Warm Up

Express each as a radical then evaluate:

a) $(216)^{\frac{2}{3}}$ $= (\sqrt[3]{216})^2$ $= 6^2$ $= 36$

b) $(1024)^{\frac{3}{5}}$ ← ex ← index $= (\sqrt[5]{1024})^3$ $= (4)^3$ $= 64$

Express each as a power:

a) $\sqrt[4]{625}$ $625^{\frac{1}{4}}$

b) $(\sqrt[5]{32})^7$ $32^{\frac{7}{5}}$

Express each in simplest radical form: (Entire → Mixed)

a) $\sqrt{405}$ $= \sqrt{81 \times 5}$ $= \sqrt{81} \times \sqrt{5}$ $= 9\sqrt{5}$

b) $\sqrt[3]{500}$ $= \sqrt[3]{125 \times 4}$ $= \sqrt[3]{125} \times \sqrt[3]{4}$ $= 5\sqrt[3]{4}$

Write the radical for the power and evaluate: (Use calculator but show work)

a) $64^{\frac{2}{3}}$ ← exp ← index $= (\sqrt[3]{64})^2$ $= 4^2$ $= 16$

b) **$7776^{\frac{3}{5}}$** $= (\sqrt[5]{7776})^3$ $= 6^3$ $= 216$

Any Homework Questions?

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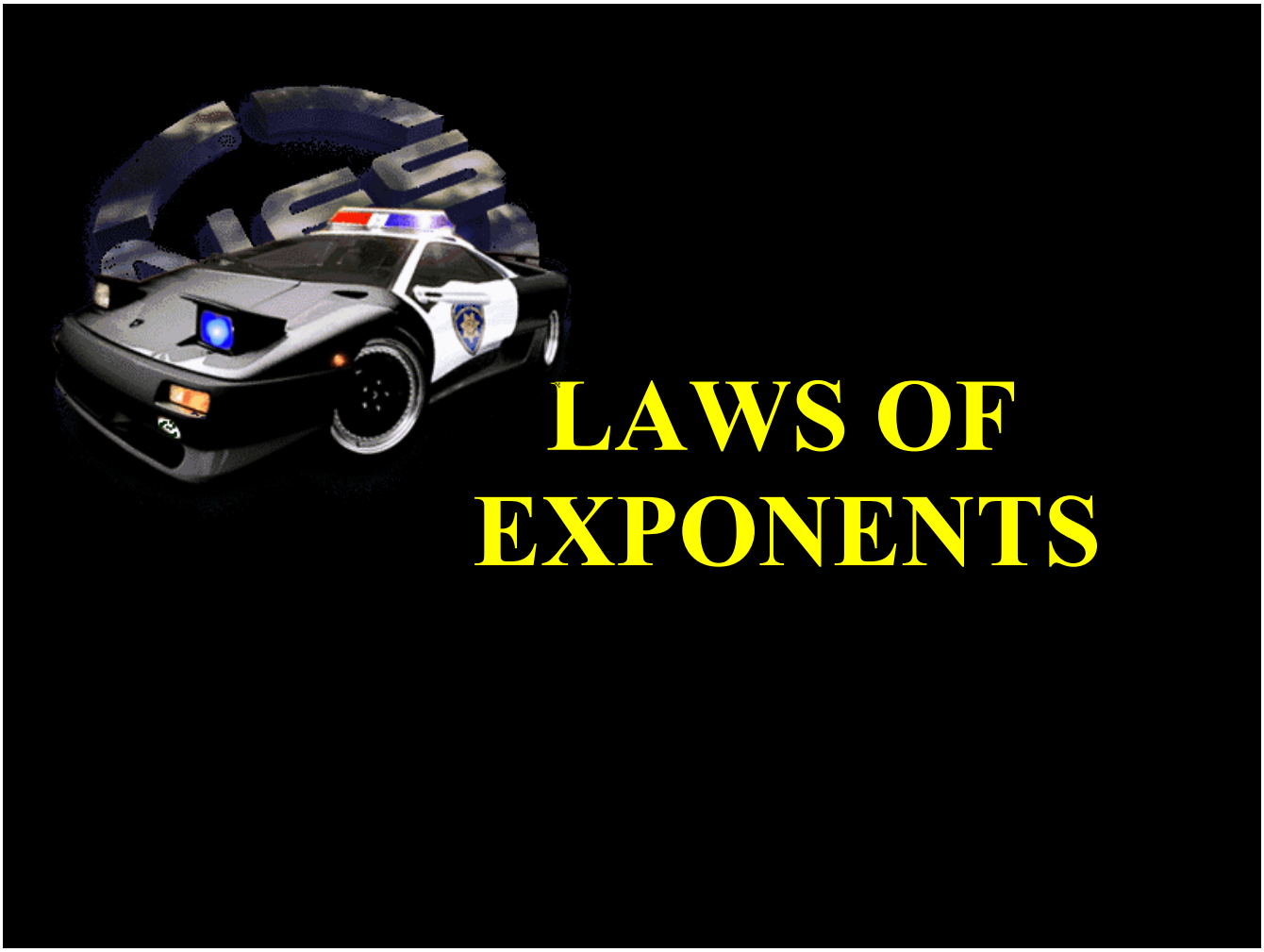
3(adf),4(acd), 5(abc), 6ac), 8a,b,c, 9, 12(a,b,c), 15


LAWS OF
EXPONENTS

Laws Of Exponents

Law #1: Product Rule

$$b^m \times b^n = b^{m+n}$$

- when multiplying powers with the **same** base you add the exponents

Exercise:

Simplify the following using the laws of exponents

a) $3^2 \times 3^4$

3^{2+4}

3^6

b) $4^3 \times 3^4$

Not the same base

c) $(q^7)(q^1)$

$= q^{7+1}$

$= q^8$

d) $p^1 \times p^3 \times p^2$

p^{1+3+2}

$= p^6$

e) $(2x^3)(4x^2)$

$2 \cdot 4 \; x^3 \; x^2$ like bases

$8 \; x^5$

f) $(3z^3)(6z^{12})$

$3 \cdot 6 \; z^3 \; z^{12}$

$18 \; z^{15}$

Law #2: Quotient Rule

$$b^m \div b^n = b^{m-n}$$

- when dividing powers with the **same** base you subtract the exponents

Exercise:

Simplify the following using exponent laws

a) $5^{23} \div 5^{12}$

$= 5^{23-12}$

$= 5^{11}$

b) $\frac{x^{34}}{x^{19}}$ $= x^{34-19}$

$= x^{15}$

c) $c^3 \div e^2$

Not like base

d) $\frac{12x^3}{4x^1}$ $= \frac{12}{4} x^{3-1}$

$= 3x^2$

e) $\frac{25c^{30}}{5c^{23}}$ $\frac{25}{5} c^{30-23}$

$= 5c^7$

Law #3: Power Rule

when raising a power to another power...MULTIPLY the exponents."

$$(b^m)^n = b^{mn}$$

Law #4: Power of Product

when a product is raised to a power, each of the factors are raised to the power."

$$(ab)^m = a^m b^m$$

- when brackets are involved you must multiply the exponents

Exercise:

Simplify the following using Laws of Exponents

a) $(m^3)^4$ power of a power

$m^{3\times4}$

$= m^{12}$

b) $(x^2y^4)^3$ power of a product

$= x^{2\times3}\ y^{4\times3}$

$= x^6\ y^{12}$

c) $(2d^3)^3$

$2^{1\times3}\ d^{3\times3}$

$= 2^3\ d^9$

$= 8\ d^9$

d) $(2m^4n^2)^2(m^3n^2)$

$= 2^2\ m^8n^2\ m^3n^2$ product law

$= 2^2\ m^{8+3}\ n^{2+2}$

$= 4\ m^{11}\ n^4$

Law #5: Power of Quotient Rule

when a quotient is raised to a power, both the divisor and the dividend are raised to the power."

$$\left(\frac{a}{b}\right)^n = \left(\frac{a^n}{b^n}\right)$$

Law #6: Zero Rule

$$b^0 = 1$$

$(36x^7y^{10})^0$

1

- any power raised to the exponent 0 (zero) is equal to 1

1 to 10 on Worksheet

1) $2v^4 \cdot 3u^4v^3 \cdot 3u^2v^2$

$2 \cdot 3 \cdot 3 \quad v^4 v^3 v^2 \quad u^4 u^2$ (product law)

$18 \quad v^{4+3+2} \quad u^{4+2}$

$18 \quad v^9 \quad u^6$

2) $4y^3 \cdot 4y^2$

$4 \cdot 4 \quad y^3 y^2$ (product law)

$16 \quad y^{3+2}$

$16 \quad y^5$

3) $2x^2 \cdot (2y^1x^3)^2$ (power law)

$= 2^1x^2 \cdot 2^2y^2x^6$

$= 2^1 \cdot 2^2 \quad x^2x^6 \quad y^2$ (product)

$2^3 \quad x^8 \quad y^2$

$8 \quad x^8 \quad y^2$

4) $y^4(2x^3y^1)^4$

$y^4 \quad 2^4x^{12}y^{16}$

$= 2^4 x^{12} y^4 y^{16}$ (product)

$16 \quad x^{12} \quad y^{20}$

5) $\dfrac{3m^{-1}n^2}{m^{-3}n^{-1}}$

$= 3\, m^{-1--3}\, n^{2--1}$ (add opposite integer rule)

$= 3\, m^{-1+3}\, n^{2+1}$

$= 3m^2n^3$

6) $\dfrac{4u^4v^2}{4v^{-2}}$

$= \dfrac{4}{4} u^4 v^{2--2}$ (add opp)

$= 1\, u^4 v^{2+2}$

$= u^4v^4$

7) $\left(\dfrac{b^2 \cdot b^1}{b^{-2}}\right)^2$

$= \left(\dfrac{b^3}{b^{-2}}\right)^2$

$= \left(b^{3--2}\right)^2$ (add opp)

$= (b^{3+2})^2$

$= (b^5)^2$

$= b^{10}$

OR $\dfrac{b^4 \cdot b^2}{b^{-4}} = \dfrac{b^6}{b^{-4}}$

$= b^{6--4}$

$= b^{6+4}$

$= b^{10}$

8) $\dfrac{(a^{-2}b^3)^{-1} \cdot 2a^4b^3}{2a}$

$= \dfrac{2\, a^2 b^{-3}\, a^4 b^3}{2a}$

$= \dfrac{2\, a^2a^4\, b^{-3}b^3}{2\, a^1}$

$= \dfrac{a^6\, b^0}{a^1}$

$= a^{6-1}\, b^0$

$= a^5 \cdot 1$

$= a^5$

Attachments

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