

# The Product and Power Rules for Exponents

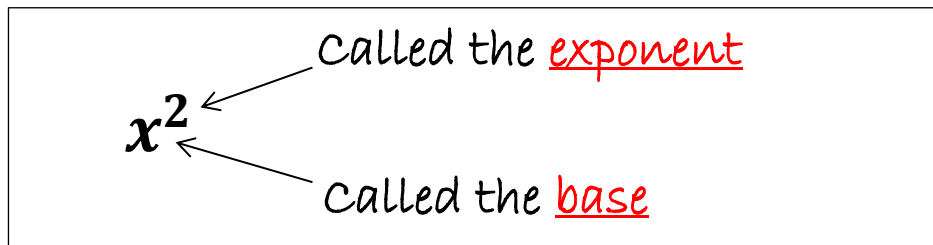
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Recall: What does  $2x$  mean?

$2x$  means \_\_\_\_\_.

So how do we write  $x \cdot x$ ?

$x \cdot x$  is written  $x^2$



$$x^3 = \underline{\hspace{2cm}}$$

$$x^4 = \underline{\hspace{2cm}}$$

$$x^3 \cdot x^4 = (x \cdot x \cdot x)(x \cdot x \cdot x \cdot x)$$

$$= \underline{\hspace{2cm}}$$

The Product Rule: When multiplying variable terms of the same base, **ADD** the exponents.

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Example 1:

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a.)  $x^{10} \cdot x^{23} = \underline{\hspace{2cm}}$

b.)  $a^3 \cdot a^5 \cdot a^4 = \underline{\hspace{2cm}}$

c.)  $x^5y^4$  (this term is simplified as possible).

d.)  $x^5 + x^5 =$  \_\_\_\_\_

e.)  $2x^5 + 7x^5 =$  \_\_\_\_\_

f.)  $5x - 2x + 3x =$  \_\_\_\_\_

g.)  $x + y \rightarrow$  why can't these two terms be combined?

h.)  $x + x^2 \rightarrow$  Are these "like terms"?

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Example 2:

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a.)  $(5x)(-2x)(3x)$

b.)  $5x - 2x(3x)$

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Example 3:

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a.)  $2x^2y + 4x^2y$

b.)  $(2x^2y)(4x^2y)$

c.)  $3x^4 - 5x(2x^3)$

The Power Rule: When raising a power to a power, multiply the exponents.

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Example 4:

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$$\begin{aligned}(x^2)^3 &= (x \cdot x)^3 \\ &= (x \cdot x)(x \cdot x)(x \cdot x) \\ &= x^6\end{aligned}$$

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Example 5:

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a.)  $(x^3)^4 = x^{3 \cdot 4} = \underline{\hspace{2cm}}$

b.)  $(x^5)^2 = \underline{\hspace{2cm}}$

c.)  $(5x)^2 = \underline{\hspace{2cm}}$

d.)  $(3x^4y^6)^3 = \underline{\hspace{2cm}}$

# The Product and Power Rules for Exponents

## Practice Problems

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Simplify each expression:

1.  $x^5 \cdot x^7$

2.  $x^{14} \cdot x^{10}$

3.  $a^4 \cdot a^5 \cdot a^6$

4.  $x^4 + x^4$

5.  $3x^2y - 2x^2y$

6.  $a + a^2$

7.  $(3x)(-2x)(x^2)$

8.  $(x^8)^2$

9.  $(a^2b^3)^4$

10.  $(2a^2bc^4)^3$