V = s^3$

Example 4: Each side of a square garden measures 22 feet. You are going to buy fertilizer for the garden before you begin planting and you need to determine the area. Find the area of the garden.

$$A = s^2 = 22^2 = 484 \text{ ft}^2$$

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Order of Operations

Parenthesis () [] - inner to outer

Exponents

Multiply

Divide

Add

Subtract

Whoever comes first left to right

Example: $12 \div 3 \times 2 =$

Whoever comes first left to right

Example: $15 - 7 + 9 =$

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Example 5: Evaluate each expression

a. $36 \div 3^2 \times 2 - 4$

$$\begin{aligned} & 36 \div 9 \times 2 - 4 \\ & 4 \times 2 - 4 \\ & 8 - 4 \\ & 4 \end{aligned}$$

b. $6 + 12 \div 3 \cdot 4^2$

$$\begin{aligned} & 6 + 12 \div 3 \cdot 16 \\ & 6 + 4 \cdot 16 \\ & 6 + 64 = 70 \end{aligned}$$

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Grouping Symbols: Indicate that the operations inside these symbols need to be performed first

1. Parentheses
2. Brackets
3. Fraction Bars (evaluate the numerator and denominator before you divide)

Example 6: Evaluate the expression.

a. $24 - (3^2 + 4)$

$$\begin{aligned} & 24 - (9 + 4) \\ & 24 - 13 = 11 \end{aligned}$$

b. $4[30 - (5 + 7)]$

$$\begin{aligned} & 4[30 - 12] \\ & 4[18] = 72 \end{aligned}$$

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Example 7: Evaluate each expression when $x = 3$

a. $\frac{10x}{2(x+2)}$ $\frac{10(3)}{2(3+2)} = \frac{30}{10} = 3$

b. $\frac{4x+8}{2+x}$ $\frac{4(3)+8}{2+3} = \frac{12+8}{5} = \frac{20}{5} = 4$

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This means try these are your own...

Checkpoint: Evaluate each expression when $w = 9$

1. $17 - 3w$

$$\begin{aligned} & 17 - 3(9) \\ & 17 - 27 = -10 \end{aligned}$$

2. $w^2 - 13$

$$\begin{aligned} & 9^2 - 13 \\ & 81 - 13 = 68 \end{aligned}$$

3. $\frac{5w}{w+6}$ $\frac{5(9)}{9+6} = \frac{45}{15} = 3$

4. $5w - \frac{1}{3}w$ $5(9) - \frac{1}{3}(9) = 45 - 3 = 42$

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Which one is right?

Method 1:

$$16 + 5 \times 35$$

$$= 16 + 175$$

$$= 191$$

Method 2:

$$16 + 5 \times 35$$

$$= 21 \times 35$$

$$= 735$$



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