

7.1 Exponent Rules

A Multiplication notation

Multiplication notation is shortcut for repetitive addition.

Examples:

a) $10 + 10 + 10 = 3(10)$

b) $x + x + x + x = 4x$

c) $\odot + \odot + \odot = 3\odot$

Example 1. Use the multiplication notation to simplify.

a) $5 + 5 + 5 + 5 + 5 + 5 =$

b) $y + y + y + y + y + y + y + y =$

c) $\odot + \odot + \odot + \odot + \odot + \odot + \odot + \odot + \odot =$

B Exponential notation is a shortcut for repetitive multiplication.

Examples:

a) $10 \times 10 \times 10 \times 10 \times 10 = 10^5$

b) $x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x = x^7$

c) $\blacksquare \times \blacksquare \times \blacksquare \times \blacksquare = \blacksquare^4$

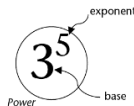
Example 2. Use the exponential notation to simplify.

a) $4 \times 4 \times 4 \times 4 =$

b) $a \cdot a \cdot a \cdot a \cdot a \cdot a =$

c) $\Delta \times \Delta \times \Delta \times \Delta \times \Delta \times \Delta \times \Delta =$

C Understanding the exponential notation



D Multiplying powers with the same base

Example 3. Write as a single power and develop a rule.

$$a^4 a^3 =$$

Conclusion:
$$a^m \times a^n = a^{m+n}$$

To multiply powers with the same base, keep the base the same and add the exponents.

Example 4. Write as a single power (simplify). Do not evaluate.

a) $10^5 \times 10^3 =$

b) $7^4 \times 7^5 =$

c) $3^{10} \times 3^{21} =$

d) $x^2 \times x^6 =$

e) $2^2 \times 2^3 \times 2^4 =$

f) $a^3 \times a^4 \times a \times a^5 =$

Note. $a^1 = a$

E Dividing powers with the same base

Example 5. Write as a single power and develop a rule.

$$a^4 \div a^3 = \frac{a^4}{a^3} =$$

Note. $a \div b = \frac{a}{b}$

Conclusion:
$$a^m \div a^n = \frac{a^m}{a^n} = a^{m-n}$$

To divide powers with the same base, keep the base the same and subtract the exponents.

Example 6. Write as a single power (simplify). Do not evaluate.

a) $10^5 \div 10^3 =$

b) $7^4 \div 7^5 =$

c) $3^{10} \div 3^2 =$

d) $x^{10} \div x^6 =$

F Power of a Power

Example 5. Write as a single power and develop a rule.

$$(a^2)^3 =$$

Conclusion: $(a^m)^n = a^{m \times n}$

To simplify a power of a power, keep the base the same and multiply the exponents.

Example 6. Write as a single power (simplify). Do not evaluate.

a) $(10^3)^4 =$

b) $(7^2)^6 =$

c) $(a^5)^2 =$

d) $(x^3)^2 =$

e) $(x^2)^3 =$

Example 7. Write as a single power (simplify). (Challenge)

a) $5^3 \times \frac{5^6}{5^2} =$

b) $3^5 \times (3^2)^4$

c) $(7^4)^4 \div (7^3)^3$

Notes: Textbook Pages 356-360

Homework: Textbook Pages 360 #1abc, 2abc, 3ab, 5abcd