

Practical 2 - Probability calculus

(some simple exercises.)

Today, we focus on discrete random variables (RVs).

①

Given:

-) RVs X_1, X_2, \dots, X_n, W , each taking values in $\{x_1, x_2, x_3, x_4\}$ (4 possible outcomes).
-) Their joint distr. $P(X_1, \dots, X_n, W)$

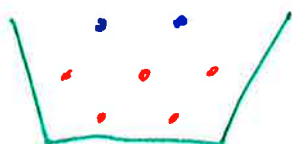
Task:

-) ~~comp~~ Find a math. expression for the marginal distr. $P(W)$.
-) How many additive terms does this expression involve? (computational costs in $\Theta(\cdot)$?)

②

Given:

-) green box with 5 apples & 2 plums
-) black box with 2 apples & 3 plums



Task: We choose randomly a box and then randomly pick a fruit out of it.

RVs $\begin{cases} X \dots \text{box} \\ Y \dots \text{fruit} \end{cases}$

-) compute all conditional probabilities $P(Y = \text{fruit} | X = \text{box})$, $\text{box} \in \{g, b\}$, $\text{fruit} \in \{a, p\}$.
-) Compute the marg. distr. $P(X), P(Y)$.
-) Assume, an apple has been picked. What are the prob. that it has been picked from the (il)green/black box? (Hint: use Bayes rule).

③

Given: •) Two binary RVs X, Y with following joint distr.:

$X \backslash Y$	0	1
0	0.28	0.52
1	0.07	0.13

Task: •) Show that X and Y are statistically independent.