# Statistics Test 4

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* Indicates required question

## Statistics Monthly Test 4

The cumulative distribution function (CDF) applies to * 1 point

- Discrete variables only
- Continuous variables only
- Both discrete and continuous variables
- None of the above

For a probability density function (PDF), the total area under the curve is: * 1 point

- 1
- 0
- Equal to the mean
- None of the above

Which of the following describes the behavior of a CDF graph for a continuous random variable? * 1 point

- ◯ The graph has horizontal steps.
- ◯ The graph is bell-shaped.
- ◯ The graph is flat after the mean.
- ◯ The graph is smooth and continuously increasing.

The Uniform distribution is characterized by * 1 point

- ◯ The Uniform distribution assumes all outcomes in a range are equally likely.
- ◯ A bell-shaped curve
- ◯ Discrete outcomes
- ◯ None of the above

The Exponential distribution is always * 1 point

- ◯ Discrete
- ◯ Continuous
- ◯ Both discrete and continuous
- ◯ None of the above

What is the primary difference between a PMF and a PDF? * 1 point

- ◯ PMF applies to continuous random variables, and PDF applies to discrete random variables.
- ◯ PMF assigns probabilities to specific values, while PDF assigns probability densities in a specific range.
- ◯ PMF and PDF are identical for all types of variables.
- ◯ PMF is always a smooth curve, while PDF is step-like.

The value of the CDF at the maximum value of a random variable is: * 1 point

- ○ 0
- ◉ 1
- ○ Equal to the mean
- ○ Undefined

What is the purpose of this code? * 2 points

```
from scipy.stats import binom
import matplotlib.pyplot as plt

x = range(0, 11)
cdf_values = binom.cdf(x, n=10, p=0.5)
plt.step(x, cdf_values)
plt.xlabel('x')
plt.ylabel('CDF')
plt.title('CDF of Binomial Distribution')
plt.show()
```

- ○ It plots the PMF of a Binomial distribution.
- ○ It plots the histogram of Binomial samples.
- ○ It plots the CDF of a Binomial distribution.
- ○ It calculates the PDF of a Binomial distribution.

If the CDF of a random variable X is plotted and shows a step-like structure, X is a continuous random variable. * 1 point

- ◉ True
- ○ False

The standard normal distribution has: * 1 point

- ○ Mean 1 and standard deviation 0
- ○ Mean 1 and standard deviation 1
- ○ Mean 0 and variance 2
- ◉ Mean 0 and standard deviation 1

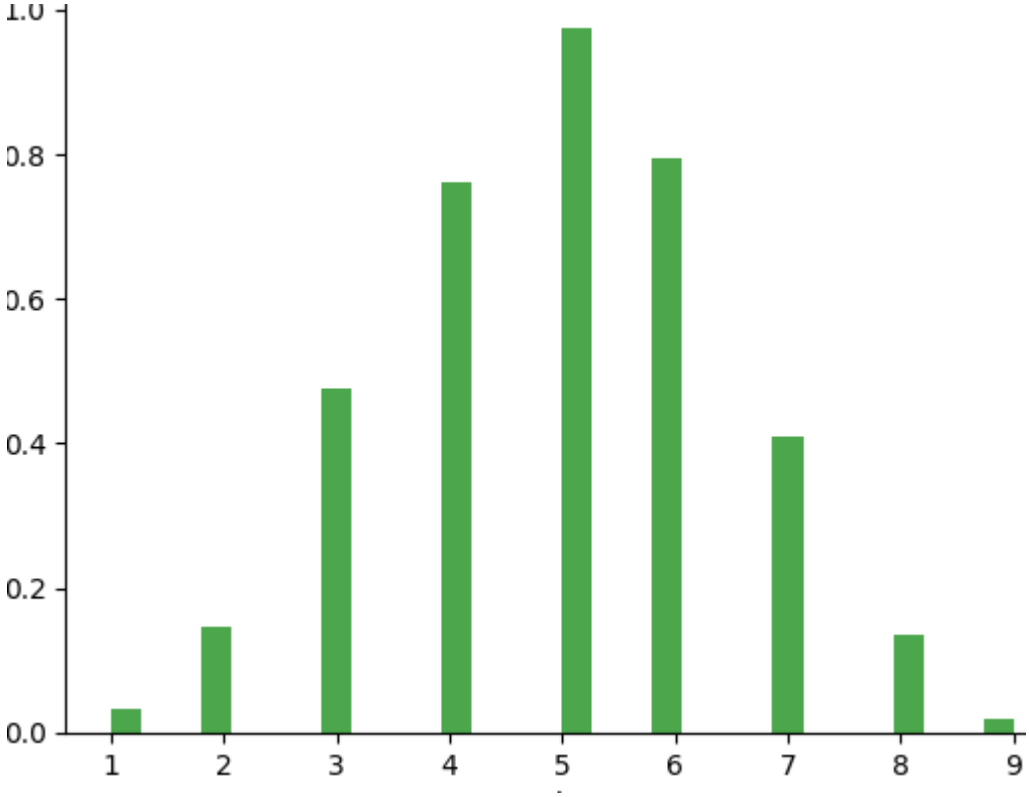
A discrete random variable: * 1 point

- ◉ Takes uncountable values
- ○ Takes countable values
- ○ Is always normally distributed
- ○ None of the above

The Cumulative Distribution Function (CDF) of any random variable is always a non-decreasing(increasing) function. * 1 point

- ○ True
- ◉ False

Look at the plot below. What type of distribution does it represent? * 2 points




- (●) Normal Distribution
- ( ) Exponential Distribution
- ( ) Poisson Distribution
- ( ) Binomial Distribution

If two events are independent, the occurrence of one affects the occurrence of the other. * 1 point

- ( ) True
- (●) False

The Poisson distribution is used to model * 1 point

- ○ Fixed intervals
- ◉ The number of events in a fixed interval of time or space
- ○ Continuous random variables
- ○ The probability of success in trials

What is the probability of getting an even number on a die roll? * 1 point

- ○ 1/2
- ○ 1/3
- ◉ 1/6
- ○ 3
- ○ 2/3

**If an event is impossible, what is its probability?** * 1 point

- ◉ 0
- ○ 0.5
- ○ 1
- ○ Cannot be determined

The Exponential distribution can be used to model the time between bus arrivals. * 1 point

- ◉ True
- ○ False

If an event is certain to happen, what is its probability? * 1 point

- 0
- 0.5
- 1
- None of the above

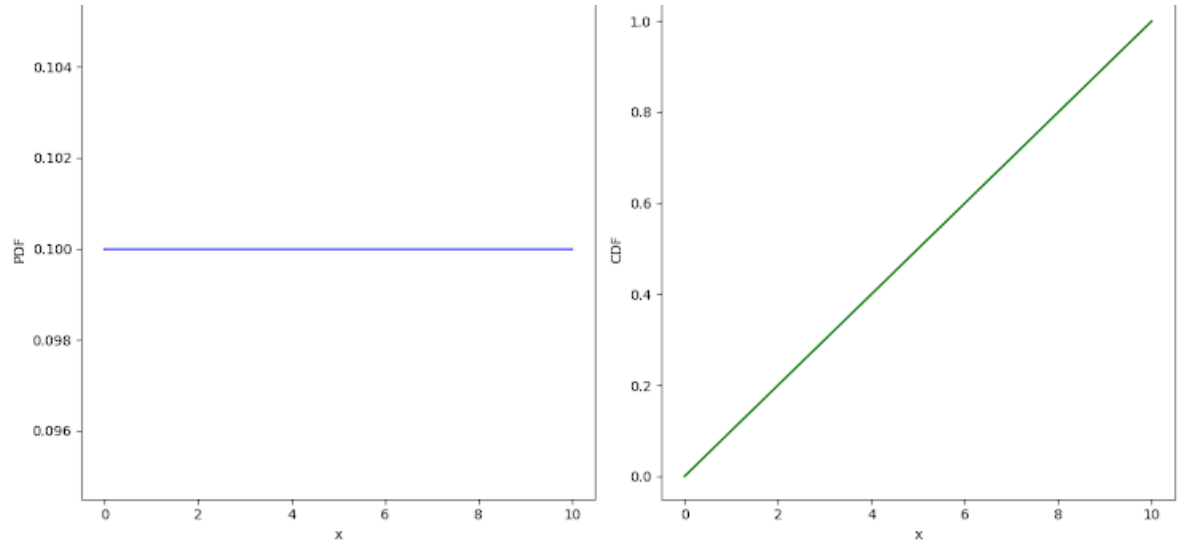
Which of the following is NOT true about random variables? * 1 point

- They are numerical values from experiments
- They can be described using PMFs or PDFs
- They always follow a normal distribution
- They have an expected value

The Normal distribution is also known as * 1 point

- Exponential distribution
- The Poisson distribution
- The Binomial distribution
- The Gaussian distribution

Look at the graph below. Which distribution does this PDF and CDF represent? * 2 points




- ○ Normal Distribution
- ○ Uniform Distribution
- ○ Exponential Distribution
- ○ Poisson Distribution

The Central Limit Theorem states that the sampling distribution of the sample mean approaches a normal distribution as: * 1 point

- ○ The number of samples increases
- ○ The sample size increases
- ○ The variance decreases
- ◉ The population mean increases

What does the following Python code do? * 1 point

```
from scipy.stats import poisson
import matplotlib.pyplot as plt

x = range(0, 10)
pmf_values = poisson.pmf(x, mu=3)
plt.bar(x, pmf_values)
plt.xlabel('x')
plt.ylabel('PMF')
plt.show()
```

- ◯ Plots the PDF of a Poisson distribution with mean 3.
- ◯ Plots the PMF of a Poisson distribution with mean 3.
- ◯ Plots the cumulative distribution of a Poisson distribution.
- ◯ Plots the histogram of a Poisson-distributed random sample.

Which of the following is NOT a property of probability? * 1 point

- ◯ $0 \leq P(E) \leq 1$
- ◯ $P(S)=1$ (where S is the sample space)
- ◯ Probabilities of all events sum to infinity
- ◯ None of the above

⚠ This is a required question

A die is rolled. What is the probability of getting any specific number (e.g., 3)? * 1 point

- (●) 1/2
- ( ) 1/3
- ( ) 1/6
- ( ) 1
- ( ) 6

The set of all possible outcomes of an experiment is called * 1 point

- ( ) Event
- ( ) Probability
- ( ) Sample Space
- ( ) Random Variable

A binomial distribution is used for: * 1 point

- ( ) Continuous random variables
- ( ) Counting the number of successes in fixed trials
- ( ) Symmetric distributions
- ( ) None of the above

The Binomial distribution is always * 1 point

- ( ) Discrete
- (●) Continuous
- ( ) Both discrete and continuous
- ( ) None of the above

In real-life, the Poisson distribution is used to model the time of customer arrivals at a store per hour. * 1 point

- ○ True
- ○ False

The Exponential distribution is used to model * 1 point

- ◉ The number of successes in n trials
- ○ Time until the next event occurs in a Poisson process
- ○ Continuous uniform data
- ○ None of the above

A probability distribution can have negative probabilities. * 1 point

- ○ True
- ◉ False

If the CDF of a variable X is plotted and has a smooth "S-shape," the variable is most likely: * 1 point

- ○ Uniformly distributed.
- ◉ Normally distributed.
- ○ Exponentially distributed.
- ○ Discretely distributed.

The cumulative distribution function (CDF) gives * 1 point

- The probability of a specific value
- The probability that a random variable is less than or equal to a value
- The probability density of a random variable
- None of the above

The mean of an Exponential distribution with rate (mean of Poisson distribution) λ are * 1 point

- λ
- λ^2
- 1/λ
- Square root of λ
- None of the above

A continuous random variable is characterized by: * 1 point

- A probability density function
- A probability mass function
- Discrete probabilities
- None of the above

Which of the following is true about PDFs? * 1 point

- They give exact probabilities for specific values
- They describe probabilities over intervals for continuous random variables
- They are used for discrete random variables
- None of the above

Which type of graph is generated by the following code? * 2 points

```
from scipy.stats import norm
import matplotlib.pyplot as plt
import numpy as np

x = np.linspace(-3, 3, 100)
pdf_values = norm.pdf(x, loc=0, scale=1)
plt.plot(x, pdf_values)
plt.title('PDF of Standard Normal Distribution')
plt.show()
```

- ○ A step-like graph representing the CDF.
- ○ A histogram approximating the PMF.
- ○ A smooth bell-shaped curve for the PDF of a standard normal distribution.
- ○ A linearly increasing CDF graph.

The probability mass function (PMF) is used for: * 1 point

- ◉ Discrete random variables
- ○ Continuous random variables
- ○ Both discrete and continuous random variables
- ○ None of the above

The Probability Mass Function (PMF) for a discrete random variable is always a smooth curve. * 1 point

- ◉ True
- ○ False

The Central Limit Theorem applies only to normal distributions. * 1 point

- [x] True
- [ ] False

Bayes' Theorem is expressed as: * 1 point

- [ ] P(A|B)= P(B|A)P(A)
- [x] P(A|B)= (P(B|A)P(A))/ P(B)
- [ ] P(A|B)= (P(B|A)P(B))/ P(A)
- [ ] P(A|B)= P(B|A)P(B)

Equally likely events have: * 1 point

- [ ] The same outcomes
- [ ] The same probabilities
- [ ] Different probabilities
- [ ] None of the above

The Uniform distribution is always * 1 point

- [x] Discrete
- [ ] Continuous
- [ ] May discrete or continuous
- [ ] Can't say

Conditional probability can be interpreted as * 1 point

- (●) The probability of A occurring, given that B has occurred
- ( ) The joint probability of A and B
- ( ) The complement of A
- ( ) None of the above

The PMF of a Binomial distribution with n=1 is identical to a Bernoulli distribution. * 1 point

- (●) True
- ( ) False

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