

Name: _____

Date: _____

SIMPLIFYING EXPRESSIONS INVOLVING EXPONENTS COMMON CORE ALGEBRA I



There are many situations in science, engineering and other fields where a process is governed by **repeatedly multiplying (or dividing) by the same quantity**. Repeated multiplication (and division) is represented by **exponents**. We have worked with these already, but let's review some basics in the first exercise.

Exercise #1: Each of the following problems involves basic exponent ideas. Answer each to review your previous knowledge.

(a) Represent 6^3 as an extended product. Do not evaluate the product.

(b) If $f(x) = 2x^3 + 7$, then $f(-1) = ?$

(c) If $x^3 \cdot x^5$ is written in the form of x^n what is the value of n ? Write extended products if you don't remember the **Exponent Rule**.

(d) If the expression $(5x^3)^2$ is written in the form ax^b , what is the value of $a + b$?

(e) If the length of a rectangle is 3×10^5 meters and its width is 2×10^4 meters, what is its area written in **scientific notation**?

(f) Rewrite the product $(3x^2)^2(2x^5)^3$ as an equivalent expression in simplest exponential form.

We also would like to be able to write **simpler equivalent expressions** involving ratios (or division problems) involving exponents. This all comes down to your ability to **“unmultiply” fractions**. The next exercise will illustrate.

Exercise #2: Consider the expression $\frac{2x^6}{4x^2}$.

(a) Write this expression as the product of two fractions, one of which is equal to **1**.

(b) Simplify the expression.



Let's see if we can develop a sense on how to simply these types of expressions more quickly.

Exercise #3: Rewrite each expression as the product of two fractions, one of which is equal to **1**. Then, write it as an equivalent, but simpler, expression.

(a) $\frac{5^7}{5^3}$

(b) $\frac{x^4}{x^{10}}$

(c) $\frac{x^4 y^8}{xy^{10}}$

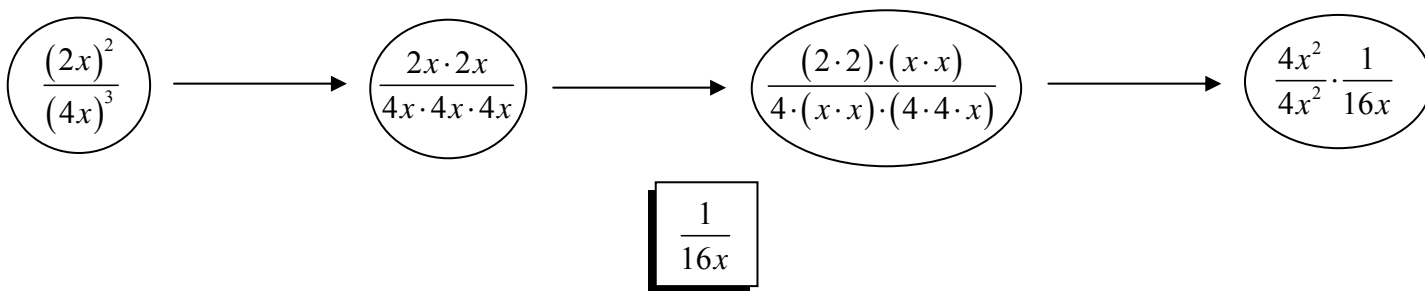
Now, let's simplify some more complicated exponential expressions. Each time, go back to rewriting the expressions based on basic principles like **repeated multiplication** and **fractions equivalent to 1**.

Exercise #4: Rewrite each of the following as equivalent exponential expressions in simplified exponential form.

(a) $\frac{(3x^2)^3}{9x^4}$

(b) $\frac{(5x^2 y^3)^2}{(10xy)^2}$

Exercise #5: The diagram below show how the expression $\frac{(2x)^2}{(4x)^3}$ gets simplified. For each transition, give the reason (rule, property, etcetera) that justifies the manipulation.



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SIMPLIFYING EXPRESSIONS INVOLVING EXPONENTS
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Which of the following is equivalent to $(3x^2y)(10x^5y^3)$?

(1) $30x^{10}y^3$

(3) $13x^7y^4$

(2) $30x^7y^4$

(4) $13x^{10}y^3$

2. If the expression $(2x^4)^3$ was written in ax^b form, which of the following would be the sum of a and b ?

(1) 20

(3) 9

(2) 14

(4) 18

3. A square field has a side length of 6×10^3 meters. Which of the following is its area in square meters?

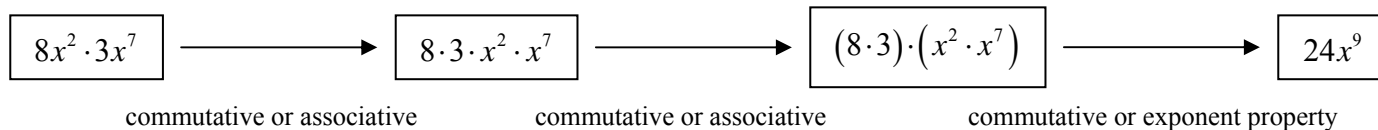
(1) 6×10^6

(3) 36×10^6

(2) 36×10^9

(4) 6×10^9

4. Circle the reason for each of the following manipulations used to simplify the product $(8x^2)(3x^7)$.



5. Rewrite each expression as the product of two fractions, one of which is equal to **1**. Then, write it as an equivalent, but simpler, expression.

(a) $\frac{10^5}{10^2}$

(b) $\frac{x^2}{x^6}$

(c) $\frac{x^4y}{xy^8}$



6. Write each of the following expressions equivalently in simplest form.

(a) $\frac{4x^7}{8x^3}$

(b) $\frac{15x^{10}}{10x^2}$

(c) $\frac{16x}{20x^3}$

(d) $\frac{x^2y^5}{xy}$

(e) $\frac{18x^4y^2}{3x^8y^5}$

(f) $\frac{6x^5y^2}{8xy^3}$

7. For each of the following fractions, first simplify the numerator and denominator, then simplify the overall fraction. The first is done as an example.

(a) $\frac{(2x^2)^3}{(4x)^2}$

(b) $\frac{(10x^4)^2}{(5x^2)^3}$

(c) $\frac{(6x)^2}{(4x^2)^3}$

$$\boxed{= \frac{8x^6}{16x^2} = \frac{x^4}{2}}$$

(d) $\frac{(x^2y^5)^3}{(xy^2)^4}$

(e) $\frac{(2xy^2)^2}{4(x^2y^3)^2}$

(f) $\frac{(9xy)^2}{(3x)^3}$

REASONING

8. Kris has incorrectly simplified the expression $\frac{20x^6}{4x^2}$ as $5x^3$.

(a) Show using the value $x = 2$ that $\frac{20x^6}{4x^2}$ and $5x^3$ are not equivalent.

(b) What is the correct simplification?

