AChor/MPM1D **Name: _____**
Date: _____

Worksheet 2-4: Multiplying and Dividing Powers

Exponent Law 1 - The Sum of Exponent Rule for Multiplying Powers

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

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

Shortcut for multiplying powers: add the exponents

Example 1: $2^2 \times 2^4 = (2\times 2)\times(2\times 2\times 2\times 2) = 2\times 2\times 2\times 2\times 2\times 2 = 2^6$

Shortcut: $2^2 \times 2^4 = 2^{2+4} = 2^6$

What should we do if we need to multiply powers with big exponents?

Example 2: $3^{10} \times 3^{50}$ **We use shortcut:** $3^{10} \times 3^{50} = 3^{10+50} = 3^{60}$

Practice:

1. **Express as a single power.**

(a) $3^{20} \times 3^5$ **(b)** $(4^5)(4^2)$ **(c)** $5^4 \cdot 5^{10} \cdot 5^2$

(d) $x^2 \times x^{13}$ **(e)** $(-2)^3(-2)^2$ **(f)** $2^{11} \cdot 2^{-8}$

2. **Express as a single power, then evaluate.**

(a) $(6^2)(6^2)$ **(b)** $(-7)^3(-7)^2$

(c) $(1.3^5)(1.3^{-2})(1.3^3)$ **(d)** $\left(\frac{2}{3}\right)^2\left(\frac{2}{3}\right)^3$

Assigned Work: WS 2-4; Textbook: p. 126 #1-4, #7 (a, b), #8(a to c)

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<u>Exponent Law 2 - The Difference of Exponent Rule for Dividing Powers</u>

$$a^m \div a^n = a^{(m-n)}$$

To divide powers with the "<u>same</u>" base, keep the base the same and subtract the exponents.

Shortcut for dividing powers: Subtract the exponents

Example 1: $2^4 \div 2^2 = \frac{2\times2\times2\times2}{2\times2} = \frac{2\times2\times2\times2}{2\times2} = 2^2$ $\rightarrow$ **Shortcut:** $2^4 \div 2^2 = 2^{4-2} = 2^2$

What should we do if we need to divide powers with big exponents?

Example 2: $3^{100} \div 3^{50}$ **We use shortcut:** $3^{100} \div 3^{50} = 3^{100-50} = 3^{50}$

Practice:

3. Express as a single power.

(a) $\frac{2^{12}}{2^3}$ **(b)** $\frac{4^{13}}{4^{10}}$ **(c)** $5^4 \div 5^2$

(d) $x^{13} \div x^2$ **(e)** $(-2)^{17} \div (-2)^2$ **(f)** $2^{20} \div 2^{-16}$

4. Express as a single power, then evaluate.

(a) $6^7 \div 6^4$ **(b)** $(-7)^{10} \div (-7)^2 \div (-7)^4$

(c) $\left(-\frac{1}{2}\right)^4 \div \left(-\frac{1}{2}\right)^2$ **(d)** $\frac{(-2)^5(-2)^2}{(-2)^4}$

Answers: 1. (a) 3^{25}, (b) 4^7, (c) 5^{16}, (d) x^{15}, (e) $(-2)^5$, (f) 2^3**; 2.** (a) 6^4, 1296, (b) $(-7)^4$, -16807, (c) 1.3^6, 4.83, (d) $\left(\frac{2}{3}\right)^5$, $\frac{32}{243}$**; 3.** (a) 2^9, (b) 4^3, (c) 5^2, (d) x^{11}, (e) $(-2)^{15}$, (f) 2^{36}**;**

4. (a) 6^3, 216, (b) $(-7)^4$, 2401, (c) $\left(-\frac{1}{2}\right)^2$, $\frac{1}{4}$, (d) $(-2)^3$, -8**.**