# Example 1

**Q**: Given the signal-to-noise ratio (SNR) of 20 dB, and the bandwidth of 4kHz (using phone line), what is the maximum data rate according to Shannon's theorem?

**Ans**:

$4 * \log_2(1 + 100) = 4 * \log_2(101) = 26.63$ kbps.

Note that the value of S/N = 100 is equivalent to the SNR of 20 dB

# Example 2

**Q**: If a binary signal is sent over a 3-kHz channel whose signal-to-noise ratio is 20 dB, what is the maximum achievable data rate?

**Ans**:

SNR of 20 dB = S/N = 100.

The Shannon limit is: $3 \times \log_2(101) = 19.975$ kbps

The Nyquist limit is:

$2B \log_2 V = 2 \times 3 \times \log_2 2 = 6$ kbps.

The bottleneck is therefore the Nyquist limit, giving a **maximum channel capacity of 6 kbps**