Lecture 5 - PON

Exercise 1: Assuming a growth rate of 30% per year, how long does it take for traffic to increase by an order of magnitude (a factor of 10)?

$$1 \times 1.3 \times 1.3 \times 1.3 = 10$$

say n years

$$(1.3)^n = 10$$

but $\log a^b = b \log a$

$$\therefore n \log 1.3 = \log 10$$

$$n = \frac{\log 10}{\log 1.3} = 8.78 \text{ years}$$

Exercise 2: What is loss of an ideal N-way splitter?

linear:

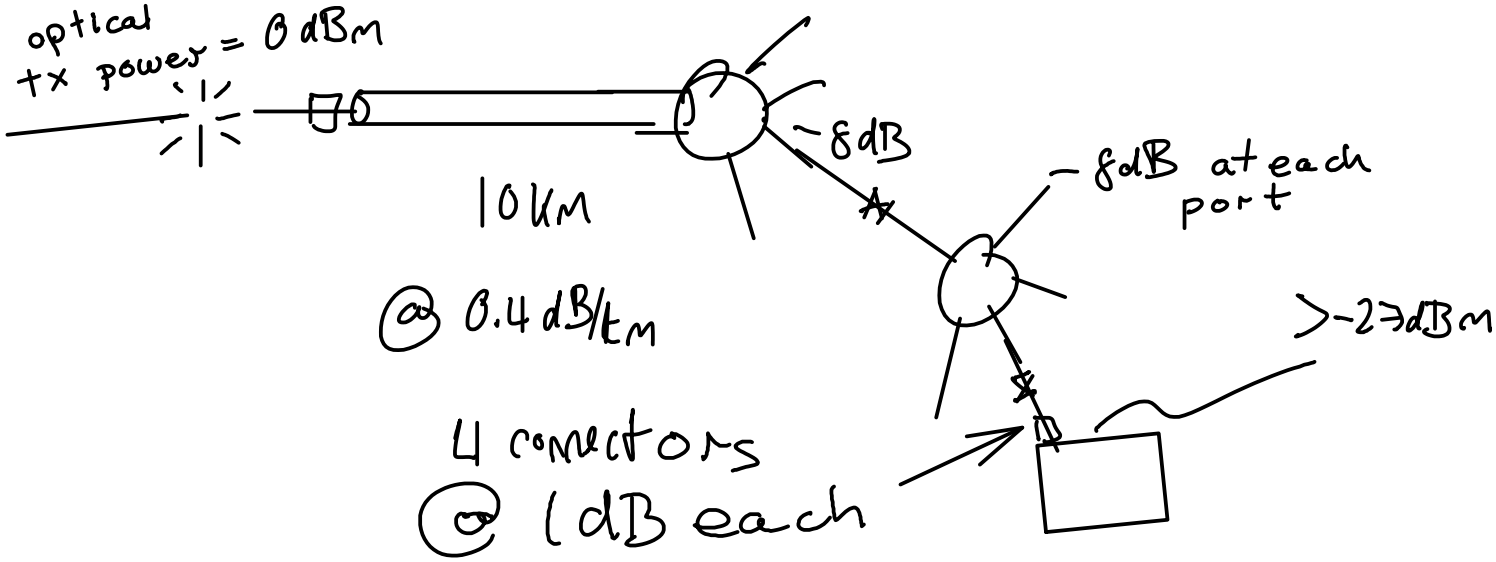
$$\frac{\text{o/p power}}{\text{i/p power}} = \frac{1}{N}$$

dB:

$$-10 \log_{10} N$$

actually, these are gains, the loss is $10 \log_{10} N$ dB

Exercise 3: Assuming a transmit power of 0 dBm, 10 km of 0.4dB /km cable, two 4-way splitters with a loss of 8 dB each, four connectors with a 1 dB loss each, and a receiver sensitivity of -27 dBm what is the margin? What if the cable was 20 km long?



Link Power Budget

0 dBm =	0 dBm	transmit power
− 10 x 0.4 =	− 4 dB	loss (gain) in fibre
− 2 x 8 =	− 16 dB	splitter loss
− 4 x 1 =	− 4 dB	connector/splice loss
	− 24 dBm	← power at ONU
	− −27 dBm	← minimum required power
=	+3 dB	← margin (difference)