1. Given continuous time signal $x(t) = 2\cos(6t)$ sampled at a sampling frequency of f_s, evaluate to a number the discrete time signal x[n] for n=0, 1, 2 if:

   a. $f_s = \dfrac{2}{\pi}$ Hz

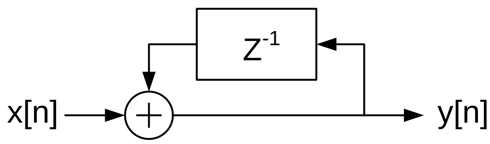
   $T_s = 1/f_s = \pi / 2$ sec
   $x[n] = x(t = n\,T_s) = x(\pi\,n / 2) = 2\cos(6\,\pi\,n / 2) = 2\cos(3\,\pi\,n)$
   $x[0] = 2\cos(0\,\pi) =$ $\boxed{x[0] = 2}$
   $x[1] = 2\cos(3\,\pi) = 2\cos(\pi) =$ $\boxed{x[1] = -2}$ (since adding or subtracting 2π changes nothing)
   $x[2] = 2\cos(6\,\pi) = 2\cos(0) =$ $\boxed{x[2] = 2}$

   b. $f_s = \dfrac{1}{2\pi}$ Hz

   $T_s = 1/f_s = 2\pi$ sec
   $x[n] = x(t = n\,T_s) = x(2\pi\,n) = 2\cos(12\,\pi\,n) = 2\cos(0) = 2$
   since can add or subtract 2 π multiples
   $\boxed{x[0] = 2}$
   $\boxed{x[1] = 2}$
   $\boxed{x[2] = 2}$

2. Given discrete time signal $x[n] = \begin{cases} 0, & n < 0 \\ 1, & n \geq 0 \end{cases}$ and the system below,

   find y[n] for n=0, 1, 2, and 3.



for n<0, x[n] is always 0 so y[n] and the output of z^{-1} (i.e. y[n-1]) is also 0.

for each n ≥ 0, evaluate x[n] first, then the output of z^{-1} (which is y[n-1]), then add to find y[n] , so

n=0: x[n] = 1. The output of z^{-1} = y[-1] = 0 from above. The sum = 1+0 = $\boxed{y[0] = 1}$
n=1: x[n] = 1. The output of z^{-1} = y[0] = 1 from above. The sum = 1+1 = $\boxed{y[1] = 2}$
n=2: x[n] = 1. The output of z^{-1} = y[1] = 2 from above. The sum = 1+2 = $\boxed{y[2] = 3}$
n=3: x[n] = 1. The output of z^{-1} = y[2] = 3 from above. The sum = 1+3 = $\boxed{y[3] = 4}$