Q5.) Image := f filter $(\eta) \in \mathbb{R}^{(2a+1)\times(2a+1)}$

We have $f_i = \underbrace{(((f * \eta)}_{\text{1st term}} * \eta) \cdots \underbrace{\eta)}_{i^{th}\ \text{term}}$

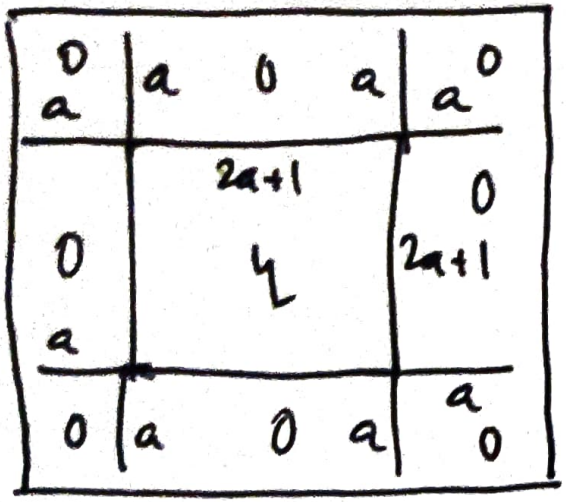
By associativity of convolution

$$f_i = f * (\underbrace{\eta}_{1st} * \eta * \cdots * \underbrace{\eta}_{i^{th}})$$

defining $\eta_i = (\underbrace{\eta * \eta * \cdots * \eta}_{i^{th}})$ (η_i := kernel)

We have $f_i = f * \eta_i$ (Single convolution)

Note: $\psi_2 = \psi * \psi \Rightarrow \psi$ must be padded with zeros such that:



ie at each step, to form

$$\psi_i = \psi * \psi_{i-1}$$

ψ should be padded for conv.

Once we obtain ψ_i thus way,

the image must be padded from $f \in \mathbb{R}^{H \times W}$

to $f' \in \mathbb{R}^{(H+2a) \times (W+2a)}$