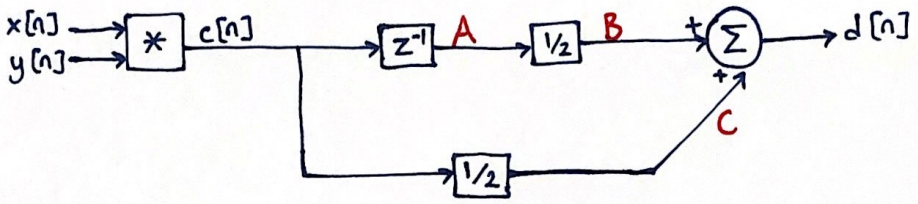
Quiz 2 Solutions

$x[n] = \{-1, \underset{\uparrow}{0}, 1, 2\}$ and $y[n] = \{-2, \underset{\uparrow}{2}, 2, -2\}$ are two discrete time signals. Find their convolution $c[n] = x[n] * y[n]$.

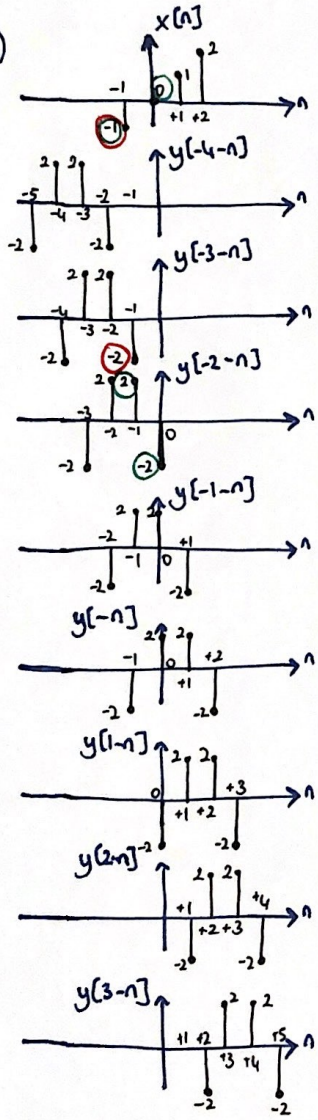
a) Draw the convolved signal $c[n]$.

b) If $c[n]$ is applied to a first order moving average filter (FIR), find and draw its output signal, $d[n]$.

Hint:



a)



$c[-4] = \sum_{n=-\infty}^{\infty} x[n] \cdot y[-4-n] = 0$ → Ignored this value in the representation of $c[n]$ since it is 0 and at the edge.

$c[-3] = \sum x[n] \cdot y[-3-n] = (-1).(-2) = 2$

$c[-2] = (-1).2 + 0.(-2) = -2$

$c[-1] = -4$

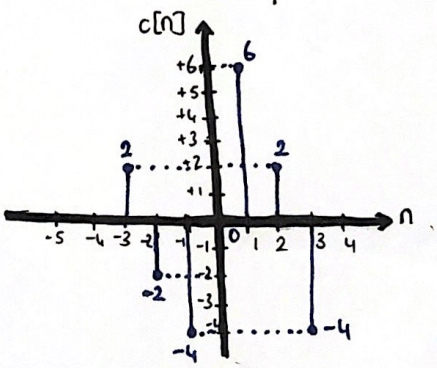
$c[0] = 0$

$c[1] = 6$

$c[2] = 2$

$c[3] = -4$

$c[n] = \{2, -2, -4, \underset{\uparrow}{0}, 6, 2, -4\}$



b)

n	c[n]	A	B	C	d[n]
-3	2	0	0	1	1
-2	-2	2	1	-1	0
-1	-4	-2	-1	-2	-3
0	0	-4	-2	0	-2
1	6	0	0	3	3
2	2	6	3	1	4
3	-4	2	1	-2	-1

Please check the provided diagram to see the locations of A, B, and C.

$$A = c[n] \cdot z^{-1}$$

$$B = \frac{A}{2}$$

$$C = \frac{c[n]}{2}$$

$$d[n] = B + C$$