HALF YEARLY

Logarithms and Page Rank

Logarithms

- Video Ted talk
- https://www.youtube.com/watch?v=zzu2POfYv0Y

Define

- Log$_b$ (n) = p
- $b^p = n$

- Brings the scale to a manageable number

Scale

In powers	Log
power of 0 = 10^0 = 1 (single item) power of 0 = 10^0 = 1 (single item)	Log(1) = 0
power of 1 = 10^1	Log(10) = 1
power of 3 = 10^3 = thousand	Log(10^3) = 3
power of 6 = 10^6 = million	Log(10^6) = 6
power of 12 = 10^{12} = trillion	Log(10^12) = 12
power of 23 = 10^{23} = number of molecules in a dozen grams of carbon	Log(10^23) = 23
power of 80 = 10^{80} = number of molecules in the universe	Log(10^80) = 80

Scale

- Exponential scales are linear
- Plot them!
- Video

Use case - 1

- Log is a scale where the ratio is constant
- Logarithmic scale
- Mark 1 2 3 etc.
- Base 10 – 1 means 10, 2 means 100
- video

Slide Ruler activity

◦ A truck is 80m behind you and is going twice as fast as you, still you won't get hurt

◦ Ice cream sticks

◦ Bands

◦ Marker

◦ Log and ln values

◦ Multiply and Divide

◦ Log a + log b = logab

◦ Log a – log b = loga/b

◦ Understand why it happens using the slide ruler

◦ Logarithms can make multiplication and division of large numbers easy because adding logarithms is the same as multiplying, and subtracting logarithms is the same as dividing.

Ritcher scale

◦ Earthquakes are measured in this scale

◦ Uses logarithms

◦ Photo

Compound interest

- P $(1+r)^{nt}$ = CI
- 40Rs increases by 5% in 3 years

Other use cases

◦ 6 digit salary

◦ Speed of algorithms in CS

◦ Moore's law

◦ Memory – 8GB of RAM - 64 bit memory – 2^{64}

◦ Benford's law (To plot populations in a bucket)

◦ Discrete logarithms in cryptography – no way computers can solve it, discrete logarithms over chosen values has no solution

Google Page Rank

- Uses logarithms
- Rank 5 and rank 9
- Diff= 4 10^4 times more popular than rank 5
- Ranks 1-10 with loads of information