

Take-Home Exam 2

Prob 1) $n=16 \ m=12 \ TC$

$$\left(-x_{15} 2^{15} + \sum_{i=0}^{14} x_i 2^i \right) \left(-y_{11} 2^{11} + \sum_{j=0}^{10} y_j 2^j \right)$$

$$= x_{15} y_{11} 2^{26} + \sum_{i=0}^{14} \sum_{j=0}^{10} x_i y_j 2^{i+j} + \sum_{i=0}^{14} \overline{x_i y_{11}} 2^{i+11} + \sum_{j=0}^{10} \overline{x_{15} y_j} 2^{j+15} + \underbrace{\left(2^{15} + 2^{11} \right)} + \underbrace{\left(2^{15+11} + 2^{15+11} \right)}$$

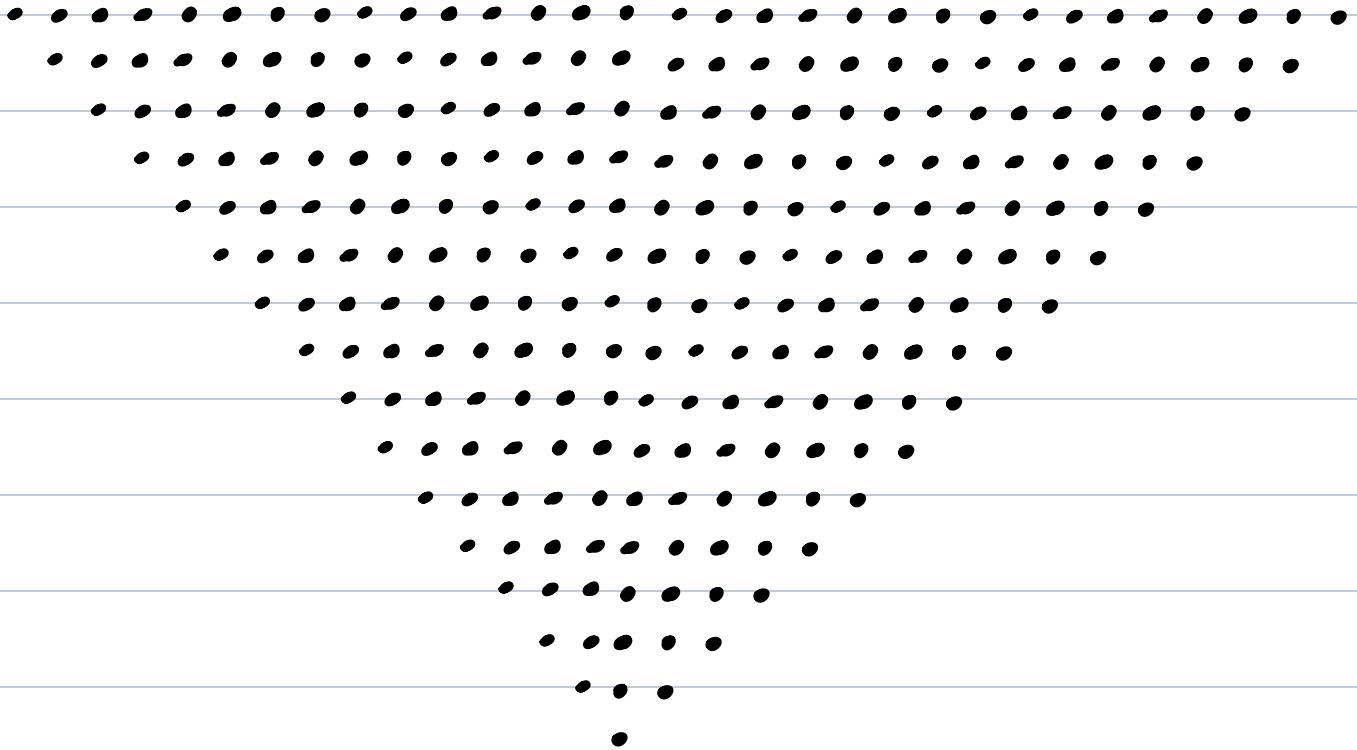
$$+ 2^{15} + 2^{11}$$

↓ ↓

Convert MAs to
FA with $c_{in}=1$

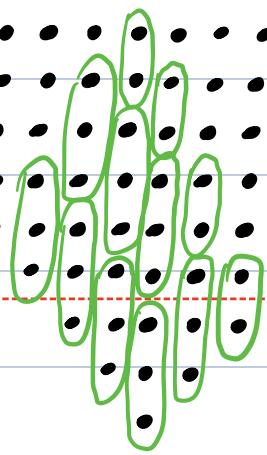
Prob 2)

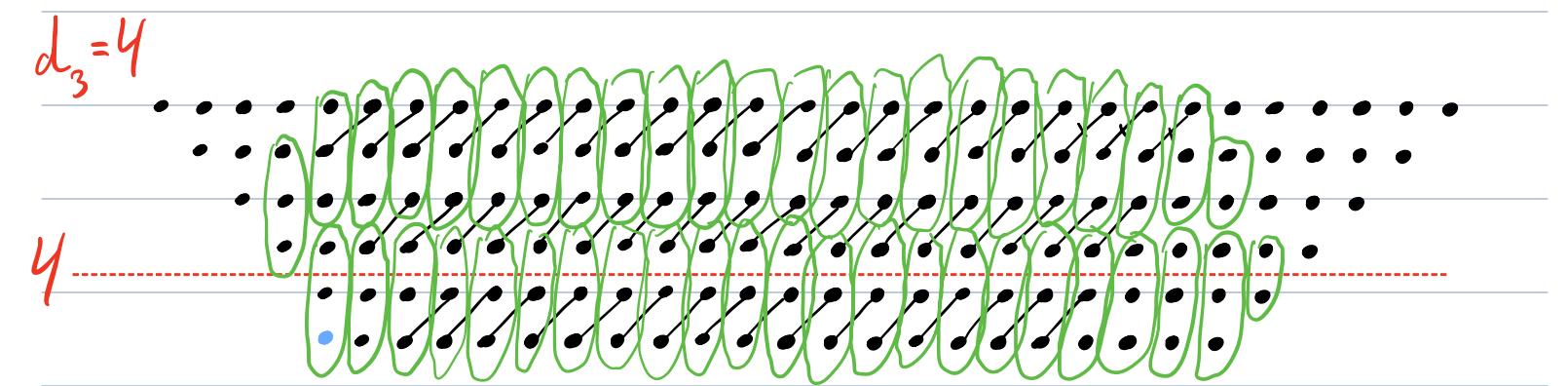
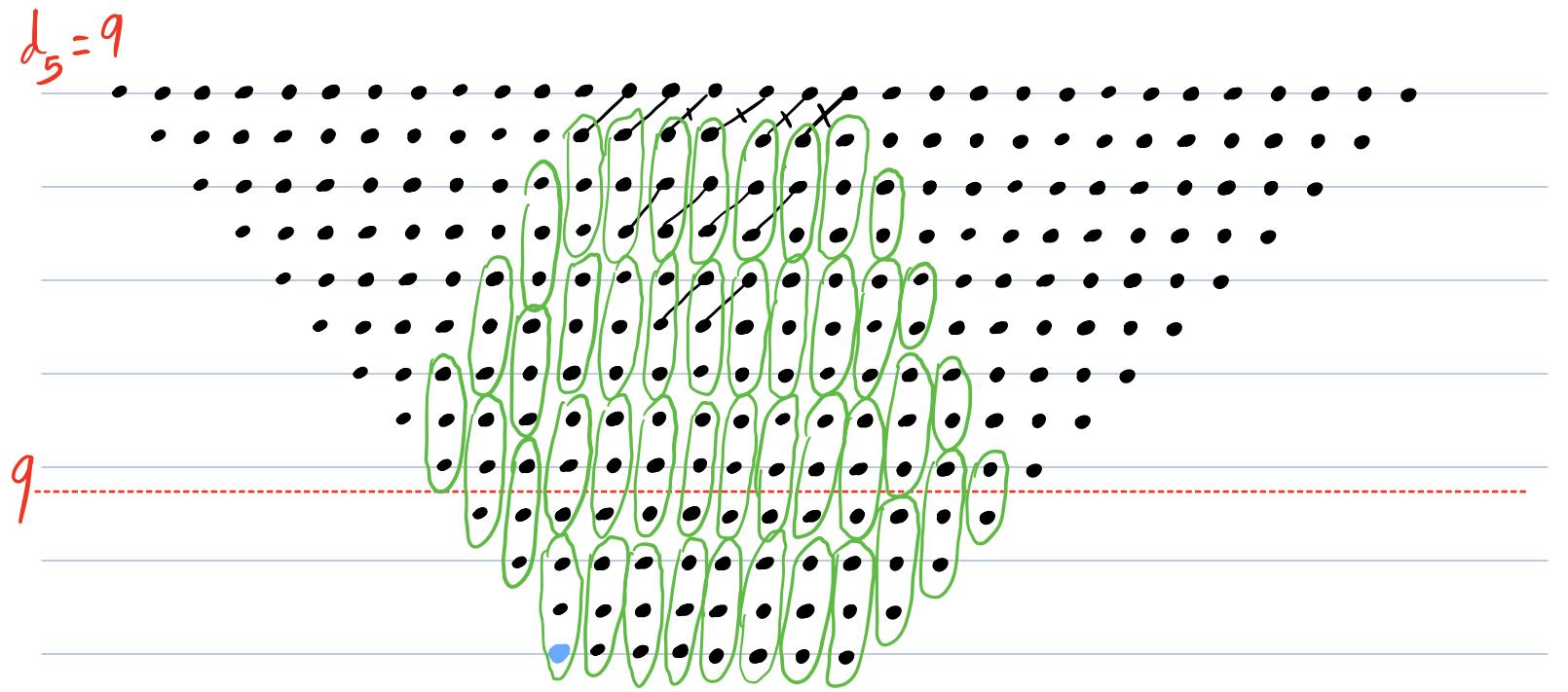


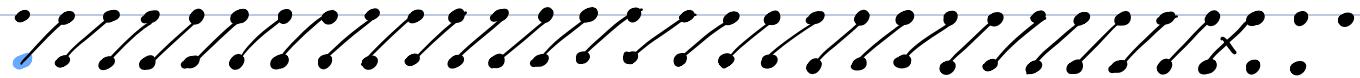
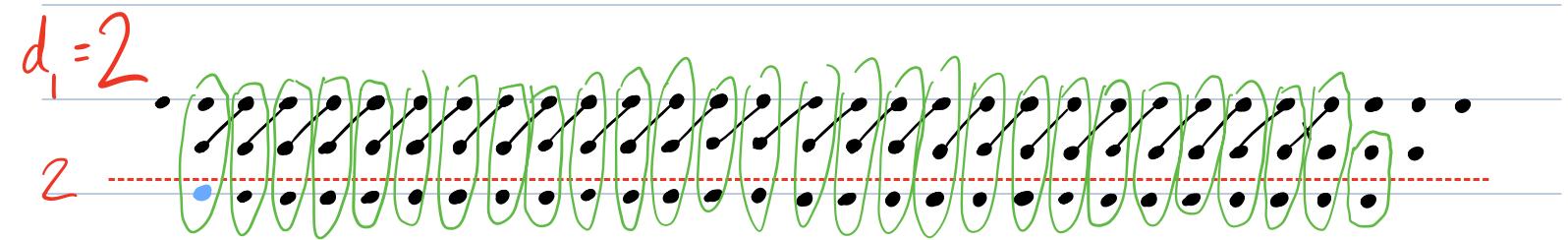
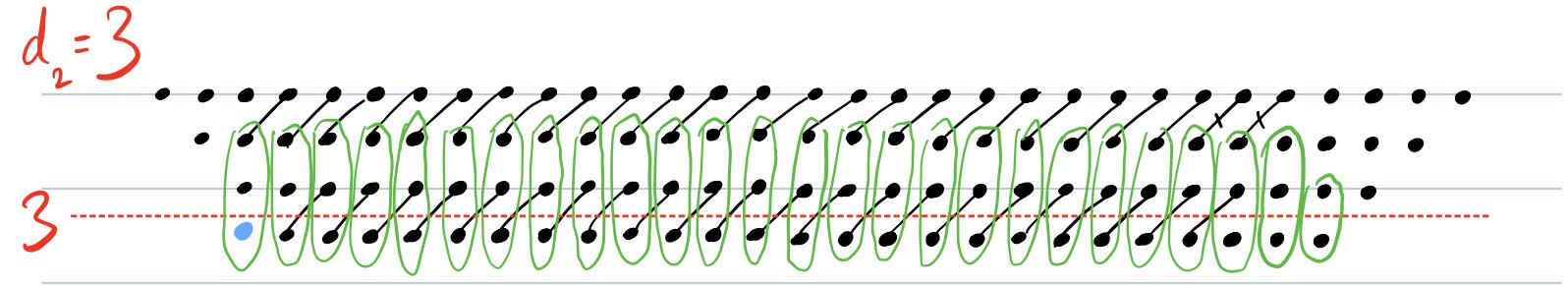


$$d_6 = 13$$

13







Prob 4)

- For 4-bit input $n=0, 1, \dots, 14, 15$ representing $1.03125 + \frac{n}{16}$

$$\text{output} = \frac{1}{1.03125 + \frac{n}{16}} \cdot \underbrace{2^{15}}_{\substack{\text{fixed-point} \\ \text{conversion}}}$$

- ERROR - largest error is when halfway between partitions

$$\text{- e.g., } \frac{1}{a} = .9408825057 \rightarrow \frac{.968523002421 - .940882505777}{.940882505777}$$

$$= \boxed{2.94\% \text{ max error}}$$