CUET Mathematics Test - Set 8

Chapter: Probability Distributions (Random Variables)

SOLUTIONS

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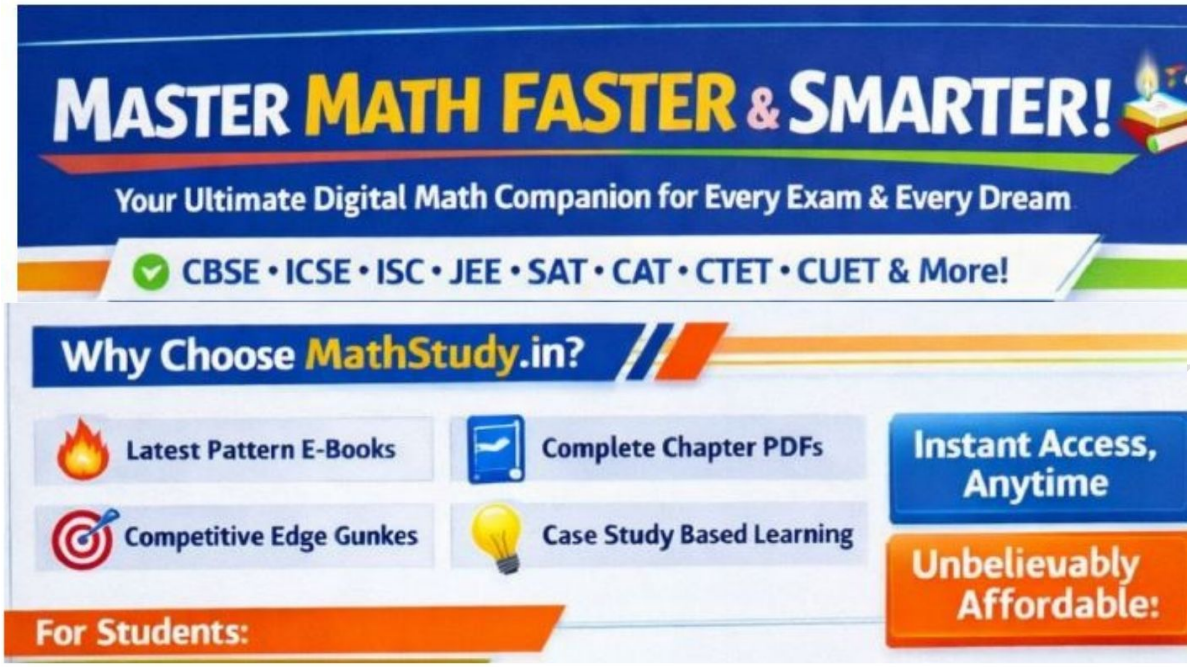

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Solutions

1. **Correct Option: (C)**. Sum of probabilities: $c + 2c + 3c + 4c = 1 \Rightarrow 10c = 1 \Rightarrow c = 0.1$. $P(1 < X \leq 3) = P(X = 2) + P(X = 3) = 3c + 4c = 7c = 0.7$.

2. **Correct Option: (C)**. Probability $P(x_i)$ must always satisfy $0 \leq P(x_i) \leq 1$. $\sin(3\pi/2) = -1$, which is impossible for a probability.

3. **Correct Option: (B)**. Absolute difference $X = 0$ occurs when both dice show the same number: (1,1), (2,2), (3,3), (4,4), (5,5), (6,6). $P = 6/36 = 1/6$.

4. **Correct Option: (A)**. $k + 2k + 3k + 4k = 1 \Rightarrow 10k = 1 \Rightarrow k = 0.1$. $P(X < 3) = P(1) + P(2) = k + 2k = 3k = 0.3$.

5. **Correct Option: (B)**. $p = 10/100 = 0.1, q = 0.9, n = 3$. $P(X = 1) = {}^3C_1(0.1)^1(0.9)^2 = 3 \times 0.1 \times 0.81 = 0.243$.

6. **Correct Option: (B)**. $k/1 + k/2 + k/3 = 1 \Rightarrow k(1 + 1/2 + 1/3) = 1 \Rightarrow k(11/6) = 1 \Rightarrow k = 6/11$.

7. **Correct Option: (C)**. $X \geq 2 \Rightarrow X \in \{2, 3\}$. $P(2) = {}^3C_2(1/2)^3 = 3/8$. $P(3) = {}^3C_3(1/2)^3 = 1/8$. Total $= 4/8 = 1/2$.

8. **Correct Option: (A)**. $k(1 + 2 + 3 + 4 + 5) = 1 \Rightarrow 15k = 1 \Rightarrow k = 1/15$. Primes in $\{1..5\}$ are $2, 3, 5$. $P = P(2) + P(3) + P(5) = k(2 + 3 + 5) = 10k = 10/15 = 2/3$.

9. **Correct Option: (A)**. $c/1^2 + c/2^2 = 1 \Rightarrow c(1 + 1/4) = 1 \Rightarrow c(5/4) = 1 \Rightarrow c = 4/5$.

10. **Correct Option: (C)**. $P(\text{Diamond}) = 13/52 = 1/4$. Since replacement is used, $P(X = 3) = (1/4)^3 = 1/64$.

11. **Correct Option: (B)**. $|X| = 1$ means $X = -1$ or $X = 1$. $P = 1/4 + 1/4 = 1/2$.

12. **Correct Option: (A)**. $C(2^1 + 2^2 + 2^3) = 1 \Rightarrow C(2 + 4 + 8) = 1 \Rightarrow 14C = 1 \Rightarrow C = 1/14$.

13. **Correct Option: (B)**. $X = 1$ (favors) has $P = 0.7$. Therefore, $X = 0$ (opposes) has $P = 1 - 0.7 = 0.3$.

14. **Correct Option: (A)**. Sum is multiple of 4: $\{4, 8, 12\}$. Pairs for 4: (1,3), (2,2), (3,1) [3]. For 8: (2,6), (3,5), (4,4), (5,3), (6,2) [5]. For 12: (6,6) [1]. Total $= 3 + 5 + 1 = 9$. $P = 9/36 = 1/4$.

15. **Correct Option: (A)**. Sum of ${}^nC_x$ from 0 to n is 2^n. $k(2^4) = 1 \Rightarrow 16k = 1 \Rightarrow k = 1/16$.