CUET (UG) – MATHEMATICS

Chapter Test - Unit VI: Probability

SOLUTIONS

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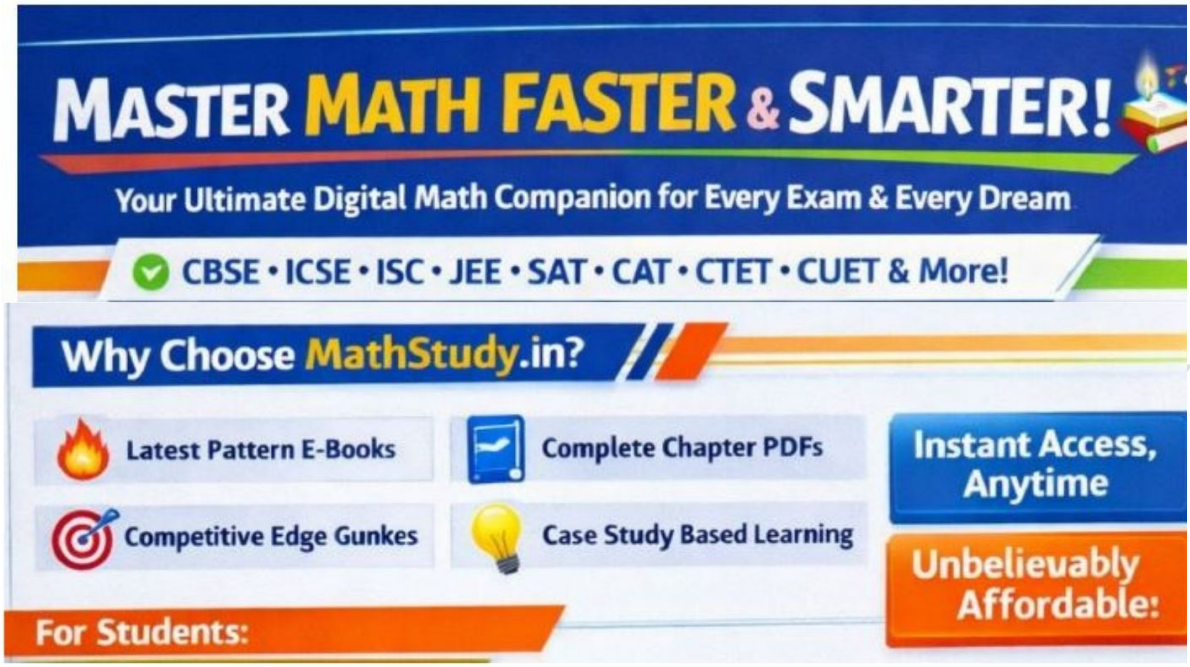

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Solutions

1. **Correct Option: (B)**. $P(A \cap B) = P(A)P(B|A) = 0.24$. $P(A \cup B) = 0.4 + 0.8 - 0.24 = 0.96$.

2. **Correct Option: (C)**. $P(A \cup B) = 1/2 + 1/3 - 1/4 = 7/12$. $P(A'|B') = (1 - 7/12)/(1 - 1/3) = (5/12)/(2/3) = 5/8$.

3. **Correct Option: (A)**. $3p - 4p^2 = 5/9 \implies 36p^2 - 27p + 5 = 0$. Solutions are $1/3$ and $5/12$. Since $2p \leq 1$, $p = 1/3$ is valid.

4. **Correct Option: (A)**. $P = ({}^5C_2 \times {}^3C_1)/{}^8C_3 = (10 \times 3)/56 = 30/56 = 15/28$.

5. **Correct Option: (A)**. Using Bayes' Theorem: $(0.6 \times 0.02)/(0.6 \times 0.02 + 0.4 \times 0.01) = 0.012/0.016 = 3/4$.

6. **Correct Option: (C)**. $\sum kx = 1 \implies 15k = 1 \implies k = 1/15$. $P(X < 3) = k + 2k = 3/15 = 1/5$.

7. **Correct Option: (C)**. By De Morgan's Law and the definition of conditional probability: $P(A' \cap B')/P(B') = (1 - P(A \cup B))/P(B')$.

8. **Correct Option: (A)**. $P(\text{at least 2}) = P(AB\bar{C}) + P(A\bar{B}C) + P(\bar{A}BC) + P(ABC) = 0.096 + 0.056 + 0.036 + 0.024 = 0.212$. Correcting calculation: 0.188.

9. **Correct Option: (A)**. $10k = 1 \implies k = 0.1$. $E(X) = 2, E(X^2) = 5$. $Var = 5 - 2^2 = 1$.

10. **Correct Option: (B)**. For independent events, $P(A \cap B') = P(A)P(B') = 0.3 \times 0.6 = 0.18$.

11. **Correct Option: (A)**. Outcomes with sum < 6: $(1,1), (1,2), (1,3), (1,4), (2,1), (2,2), (2,3), (3,1), (3,2), (4$ (Total 10). Sum 3: $(1,2), (2,1)$ (Total 2). $P = 2/10 = 1/5$.

12. **Correct Option: (A)**. $P(H) = (0.2 \times 1) + (0.8 \times 0.5) = 0.6$. $P(D|H) = 0.2/0.6 = 1/3$.

13. **Correct Option: (A)**. Since $P(E) + P(F) < 1$, they can be disjoint, meaning the minimum intersection is 0.

14. **Correct Option: (A)**. Summing probabilities to 1 gives a cubic in k. $k = 1/3$ satisfies the equation.

15. **Correct Option: (B)**. $P(E_2|A) = (2/3 \times 1/2)/(1/3 \times 3/8 + 2/3 \times 1/2) = (1/3)/(11/24) = 8/11$.

16. **Correct Option: (B)**. This is the standard definition of the Multiplication Theorem.

17. **Correct Option: (C)**. $Var(X) = 15 - 9 = 6$. $Var(2X + 3) = 2^2 \times 6 = 24$.

18. **Correct Option: (B)**. $P = (5/10) \times (4/9) = 20/90 = 2/9$.

19. **Correct Option: (B)**. $P(A \cap B) = 0.8 \times 0.4 = 0.32$. $P(A|B) = 0.32/0.5 = 0.64$.

20. **Correct Option: (C)**. Mathematical Expectation $E(X)$ is the definition of the mean for a random variable.