

**BASIC PROBABILITY: THEORY**

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# Board questions set 3

**Problem 1: Discrete Distributions**

$X$	1	3	5	7
$F(X \leq x)$	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  $X \sim \text{Geometric}(p)$ . Show that the geometric distribution is memoryless (or stationary), i.e. show that

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

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  $\frac{X}{\sigma(X)}$ ?