

1.6-B- Laws of Exponents

| Question | Expanded Form | Exponent | Law |
|------------------------------|---------------|----------|--------------------------------|
| $5^2 \times 5^4$ | | | $a^m \times a^n =$ |
| $2^5 \div 2^2$ | | | $a^m \div a^n =$ If $m > n$ |
| $2^2 \div 2^5$ | | | $a^m \div a^n =$ If $m < n$ |
| $(4^3)^2$ | | | $(a^m)^n =$ |
| $(5a)^4$ | | | $(ab)^n =$ |
| $\left(\frac{3}{4}\right)^2$ | | | $\left(\frac{a}{b}\right)^n =$ |

Why is $a^0 = 1$

$$\begin{array}{l}
 5^3 \div 5^3 \\
 = \frac{5 \times 5 \times 5}{5 \times 5 \times 5} \\
 = \frac{125}{125} \\
 = 1
 \end{array}
 \qquad
 \begin{array}{l}
 5^3 \div 5^3 \\
 = 5^{3-3} \\
 = 5^0
 \end{array}$$

Therefore $5^0 = 1$

Ex 1: Simplify these exponents (DO NOT EVALUATE)

$$\begin{array}{ll}
 9^7 \times 9^6 = \underline{\hspace{2cm}} & 3^7 \div 3 = \underline{\hspace{2cm}} \\
 3^7 \times 3 = \underline{\hspace{2cm}} & 9^7 \div 9^6 = \underline{\hspace{2cm}} \\
 4^7 \times 4^{-3} = \underline{\hspace{2cm}} & 4^7 \div 4^{-3} = \underline{\hspace{2cm}} \\
 7^0 \times 7^{12} = \underline{\hspace{2cm}} & \frac{7^{12}}{7^9} = \underline{\hspace{2cm}} \\
 2^{22} \times 2^{-20} = \underline{\hspace{2cm}} & 2^{22} \div 2^{-20} = \underline{\hspace{2cm}} \\
 (-6)^7 \times (-6)^6 = \underline{\hspace{2cm}} & \frac{(-6)^5}{(-6)^7} = \underline{\hspace{2cm}}
 \end{array}$$

Ex 2: Simplify these exponents

$$\begin{array}{l}
 (2^7)^2 = \underline{\hspace{2cm}} \\
 (3^3)^2 = \underline{\hspace{2cm}} \\
 (a^4)^3 = \underline{\hspace{2cm}} \\
 (q^n)^m = \underline{\hspace{2cm}} \\
 (5^5)^5 = \underline{\hspace{2cm}} \\
 ((-3)^2)^4 = \underline{\hspace{2cm}}
 \end{array}$$

Ex 3: Simplify these exponents

$$\begin{array}{l}
 \frac{(x^3)^2}{x^2} = \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \\
 \frac{(2^3)(a^2)^3(b^3)^3}{4a^6b^8} = \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}}
 \end{array}$$

Ex 4: Express each power as a new power with the given base

$$\begin{array}{l}
 16^2 = \underline{\hspace{2cm}} = 2^{\underline{\hspace{1cm}}} \\
 16^2 = \underline{\hspace{2cm}} = 4^{\underline{\hspace{1cm}}} \\
 25^3 = \underline{\hspace{2cm}} = 5^{\underline{\hspace{1cm}}} \\
 27^3 = \underline{\hspace{2cm}} = 3^{\underline{\hspace{1cm}}}
 \end{array}$$

Ex 4: Solve $4^4 \div 2^2 =$

Ex 5: Simplify these exponents

$$\begin{array}{l}
 \frac{3a^2}{9a^4} = \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \\
 \frac{15a^5}{25a^2} = \underline{\hspace{2cm}} \\
 \underline{\hspace{2cm}} \\
 \frac{3a^4}{6b^2} \times \frac{2a^2}{b^4} \times \frac{b^9}{a^5} = \underline{\hspace{2cm}}
 \end{array}$$

Ex 6: Simplify

$$(3a)^6 = \underline{\hspace{2cm}}$$

$$(6b)^3 = \underline{\hspace{2cm}}$$

$$(2a^3)^2 = \underline{\hspace{2cm}}$$

$$(a \times b)^n = \underline{\hspace{2cm}}$$

$$\left(\frac{5}{3}\right)^4 = \underline{\hspace{2cm}}$$

$$\left(\frac{7}{x}\right)^3 = \underline{\hspace{2cm}}$$

$$\left(\frac{b}{8}\right)^2 = \underline{\hspace{2cm}}$$

$$\left(\frac{a}{b}\right)^n = \underline{\hspace{2cm}}$$

Ex 4: Fill in with $=$ or \neq

1) $5^2 + 5^3$ 5^5

2) $2^4 \times 2^3$ 2^{12}

3) $4^2 \times 5^3$ 20^5

4) $5^2 + 5^2$ 10^4

5) $5^6 - 5^2$ 5^4

6) $6^4 / 2^2$ 3^2

7) $5^6 / 5^2$ 5^3

8) x x^0

Ex 7: Simplify

12f) $(5x^3)^2 = \underline{\hspace{2cm}}$

13f) $(3a^4b^2)^2 (-a^5b)^2 (2a^3b^2)^2$
 $= \underline{\hspace{2cm}}$
 $= \underline{\hspace{2cm}}$

15d) $\left(\frac{3x^2}{y^3}\right)^3 \left(\frac{y^4}{9x^4}\right)^2 = \underline{\hspace{2cm}}$

Ex 8: Extra Practice - Simplify

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

$= \underline{\hspace{2cm}}$

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

$= \underline{\hspace{2cm}}$

c) $\frac{(5a^6b^4)^3}{(5a^2)^3}$

$= \underline{\hspace{2cm}}$

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

$= \underline{\hspace{2cm}}$

Evaluate at $a = -2$ and $b = -1$

Practice:

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 only (acegik) of each question

