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2–6 Rules for Multiplication

Objective: To multiply real numbers.

Properties	Examples
Identity Property of Multiplication The product of a number and 1 is identical to the number itself. $a \cdot 1 = a$ and $1 \cdot a = a$	$6 \cdot 1 = 6$ and $1 \cdot 6 = 6$
Multiplication Property of Zero When one of the factors of a product is zero, the product itself is zero. $a \cdot 0 = 0$ and $0 \cdot a = 0$	$6 \cdot 0 = 0$ and $0 \cdot 6 = 0$
Multiplication Property of -1 For every real number a: $a(-1) = -a$ and $(-1)a = -a$	$6(-1) = -6$ and $(-1)6 = -6$ $(-5)(-1) = -(-5) = 5$ and $(-1)(-5) = -(-5) = 5$
Property of Opposites in Products For all real numbers a and b: $(-a)(b) = -ab$ $a(-b) = -ab$ $(-a)(-b) = ab$	$(-4)(5) = -20$ $4(-5) = -20$ $(-4)(-5) = 20$

Rules for Multiplication

1. If two numbers have the *same* sign, their product is positive.
   If two numbers have *opposite* signs, their product is negative.
2. The product of an *even* number of negative numbers is positive.
   The product of an *odd* number of negative numbers is negative.

Example 1 Multiply: **a.** $3(6)$ **b.** $(-3)(6)$ **c.** $3(-6)$ **d.** $(-3)(-6)$

Solution

a. $3(6) = 18$ (Both factors have the same sign.)

b. $(-3)(6) = -18$ (The two factors have opposite signs.)

c. $3(-6) = -18$ (The two factors have opposite signs.)

d. $(-3)(-6) = 18$ (Both factors have the same sign.)

Example 2

a. $2(-3)(-4)(-5)$ is negative because it has 3 negative factors.

b. $(-1)(-4)(-5)(6)(-7)$ is positive because it has 4 negative factors.

c. $(-6)(7)(0)(-4)$ is zero because it has a zero factor.

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2–6 Rules for Multiplication *(continued)*

Multiply.

1. $(-12)(-3)$	**2.** $18(-4)$	**3.** $2(17)$	**4.** $18(0)$
5. $(-2)(5)(-8)$	**6.** $(4)(-7)(10)$	**7.** $(-2)(-3)(-4)$	**8.** $(-11)(-12)(0)$
9. $35(-26)(0)$	**10.** $5(-2)(-8)(-5)$	**11.** $(-7)(3)(-1)(2)$	**12.** $(-8)(-5)(-1)(-3)$

Example 3 Simplify: **a.** $(-2x)(-6y)$ **b.** $3y + (-7y)$

Solution

a. $(-2x)(-6y) = (-2)x(-6)y$
$= (-2)(-6)xy$
$= 12xy$

b. $3y + (-7y) = [3 + (-7)]y$
$= (-4)y$
$= -4y$

Simplify.

13. $(-3a)(-4b)$	**14.** $(5x)(6y)$	**15.** $2p(-5q)$	**16.** $(-4e)(7f)$	**17.** $(-6a)(-5b)$
18. $-7a + (-8a)$	**19.** $2x + (-5x)$	**20.** $8x + (-3x)$	**21.** $(-11y) + 3y$	**22.** $-4n + 4n$

Example 4 Simplify: **a.** $-3(2x - y)$ **b.** $5x - 4(x - 1)$

Solution

a. $-3(2x - y) = -3(2x) - (-3)(y)$
$= -6x - (-3y)$
$= -6x + 3y$

b. $5x - 4(x - 1) = 5x - (4x - 4 \cdot 1)$
$= 5x - (4x - 4)$
$= 5x - 4x + 4$
$= x + 4$

Simplify.

23. $-6(x - 2y)$	**24.** $-5(2c + d)$	**25.** $-4(3m + 2n)$
26. $-7(-4y - 5)$	**27.** $(3x - 5)(-6)$	**28.** $(-3 + 5y)(-2)$
29. $4x - 3(x - 2)$	**30.** $6x - 2(x + 3)$	**31.** $3x - 5(x - 1)$
32. $(-1)(a - b + 2)$	**33.** $(-1)(2x - y - 3)$	**34.** $(-1)(x + y - z)$
35. $4x - 2x + 7 + x$	**36.** $2y - 5 - 5y + 3$	**37.** $11p - 6c - 7c + 9p$

Mixed Review Exercises

Translate each sentence into an equation.

1. Three times a number is 27.
2. The quotient of n and 4 is 15.
3. One half of a number is nine.
4. Six less than twice a number is 14.

Simplify.

5. $110 - (12 - 8)$	**6.** $161 - (8 - 11)$	**7.** $2 + (-5) + (-y) + 9$
8. $3(20 + 5)$	**9.** $2n + (-5n)$	**10.** $5(n + 1) + 7$