Seminar 1
Probabilities

DEDP

1. Let A be a continuous r.v. with distribution $\mathcal{U}\,[0,6]$

   a. Draw the PDF of A
   b. Compute the probability that $A > 1$
   c. Compute the probability that $A \in (0,2)$
   d. Draw the CDF function and write its mathematical expression
   e. What is the distribution of $B = A - 2$?

2. Let A be a r.v. with distribution $\mathcal{N}\,(\mu = 1, \sigma^2 = 2)$.

   a. Compute the probability that $A \in [2,4]$
   b. What is the distribution of $B = A - 2$?
   c. What is the maximum value of $w_A(x)$ and for what x is it reached?

3. Knowing that the IQ score follows a distribution $\mathcal{N}\,(\mu = 100, \sigma = 15)$, find:

   a. The probability that a random person has IQ score > 130
   b. If the total population is 8 billion, how many people have IQ smaller than 75

4. Let A be a **discrete** random variable with uniform distribution $\mathcal{U}\,[0,10]$

   a. How many different realizations of A are possible?
   b. Draw the PMF of A
   c. Find the probability that A is an odd number
   d. Find the probability that $A \in [3,7]$

5. Compute the probability that three r.v. X, Y and Z i.i.d. $\mathcal{N}(-1,1)$ are all positive simultaneously

6. Consider 3 three normal random variables $A \sim \mathcal{N}\,(\mu = 1, \sigma^2 = 3)$, $B \sim \mathcal{N}\,(\mu = -4, \sigma^2 = 3)$, $C \sim \mathcal{N}\,(\mu = 5, \sigma^2 = 3)$.

a. Is it more likely that (A, B, C) has values around $(2, -6, 3)$ or around $(-2, -3, 2)$?

b. Find a set of values (x, y, z) such that (A, B, C) are as likely to be in a vicinity of (x, y, z) as in a vicinity of $(2, -6, 3)$.

7. Compute the average value, the average squared value, and the variance for a continuous random variable with the uniform distribution $\mathcal{U}[2, 10]$.