# Discrete Random Variables/ Series N°2

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## Exercise 1

Suppose that a random variable $X$ follows a normal distribution $X \sim N(0, 1)$. Using the standard normal table, calculate:

1. $P(X < 0.75)$, $P(X \leq 0.5)$, $P(|X| < 1.32)$, $P(|X| < 3.42)$, $P(-1 < X \leq 1)$ and $P(-1.6 \leq X < 4.09)$.

2. In each case, determine the real value $a$ such that $P(X > a) = 0.1762$, $P(X > -a) = 0.9406$ and $P(X < a) = 0.888$.

3. Given $X \sim N(31.6, 10^2)$, find $a$ such that $P(X < a) = 0.9671$.

## Exercise 2

Le Tapis Vert was a game by La Française des Jeux broadcast on TF1 in the 1980s. In this game, 32 cards were used, and one card was drawn successively from each of the four suits: spades, hearts, clubs, and diamonds.
The player selected one card from each suit on their ticket. The winnings were:

- 2 times the bet if 2 selected cards were correct,

- 30 times the bet if 3 selected cards were correct,

- 1000 times the bet if 4 selected cards were correct.

Let $X$ be the random variable representing the number of correct cards obtained after a draw.

1. Determine the probability distribution followed by the random variable $X$.

2. Compute $P(X = 2)$, $P(X = 3)$, and $P(X = 4)$ (in fraction form).

3. Deduce the probability of losing in "Le Tapis Vert".

# Exercise 3

A machine is responsible for packaging flour bags. the weight $M$ of a bag is a random variable that follows a normal distribution with a constant standard deviation $\sigma = 30$g, while the mean weight $\mu$ can be adjusted. A bag is rejected if its weight is less than 995g.

1. Assuming the mean weight is $\mu = 1000$g, what is the probability that a bag is rejected?

2. To reduce the number of rejected bags, the machine's settings are modified. What should be the value of $\mu$ so that the probability of accepting a bag is equal to 0.99?.

# Exercise 4

A salesperson must visit 5 clients. He knows that the probability of obtaining an order is the same for all clients and has a value of 0.2. It is assumed that each client's decision is independent of the others. Let $X$ be the random variable representing the number of clients who placed an order.

1. What is the probability distribution of $X$? Specify its parameters and justify your answer.

2. What is the probability that the salesperson obtains exactly three orders?

3. What is the probability that the salesperson obtains no orders at all?

4. Does the salesperson have more than a 50% chance of obtaining at least two orders?