

Advanced Algebra

Exponent Rules and Shortcuts Practice GREEN #3 2023

Multiplying like bases	Shortcut: $b^m b^n = b^{m+n}$
Dividing like bases	Shortcut: $\frac{b^m}{b^n} = b^{m-n}$
Parenthesis Exponents	Shortcut: $(ab)^n = a^n b^n$ and $(b^m)^n = b^{mn}$
Negative Exponents	Shortcut: $b^{-m} = \frac{1}{b^m}$ and $\frac{a^{-n}}{b^{-m}} = \frac{b^m}{a^n}$
Zero Exponents	Shortcut: $b^0 = 1$

Use the shortcuts to simplify these expressions. They should be quick one-step problems:

- 1) $b^2 b^{14}$ 2) $\frac{x^{22}}{x^{10}}$ 3) $a^8 b^{-7}$ 4) $\frac{x^7}{x^{13}}$
- 5) x^0 6) $(a^{1.5} b c^3)^4$ 7) $(7xy^8)^0$ 8) $a^{15} a^{-9}$
- 9) $a^{12} b^{-2} c^{-5}$ 10) $(x^4)^8$ 11) $(a^2)^{13}$

Use two of the rules together to simplify these expressions.

- 1) $(5x^4)^2 x^7$ 2) $(a^2 b^3)^4 a^3 b^3$ 3) $\frac{(a^2 b^5)^3}{ab^{13}}$
- 4) $\frac{(6x^3)^2}{x^8}$ 5) $x^3 y^4 z^3 x^{-8} y^{-6} z^{10}$ 6) $a^8 b^6 c^4 a^{-5} b^{-2} c^{-12}$
- 7) $(x^3 y^8)^{-2}$ 8) $(a^3 b^2)^{-5}$ 9) $(\frac{a^2}{2b})^6$

Side 1 is how our non-calculator Quiz will be.

Green #3

Make sure to know great order of operations problem

$$\frac{5w^{19}}{35w^{18}y^8y^2}$$

$$10) \frac{5w^{-18}y^{-2}}{35y^8w^{-19}}$$

$$\frac{w}{7y^{10}}$$

$$11) (-4xy^3)(5xy^8)$$

$$-20x^2y^{11}$$

$$12) 4(2j^4)^4$$

$$4 \cdot 2^4 \cdot j^{16}$$

$$64j^{16}$$

Remember a Root is a fraction exponent. So anything with a radical sign can be written with a rational exponent. So $\sqrt{6}$ is the same thing as $6^{\frac{1}{2}}$

$$1) \sqrt[3]{27x^6y^{18}}$$

You should rewrite without the radical notation. Then use parenthesis rule

$$(27x^6y^{18})^{\frac{1}{3}}$$

$$27^{\frac{1}{3}} x^2 y^6$$

$$3x^2y^6$$

Same base add exponents. Then parenthesis rule

$$2) \left(\frac{b^{6x}b^{4x}}{b^4}\right)^3$$

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

$$\frac{b^{30x}}{b^{12}}$$

$$3) 2^{3k+1} * 32^{k-6}$$

$$2^{3k+1} \cdot 2^{5(k-6)}$$

$$2^{3k+1} \cdot 2^{5k-30}$$

$$2^{8k-29}$$

Hint: Make sure to change the base

$$4) (x^{\frac{1}{2}}y^{\frac{1}{5}})^{30}$$

$$x^{15}y^6$$

You should rewrite without the radical notation

$$5) (6^4\sqrt{6^7})(\sqrt{6^5})$$

$$6^4 \cdot 6^{\frac{7}{2}} \cdot 6^{\frac{5}{2}}$$

$$6^4 \cdot 6^{12}$$

$$6^4 \cdot 6^6$$

$$6^{10}$$

$$6) \frac{a^2b^{\frac{-1}{3}}c^{-1}}{a^{\frac{1}{2}}b^{\frac{4}{3}}c^2}$$

$$\frac{a^{1.5}}{b^{\frac{5}{3}}c^3}$$

$$7) \frac{x^2y^{-3}z^{-1}}{(a^{\frac{2}{5}}b^{\frac{1}{5}}c^{\frac{3}{5}})^{12}}$$

$$\frac{x^2}{a^{4.8}b^{2.4}c^{7.2}} y^{-3} z^{-1}$$

$$\frac{x^2 y^{-3} z^{-1}}{a^{4.8} b^{2.4} c^{7.2}}$$

$$8) \frac{x^{10}y^{12}}{x^6y^3z^2}$$

$$\frac{x^4y^9}{z^2}$$

Re-write the following as a logarithm

$$9) 28^x = 1200$$

$$\log_{28} 1200 = x$$

$$10) 13^x = 905$$

$$\log_{13} 905 = x$$

11) Re-write the equation $\log_3 \frac{1}{27} = -3$ in exponent form

$$3^{-3} = \frac{1}{27}$$

12) Solve the following equation: $5^{x-3} = 6^{2x-2}$

$$(x-3) = (2x-2) \frac{\log 6}{\log 5}$$

$$x-3 = 1.1(2x-2)$$

Should be $x-3 = (2x-2) \left(\frac{\log 6}{\log 5}\right)$

$$x-3 = 2.22x - 2.22$$

$$-.78 = 1.22x$$

$$x = -.64$$