What have we learned?

The DFT can be used as an analysis tool to understand the oscillatory components that make up a signal. If a signal has an associated system clock T_s (or a frequency $F_s = 1/T_s$), we can map the index k of the DFT coefficients to real-world frequencies. The largest digital frequency $N/2$ is associated with the largest continuous-time frequency $F_s/2$. Thus, the continuous frequency corresponding to index k is given by $\frac{kF_s}{N}$ and is measured in Hz.

The DFT synthesis can be seen as a series of N sinusoidal generators added together:

- sinusoidal generator k has frequency $2\pi k/N$
- the amplitude of sinusoidal generator k is given by the magnitude of the DFT coefficient $|X[k]|$
- the phase of sinusoidal generator k is given by the phase of the DFT coefficients $\angle X[k]$

If we let the DFT synthesis run beyond $N-1$, we obtain a N-pediodic signal, $x[n+N] = x[n]$. Likewise, the analysis formula produces also a N-periodic series of Fourier coefficients. This fact will be very important when we study another form of Fourier transform for periodic sequences, namely the discrete Fourier series (DFS).