

BASIC PROBABILITY: THEORY

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Board questions set 3

Problem 1: Discrete Distributions

x	1	3	5	7
$F_X(x)$	0.5	0.75	0.9	1

- (a) What is $P(X \leq 3)$?
- (b) What is $P(X = 3)$?

Problem 2: Expectations

- (a) Would you accept a gamble that offers a 10% chance to win €95 and a 90% chance of losing €5?
- (b) Would you pay €5 to participate in a lottery that offers a 10% chance to win €100 and a 90% chance to win nothing?

Problem 3: Memorylessness

Assume that $X \sim \text{Geometric}(p)$, so $p(X = k) = p(1 - p)^k$. Show that the geometric distribution is *memoryless*, i.e. show that

$$P(X = n + k \mid X \geq n) = P(X = k)$$

where $n, k > 0$.

Problem 4: Variance

x	1	2	3	4	5
$P(X = x)$	0.1	0.2	0.4	0.2	0.1

- (a) Compute the variance and standard deviation $\sigma(X)$ of X .
- (b) What are the variance and standard deviation of $\frac{X}{\sigma(X)}$?