

# • Evaluating Algebraic Expressions •



In algebra, letters are called **variables** and they are used to represent numbers. When numbers, variables and mathematical operations (+, −, ×, ÷) are used together, **algebraic expressions** are formed.

EXAMPLES:       $2x$                $3b + 4c$                $7(a^2 - b)$                $3x^2 + 5y(z - 8)$

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We often need to **evaluate** algebraic expressions when variables are given numerical values.

EXAMPLE: If  $a = 4$  and  $b = -3$ , evaluate  $a^2 + 6b$ .

**Step 1:** Replace the variables with the given numerical values.

$$\begin{aligned} & a^2 + 6b \\ & (4)^2 + 6(-3) \end{aligned}$$

**Step 2:** Perform the indicated operations.

$$\begin{aligned} & (4)^2 + 6(-3) \\ & 16 + (-18) = -2 \end{aligned}$$

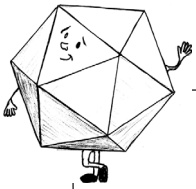

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**Try these:**

1) If  $a = 5$  and  $b = 2$ , evaluate  $a + 3b$ . \_\_\_\_\_

2) If  $x = 3$  and  $y = 5$ , evaluate  $x^2 - 2y$ . \_\_\_\_\_

3) If  $a = 4$  and  $b = 0$ , evaluate  $a + 3(5b^2 - a)$ . \_\_\_\_\_



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1) If  $a = 7$  and  $b = 22$ , evaluate  $2a + b$ . \_\_\_\_\_

2) If  $x = 3$  and  $y = 5$ , evaluate  $x^2 + 2xy$ . \_\_\_\_\_

3) If  $m = 1$  and  $n = 5$ , evaluate  $7m^2 + 6n$ . \_\_\_\_\_

4) If  $a = 3$  and  $b = 4$ , evaluate  $a^2 + b^2$ . \_\_\_\_\_

5) If  $m = 10$  and  $n = -4$ , evaluate  $2n + 3m + 6$ . \_\_\_\_\_

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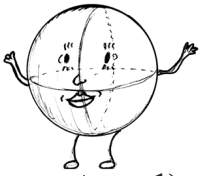
6) Evaluate  $5x + 4y$  when  $x = -8$  and  $y = 7$ . \_\_\_\_\_

7) Evaluate  $2a^2 - 3b$  when  $a = 7$  and  $b = 12$ . \_\_\_\_\_

8) Evaluate  $6x + y^3$  when  $x = -2$  and  $y = 2$ . \_\_\_\_\_

9) Evaluate  $c - d - 1$  when  $c = -1$  and  $d = 3$ . \_\_\_\_\_

10) Evaluate  $3z^3 - 2y^2$  when  $z = 2$  and  $y = 3$ . \_\_\_\_\_



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1) Evaluate  $a + bc$  when:

a)  $a = 2$ ,  $b = 3$ , and  $c = 4$  \_\_\_\_\_ b)  $a = 4$ ,  $b = 6$ , and  $c = 2$  \_\_\_\_\_

2) Evaluate  $2a + 5b$  when:

a)  $a = 3$  and  $b = 4$  \_\_\_\_\_ b)  $a = 12$  and  $b = 15$  \_\_\_\_\_

3) Evaluate  $a + 3b$  when:

a)  $a = -3$  and  $b = 4$  \_\_\_\_\_ b)  $a = 5$  and  $b = 11$  \_\_\_\_\_

4) Evaluate  $2a + 3b + 4c$  when:

a)  $a = 1$ ,  $b = 0$ , and  $c = 5$  \_\_\_\_\_ b)  $a = -1$ ,  $b = 4$ , and  $c = \frac{1}{2}$  \_\_\_\_\_

5) Evaluate  $\frac{a}{b} + \frac{b}{c} + \frac{a}{c}$  when:

a)  $a = 12$ ,  $b = 6$ , and  $c = 2$  \_\_\_\_\_ b)  $a = 24$ ,  $b = 12$ , and  $c = 3$  \_\_\_\_\_

6) Evaluate  $a^2 + b^2$  when:

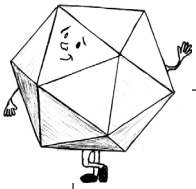
a)  $a = 7$  and  $b = 6$  \_\_\_\_\_ b)  $a = 12$  and  $b = 13$  \_\_\_\_\_

7) Evaluate  $a^3 + b^3$  when:

a)  $a = 2$  and  $b = 1$  \_\_\_\_\_ b)  $a = 3$  and  $b = 2$  \_\_\_\_\_

8) Evaluate  $a + 2b^3$  when:

a)  $a = 2$  and  $b = 3$  \_\_\_\_\_ b)  $a = -5$  and  $b = 2$  \_\_\_\_\_



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1) If  $a = 3$  and  $b = 4$ , evaluate  $2ab + a^2$ . \_\_\_\_\_

2) If  $x = 5$  and  $y = 4$ , evaluate  $x^2 - xy$ . \_\_\_\_\_

3) If  $s = -2$  and  $t = 5$ , evaluate  $2t^2 + 5s$ . \_\_\_\_\_

4) If  $a = 6$ ,  $b = 10$ , and  $c = 3$ , evaluate  $b^2 - a^2 + c$ . \_\_\_\_\_

5) If  $m = 10$  and  $n = 3$ , evaluate  $6m + 3mn$ . \_\_\_\_\_

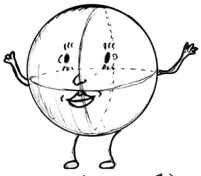
6) Evaluate  $3a - 2b$  when  $a = 7$  and  $b = 9$ . \_\_\_\_\_

7) Evaluate  $2a^2 - 3b^2$  when  $a = 4$  and  $b = 3$ . \_\_\_\_\_

8) Evaluate  $3(g + h^2)$  when  $g = -5$  and  $h = 3$ . \_\_\_\_\_

9) Evaluate  $x^2 + 3y - z$  when  $x = 6$ ,  $y = -7$ , and  $z = 9$ . \_\_\_\_\_

10) Evaluate  $z^3 - 4y^2$  when  $z = 3$  and  $y = 2$ . \_\_\_\_\_



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1) Evaluate  $2ab + 4a$  when:

a)  $a = -3$  and  $b = 5$  \_\_\_\_\_

b)  $a = 1$  and  $b = -3$  \_\_\_\_\_

2) Evaluate  $3x - 5y^2$  when:

a)  $x = -2$  and  $y = 3$  \_\_\_\_\_

b)  $x = -10$  and  $y = 2$  \_\_\_\_\_

3) Evaluate  $3a(b - 2) + 4b^2$  when:

a)  $a = 13$  and  $b = 2$  \_\_\_\_\_

b)  $a = -1$  and  $b = 3$  \_\_\_\_\_

4) Evaluate  $3x^2 - 2y^2$  when:

a)  $x = 2$  and  $y = 3$  \_\_\_\_\_

b)  $x = 5$  and  $y = 3$  \_\_\_\_\_

5) Evaluate  $x + 3(2y + z)$  when:

a)  $x = 7$ ,  $y = 5$ , and  $z = 3$  \_\_\_\_\_

b)  $x = 10$ ,  $y = -1$ , and  $z = 12$  \_\_\_\_\_

6) Evaluate  $2x^2 + 5y(z - 6)$  when:

a)  $x = 4$ ,  $y = 3$ , and  $z = 10$  \_\_\_\_\_

b)  $x = 1$ ,  $y = 5$ ,  $z = 8$  \_\_\_\_\_

7) Evaluate  $(x - 4y)^2$  when:

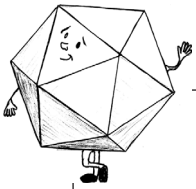
a)  $x = 7$  and  $y = 3$  \_\_\_\_\_

b)  $x = -6$  and  $y = -1$  \_\_\_\_\_

8) Evaluate  $2a + b^3$  when:

a)  $a = 4$  and  $b = 2$  \_\_\_\_\_

b)  $a = -6$  and  $b = 3$  \_\_\_\_\_



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1) If  $s = 3$  and  $t = 4$ , evaluate  $4st - s^2$ . \_\_\_\_\_

2) If  $x = 3$  and  $y = -4$ , evaluate  $x^2 - y$ . \_\_\_\_\_

3) If  $p = 9$  and  $q = 15$ , evaluate  $3p + 10q$ . \_\_\_\_\_

4) If  $a = 8$  and  $b = 4$ , evaluate  $3a + b^2$ . \_\_\_\_\_

5) If  $u = 12$  and  $v = 11$ , evaluate  $3u + 6v - 9$ . \_\_\_\_\_

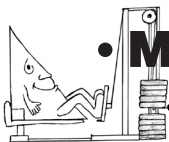
6) Evaluate  $5x + 4y - z$  when  $x = 4$ ,  $y = -2$  and  $z = 3$ . \_\_\_\_\_

7) Evaluate  $12a^2 - 3b$  when  $a = 2$  and  $b = 15$ . \_\_\_\_\_

8) Evaluate  $6a + b^3 + 3c$  when  $a = -3$ ,  $b = 4$ , and  $c = 2$ . \_\_\_\_\_

9) Evaluate  $x - y - z$  when  $x = -1$ ,  $y = -2$  and  $z = -3$ . \_\_\_\_\_

10) Evaluate  $8z^2 - 8y^2$  when  $z = 4$  and  $y = 3$ . \_\_\_\_\_



# • **Mastery Check: Evaluating Algebraic Expressions** •



1) If  $a = 3$  and  $b = 4$ , evaluate  $4a - 5b$ . \_\_\_\_\_

2) If  $a = 5$ ,  $b = 2$ , and  $c = 7$ , evaluate  $3a^2 + 5b(c - 4)$ . \_\_\_\_\_

3) If  $x = -1$  and  $y = 4$ , evaluate  $3x + 2xy$ . \_\_\_\_\_

4) Evaluate  $a^2 + 2b + ab$  when  $a = 5$  and  $b = -1$ . \_\_\_\_\_

5) Evaluate  $(a - 3b)^2$  when  $a = 10$  and  $b = 4$ . \_\_\_\_\_

6) Evaluate  $(xy + 3) + 8x$  when  $x = 4$  and  $y = -2$ . \_\_\_\_\_

## Challenge:

7) If  $x = 10$  and  $y = -5$ , evaluate  $\frac{x - y}{y - x} - \frac{x^2}{xy}$ . \_\_\_\_\_