Why use Scientific notation?

- make writing really large + really small numbers easier by "collecting" powers of 10 and reducing the number of zeroes we have to keep track of

What does it mean for a number to increase by a "power of 10"?

* you are multiplying that number by 10 (ex: 2 increase by a power of 10 = $2 \times 10 = 20$)

What about if you increase the number by three "powers of ten"?

* you are multiplying that number by 10 three times (or multiplying by 10^3)

What about if you decrease a number by a "power of 10"?

* you are dividing that number by 10 (or we can also say we are multiplying by 10^{-1})

how about decreasing a number by four powers of 10?

* you are dividing by 10 four times (or we can say we are multiplying by 10^{-4})

How would you get from 1×10^3 to 1×10^8?

- multiply by 10^5!

How about from 1×10^{-2} to 1×10^{-5}? * multiply by 10^{-3}

What about from 1×10^{-5} to 1×10^{-2}? * multiply by 10^3

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* increase by a power of 10...

$$2 \times 10^1 = 20$$

* increase by 4 powers of 10...

$$2 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 2 \times 10^4 = 20000$$

* decrease by a power of 10...

$$2 \div 10 = 2 \times 10^{-1} = .2$$

* decrease by 4 powers of 10...

$$2 \div 10 \ {\scriptstyle \text{four times}} = 2 \times 10^{-4} = .0002$$

difference between 2 numbers....

$$10^3 \xrightarrow{\times 10^3} 10^6$$

$$\underbrace{10^3 \cdots\cdots 10^6}_{10^3}$$

$$1\times10^3 \longleftrightarrow 1\times10^6$$

difference is three powers of 10

$$\underline{1\times10^3} \xrightarrow[\times 10^3]{} \underline{1\times10^6}$$

$$\underline{1\times10^6} \xrightarrow[\times 10^{-3}]{} \underline{1\times10^3}$$

What about...

$$1\times10^{-2} \xrightarrow[\times 10^{-3}]{} 1\times10^{-5}$$

.000.01 .00001

OR

$$1\times10^{-5} \xrightarrow[\times 10^{3}]{} 1\times10^{-2}$$

$$2 \xrightarrow[\times 10^{1}]{} 20$$

$$2 \xrightarrow[\times 10^{-1}]{} .2$$

$$1\times10^{-5} \xleftarrow{\times 10^{-3}} 1\times10^{-2}$$

$$1\times10^{-5} \xrightarrow[\times 10^{3}]{} 1\times10^{-2}$$

$$1\times10^{5} \underset{\times 10^{-3}}{\overset{\times 10^{3}}{\rightleftarrows}} 1\times10^{8}$$