8th grade Notes & Activity

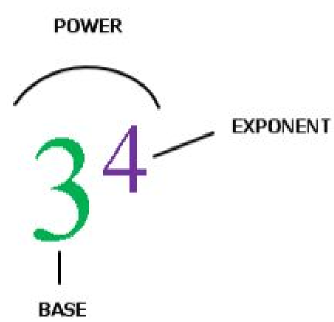
Topic : COMPUTATION and NUMBERS I

Sub-Topic: INDICES

A square number is any number that is the product of a natural (or counting) number and itself. **E.g. $3 \times 3 = 9$**

A cube number is any number that is the result of using a natural (or counting) number in a multiplication three times. **E.g. $3 \times 3 \times 3 = 27$**

A number written in index form is that number written as an exponential expression, or a single number raised to another number, for example, 3^4.



We say: **"three to the power of four"** or **"three to the fourth power" $3^4 = 3 \times 3 \times 3 \times 3 = 81$**

A number written in the form a^m is said to be written in index form. The base number in a^m is 'a' and it tells the number that is to be multiplied by itself. The index (also called the power or exponent) m tells how many times to repeat the multiplication.

Examples:

a^3 means a is multiplied by itself 3 times or $a \times a \times a$

5^3 means $5 \times 5 \times 5 = 25 \times 5 = 125$

5^m tells that ***5*** is to be multiplied by itself ***m*** number of times

When terms, written in index form, are multiplied or divided some special rules/laws can be used to write the product or quotient in index form. However, one of two conditions must be present, either the bases are the same or the powers are the same.

LAWS OF INDICES

Rule 1: Zero Exponent Rule

$a^0 = 1$

Any number, except 0, whose index is 0 is always equal to 1, regardless of the value of the base.

An Example: Simplify 2^0: $2^0 = 1$

Rule 2: Product Rule : $a^m \times a^n = a^{m+n}$

For example: When the bases are the same:

$4^2 \times 4^3 = 4 \times 4 \times 4 \times 4 \times 4 = 4^5$ - Notice that when 4 is multiplied by itself 2 times and then 3 more times it is all together multiplied by itself 5 times. Therefore, when multiplying terms and the bases are the *same* we *add* the powers.

Rule 3: Quotient Rule: $a^m \div a^n = a^{m-n}$

$4^5 \div 4^3 =$

$\frac{4 \times 4 \times 4 \times 4 \times 4}{4 \times 4 \times 4} = \frac{4 \times 4}{1} = 4^2$ - Notice the result after canceling sets of 4. Therefore, when dividing terms and the bases are the *same* we *subtract* the powers.

Where none of the two conditions are present, each term must be calculated and then used to determine the product or quotient.

For example:

$a^m \times b^n$

$4^2 \times 3^4 = 4 \times 4 \times 3 \times 3 \times 3 \times 3 = 16 \times 81 = 1296$

a^m / b^n

$4^5 \div 3^4 = \frac{4 \times 4 \times 4 \times 4 \times 4}{3 \times 3 \times 3 \times 3} = \frac{1024}{81}$

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ACTIVITY

Name : ___________________ Grade: ______ Date:__________

Instruction: Answer all questions below

1. Calculate the value of the following

Example 1: $6^2 = 6 \times 6 = 64$ 2 marks each

a. 5^2

b. 2^5

c. 3^0

d. 10^1

2. Copy each of the following statements and fill in the missing number or numbers: 2 marks each

Example 2: $2^{\square} = 2 \times 2 \times 2$

$2^{\square} = 2^3$

a. $2^{\square} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

b. $3^{\square} = 9$

c. $5^3 = \square \times \square \times \square$

d. $64 = \square^2$

3. (a) Simplify the following 2 marks each

Example 3: $m^5 \times m^3 = (m \times m \times m \times m \times m) \times (m \times m \times m)$

$= m^8$

Example 4: $m^5 \div m^3 = (m \times m \times m \times m \times m) \times (m \times m \times m)$

$= m^2$

a. $2^7 \times 2^3$

b. $a^7 \times a^9$

c. $3^7 \div 3^3$

d. $w^{12} \div w^5$

4. Simplify the following: 2 marks each

Example 5: $4^2 \times 3^4 = 4 \times 4 \times 3 \times 3 \times 3 \times 3$

$= 16 \times 81$

$= 1296$

Example 6: $4^5 \div 3^4 = \frac{4 \times 4 \times 4 \times 4 \times 4}{3 \times 3 \times 3 \times 3}$

$= \frac{1024}{81}$

a. $5^4 \times 4^4$
b. $10^4 \times 7^2$
c. $8^2 \div 9^3$
d. $2^5 \div 6^3$

Maths is FUN

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