

Name : _____ Score : _____

Teacher : _____ Date : _____

Exponents and Multiplication

Simplify. Your answer should contain only positive exponents.

1) $k \cdot k^{-2}$

8) $r^{-3} \cdot r^6$

2) $6d^4 \cdot 5d^{-6}g^3$

9) $6b^6c^{-2} \cdot 3b^{-3}c^5$

3) $\left(\frac{1}{7}\right)^2 \cdot \left(\frac{1}{7}\right)^3 \cdot \left(\frac{1}{7}\right)^5$

10) $4^6 \cdot 4^4$

4) $yc \cdot 5y^2c^4$

11) $7^{-5} \cdot 7^2$

5) $4y^5 \cdot 6y^4 \cdot 2y^3$

12) $6cg^3 \cdot 8c^6g^2$

6) $\left(\frac{1}{3}\right)^4 \cdot \left(\frac{1}{3}\right)^5$

13) $z \cdot z^5$

7) $w^4 \cdot w^{-5} \cdot w^{-3}$

14) $2c \cdot 4c^{-5}$



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Exponents and Multiplication

Simplify. Your answer should contain only positive exponents.

1) $k \cdot k^{-2}$

$$\frac{1}{k}$$

8) $r^{-3} \cdot r^6$

$$r^3$$

2) $6d^4 \cdot 5d^{-6}g^3$

$$\frac{30g^3}{d^2}$$

9) $6b^6c^{-2} \cdot 3b^{-3}c^5$

$$18b^3c^3$$

3) $\left(\frac{1}{7}\right)^2 \cdot \left(\frac{1}{7}\right)^3 \cdot \left(\frac{1}{7}\right)^5$

$$\left(\frac{1}{7}\right)^{10}$$

10) $4^6 \cdot 4^4$

$$4^{10}$$

4) $yc \cdot 5y^2c^4$

$$5y^3c^5$$

11) $7^{-5} \cdot 7^2$

$$\frac{1}{7^3}$$

5) $4y^5 \cdot 6y^4 \cdot 2y^3$

$$48y^{12}$$

12) $6cg^3 \cdot 8c^6g^2$

$$48c^7g^5$$

6) $\left(\frac{1}{3}\right)^4 \cdot \left(\frac{1}{3}\right)^5$

$$\left(\frac{1}{3}\right)^9$$

13) $z \cdot z^5$

$$z^6$$

7) $w^4 \cdot w^{-5} \cdot w^{-3}$

$$\frac{1}{w^4}$$

14) $2c \cdot 4c^{-5}$

$$\frac{8}{c^4}$$



1 Polynomial Multiplied by Monomial To find the product of a polynomial and a monomial, you can use the Distributive Property.



Example 1 Multiply a Polynomial by a Monomial

Find $-3x^2(7x^2 - x + 4)$.

Horizontal Method

$$\begin{aligned}
 &-3x^2(7x^2 - x + 4) && \text{Original expression} \\
 &= -3x^2(7x^2) - (-3x^2)(x) + (-3x^2)(4) && \text{Distributive Property} \\
 &= -21x^4 - (-3x^3) + (-12x^2) && \text{Multiply.} \\
 &= -21x^4 + 3x^3 - 12x^2 && \text{Simplify.}
 \end{aligned}$$

Vertical Method

$$\begin{array}{r}
 7x^2 - x + 4 \\
 (\times) \quad -3x^2 \\
 \hline
 -21x^4 + 3x^3 - 12x^2
 \end{array}
 \begin{array}{l}
 \text{Distributive Property} \\
 \text{Multiply.}
 \end{array}$$

Guided Practice

Find each product.

1A. $5a^2(-4a^2 + 2a - 7)$

1B. $-6d^3(3d^4 - 2d^3 - d + 9)$

We can use this same method more than once to simplify large expressions.

Example 2 Simplify Expressions



Simplify $2p(-4p^2 + 5p) - 5(2p^2 + 20)$.

$$2p(-4p^2 + 5p) - 5(2p^2 + 20)$$

Original expression

$$= (2p)(-4p^2) + (2p)(5p) + (-5)(2p^2) + (-5)(20)$$

Distributive Property

$$= -8p^3 + 10p^2 - 10p^2 - 100$$

Multiply.

$$= -8p^3 + (10p^2 - 10p^2) - 100$$

Commutative and Associative Properties

$$= -8p^3 - 100$$

Combine like terms.

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Guided Practice

Simplify each expression.

2A. $3(5x^2 + 2x - 4) - x(7x^2 + 2x - 3)$

2B. $15t(10y^3t^5 + 5y^2t) - 2y(yt^2 + 4y^2)$

Example 4 Equations with Polynomials on Both Sides

Solve $2a(5a - 2) + 3a(2a + 6) + 8 = a(4a + 1) + 2a(6a - 4) + 50$.

$2a(5a - 2) + 3a(2a + 6) + 8 = a(4a + 1) + 2a(6a - 4) + 50$	Original equation
$10a^2 - 4a + 6a^2 + 18a + 8 = 4a^2 + a + 12a^2 - 8a + 50$	Distributive Property
$16a^2 + 14a + 8 = 16a^2 - 7a + 50$	Combine like terms.
$14a + 8 = -7a + 50$	Subtract $16a^2$ from each side.
$21a + 8 = 50$	Add $7a$ to each side.
$21a = 42$	Subtract 8 from each side.
$a = 2$	Divide each side by 21.

CHECK

$2a(5a - 2) + 3a(2a + 6) + 8 = a(4a + 1) + 2a(6a - 4) + 50$	
$2(2)[5(2) - 2] + 3(2)[2(2) + 6] + 8 \stackrel{?}{=} 2[4(2) + 1] + 2(2)[6(2) - 4] + 50$	
$4(8) + 6(10) + 8 \stackrel{?}{=} 2(9) + 4(8) + 50$	Simplify.
$32 + 60 + 8 \stackrel{?}{=} 18 + 32 + 50$	Multiply.
$100 = 100$ ✓	Add and subtract.

Guided Practice

Solve each equation.

4A. $2x(x + 4) + 7 = (x + 8) + 2x(x + 1) + 12$

4B. $d(d + 3) - d(d - 4) = 9d - 16$ ✓

Practice/Homework:
page 474: 1-17 (all)