CLASS XI – MATHEMATICS (041)

CHAPTER 14 : PROBABILITY

PRACTICE PAPER – STEP-BY-STEP SOLUTIONS & MARKING SCHEME

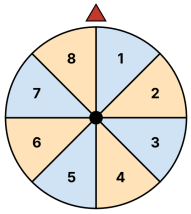
Section A – Answer Key (1 mark each)

Q1	Q2	Q3	Q4	Q5	Q6	Q7
C	D	A	B	C	A	D
Q8	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**
B	A	D	B	C	D	D

SECTION – A (14 × 1 = 14)

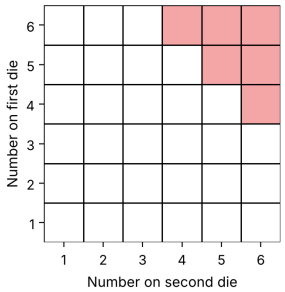
Multiple Choice and Assertion–Reason Questions

Q1. Answer: (C) — 1 mark



S = {1, 2, ..., 8}, so n(S) = 8. The factors of 8 are 1, 2, 4, 8, so n(E) = 4.
P(E) = 4/8 = **1/2**.

Q2. Answer: (D) — 1 mark



n(S) = 36. The shaded cells are (4, 6), (5, 5), (5, 6), (6, 4), (6, 5), (6, 6), i.e. the sum is at least 10, so n(E) = 6.
P(E) = 6/36 = **1/6**.

Q3. Answer: (A) — 1 mark

P(not A) = 1 – P(A) = 1 – 5/12 = **7/12**.

Q4. Answer: (B) — 1 mark

A valid assignment needs $0 \le P(\omega_i) \le 1$ for each outcome and a total of 1.
(A) total = 1.2 ✗; (C) has –0.1 ✗; (D) has values 1/2 + 1/2 + 1/2 and –1/2, one negative ✗.
(B) 0.1 + 0.2 + 0.3 + 0.4 = 1 and every value lies in [0, 1] ✓. Answer: **0.1, 0.2, 0.3, 0.4**.

Q5. Answer: (C) — 1 mark

P(A ∪ B) = P(A) + P(B) – P(A ∩ B) = 0.5 + 0.35 – 0.2 = **0.65**.

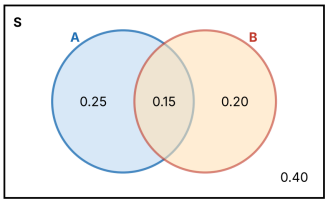
Q6. Answer: (A) — 1 mark

For mutually exclusive events, P(A or B) = P(A) + P(B) = 2/5 + 1/3 = 6/15 + 5/15 = **11/15**.

Q7. Answer: (D) — 1 mark

There are 2 red kings (hearts and diamonds) among 52 cards.
P = 2/52 = **1/26**.

Q8. Answer: (B) **1 mark**



P(A ∪ B) is the sum of the probabilities of the three regions A – B, A ∩ B and B – A.
= 0.25 + 0.15 + 0.20 = **0.60**. (Check: 1 – 0.40 = 0.60.)

Q9. Answer: (A) **1 mark**

Total committees = $^5C_2$ = 10; committees of 2 men = $^3C_2$ = 3.
P = 3/10 = **3/10**.

Q10. Answer: (D) **1 mark**

n(S) = 8. Exactly two tails: {HTT, THT, TTH}, so n(E) = 3
P = **3/8**.

Q11. Answer: (B) **1 mark**

P(A ∩ B) = P(A) + P(B) – P(A ∪ B) = 0.5 + 0.4 – 0.7 = **0.2**.

Q12. Answer: (C) **1 mark**

MATHEMATICS has 11 letters. The vowels are A, E, A, I, so there are 4 of them.
P(vowel) = **4/11**.

Q13. Answer: (D) **1 mark**

Sum of the given numbers = 0.2 + 0.3 + 0.4 + 0.5 = 1.4 ≠ 1, so the assignment is not valid. **(A) is false.**
The sum of the probabilities of all outcomes is 1, so **(R) is true**. Correct option: **(D)**.

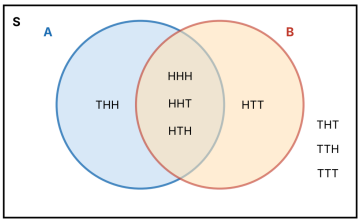
Q14. Answer: (D) **1 mark**

The addition rule is P(A ∪ B) = P(A) + P(B) – P(A ∩ B). It reduces to P(A) + P(B) only when P(A ∩ B) = 0, so **(A) is false** in general.
For mutually exclusive events A ∩ B = φ, so P(A ∪ B) = P(A) + P(B). **(R) is true**. Correct option: **(D)**.

SECTION – B (4 × 2 = 8)

Very Short Answer Questions

Q15. 2 marks



(i) From the diagram, n(S) = 8 and A ∩ B = {HHH, HHT, HTH}. **[½]**
P(A ∩ B) = 3/8. **[½]**
(ii) A ∪ B = {THH, HHH, HHT, HTH, HTT}, so n(A ∪ B) = 5. **[½]**
P(A ∪ B) = **5/8**. (Check: P(A) + P(B) – P(A ∩ B) = 4/8 + 4/8 – 3/8 = 5/8.) **[½]**

Q16. 2 marks

Let R = 'red card' and E = 'ace'. n(R) = 26, n(E) = 4 and R ∩ E = the two red aces, so n(R ∩ E) = 2. **[1]**
P(R ∪ E) = 26/52 + 4/52 – 2/52 = 28/52 = **7/13**. **[1]**

Q17. 2 marks

(A) P(A ∪ B) = 0.6 + 0.5 – 0.3 = 0.8. P(neither) = 1 – 0.8 = **0.2**. **[1]**
P(A but not B) = P(A) – P(A ∩ B) = 0.6 – 0.3 = **0.3**. **[1]**
OR (B) Let E = 'Rahul qualifies' and F = 'Sneha qualifies'. P(only E) = 0.3 – 0.1 = 0.2 and P(only F) = 0.4 – 0.1 = 0.3. **[1]**
P(exactly one) = 0.2 + 0.3 = **0.5**. **[1]**

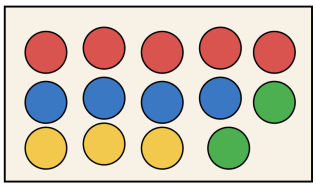
Q18. 2 marks

(A) The probabilities of all outcomes add up to 1: 0.1 + 0.2 + k + 0.25 + 0.15 = 1 ⇒ 0.7 + k = 1 ⇒ k = **0.3**. **[1]**
P({ω_1, ω_3}) = 0.1 + 0.3 = **0.4**. **[1]**
OR (B) Total balls = 12, so total ways = $^{12}C_2$ = 66; ways to choose 2 red = $^{5}C_2$ = 10. **[1]**
P(both red) = 10/66 = **5/33**. **[1]**

SECTION – C (3 × 3 = 9)

Short Answer Questions

Q19. 3 marks



From Fig. 5: red = 5, blue = 4, yellow = 3, green = 2, total = 14. **[½]**

(i) P(red) = **5/14**. **[½]**

(ii) P(green) = 2/14 = 1/7, so P(not green) = 1 – 1/7 = **6/7**. **[1]**

(iii) Red and yellow are mutually exclusive: P(red or yellow) = 5/14 + 3/14 = 8/14 = **4/7**. **[1]**

Q20. 3 marks

(A) n(S) = 36. Sum 8: (2,6), (3,5), (4,4), (5,3), (6,2), i.e. 5 outcomes. Sum 5: 4 outcomes. Sum 10: (4,6), (5,5), (6,4), i.e. 3 outcomes. **[2]**

The events are mutually exclusive, so the favourable outcomes = 5 + 4 + 3 = 12 and P = 12/36 = **1/3**. **[1]**

OR (B) Total ways = $^{52}C_2$ = 1326; ways to choose 2 aces from 4 = $^{4}C_2$ = 6. **[2]**

P(both aces) = 6/1326 = **1/221**. **[1]**

Q21. 3 marks

(A) P(A ∪ B ∪ C) = P(A) + P(B) + P(C) – P(A ∩ B) – P(A ∩ C) – P(B ∩ C) + P(A ∩ B ∩ C). **[1]**

= 0.5 + 0.4 + 0.3 – 0.2 – 0.1 – 0.15 + 0.05. **[1]**

= 1.2 – 0.45 + 0.05 = **0.8**. **[1]**

OR (B) n(S) = 50. n(T ∪ C) = 28 + 20 – 8 = 40, so P(T ∪ C) = 40/50 = 4/5. **[1]**

(a) P(neither) = 1 – 4/5 = **1/5**. **[1]**

(b) Tea only = 28 – 8 = 20, so P(only tea) = 20/50 = **2/5**. **[1]**

SECTION – D (1 × 5 = 5)

Long Answer Question

Q22. **5 marks**

(A) Let E = 'A passes' and F = 'B passes'. P(E) = 0.6, P(F) = 0.5, P(E ∩ F) = 0.35. **[½]**

P(E ∪ F) = 0.6 + 0.5 – 0.35 = 0.75. **[1]**

(a) Neither passes: P(E′ ∩ F′) = P((E ∪ F)′) = 1 – 0.75 = **0.25**. **[1]**

(b) At least one does not pass = 1 – P(both pass) = 1 – 0.35 = **0.65**. **[1]**

(c) Only one passes = P(E ∩ F′) + P(E′ ∩ F) = (0.6 – 0.35) + (0.5 – 0.35) = 0.25 + 0.15 = **0.40**. **[1½]**

OR (B) Total ways = $^{9}C_{3}$ = 84. **[½]**

(a) All men: $^{5}C_{3}$ = 10, so P = 10/84 = **5/42**. **[1½]**

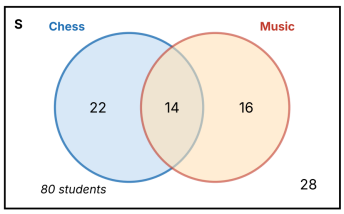
(b) Exactly two women and one man: $^{4}C_{2} \times {}^{5}C_{1}$ = 6 × 5 = 30, so P = 30/84 = **5/14**. **[1½]**

(c) At least one woman = 1 – P(all men) = 1 – 5/42 = **37/42**. **[1]**

SECTION – E (1 × 4 = 4)

Case Study Based Question

Q23. **4 marks**



From Fig. 6: Chess only = 22, both = 14, Music only = 16, neither = 28; total = 80.
(i) Chess club members = 22 + 14 = 36, so P = 36/80 = **9/20**. **[1]**
(ii) At least one club = 22 + 14 + 16 = 52, so P = 52/80 = **13/20**. **[1]**
(iii)(a) Exactly one club = 22 + 16 = 38. **[1]**
P = 38/80 = **19/40**. **[1]**
OR (b) Music but not Chess = 16, so P = 16/80 = **1/5**. **[1]**
Neither club = 28, so P = 28/80 = **7/20**. **[1]**

— End of Solutions —