

CUET Mathematics Test

Chapter: Probability Distributions - Random Variables

General Instructions

1. Total Questions: **20**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Each question carries **5 marks**.
5. For each correct answer: **+5 marks**.
6. For each incorrect answer: **-1 mark**.
7. No negative marking for unanswered questions.
8. Use of calculator or electronic devices is strictly prohibited.
9. Choose the most appropriate answer from the given options.

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1. A random variable X has a probability distribution $P(X)$ of the form: $P(X = x) = k$ if $x = 0$; $2k$ if $x = 1$; $3k$ if $x = 2$; and 0 otherwise. Determine the value of k .
- (A) $1/6$
(B) $1/3$
(C) $1/4$
(D) $1/5$
2. Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Let X be the random variable of the number of aces. Find the probability $P(X = 1)$.
- (A) $24/169$
(B) $12/169$
(C) $1/169$
(D) $2/13$
3. A pair of dice is thrown. Let X be the random variable denoting the sum of the numbers appearing on the dice. Find $P(X \geq 10)$.
- (A) $1/12$
(B) $1/6$
(C) $1/9$
(D) $5/36$
4. Let X denote the number of hours you study during a randomly selected school day. The probability that X can take the values x has the following form, where k is some unknown constant: $P(X = x) = 0.1$ if $x = 0$; kx if $x = 1$ or 2 ; $k(5 - x)$ if $x = 3$ or 4 ; 0 otherwise. Find the value of k .
- (A) 0.1
(B) 0.15
(C) 0.2
(D) 0.25
5. The probability distribution of a random variable X is given by:
 $X : 0, 1, 2$
 $P(X) : 3k^3, 4k - 10k^2, 5k - 1$
Find the value of k .
- (A) $1/3$
(B) $1/2$
(C) $2/3$
(D) $1/4$
6. A box contains 3 orange balls and 2 green balls. A random variable X denotes the number of orange balls in a draw of 2 balls without replacement. Find the probability $P(X = 0)$.
- (A) $1/10$
(B) $3/10$
(C) $6/10$
(D) $1/5$
7. Let X be a random variable such that $P(X = -2) = P(X = -1) = P(X = 1) = P(X = 2) = 0.2$ and $P(X = 0) = 0.2$. Find $P(X^2 < 2)$.
- (A) 0.2
(B) 0.4
(C) 0.6
(D) 0.8
8. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, let X be the number of tails. Find $P(X = 2)$.

- (A) $1/16$
 (B) $3/16$
 (C) $9/16$
 (D) $1/4$
9. The range of a random variable X is $\{0, 1, 2\}$. Given $P(X = 0) = 3c^3, P(X = 1) = 4c - 10c^2, P(X = 2) = 5c - 1$. What is the probability $P(X < 1)$?
 (A) $1/9$
 (B) $3/8$
 (C) $1/8$
 (D) $3/27$
10. A random variable X takes values $0, 1, 2, 3$ with probabilities $P(X = 0) = x, P(X = 1) = 2x, P(X = 2) = 3x, P(X = 3) = 4x$. Find $P(X \text{ is even})$.
 (A) 0.3
 (B) 0.4
 (C) 0.5
 (D) 0.6
11. A random variable X has the following distribution:
 $x : 1, 2, 3, 4$
 $P(x) : 0.1, 0.2, 0.3, 0.4$
 Find $P(1 < X < 4)$.
 (A) 0.3
 (B) 0.5
 (C) 0.4
 (D) 0.6
12. Let X represent the number of heads in 4 tosses of a fair coin. Find $P(X = 2)$.
 (A) $1/4$
 (B) $3/8$
 (C) $1/2$
 (D) $5/16$
13. If X is a random variable with $P(X = x) = \frac{x}{15}$ for $x = 1, 2, 3, 4, 5$. Find $P(X \leq 2)$.
 (A) $1/5$
 (B) $1/3$
 (C) $1/15$
 (D) $2/15$
14. A random variable X has the probability distribution:
 $X : -2, -1, 0, 1, 2$
 $P(X) : 0.1, k, 0.2, 2k, 0.3$
 Find the value of k .
 (A) 0.1
 (B) 0.133
 (C) 0.2
 (D) 0.05
15. Two cards are drawn from a pack of 52 cards. Let X be the number of kings. Find $P(X \geq 1)$ if drawing is without replacement.
 (A) $33/221$
 (B) $1/221$
 (C) $32/221$
 (D) $190/221$

16. A random variable X can take any non-negative integer n with probability $P(X = n) = ar^n$ ($0 < r < 1$). Find the value of a .
- (A) r
 - (B) $1 - r$
 - (C) $1/r$
 - (D) $r/(1 - r)$
17. If X is a random variable taking values $1, 2, 3, \dots, n$ with equal probabilities, find $P(X > n/2)$ when n is even.
- (A) $1/2$
 - (B) $1/n$
 - (C) $(n + 1)/2n$
 - (D) $1/4$
18. Let X be a random variable with $P(X = k) = \frac{1}{2^k}$ for $k = 1, 2, 3, \dots$. Find $P(X \text{ is even})$.
- (A) $1/2$
 - (B) $1/3$
 - (C) $2/3$
 - (D) $1/4$
19. A bag contains 4 white and 2 black balls. Three balls are drawn at random. Let X be the number of black balls. Find $P(X = 1)$.
- (A) $1/5$
 - (B) $3/5$
 - (C) $4/5$
 - (D) $2/5$
20. A random variable X has the probability distribution $P(X)$ as: $P(X = 0) = k, P(X = 1) = 2k, P(X = 2) = 3k, P(X = 3) = k^2, P(X = 4) = 5k^2, P(X = 5) = 7k^2 + k$. Find $P(X < 3)$.
- (A) $3/4$
 - (B) $1/2$
 - (C) $1/9$
 - (D) $6/9$

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