

Evaluating Algebraic Expressions

An **algebraic expression** is an expression that may contain numbers, operations, and one or more symbols. A symbol that represents one or more numbers is called a **variable**. To evaluate an algebraic expression, substitute a number for each variable. Then use the order of operations to find the value of the numerical expression.

Example 1 Evaluate each expression when $x = 3$.

a. $5x + 7$

$$\begin{aligned} 5x + 7 &= 5(3) + 7 && \text{Substitute 3 for } x. \\ &= 15 + 7 && \text{Multiply.} \\ &= 22 && \text{Add.} \end{aligned}$$

b. $14 - x^2$

$$\begin{aligned} 14 - x^2 &= 14 - 3^2 && \text{Substitute 3 for } x. \\ &= 14 - 9 && \text{Evaluate power.} \\ &= 5 && \text{Subtract.} \end{aligned}$$

c. $2x^2 - 8x + 4$

$$\begin{aligned} 2x^2 - 8x + 4 &= 2(3)^2 - 8(3) + 4 && \text{Substitute 3 for } x. \\ &= 2(9) - 8(3) + 4 && \text{Evaluate power.} \\ &= 18 - 24 + 4 && \text{Multiply.} \\ &= -2 && \text{Simplify.} \end{aligned}$$

Example 2 Evaluate each expression when $x = -2$ and $y = 6$.

a. $7x - 5y$

$$\begin{aligned} 7x - 5y &= 7(-2) - 5(6) \\ &= -14 - 30 \\ &= -44 \end{aligned}$$

b. $x^2 - 2xy + y^2$

$$\begin{aligned} x^2 - 2xy + y^2 &= (-2)^2 - 2(-2)(6) + 6^2 \\ &= 4 - 2(-2)(6) + 36 \\ &= 4 - (-24) + 36 \\ &= 64 \end{aligned}$$

Practice

Check your answers at BigIdeasMath.com.

Evaluate the expression when $x = 2$ and $y = -3$.

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|------------------------------|------------------------------|---|--|
| 1. $3x + 10$ 16 | 2. $14 - 2y$ 20 | 3. $5 - y^2$ -4 | 4. $4x^2 + 9$ 25 |
| 5. $y^2 + 8y - 4$ -19 | 6. $-3x^2 - x + 7$ -7 | 7. $0.75x - 4x - 1.5$ -8 | 8. $3(y + 8 - 4y)$ 51 |
| 9. $2x + 3y$ -5 | 10. $6y - 5x$ -28 | 11. $4x^2 + 3y$ 7 | 12. $x^2 - y^2$ -5 |
| 13. $y - x + y^2$ 4 | 14. $x^2y^2 + xy$ 30 | 15. $\frac{x+y}{y-x}$ $\frac{1}{5}$ | 16. $\frac{2x+y}{xy}$ $-\frac{1}{6}$ |

Copy and complete the table.

17.	x	0	1	2	3	4
	$3x - 2$	-2	1	4	7	10

18.	x	-2	-1	0	1	2
	$-4x + 1$	9	5	1	-3	-7

19. **MONEY** You earn $8x + 7y$ dollars for working x hours at a restaurant and y hours at a bus station. How much do you earn for working 12 hours at the restaurant and 16 hours at the bus station? **\$208**