Negative Exponents Practice

1. The correct simplification of $\frac{-7m^4n}{m^{-2}n^3}$ is

   A) $\frac{m^6}{7n^2}$ B) $\frac{-7m^6}{n^2}$ C) $\frac{-7m^2}{n^2}$ D) $\frac{m^2n^2}{7}$

2. Without using the calculator, $\left(\frac{2}{5}\right)^{-2}\left(\frac{(3^{-1})(4)}{2^2}\right)$ is equivalent to

   A) $\frac{25}{12}$ B) $\frac{100}{24}$ C) $\frac{24}{100}$ D) $\frac{12}{25}$

3. The expression, $\frac{(2x^2)^3(5x^{-1})^{-2}}{x^{-1}}$, can be simplified in the form, $\frac{8x^M}{25}$. The value of M is _____.

4. A simplified expression for the sum of $\left(\frac{x}{4}\right)^{-2}+\left(\frac{x^2}{5}\right)^{-1}$ is

   A) $\frac{16}{5x^2}$ B) $-\frac{5x^2}{16}$ C) $\frac{21}{x^2}$ D) $-\frac{x^2}{21}$

5. Simplify $\frac{-10x^{-2}}{5y^{-3}}$ with positive exponents.

Use the following information to answer the next question.

Olivia was asked to simplify the following expression with positive exponents.

$$\frac{(3m^{-2}n)^2}{18m^3n^{-5}}$$

Her work is shown below.

Step 1	$\frac{3m^{-4}n^2}{18m^3n^{-5}}$
Step 2	$\frac{3n^2n^5}{18m^3m^4}$
Step 3	$\frac{3n^7}{18m^7}$
Step 4	$\frac{n^7}{6m^7}$

6. Unfortunately, Olivia made an error. Her error occurred in step

   A) 1 B) 2 C) 3 D) 4

7. Which of the following expressions simplifies to 1.

   A) $\frac{t^4}{t^3}$ B) $\frac{t^{-5}}{t^5}$ C) $\frac{t^5}{t^{-5}}$ D) $\frac{t^{-5}}{t^{-5}}$

8. A seed on a dandelion flower weighs 10^{-3} grams. The dandelion itself can weigh up to 10^3 grams. How many times heavier is a dandelion than its seeds?

Negative Exponents Practice Solutions

1. The correct simplification of $\frac{-7m^4n}{m^{-2}n^3}$ is

A) $\frac{m^6}{7n^2}$ B) $\frac{-7m^6}{n^2}$ C) $\frac{-7m^2}{n^2}$ D) $\frac{m^2n^2}{7}$

Solution

The negative 7 coefficient stays in the numerator. The power of m with the negative exponent in the denominator can be moved to the numerator, and have it sign change.

$$\frac{-7m^4m^2n}{n^3}$$

Combine the powers of m using the multiplication rule and combine the powers of n using the division rule.

Rules of Exponents or Laws of Exponents

Multiplication Rule	$a^x \times a^y = a^{x+y}$
Division Rule	$a^x \div a^y = a^{x-y}$
Power of a Power Rule	$(a^x)^y = a^{xy}$
Power of a Product Rule	$(ab)^x = a^x b^x$
Power of a Fraction Rule	$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$
Zero Exponent	$a^0 = 1$

The correct answer is B, $\frac{-7m^6}{n^2}$.

2. Without using the calculator, $\left(\frac{2}{5}\right)^{-2}\left(\frac{(3^{-1})(4)}{2^2}\right)$ is equivalent to

A) $\frac{25}{12}$ Ans. B) $\frac{100}{24}$ C) $\frac{24}{100}$ D) $\frac{12}{25}$

Solution

Reciprocate the fraction and change the sign on the exponent.

$$\left(\frac{5}{2}\right)^2\left(\frac{(3^{-1})(4)}{2^2}\right)$$

Move the power of 3 to the denominator and change the sign on the exponent.

$$\left(\frac{5}{2}\right)^2\left(\frac{(4)}{(3^1)2^2}\right)$$

$$= \quad \left(\frac{25}{4}\right)\left(\frac{4}{12}\right)$$

$$= \quad \left(\frac{25}{12}\right)$$

The correct answer is A.

3. The expression, $\frac{(2x^2)^3(5x^{-1})^{-2}}{x^{-1}}$, can be simplified in the form, $\frac{8x^M}{25}$. The value of M is _9_.

Solution

Use the power of a product rule to remove the brackets. Whenever there is an exponent outside of brackets, multiply this exponent by each exponent on every base inside the brackets.

Rules of Exponents or Laws of Exponents

Multiplication Rule	$a^x \times a^y = a^{x+y}$
Division Rule	$a^x \div a^y = a^{x-y}$
Power of a Power Rule	$(a^x)^y = a^{xy}$
Power of a Product Rule	$(ab)^x = a^x b^x$
Power of a Fraction Rule	$\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$
Zero Exponent	$a^0 = 1$

$$\frac{(2^3x^6)(5^{-2}x^2)}{x^{-1}}$$

Make all negative exponents positive.

$$\frac{(8)(x^6)(x^2)(x^1)}{5^2}$$

Simplify: $\frac{8x^9}{25}$ M = 9

4. A simplified expression for the sum of $\left(\frac{x}{4}\right)^{-2} + \left(\frac{x^2}{5}\right)^{-1}$ is

A) $\frac{16}{5x^2}$ B) $-\frac{5x^2}{16}$ C) $\frac{21}{x^2}$ Ans. D) $-\frac{x^2}{21}$

Solution

Reciprocate both fractions and change the sign on the exponents.

$\left(\frac{4}{x}\right)^{2} + \left(\frac{5}{x^2}\right)^{1}$

= $\frac{16}{x^2} + \frac{5}{x^2}$

Since the denominators are the same and we are adding, keep the denominator and add the numerators.

= $\frac{21}{x^2}$

The correct answer is C.

5. Simplify $\frac{-10x^{-2}}{5y^{-3}}$ with positive exponents.

Solution

The coefficients, $-\frac{10}{5}$ can be simplified to -2.

The final answer is $\frac{-2y^3}{x^2}$

Use the following information to answer the next question.

Olivia was asked to simplify the following expression with positive exponents.

$$\frac{(3m^{-2}n)^2}{18m^3n^{-5}}$$

Her work is shown below.

Step 1	$\frac{3m^{-4}n^2}{18m^3n^{-5}}$
Step 2	$\frac{3n^2n^5}{18m^3m^4}$
Step 3	$\frac{3n^7}{18m^7}$
Step 4	$\frac{n^7}{6m^7}$

6. Unfortunately, Olivia made an error. Her error occurred in step
   A) 1 Ans. B) 2 C) 3 D) 4

Solution

The error was made in step 1. Olivia forgot to apply the exponent of 2 to the base of 3. Instead of $\frac{3m^{-4}n^2}{18m^3n^{-5}}$, it should be $\frac{9m^{-4}n^2}{18m^3n^{-5}}$.

The correct answer is A.

7. Which of the following expressions simplifies to 1.
   A) $\frac{t^4}{t^3}$ B) $\frac{t^{-5}}{t^5}$ C) $\frac{t^5}{t^{-5}}$ D) $\frac{t^{-5}}{t^{-5}}$ Ans.

Solution

$\frac{t^4}{t^3} = t^1$

$\frac{t^{-5}}{t^5} = \frac{1}{t^{10}}$

$\frac{t^5}{t^{-5}} = t^{10}$

$\frac{t^{-5}}{t^{-5}} = 1$

The correct answer is D, as anything divided by itself is 1.

8. A seed on a dandelion flower weighs 10^{-3} grams. The dandelion itself can weigh up to 10^3 grams. How many times heavier is a dandelion than its seeds?

Solution

$$\frac{10^3}{10^{-3}}$$

Move 10^{-3} from the denominator to the numerator.

$$\frac{10^3}{10^{-3}} = \frac{(10^3)(10^3)}{1} = 10^6$$

A dandelion is 10^6 times as heavy as its seeds.