Exponents

Just as multiplication involves repeated addition, there are instances where we encounter repeated multiplication.

Answer each of the multiplication:

⇒ (+2) • (+2) • (+2) • (+2) • (+2) = 32

⇒ (-4) • (-4) • (-4) = 64

We can express this repeated multiplication by using what is called *exponents*.

* superscript

b^n

Exponent
The value that specifies how many times the base will be multiplied by itself

Base
The number or variable that is being multiplied repeatedly in the expanded form

Rewrite the following using exponent notation:

⇒ (+2) • (+2) • (+2) • (+2) • (+2) = $(+2)^5$

⇒ (-4) • (-4) • (-4) = $(-4)^3$

Write each of the exponents as repeated multiplication and determine the result:

⇒ 3^3 = 3×3×3 = 27

⇒ $(-1)^5$ = (-1)(-1)(-1)(-1)(-1) = -1

Just as with multiplication, if there is an ***odd*** exponent to a negative (-) base then the answer will be ***negative*** (-). If there is an ***even*** exponent to a negative (-) base then the answer will be ***positive*** (+).

Caveat! Be careful if the base is negative or if the expression is negative.

Example:

⇒ 2^5 = 2×2×2×2×2 = 32

⇒ $(-2)^5$ = (-2)(-2)(-2)(-2)(-2) = -32

⇒ -2^5 = -(2)(2)(2)(2)(2) = -32

Negative is not part of the base!

$(-2)^4 = (-2)(-2)(-2)(-2) =$

$-2^4 = -(2)(2)(2)(2) = -$

Integers – Multiplying & Dividing

Complete the following:

a) $6^3 = 216$ (6×6×6) b) $(-1)^4 = 1$ c) $-3^3 = -27$

d) $-4^2 = -16$ e) $10^4 = 10000$ f) $(-5)^3 = -125$

calculator button y^x | $x^{\square}$ | $\wedge$

Order of Operations

Answer the following viral math problems: By hand 1st! Use calculator 2nd!

⇒ $6 + 2(1 + 2) =$ _____

⇒ $6^2 \div 2(3) + 4 =$ _____

⇒ $9 - 6 \div 3 + 1 =$ _____

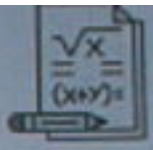
As you can see you all got different answers to the same questions, but why is this?

These questions illustrate the importance of having a consistent set of rules/steps to follow, so everyone can get the same answer.

We call these steps **BEDMAS**

Brackets	Brackets
Exponents	Exponents
Division	Division – Multiplication*
Multiplication	Addition – Subtraction*
Addition	*Treated Equally Solve Left-to-Right*
Subtraction	

In Math we refer to BEDMAS as the *Order of Operations* refers to the sequence in which mathematical operations should be performed within an expression. It ensures that everyone gets the same answer when solving a mathematical problem.



Let's try our original questions again, but this time using our new rules!

Re-try the following viral math problems:

$\Rightarrow 6 \div 2(1+2) =$ $6 \div 2(3) \Rightarrow 3(3) = 9$ or $36 \div 2 \times 3 \times 4$ $18 \times 3 \times 4$ $54 \times 4 = 56$

$\Rightarrow 6^2 \div 2(3) + 4 =$ $36 \div 2(3) + 4 \Rightarrow 36 \div 6 + 4 = 6 + 4 = 10$

$\Rightarrow 9 - 6 + 3 + 1 =$ $9 - 2 + 1 \Rightarrow 7 + 1 = 8$

Evaluate the following expressions:

a) $4 + 3 \times 2 =$ 10

$4 + 6 = 10$

b) $8 - (5 \times 2) + 4 =$ 2

$8 - 10 + 4 = 2$

c) $5 + (-3) \times 4 - 2 =$ -9

$5 + (-12) - 2$

d) $(-10) \div 2 + 3 \times (4 - 1) =$ 4

$(-5) + 3 \times 3$

$(-5) + 9 = 4$

e) $2 \times (3 + 5 - 1) =$ 20

$2(8) + 4$

$16 + 4 = 20$

f) $12 - 3 \times (6 \div 2)^2 =$ -15

$12 - 3 \times (3)^2$

$12 - 3 \times 9$

$12 - 27 = (-15)$

g) $(7 - 2) \times 3 + 4^2 =$ 31

$5 \times 3 + 4^2$

$5 \times 3 + 16$

$15 + 16 = 31$

h) $18 \div (4 - 1)^2 + 5 =$ 7

$18 \div (3)^2 + 5$

$18 \div 9 + 5$

$2 + 5 = 7$

Understanding and applying the order of operations correctly is fundamental in mathematics. It ensures clarity and consistency in mathematical expressions and calculations. YOU MUST MASTER THIS SKILL!