(Math 9)

Unit 2.1

What is a power?

3^4

Together, this is called a Power

This is called THE BASE

this is called the EXPONENT

7^9 → 7 is the base 9 is the exponent

3^2 → 3 is the base 2 is the exponent

This Reads "3 to the power of 4"

This Reads "7 to the Power of 9"

this Reads "3 to the Power of 2"

But what is a power?

$3^4 \rightarrow$ 3 to the power of 4

ALSO

3 four times $\rightarrow$ 3 multiplied by itself 4 times

Power is Repeated multiplication

this is called Repeated multiplication

$$3^4 = \underbrace{\underbrace{\underbrace{3 \times 3}_{9} \times 3}_{27} \times 3}_{81} = 81$$

This is the POWER

This is called STANDARD FORM

$5^6 = 5 \times 5 \times 5 \times 5 \times 5 \times 5 = 15{,}625$

Power — Repeated Multiplication FORM — STANDARD FORM

$2^3 = 2 \times 2 \times 2 = 8$

Power — Repeated Multiplication — Standard FORM

BUT... THERE ARE SPECIAL CASES:

FIRST $\rightarrow$ 7 $\Rightarrow$

- Base is 7
- The exponent is: 1

So if there isn't a written exponent, this means the exponent is 1

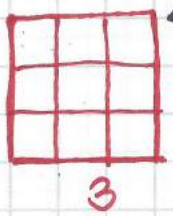
$8 = 8^1$ (8 one time)

$168 = 168^1$ (168 one time)

2 SPECIAL NAMES UNIQUE

3^2

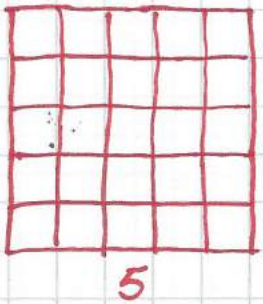
- READS "3 SQUARED"
- THIS IS BECAUSE IT REPRESENTS A SQUARE AND ITS AREA:

$3^2 =$  $= 9$ (area)

all squares

3

3

$5^2 =$  $= 25$

5

5

THERE ARE 25 SQUARES inside, THUS AREA = 25

Remember Perfect Squares?

$1 \times 1 = 1^2 = 1$

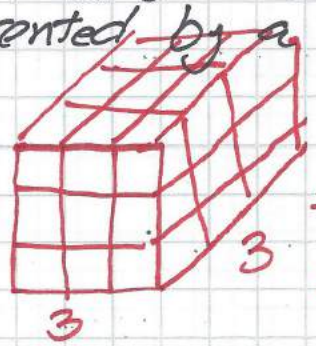
$2 \times 2 = 2^2 = 4$

$3 \times 3 = 3^2 = 9$

they can be Represented by the Area of a SQUARE

3^3

- READS "3 CUBED"
- THIS means it can be Represented by a CUBE

$3^3 =$  $= 3 \times 3 \times 3$

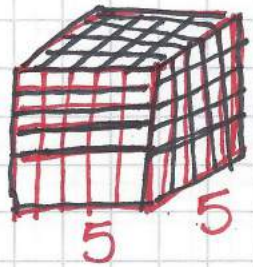
$= 27$

3

3

3

There are 27 squares inside the cube

$5^3 =$  $= 125$

5

5

5

There are 125 squares inside

SO exponent = 2

↳ square

exponent = 3

↳ cube

- count the squares on each side

THIRD → NEGATIVE BASE

Be careful with this!!!

-3^2

- Because the $-$ is NOT inside the bracket, it does NOT belong to the base
- That is, the Base is 3, and NOT -3
- This also means that the Standard Form IS ALWAYS NEGATIVE!!
- Carry the $-$ over:

$-3^2 = -(3 \times 3) = -9$

carry it over

Always Negative!

$-2^5 = -(2 \times 2 \times 2 \times 2 \times 2) = -32$

Look at this Example:

$(-3)^4$

- the $-$ is inside the bracket. So...
- the base is (-3)

$(-3)(-3)(-3)(-3)$

$+81$

-3^4

- the $-$ is outside a bracket... so
- Base is Positive 3

Bring the $-$ over: $-(3 \times 3 \times 3 \times 3)$

-81

$-(-3^4)$

$-$ inside bracket so

(-3) is Base

- STANDARD:

Bring over

$-[(-3)(-3)(-3)(-3)]$

$-[81] \rightarrow -81$

SECOND → NEGATIVE INTEGER BASES

- The base is negative ONLY WHEN THE NEGATIVE SIGN IS INSIDE THE BRACKETS

$(-3)^2$ → the BASE is (-3)

↳ AS REPEATED MULTIPLICATION = $(-3)(-3) = +9$

$(-)\cdot(-) = +$

AS STANDARD FORM

$(-5)^5$ → the BASE is (-5)

↳ AS Repeated Multiplication = $(-5)(-5)(-5)(-5)(-5)$

STANDARD = -3125

NEGATIVE INTEGER BASES

(work out the signs)

ODD EXPONENT (1, 3, 5, 7, 9, 11, 13, 15, etc)

ALWAYS RESULT IN NEGATIVE NUMBER

$(-2)^3 = (-2)(-2)(-2) = -8$ ($- \cdot - = + \cdot - = -$)

$(-4)^5 = (-4)(-4)(-4)(-4)(-4) = -1024$

ALWAYS!!

EVEN EXPONENT (2, 4, 6, 8, 10, 12, etc)

ALWAYS RESULT IN POSITIVE NUMBER

$(-2)^4 = (-2)(-2)(-2)(-2) = 16$

$(-3)^2 = (-3)(-3) = +9$

To Find Squares

3^2 ⇒
- Press $\boxed{3}$
- Press $\boxed{x^2}$

= 9

$(-3)^2$ ⇒
- Press $\boxed{3}$
- Press $\boxed{+/-}$
- Press $\boxed{x^2}$

= 9

-3^2 Press $\boxed{3}$ – Press $\boxed{x^2}$ – Now just write a (–) in front of the number

To Find Cubes

4^3 ⇒
- Press $\boxed{4}$
- Press $\boxed{x^3}$

= 64

$(-4)^3$ ⇒
- Press $\boxed{4}$
- Press $\boxed{+/-}$
- Press $\boxed{x^3}$

= −64

-4^3 ⇒ Press $\boxed{4}$ / Press $\boxed{x^3}$ / Now write a (–) sign in front of your answer

How to find Powers Using Calculator

6^7

- PRESS $\boxed{6}$
- PRESS $\boxed{x^y}$ $= 279,936$
- PRESS $\boxed{7}$

$(-6)^7$

- PRESS $\boxed{6}$
- PRESS $\boxed{+/-}$ (this makes it negative)
- PRESS $\boxed{x^y}$ $= -279,936$
- PRESS $\boxed{7}$

-6^7 Calculate 6^7 Like We DiD above

Then Remember to write the $-$

$-279,936$