

1. Consider the function f defined as follows:

- $f(x) = x$ if $0 \leq x \leq 1$
- $f(x) = 2 - x$ if $1 \leq x \leq 2$
- $f(x) = 0$ if x is outside $[0, 2]$.

Verify that f is a valid probability density function for a random variable (X, f) . What is the mean and variance of X ?

2. Let $D_1 \times D_2$ correspond to the roll of two dice. Define the function g on the outcome set as follows: $g(i, j) = \|i - j\|$. What is the expected value of g ?

3. By change of variable, verify that the mean and variance of the normal variable $N(\mu, \sigma)$ is indeed μ and σ^2 .

4. For $N(2, 2)$, use `cdfnor` to find a such that $Pr(2 - a \leq x \leq 2 + a) = 0.5$.

5. Plot various attributes for your talukas and check if they satisfy (visually) the normality assumption.

6. Let X_i be identical independent uniform random variables and let Y_n be the sum of n such copies. What is the mean and variance of Y_n ? Write scilab code to make call 10000 copies of Y_n for various n and plot histograms. What is the observed mean and variance?

7. Compute the variance of the Binomial random variable. For $q = 0.6$ and n , find through experimentation, k such that $Pr(0.6 * n - k \leq x \leq 0.6 * n + k) = 0.5$. Plot k for various n and compare this with the normal case.

8. Let X be the random variable $Binom(m, q)$ and Y be $Binom(n, q)$ and let $Z = X + Y$. Compute the probability p_i of $Z = i$.