1.3 Exponent Laws: Multiplying and Dividing

(chapter 3.3 in text)

Learning Goal: you will multiply and divide powers in expanded form, and derive a rule for multiplication and division of powers with the same base.

Exponent Laws

We can use exponent laws to simplify expressions involving powers with the same base.

product	expanded form	single power
$3^2 \times 3^4$	$(3\times3)\times(3\times3\times3\times3)$	3^6
$4^3 \times 4^3$		
$6^4 \times 6$		
$2^4 \times 2^2 \times 2^3$		
$k^3 \times k^5$		

Can we come up with an example using fractions as a base? Or negative numbers?

This first rule is called the PRODUCT RULE:

When multiplying powers with the same base, add the exponents.

Ex. Write each as a single power.

a) $3^2 \times 3^3$ b) $5^2 \times 5 \times 5^2$ c) $(-2)^4 \times (-2)^3$

d) $\left(\frac{1}{2}\right)^3 \times \left(\frac{1}{2}\right)^2$ e) $0.1^4 \times 0.1^2$ f) $4^6(4^5)$

The second exponent rule is called the QUOTIENT RULE:

quotient	expanded form	single power
$5^5 \div 5^3$	$\frac{5\times5\times5\times5\times5}{5\times5\times5}$	5^2
$\frac{7^4}{7}$		
$p^8 \div p^5$		

The quotient rule: when dividing powers with the same base, subtract the exponents.

Ex. Write each as a single power.

a) $8^7 \div 8^5$

b) $4^7 \div 4 \div 4^3$

c) $\frac{(-0.5)^6}{(-0.5)^3}$

d) $\frac{\left(\frac{3}{4}\right)^4 \times \left(\frac{3}{4}\right)^2}{\left(\frac{3}{4}\right)^5}$

5 What goes in the ☐ to complete the equation below?

$$(8x^3)(\square) = 24x^{12}$$

A $3x^9$

B $3x^4$

C $16x^9$

D $16x^4$

2 What exponent goes in the box to make the following equation true?

$$\frac{x\square x^6}{x^2} = x^{12}$$

a 9

b 8

c 4

d 3

2 What value of m makes the equation $\frac{6a^m}{2a^3} = 3a^5$ true?

a 2

b 8

c 15

d 18

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