

^ j

$$= 12b^6c^4$$

$$= \frac{5}{2} e^4 f^5 \text{ or } \frac{5e^4 f^5}{2}$$

Complete Assignment Questions #1 - #4

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30 Prime Factorization and Exponents Lesson #4: Combining the Exponent Laws

Combining the Exponent Laws

The following examples use two or more of the exponent laws in their solution.



Simplify.

a) $(3x^2)^3$
 $= 3^3 x^{2 \cdot 3}$
 $= 27x^6$

b) $(-2a^2b^3)^2$
 $= 4a^4b^6$

c) $\frac{x^3 x^5}{x^2 x}$
 $\frac{x^{3+5}}{x^{2+1}} = \frac{x^8}{x^3}$
 $= x^{8-3} = x^5$

d) $\left(-\frac{2a}{y^3}\right)^3$
 $= -\frac{8a^3}{y^9}$



Simplify the following. **BEDMAS**

a) $-(-n^2)^5$
 \downarrow
 $-(-1)^5 n^{10}$
 $-(-1)n^{10}$
 $= n^{10}$

b) $\left(\frac{4y^3 \times 3x^6}{6x^5}\right)^4$
 $= \left(\frac{12y^3x^6}{6x^5}\right)^4$
 $= (2y^3x)^4$
 $= 2^4 y^{12} x^4 = 16y^{12}x^4$

c) $\frac{16(x^3y^5)^2}{(2x^2)^3}$
 $= \frac{16x^6y^{10}}{8x^6}$
 $= 2y^{10}$

d) $(5ab^6)^2 (4a^2b)$
 $= (25a^2b^{12})(4a^2b)$
 $= 100a^4b^{13}$

(-)^{even} = + ex. $(-1)^2 = -1 \cdot -1 = +1$
(-)^{odd} = - ex. $(-1)^3 = -1 \cdot -1 \cdot -1 = -1$



Write in simplest form.

a) $(-a)^6 \div (-a)^4$
 $(-a)^{6-4} = (-a)^2$
 $= a^2$

b) $-a^6 \div (-a)^4$
 $-a^6 \div a^4$
 $= -a^{6-4}$
 $= -a^2$

c) $-a^7 \div (-a)^3$
 $-a^7 \div -a^3$
 $= +a^{7-3} = a^4$

(1, 2, 3, 4, 5)

$$= a^{\alpha}$$

$$= -a^{\alpha}$$

Complete Assignment Questions #5 - #12

(1, 2, 3, 4, 6, 8) ace, T, 9f

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Extension

In higher level mathematics courses, you may meet variable bases and variable exponents including binomial exponents.

Use the exponent laws to simplify the following.



a) $\frac{b^{4x+y}}{b^{x-2y}}$

b) $\frac{x^{5a+7b} \cdot x^{3a+b}}{x^a \cdot x^{2a-7b}}$

Complete Assignment Question #13

Assignment

1. Simplify the following.

a) $3a^3 \times 3a^4$

b) $(10b^7)(3b^8)$

c) $3a^3 \cdot 5a^3$

d) $(-2x^4)(12x^9)$

e) $\left(-\frac{1}{2}e^7\right)(-14e^8)$

f) $0.4c^3 \times 0.5c$

2. Simplify.

a) $12x^4 \div 6x^2$

b) $(81e^9) \div (9e^8)$

c) $\frac{21d^6}{7d^2}$

d) $\frac{-80d^{80}}{8d^8}$

e) $(-10e^{10}) \div (-5e^5)$

f) $\frac{12f^6}{12f^5}$

3. Write in simplest form.

a) $(3a^2b^3)(5a^4b^8)$

b) $x^9y^0x^2y^4$

c) $\frac{6x^4y^7}{2x^3y^2}$

d) $\frac{5x^4y^7}{x^3y^2}$

e) $\frac{4f^{12}d^3}{12f^4d}$

f) $(7b^4c)(bc^2)(-2b^2c^6)$

4. Simplify.

a) $\frac{10e^8f^8}{15e^4f^2}$

b) $(2p^3)(4p^7)(-2p)$

c) $(-2xy)(x^2y^3)(-3xy)$

d) $(-8b^6c) \div (2b^3c)$

e) $(-10t^8y^6) \div (-2t^7y^3)$

f) $(4x^5z^7) \div (-16xz^6)$

5. Write in simplest form.

a) $(-a^2b^3)^4$

b) $(-a^2b^3)^5$

c) $\left(\frac{b^4}{a^3}\right)^3$

d) $\frac{c^5 \times c^2}{c^4 \times c}$

6. Simplify.

a) $(3ab^2)^4$

b) $(-4a^5c^2)^4$

c) $(-2m^3n^4)^5(m^2n^3)$

d) $(-4x^2y^3)^3(8xy^8)$

e) $(a^3b^4c^5)(3abc^2)^3$

7. Write each expression in simplest form without brackets.

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

b) $\left(\frac{-16a^5b^3 \cdot 2a^2b^6}{8ab^7}\right)^3$

c) $\left(\frac{-5k^3 \cdot k^2}{k}\right)^2 \left(\frac{(-k)^5 \cdot k^2}{5k^2}\right)$

8. Write in a simpler form and evaluate.

a) $\frac{6^6 \times 6}{6^4}$

b) $(-3^3)^2$

c) $\left(\frac{2^{10}}{2^5}\right)^3$

d) $\frac{(0.7)^8}{(0.7)^4 \times (0.7)^2}$

e) $-5^6 \times 5^2$

f) $(-5)^6 \times (-5)^2$

g) $-10^{10} \div (-10)^8$

h) $\frac{-10^{10}}{-10^8}$

9. Write each expression in simplest form without brackets.

a) $(-x)^{12} \div (-x)^6$

b) $(-a)^6 \div (-a^4)$

c) $-p^{10} \div (-p)^2$

d) $c^5 \div (-c)^2$

e) $-(-t)^4 \div (-t)^3$

f) $-(-t^4) \div (-t)^3$

**Multiple
Choice**

10. The simplified form of $\frac{1}{36}(2x^3)^2(-3yx^2)$ is

A. x^8y^2

B. $-\frac{1}{3}x^8y$

C. $-\frac{1}{3}x^7y$

D. $-\frac{1}{6}x^6y$

11. The expression $\frac{6(x^3y^5)^2}{(3xy)^4}$ is equivalent to the expression

A. $\frac{4}{9}x^2y^6$

B. $2x^5y^6$

C. $2x^2y^6$

D. $\frac{2}{27}x^2y^6$

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Numerical Response

12. If the expression $\frac{4x^{-4}}{8x^{-3}}$ is written in the form ax^b , then the value of $a - b$ is _____.

(Record your answer in the numerical response box from left to right)

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Extension

13. Simplify each expression.

a) $a^{x+y}a^{2x+3y}$

b) $\frac{m^{x+9}}{m^3}$

c) $\frac{a^{3m+2}}{a^{m-3}}$

d) $\frac{x^{2y+7} \cdot x^{3y+2}}{x^{y+8}}$

Answer Key

1. a) $9a^7$ b) $30b^{15}$ c) $15a^6$ d) $-24x^{13}$ e) $7e^{15}$ f) $0.2c^4$
2. a) $2x^2$ b) $9e$ c) $3d^4$ d) $-10d^{72}$ e) $2e^5$ f) f
3. a) $15a^6b^{11}$ b) $x^{11}y^4$ c) $3xy^5$ d) $5xy^5$ e) $\frac{1}{3}f^8d^2$ f) $-14b^7c^9$
4. a) $\frac{2}{3}e^4f^6$ b) $-16p^{11}$ c) $6x^4y^5$ d) $-4b^3$ e) $5ty^3$ f) $-\frac{1}{4}x^4z$
5. a) a^8b^{12} b) $-a^{10}b^{15}$ c) $\frac{b^{12}}{a^9}$ d) c^2
6. a) $81a^4b^8$ b) $256a^{20}c^8$ c) $-32m^{17}n^{23}$ d) $-512x^7y^{17}$ e) $27a^6b^7c^{11}$
7. a) $\frac{d^{18}}{8}$ b) $-64a^{18}b^6$ c) $-5k^{13}$
8. a) $6^3 = 216$ b) $3^6 = 729$ c) $2^{15} = 32768$ d) $(0.7)^2 = 0.49$
 e) $-5^8 = -390625$ f) $(-5)^8 = 390625$ g) $-10^2 = -100$ h) $10^2 = 100$
9. a) x^6 b) $-a^2$ c) $-p^8$ d) c^3 e) t f) $-t$
10. B 11. D 12.

1	.	5	
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13. a) a^{3x+4y} b) m^{x+6} c) a^{2m+5} d) x^{4y+1}