CUET Mathematics Test - Set 23

Unit VI: Probability (Intermediate)

SOLUTIONS

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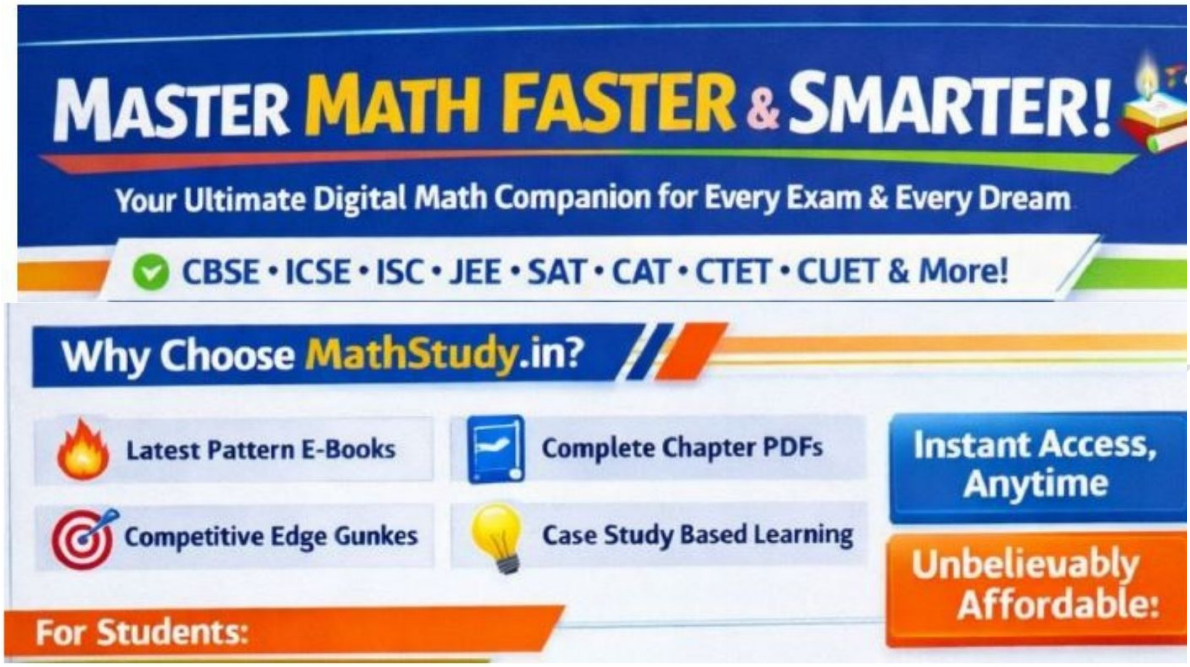

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Solutions

1. **Solution:** $P(A \cup B) = P(A) + P(B) - P(A \cap B)$. Since $P(A \cup B) \leq 1$, we have $0.8 + 0.5 - P(A \cap B) \leq 1 \implies 1.3 - 1 \leq P(A \cap B) \implies P(A \cap B) \geq 0.3$. **Correct Option: (A)**

2. **Solution:** $P(\text{solved}) = 1 - P(\text{none solve}) = 1 - (1/2 \times 2/3 \times 3/4) = 1 - 1/4 = 3/4$. **Correct Option: (C)**

3. **Solution:** For independent events, $P(A \cup B) = P(A) + P(B) - P(A)P(B) \implies 0.6 = 0.2 + x - 0.2x \implies 0.4 = 0.8x \implies x = 0.5$. **Correct Option: (B)**

4. **Solution:** Case 1: Red then Black $= (26/52) \times (26/51)$. Case 2: Black then Red $= (26/52) \times (26/51)$. Total $= 2 \times (1/2 \times 26/51) = 26/51$. **Correct Option: (A)**

5. **Solution:** $P(A) = 1/2, P(B) = 1/2$. $P(A \cap B) = P(\text{odd, odd}) = 9/36 = 1/4$. Since $P(A) \cdot P(B) = 1/4 = P(A \cap B)$, they are independent. **Correct Option: (B)**

6. **Solution:** $P(A \cap B) = P(A) + P(B) - P(A \cup B) = 6/11 + 5/11 - 7/11 = 4/11$. $P(A|B) = \frac{4/11}{5/11} = 4/5$. **Correct Option: (B)**

7. **Solution:** $E(X) = 0(1/3) + 1(1/6) + 2(1/2) = 1/6 + 1 = 7/6 \approx 1.16$. **Correct Option: (A)**

8. **Solution:** $1 - (1/4)^n > 0.99 \implies (1/4)^n < 0.01 \implies 4^n > 100$. For $n = 3, 64 < 100$; for $n = 4, 256 > 100$. **Correct Option: (B)**

9. **Solution:** Multiples of 3: $\{3, 6, \ldots, 99\} \to 33$. Multiples of 7: $\{7, 14, \ldots, 98\} \to 14$. Multiples of 21: $\{21, 42, 63, 84\} \to 4$. Probability $= (33 + 14 - 4)/100 = 43/100$. **Correct Option: (A)**

10. **Solution:** $P(A \cap B) = P(A) + P(B) - P(A \cup B) = 0.4 + 0.3 - 0.5 = 0.2$. $P(\bar{B} \cap A) = P(A) - P(A \cap B) = 0.4 - 0.2 = 0.2$. **Correct Option: (B)**

11. **Solution:** $P(B|M) = \frac{P(B \cap M)}{P(M)} = \frac{0.2}{0.6} = 1/3$. **Correct Option: (B)**

12. **Solution:** $np = 4, npq = 3 \implies 4q = 3 \implies q = 3/4 \implies p = 1/4$. $n(1/4) = 4 \implies n = 16$. **Correct Option: (B)**

13. **Solution:** $P(A'|B') = \frac{P(A' \cap B')}{P(B')} = \frac{1 - P(A \cup B)}{1 - P(B)}$. $P(A \cup B) = 0.5 + 0.4 - 0.3 = 0.6$. Probability $= \frac{1 - 0.6}{1 - 0.4} = \frac{0.4}{0.6} = 2/3$. **Correct Option: (C)**

14. **Solution:** $\text{Var}(X) = E(X^2) - [E(X)]^2 \implies 4 = E(X^2) - 2^2 \implies E(X^2) = 8$. **Correct Option: (C)**

15. **Solution:** $P(A \cup B) = P(A) + P(B) - P(A \cap B) \implies 0.8 = P(A) + P(B) - 0.3 \implies P(A) + P(B) = 1.1$. $P(A') + P(B') = (1 - P(A)) + (1 - P(B)) = 2 - (P(A) + P(B)) = 2 - 1.1 = 0.9$. **Correct Option: (D)**