Dilation $\quad A \oplus B = \bigcup_{b \in B} A_b$

prove $\quad A \oplus B = B \oplus A$

consider $\quad A \oplus B \neq B \oplus A \therefore \bigcup_{b \in B} A_b \neq \bigcup_{a \in A} B_a$

$\because \bigcup_{b \in B} A_b \neq \bigcup_{a \in A} B_a$ either $\bigcup_{b \in B} A_b = \emptyset \wedge \bigcup_{a \in A} B_a = 1$

-or-

$\bigcup_{b \in B} A_b = 1 \wedge \bigcup_{a \in A} B_a = \emptyset$

Case 1:

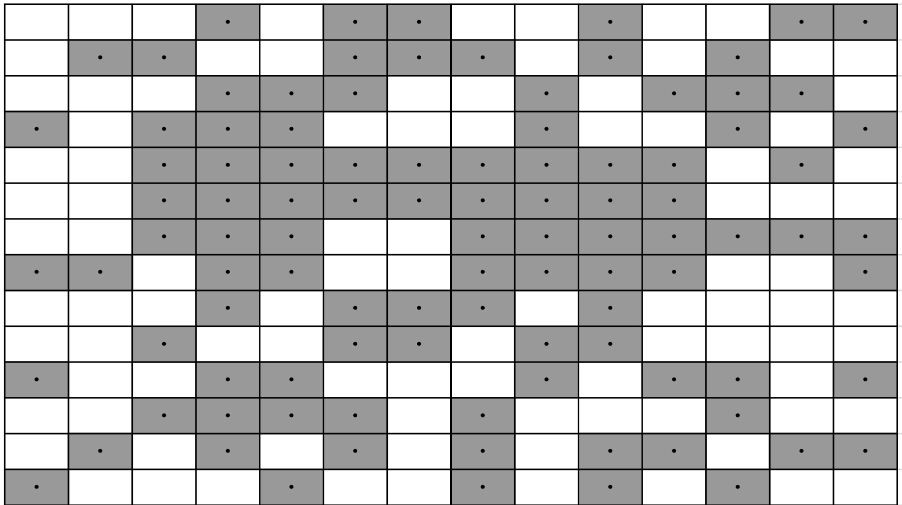
$\bigcup_{b \in B} A_b = \emptyset \wedge \bigcup_{a \in A} B_a = 1$

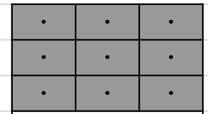
$\bigcup_{b \in B} A_b = \emptyset \rightarrow \nexists K \mid A_K = 1 \therefore \nexists q \mid B_q = 1 \because B_q = A_K$ for some K

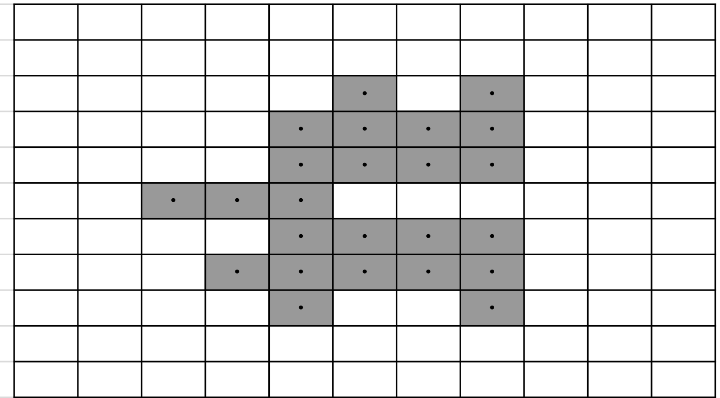
Contradiction

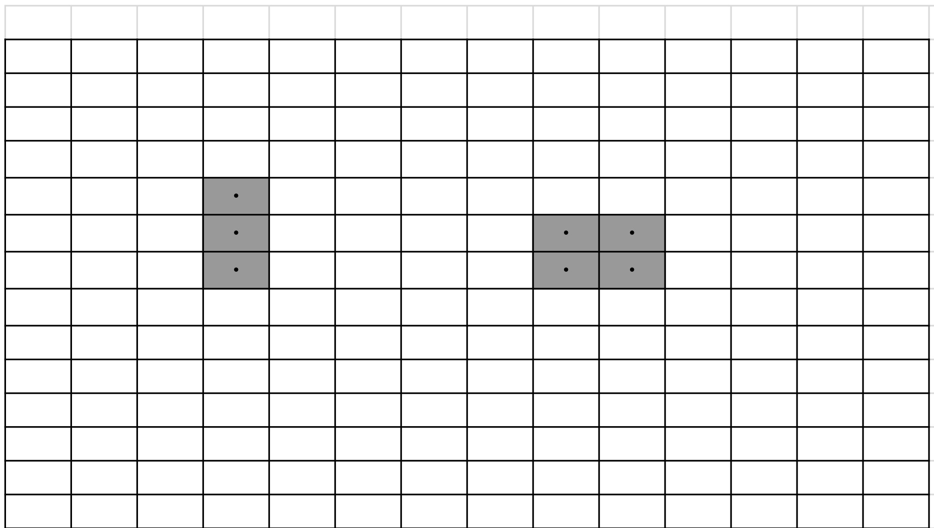
Case 2:

reverse A&B labels from case 1 & apply same logic

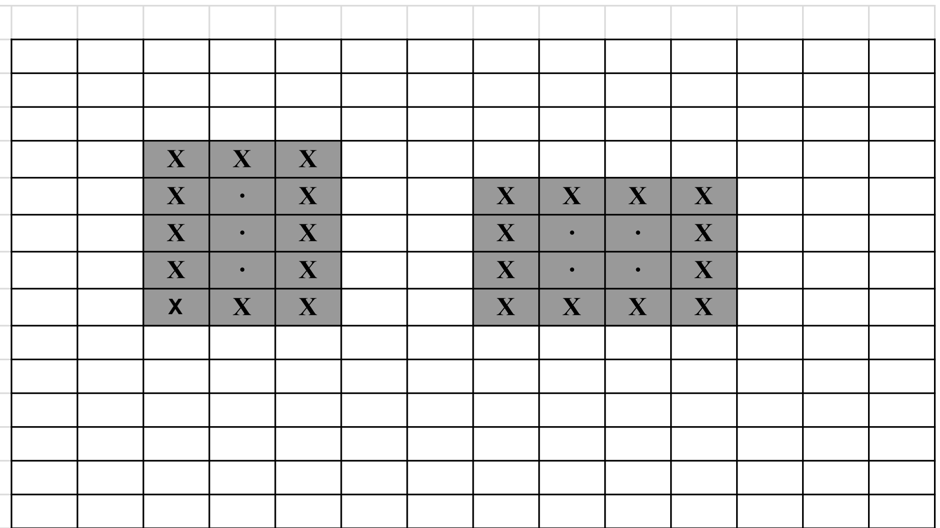

Question 2, Structure A


Q2 Struct B

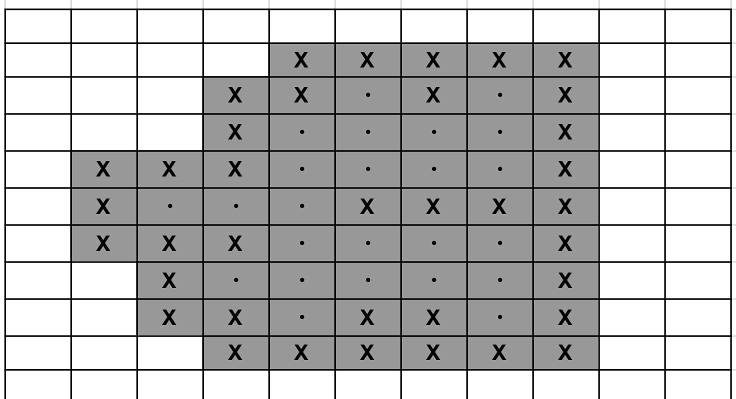

Q2 Structure C



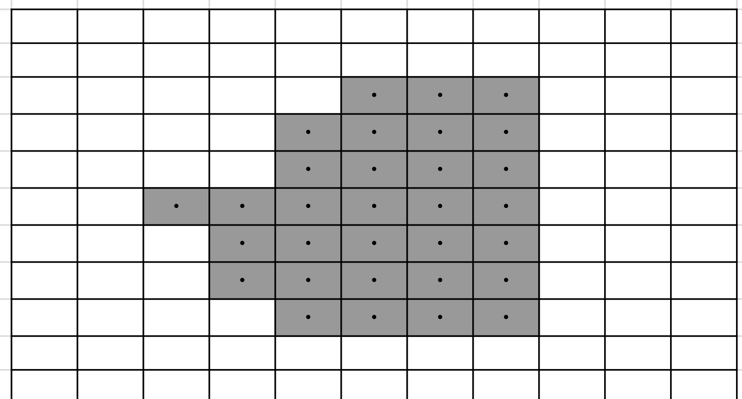
Question 2, Structure $A \ominus B$



Question 2, Structure $(A \ominus B) \oplus B = (A \circ B)$

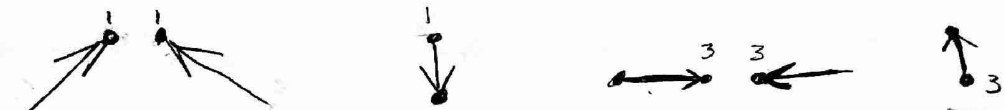


Q2 Structure $C \oplus B$

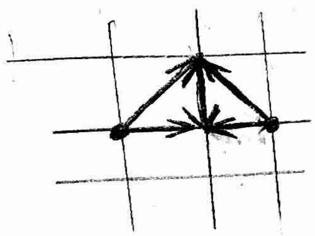


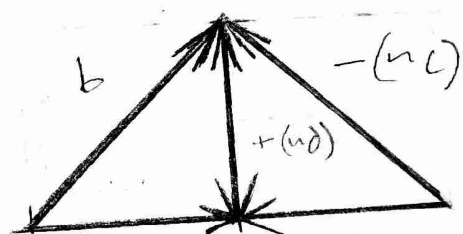
Q2 Structure $(C \oplus B) \ominus B = C \cdot B$

(3)



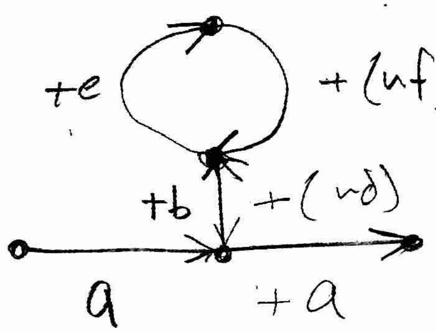
$$\Big[\big[b - (-c)\big] + (-d)\Big] - \Big[\big[a - (-a)\big] + d\Big]$$

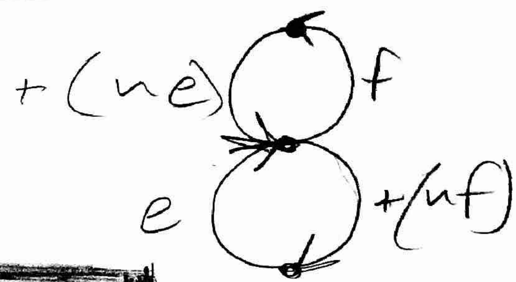




Final Answer

$\boxed{3.\ A}$





$$[[[(a+b)+e]+(vf)]+(vd)]+a$$

3b

$$[(e+f)+(ve)]+(vf)$$