



Section 2.2

Powers of Ten and the Zero Exponent



Avogadro's number = 6.0221415×10^{23}

The speed of light = $2.99\ 792\ 458 \times 10^8$ m / s

Temperature of the Sun's Core = 1.5×10^6 °C

since 15000000 kelvin = 14999726.85 degree Celsius

Distance related to Powers of 10

<http://vimeo.com/819138>

I picked 3 as my base

Exponent	Power	Repeated Multiplication	Standard Form
4	3^4	$3 \times 3 \times 3 \times 3$	81
3	3^3	$3 \times 3 \times 3$	27
2	3^2	3×3	9
1	3^1	3	3

Let's Try Base 10

Exponent	Power	Repeated Multiplication	Standard Form
4	10^4	$10 \times 10 \times 10 \times 10$	10000
3	10^3	$10 \times 10 \times 10$	1000
2	10^2	10×10	100
1	10^1	10	10

What do you notice ?????

Therefore:

Number in Words	Standard Form	Power
One billion	1 000 000 000	10^9
One hundred million	100 000 000	10^8
Ten million	10 000 000	10^7
One million	1 000 000	10^6
One hundred thousand	100 000	10^5
Ten thousand	10 000	10^4
One thousand	1 000	10^3
One hundred	100	10^2
Ten	10	10^1
One	1	10^0



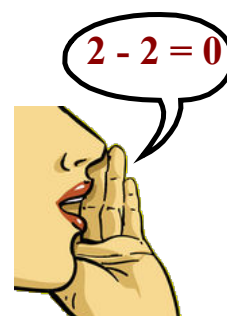
Let's jump back in time.....



$$\begin{aligned} & \frac{5^2}{5^2} \\ = & \frac{25}{25} \\ = & 1 \end{aligned}$$

Use Exponent Rules:

$$\begin{aligned} & \frac{5^2}{5^2} \\ = & 5^0 \\ = & 1 \end{aligned}$$



Solve:

$$\left(\sum_{k=0}^n \binom{5}{6} 8^4 5^{n-k} \right)^0$$

$$= 1$$

Any number (except 0) with an exponent 0 will equal 1

$$\frac{2^5}{2^5} = \frac{32}{32} = 2^0 = 1 \quad \text{Why???$$

$$\begin{aligned} 2^0 &= 1 \\ 13^0 &= 1 \\ 199^0 &= 1 \\ (-6)^0 &= 1 \end{aligned}$$



Zero Exponent LAW

A power with an interger base, not including 0, and an exponent of 0 is equal to 1

$$\left(\text{☺} \right)^0 = 1$$



Try this

Evaluate each expression



a) 5^0

$= 1$

b) $-(5)^0$

$- 1$

c) $(-5)^0$

$= 1$

d) -5^0

$- 1$

Writing Numbers Using Powers of Ten

A place value chart may help



Write 96 713 as a power of 10

Ten Thousands	Thousands	Hundreds	Tens	Ones
90 000	6 000	7 00	10	3

$$96\ 713 = 90\ 000 + 6000 + 700 + 10 + 3$$

$$= (9 \times 10\ 000) + (6 \times 1000) + (7 \times 100) + (1 \times 10) + (3 \times 1)$$

$$= (9 \times 10^4) + (6 \times 10^3) + (7 \times 10^2) + (1 \times 10^1) + (3 \times 10^0)$$

You Try !!!!

98,452

$$= 90\,000 + 8\,000 + 400 + 50 + 2$$

$$= (9 \times 10\,000) + (8 \times 1\,000) + (4 \times 100) + (5 \times 10) + (2 \times 1)$$

$$= (9 \times 10^4) + (8 \times 10^3) + (4 \times 10^2) + (5 \times 10^1) + (2 \times 10^0)$$

Write 85602 as a power of 10

$$85602 =$$

$$80\,000 + 5\,000 + 600 + 2$$

$$(8 \times 10\,000) + (5 \times 1\,000) + (6 \times 100) + (2 \times 1)$$

$$(8 \times 10^4) + (5 \times 10^3) + (6 \times 10^2) + (2 \times 10^0)$$

Write 65023 as a power of 10

$$65023 =$$

PRACTICE TIME

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4(a, b)

5(a, b, c, d)

#6(a, c, e)

#8(a, c, e)

#9(a, c, e)

#10 all



$$(9 \times 10^5) + (9 \times 10^3) + (3 \times 10^2) + (4 \times 10^0)$$

$$(9 \times 100000) + (9 \times 1000) + (3 \times 100) + (4 \times 1)$$

$$900000 + 9000 + 300 + 4$$

$$= 909304$$

