⊛ The conditional probability of B given A: $P(B|A)$ is the probability that B occurs WHEN A occurs:

$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

→ For any event A and B (regardless of dependency):

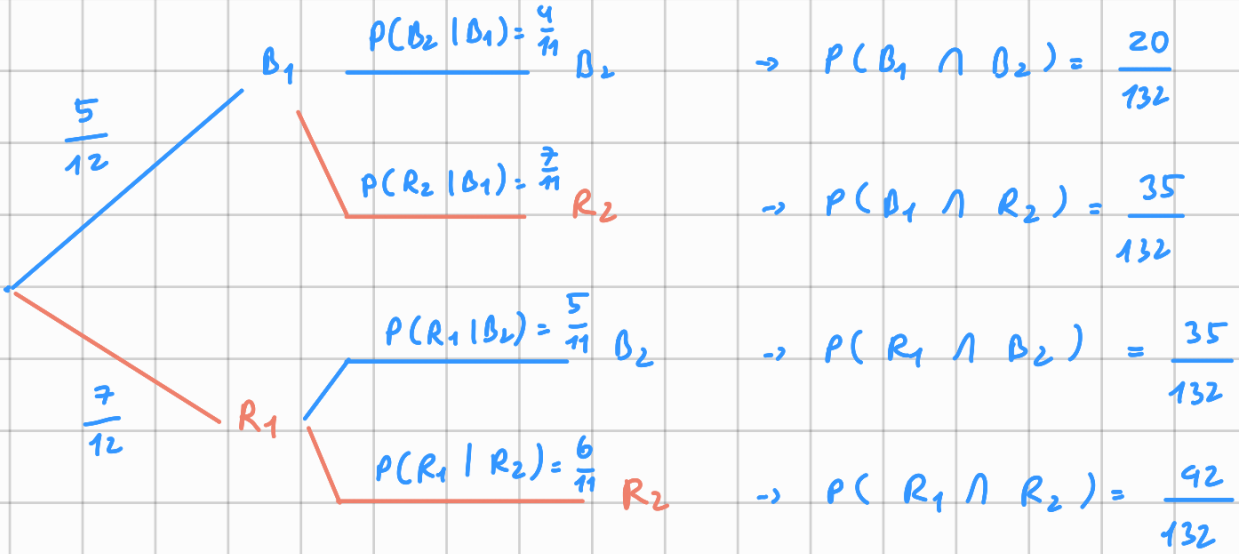
$$P(A \cap B) = P(A) \cdot P(A|B)$$

If A and B is independent:

$$P(A \cap B) = P(A) \cdot P(B)$$

⊛ Ex: An urn contains 5 blue & 7 red balls. 2 are drawn without replacement. Find probability:

a. No ball is blue
b. 2 ____
b. Exactly 1 ball is blue
d. At least 1 ball is blue



→ $P(B_1 \cap B_2) = \frac{20}{132}$

→ $P(B_1 \cap R_2) = \frac{35}{132}$

→ $P(R_1 \cap B_2) = \frac{35}{132}$

→ $P(R_1 \cap R_2) = \frac{42}{132}$

→ $a = \frac{42}{132}$ $b = \frac{35}{132} + \frac{35}{132} = \frac{70}{132}$

$c = \frac{20}{132}$ $d = 1 - a = \frac{90}{132}$

Bayes Theorem:

Suppose $B_1, B_2, \dots B_n$ are mutually exclusive events that $B_1 \cup B_2 \cup \dots = S$.

If A and $B_k \neq 0$ $(1 \leq k \leq n)$, then for any k:

$$P(B_k \mid A) = \frac{P(B_k) \cdot P(A \mid B_k)}{P(B_1) \cdot P(A \mid B_1) + P(B_2) \cdot P(A \mid B_2) + \dots}$$