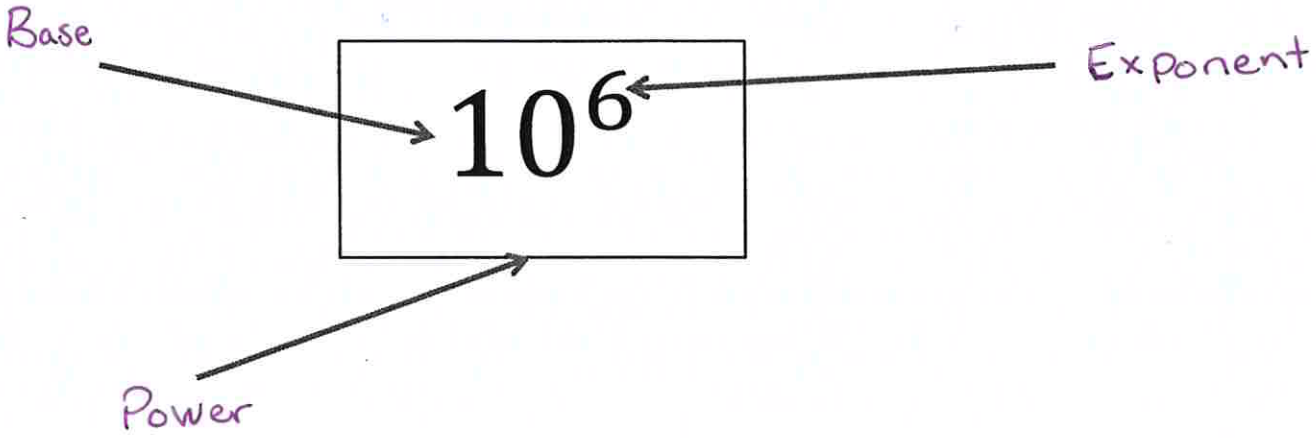
September 14th 2022

M9

2.1 Exponents



- **An exponent** is used to simplify repeated multiplication.
  - The operation is called **exponentiation.**

Examples	
Repeated multiplication = expanded form	**Exponent form = exponentiation**
$5 \times 5 \times 5$	5^3
$x \cdot x \cdot x \cdot x \cdot x$	$x^5 = (x)^5$
$(\frac{1}{2})(\frac{1}{2})(\frac{1}{2})(\frac{1}{2})$	$(\frac{1}{2})^4$
! $3x \cdot 3x \cdot 3x \cdot 3x$	$(3x)^4 = 3^4 \cdot x^4$
$-4 \cdot a \cdot a \cdot a \cdot a \cdot a \cdot a$	$-4(a^6)$ or $-4a^6$

- There are two special exponents that have their own name:

The exponent of 2	The exponent of 3
Square	Cube
x^2	x^3
We say: "x" Squared or "x" to the power of two	We say: "x" Cubed or "x" to the power of three

- If a number or a variable does not have an exponent written down, the exponent is 1 = one !

$3 = 3^1$; $x = x^1$; $a = a^1$ (we don't write the exponent one)

Practice:

1. Circle the base in each expression.

1	5^4	6	x^2
2	$(-2)^4$	7	$5x^{10}$
3	! The negative needs brackets to be part of the base ! -9^2	8	! the brackets mean the exponent is for the whole contents. ! $\left(\frac{x}{5}\right)^6$
4	$\left(\frac{1}{2}\right)^5$	9	$-(-3)^8$
5	$\frac{4^3}{5}$	10	! it's possible to have multiple bases ! $(-15^4)^2$

2. Write the expression in English.

5^2	Five Squared.
2^3	Two Cubed.
4^9	Four to the power of nine.
10^{11}	Ten to the power of eleven.
3^1	Three or three to the power of one.

3. Write in expended form.

6^2	6×6
$(-4)^3$	$(-4)(-4)(-4)$
x^6	$x \cdot x \cdot x \cdot x \cdot x \cdot x$
-10^5	$-10 \cdot 10 \cdot 10 \cdot 10 \cdot 10$
10	10

Buttons on your calculator

2 [^] 9 or 2 [y^x] 9 or 2 [$x^\blacksquare$] 9

4. Evaluate using your calculator.

2^9	3^3	$(-4)^2$	$(-1)^2$	$(-6)^0$	-15^2
512	27	+16	+1	+1	-225

Perfect Squares = Square Numbers

- Non-negative integers that are the result of a integer being squared.

Exponent Form	Square Number
Smallest 0^2	0
1^2	1
2^2	4
3^2	9
4^2	16
5^2	25
6^2	36
7^2	49

Exponent Form	Square Number
8^2	64
9^2	81
10^2	100
11^2	121
12^2	144
13^2	169
14^2	196
15^2	225