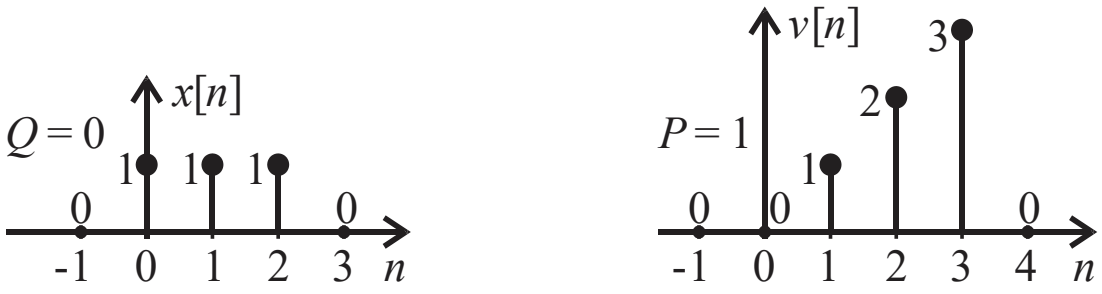
Ex. Convolve the signals $x[n]$ and $v[n]$ (shown below) using the array method.



General array layout-

	$x[Q]$	$x[Q+1]$	$x[Q+2]$	$x[Q+3]$
$v[P]$	$x[Q]v[P]$	$x[Q+1]v[P]$	$x[Q+2]v[P]$	$x[Q+3]v[P]$
$v[P+1]$	$x[Q]v[P+1]$	$x[Q+1]v[P+1]$	$x[Q+2]v[P+1]$	$x[Q+3]v[P+1]$
$v[P+2]$	$x[Q]v[P+2]$	$x[Q+1]v[P+2]$	$x[Q+2]v[P+2]$	$x[Q+3]v[P+2]$
$v[P+3]$	$x[Q]v[P+3]$	$x[Q+1]v[P+3]$	$x[Q+2]v[P+3]$	$x[Q+3]v[P+3]$

Fill in array with non-zero values of signals $x[n]$ and $v[n]$. Note that $Q = 0$ for $x[n]$ and $P = 1$ for $v[n]$.

	$x[0] = 1$	$x[1] = 1$	$x[2] = 1$
$v[1] = 1$	1	1	1
$v[2] = 2$	2	2	2
$v[3] = 3$	3	3	3

Starting in upper lefthand corner, add up the diagonals to get non-zero values of $y[n] = x[n] * v[n]$

$y[P+Q] = y[1+0] = 1 \quad \Rightarrow \quad \mathbf{y[1] = 1}$

$y[P+Q+1] = y[1+0+1] = 2+1 \quad \Rightarrow \quad \mathbf{y[2] = 3}$

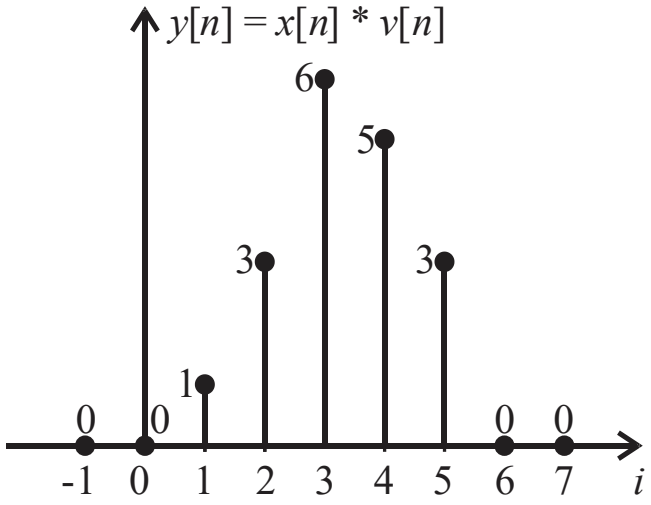
$y[P+Q+2] = y[1+0+2] = 3+2+1 \quad \Rightarrow \quad \mathbf{y[3] = 6}$

$y[P+Q+3] = y[1+0+3] = 3+2 \quad \Rightarrow \quad \mathbf{y[4] = 5}$

$y[P+Q+4] = y[1+0+4] = 3 \quad \Rightarrow \quad \mathbf{y[5] = 3}$

everywhere else $\Rightarrow \quad \mathbf{y[n \le 0] = y[n \ge 6] = 0}$

Overall, for $y[n] = x[n] * v[n]$, the array method yields the same answer-



Note:

- First non-zero term of $y[n]$ occurs at index $n = P + Q = 0 + 1 = \mathbf{1}$
- The length of $y[n]$ is $\{\text{length}(x[n]) + \text{length}(v[n]) - 1\} = 3 + 3 - 1 = \mathbf{5}$
- Last non-zero term of $y[n]$ occurs at $n = P + Q + \text{length}(y[n]) - 1$
  $= 0 + 1 + 5 - 1 = \mathbf{5}$