1 Exponents Tutorial

1.1 Notation

Write in either exponent form or as a repeated multiplication

1) $2 \times 2 \times 2$

2) $5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5$

3) 6^4

4) 10^2

Note:

When you have a repeated multiplication, you put the number of times you multiply as the exponent. For example: $3 \times 3 \times 3 \times 3 = 3^4$

1.2 Multiplication

5) $x^3 \times x^2$

6) $g^{-1} \times g^{-5} \times g \times g^5$

7) $t^2 \times t^6$

8) $c^2 \times c^2 \times c^2$

9) $a^3 \times b^2$

10) $h \times k^2$

11) $(m^{-4})(n^{12})(m^{10})$

12) $a^3 \times b^9 \times c^4$

Note:

When we are multiplying two numbers with the same base, you can add the exponents. For example: $a^3 \times a^2 = a^{3+2} = a^5$

Note:

When we are multiplying two numbers that <u>DO NOT</u> have the same base, we <u>CANNOT</u> add the bases.

1.3 Division Law

13) $\frac{x^{10}}{x^9}$

14) $\frac{a^2}{a^{10}}$

15) $z^4 \div z^2$

16) $\frac{c^3}{c^5}$

Note:

If two exponential numbers are being divide and they have the same, we subtract the exponent in the numerator by the exponent in the denominator. For example: $\frac{x^8}{x^5} = x^{8-5} = x^3$

17) $\dfrac{e^{-1}}{e^2}$

18) $\dfrac{b^{-3}}{b^{-5}}$

19) $t^9 \div t^5$

20) $a^3 \div b^2$

21) $\dfrac{h^4}{k^9}$

22) $d^4 \div e^5$

23) $j^5 \div \dfrac{k^4}{g^2}$

Note:

When we are dividing two numbers that <u>DO NOT</u> have the same base, we <u>CANNOT</u> subtract the bases.

1.4 Power Law

24) $(a^2)^3$

25) $(v^3)^3$

26) $(6^2)^4$

27) $2(m^5)^4$

28) $(p^2q)^3$

29) $(de)^7$

30) $\left(\dfrac{1}{y}\right)^{19}$

Note:

When we are taking the power of a base that already has an exponent, we multiply the two exponents. For example: $(a^4)^2 = a^{4\times2} = a^8$

Note:

When we have two terms that are both being brought the power of some number, then we must bring both terms to that power. For example: $(3a^4)^2 = 3^2 \times (a^4)^2 = 9a^8$

1.5 Inverse Law

31) a^{-3}

32) $-(k^{-1})^{-1}$

33) $(g^{-2})^{-4}$

34) k^{-3}

Note:

When the exponent is a negative, we place the base and the exponent at the bottom of a fraction. For example: $a^{-1} = \dfrac{1}{a}$

35) $\frac{1}{h^{-2}}$

36) $\left(\frac{a^3 b^{-5} c^4}{x^3 y^{-5} z^4}\right)^{-1}$

2   Using all the Laws

37) $\left(\frac{6m^3 x^0}{3m^2 n^3}\right)^{-2}$

38) $(-5x^{-5})(2xy^7)(-y^3)^2$

39) $\frac{-x^{12}}{9y^9 z^3} \times \frac{-12y^{-3}}{-x^{11}}$

40) $\frac{12a^3}{5b^2} \times \frac{15a}{b}$

41) $\left(\frac{a^4 b^3}{c^3}\right)\left(\frac{b^2 c^3}{a^4}\right)\left(\frac{a^4 c^3}{b^2}\right)$

42) $\frac{(2x^2)^4}{9y^2 z^2} \times \frac{(3yz)^2}{(4x^4)^2}$

43) $\left(\frac{7}{-p^5 q}\right)\left(\frac{-9p^3 q^8}{14}\right)$

44) $(-3m^2 \div 7n^4) \times (2n \div m)$

45) $\left(\frac{s^{-3} t}{c^4}\right)^{-2}$

46) $\frac{x^3 y^5}{6} \times \frac{x^{-2} z^2}{3} \times \frac{y^{-3}}{2}$

47) $\left(\frac{3x^{12} y^8 z^4}{v^{15} w^7}\right)^0$

48) $(x^{-2} y^2)^{-2}$

Answers/Solutions

1) 2^3

2) 5^7

3) $6 \times 6 \times 6 \times 6$

4) 10×10

5) x^5

6) g^0 or 1

7) t^8

8) c^6

9) $a^3 \times b^2$

10) hk^2

11) $(m^6)(n^{12})$

12) $a^3 \times b^9 \times c^4$

13) x^1 or x

14) a^{-1}

15) z^2

16) $\dfrac{1}{c^2}$ or c^{-2}

17) $\dfrac{1}{e^3}$ or e^{-3}

18) b^2

19) t^4

20) $\dfrac{a^3}{b^2}$

21) $\dfrac{h^4}{k^9}$

22) $\dfrac{d^4}{e^5}$

23) $\dfrac{j^4 \times g^2}{k^4}$

24) a^6

25) v^9

26) 6^8

27) $2m^{20}$

28) $p^6 q^3$

29) $d^7 e^7$

30) $\dfrac{1}{y^{19}}$

31) $\dfrac{1}{a^3}$

32) $-k$

33) g^8

34) $\dfrac{1}{k^3}$

35) h^2

36) $\dfrac{a^{-3} b^5 c^{-4}}{x^{-3} y^5 z^{-4}}$ or $\dfrac{x^3 b^5 z^4}{a^3 y^5 c^4}$

37) $\dfrac{n^6}{4m^2}$

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38) $\dfrac{-10y^{13}}{x^4}$

39) $\dfrac{-4x}{3y^{12}z^3}$

40) $\dfrac{36a^4}{b^3}$

41) $a^4 b^3 c^3$

42) 1

43) $\dfrac{9q^7}{2p^2}$

44) $\dfrac{-6m}{7n^3}$

45) $\dfrac{s^6 c^8}{t^2}$

46) $\dfrac{xy^2 z^2}{36}$

47) 1

48) $\dfrac{x^4}{y^4}$

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