Example 8-1: In order to compute the 4-point DFT of the sequence $x[n] = \{1, 1, 0, 0\}$, we carry out the sum (**??**) four times, once for each value of $k = 0, 1, 2, 3$. When $N = 4$, all the exponents in (**??**) are integer multiples of $\pi/2$ because $2\pi/N = \pi/2$.

$$
\begin{aligned}
X[0] &= \cancelto{1}{x[0]}e^{-j0} + \cancelto{1}{x[1]}e^{-j0} + \cancelto{0}{x[2]}e^{-j0} + \cancelto{0}{x[3]}e^{-j0} \\
&= 1 + 1 + 0 + 0 = 2 \\
X[1] &= 1e^{-j0} + 1e^{-j\pi/2} + 0e^{-j\pi} + 0e^{-j3\pi/2} \\
&= 1 + (-j) + 0 + 0 = 1 - j = \sqrt{2}e^{-j\pi/4} \\
X[2] &= 1e^{-j0} + 1e^{-j\pi} + 0e^{-j2\pi} + 0e^{-j3\pi} \\
&= 1 + (-1) + 0 + 0 = 0 \\
X[3] &= 1e^{-j0} + 1e^{-j3\pi/2} + 0e^{-j3\pi} + 0e^{-j9\pi/2} \\
&= 1 + (j) + 0 + 0 = 1 + j = \sqrt{2}e^{j\pi/4}
\end{aligned}
$$

Thus, we obtain the four DFT coefficients $X[k] = \{2, \sqrt{2}e^{-j\pi/4}, 0, \sqrt{2}e^{j\pi/4}\}$.

Note: The term "coefficient" is commonly applied to DFT values. This is appropriate because $X[k]$ is the (complex amplitude) coefficient of $e^{j(2\pi/N)kn}$ in the IDFT (**??**).

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