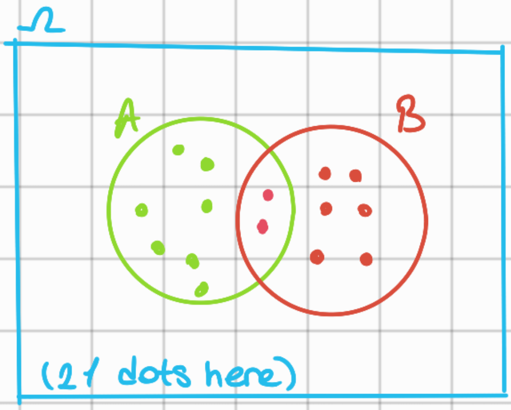
→ We can see that this is true by the following example:




→ We have 36 points total in the sample space (all of them are equally probable)

→ A has 9 dots
→ B has 8 dots

$A \cap B = 2$ dots

→ Is A and B are independent events?

If $P(A \cap B) = P(A) \cdot P(B)$ then A and B are independent events.

$$\frac{2}{36} \overset{?}{=} \frac{\cancel{9}}{\cancel{36}_{9}} \cdot \frac{\cancel{8}^{2}}{36} \rightarrow \frac{2}{36} = \frac{2}{36} \checkmark$$ Yes, they are independent.

→ What is the probability of observing A given that B is observed?

If B is observed, one of the 8 points in B is observed. So our sample space is 8. To observe A at the same time, one of the 2 points in the intersection must have been observed. Thus,

$$\frac{\text{desired}}{\text{sample}} = \frac{2}{8} = 0.25 = P(A) \text{ since } P(A) = \frac{9}{36} = \frac{1}{4} = 0.25$$

→ What is the probability of observing B given that A is observed?
Same logic as above.

$$\frac{\text{desired out.}}{\text{sample}} = \frac{\#\text{ in } A \cap B}{\#\text{ in } A} = \frac{2}{9} = P(B) \text{ since } P(B) = \frac{8}{36} = \frac{2}{9}$$

* So independent events does not affect each others probability of happening!