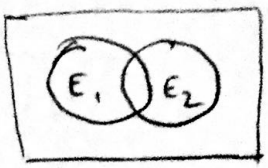
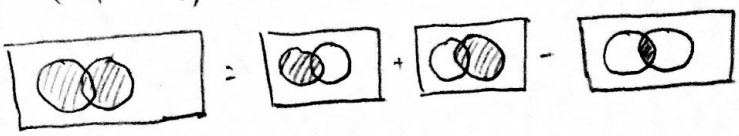
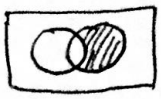
Exercise set 4-1 #3

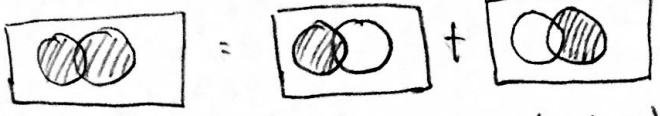


Show that $P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$



Define the set difference $E_2 \setminus E_1$ as  - set of elements in E_2 that are not in E_1

Notice that: $P(E_1 \cup E_2) = P(E_1 \cup E_2 \setminus E_1)$



(b/c $E_1 \cap E_2 \setminus E = \emptyset$)

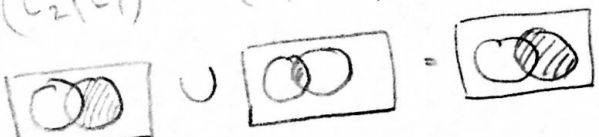
$P(E_1 \cup E_2) = P(E_1) + P(E_2 \setminus E_1)$

so we have to show that:

$P(E_2 \setminus E_1) = P(E_2) - P(E_1 \cap E_2)$

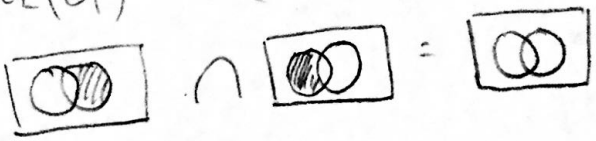
Notice that:

$(E_2 \setminus E_1) \cup (E_1 \cap E_2) = E_2$

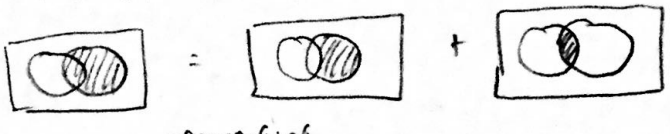


AND

$(E_2 \setminus E_1) \cap (E_1 \setminus E_2) = 0$



$\therefore P(E_2) = P(E_2 \setminus E_1) + P(E_1 \cap E_2)$



rearranging...

$P(E_2 \setminus E_1) = P(E_2) - P(E_1 \cap E_2)$ ok!