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1. What is the relation between period and frequency?
   Frequency is how many cycles of an oscillation occur per second and is measured in cycles per second or hertz. Period of a wave is the amount of time it takes a wave to vibrate one full cycle. These two terms are inversely proportional to each other: f=1/T and T=1/f.

2. Distinguish between baseband transmission and broadband transmission?
   Baseband Transmission is sending digital signal over a channel without changing the digital signal to analog signal. It requires the low-pass channel with two cases a wide bandwidth and a narrow bandwidth.
   Broadband transmission means changing the digital signal to analog signal for transmission. It allows to use a Bandpass channel.

3. A line has a signal-to-noise ratio of 1000 and a bandwidth of 4000 KHz. What is the maximum data rate supported by this line?
   Capacity = Bandwidth * $\log_2(1 + SNR)$
   $= 4000 * \log_2(1 + 1000) =$ 39800

4. A signal with 200 milliwatts power pass through 10 devices, each with an average noise of 2 microwatts. what is the SNR? what is SNR in dB?
   +Average signal power: 200 milliW = 0.2 W
   +Average noise power: 2 microW = 0.00002 w

   SNR = average signal power / average noise power = 0.2 / 0.00002 = 10000
   $SNR_{db} = 10 \log_{10}(SNR) = 10 \log(10000) = 10 * 4 =$ 40

5. We have a channel with 4 KHz bandwidth. If we want to send data at 100 kbps, what is the minimum SNR in dB? What is the SNR?

   Capacity = Bandwidth log(1+SNR)
   $100*10^3 = 4*10^3 \log_2(1+SNR)$
   $\log_2(1+SNR) = 25$
   $1 + SNR = 2^{25}$
   $SNR = 2^{25} - 1 =$ 33 554 431

   $SNR_{db} = 10 \log_{10}(33554431) =$ 75db