SOLUTIONS

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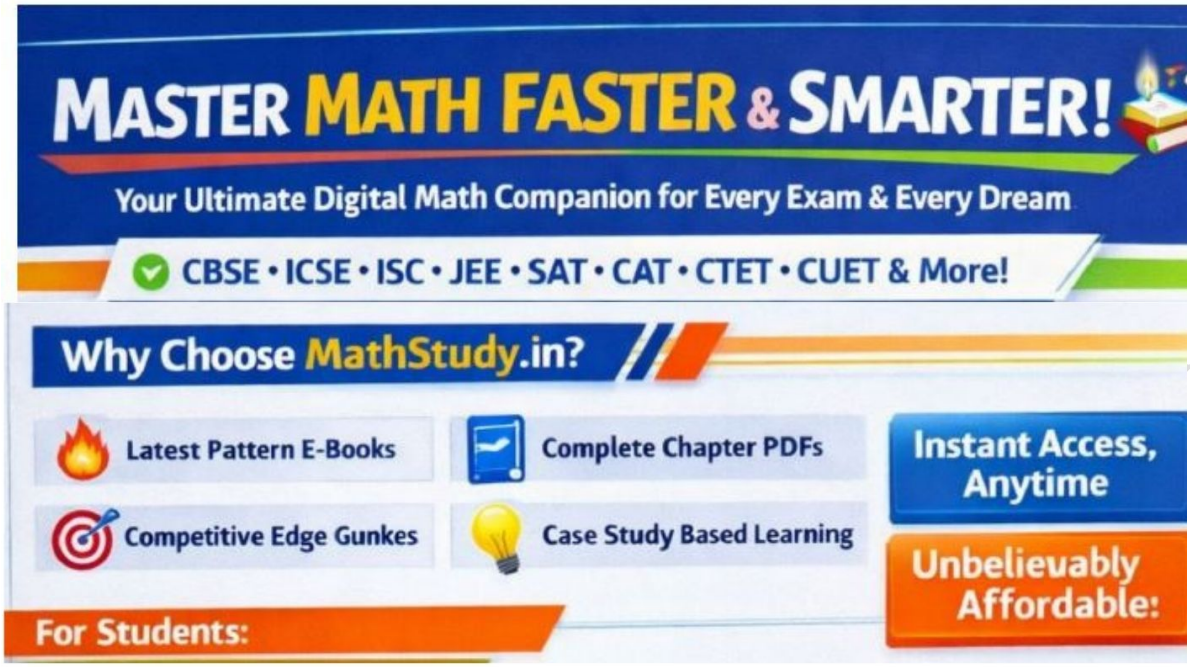

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SOLUTIONS: CHAPTER TEST PROBABILITY

Mathematics | Class IX | (2026/PROBAB/09/002)

Section A (Multiple Choice Questions)

1. **Answer: (c) 1**
   Reasoning: The sum of probabilities of all elementary events in a sample space is always unity.

2. **Answer: (a) 0.455**
   Reasoning: $P(\text{Head}) = \frac{\text{Frequency of Head}}{\text{Total trials}} = \frac{455}{1000} = 0.455$.

3. **Answer: (b) -1.5**
   Reasoning: Probability $P(E)$ of any event always lies between 0 and 1 ($0 \leq P(E) \leq 1$). It cannot be negative.

4. **Answer: (c) 0.63**
   Reasoning: $P(\text{not E}) = 1 - P(E) = 1 - 0.37 = 0.63$.

5. **Answer: (a) $\frac{1}{2}$**
   Reasoning: Outcomes on a die: $\{1, 2, 3, 4, 5, 6\}$. Prime numbers: $\{2, 3, 5\}$. $P(\text{Prime}) = \frac{3}{6} = \frac{1}{2}$.

6. **Answer: (b) 0.29**
   Reasoning: Total ladies = 200. Dislike coffee = 58. $P(\text{Dislike}) = \frac{58}{200} = \frac{29}{100} = 0.29$.

7. **Answer: (c) 0**
   Reasoning: An impossible event has no favorable outcomes, so its probability is 0.

8. **Answer: (b) $\frac{7}{12}$**
   Reasoning: Total balls = $3 + 5 + 4 = 12$. Not black balls (Red + White) = $3 + 4 = 7$. $P(\text{not black}) = \frac{7}{12}$.

Section B (Very Short Answer)

1. **Definition:** The set of all possible outcomes of a random experiment is called the Sample Space.
   Example: When a die is thrown, the sample space $S = \{1, 2, 3, 4, 5, 6\}$.

2. Total days = 200. Correct forecasts = 150.
   Incorrect forecasts = $200 - 150 = 50$.
   $P(\text{not correct}) = \frac{50}{200} = \frac{1}{4}$ or 0.25.

3. When two coins are tossed simultaneously, the possible outcomes are:
   $S = \{(H, H), (H, T), (T, H), (T, T)\}$. Total outcomes = 4.

4. Total tokens = 50.
   Multiples of 10 between 1 and 50 are: $\{10, 20, 30, 40, 50\}$. (Total 5).
   $P(\text{multiple of 10}) = \frac{5}{50} = \frac{1}{10}$ or 0.1.

Section C (Short Answer)

1. Total students $= 7 + 10 + 10 + 20 + 20 + 15 = 82$.
   (a) Less than 40 marks: students in intervals (0-20), (20-30), (30-40) $= 7 + 10 + 10 = 27$.
   $P(< 40) = \frac{27}{82}$.
   (b) 60 or more marks: students in (60-Above) $= 15$.
   $P(\geq 60) = \frac{15}{82}$.
2. Total sectors on the spinner $= 8$.
   (a) Even numbers: $\{2, 4, 6, 8\}$ (Total 4). $P(\text{Even}) = \frac{4}{8} = \frac{1}{2}$.
   (b) Greater than 5: $\{6, 7, 8\}$ (Total 3). $P(> 5) = \frac{3}{8}$.
3. Total families $= 1500$.
   (a) $P(2 \text{ girls}) = \frac{475}{1500} = \frac{19}{60}$.
   (b) $P(\text{No girl}) = \frac{211}{1500}$.

Section D (Long Answer)

1. Total trials $= 200$.
   (a) $P(\text{Exactly 2 heads}) = \frac{72}{200} = \frac{9}{25} = 0.36$.
   (b) At least 2 heads $=$ (2 heads) or (3 heads) $= 72 + 23 = 95$.
   $P(\text{At least 2 heads}) = \frac{95}{200} = \frac{19}{40} = 0.475$.
   (c) More tails than heads: This occurs with "1 head" (2 tails) or "No head" (3 tails).
   Total frequency $= 77 + 28 = 105$.
   $P(\text{More tails}) = \frac{105}{200} = \frac{21}{40} = 0.525$.
2. Total balls $= 14$. (6 Red, 5 Blue, 3 Green).
   (a) $P(\text{Red}) = \frac{6}{14} = \frac{3}{7}$.
   (b) Blue or Green $= 5 + 3 = 8$. $P(\text{Blue or Green}) = \frac{8}{14} = \frac{4}{7}$.
   (c) $P(\text{Not red}) = 1 - P(\text{Red}) = 1 - \frac{3}{7} = \frac{4}{7}$.
   (d) New Green balls $= 3 + 2 = 5$. New Total $= 14 + 2 = 16$.
   New $P(\text{Green}) = \frac{5}{16}$.

Case Study Solutions

1. **Answer: (c) 500**
   The experiment monitors five hundred solar streetlights.
2. **Answer: (a)** 11/100
   Battery failures $=$ Total - (Operational + Flickers) $= 500 - (320 + 125) = 55$.
   $P(\text{Failure}) = \frac{55}{500} = \frac{11}{100}$.
3. **Answer: (b) 0.89**
   $P(A) = \frac{320}{500} = 0.64$; $P(B) = \frac{125}{500} = 0.25$.
   $P(A) + P(B) = 0.64 + 0.25 = 0.89$.

4. **Answer: (b) Yes, because** $1 - P(\textbf{Battery Failure}) = 0.89$
   $P(\text{Not Battery Failure}) = 1 - \frac{55}{500} = 1 - 0.11 = 0.89$.

5. **Answer: (b) 1,250**
   $P(\text{Flickers}) = 0.25$. For 10,000 units: $0.25 \times 10,000 = 2,500$.
   Correction: Calculation $125/500 = 1/4$. $10000/4 = 2500$.