PRACTICE PAPER 01 (2026-27) – ANSWER KEY WITH SOLUTIONS
CHAPTER 13 : PROBABILITY

SUBJECT: MATHEMATICS	**MAX. MARKS:** 40
CLASS: XII	**DURATION:** 1½ hrs

SECTION – A

Questions 1 to 10 carry 1 mark each.

1. P(A | B)

Ans: (b) $\frac{2}{3}$

P(A | B) = P(A ∩ B) / P(B) = 0.2 / 0.3 = $\frac{2}{3}$.

2. P(A ∪ B), A and B independent

Ans: (c) $\frac{1}{2}$

P(A ∩ B) = $\frac{1}{3} \times \frac{1}{4} = \frac{1}{12}$. P(A ∪ B) = $\frac{1}{3} + \frac{1}{4} - \frac{1}{12} = \frac{6}{12} = \frac{1}{2}$.

3. Two coins

Ans: (a) $\frac{1}{3}$

S = {HH, HT, TH, TT}. Given at least one head, the sample space is {HH, HT, TH}, and only HH is favourable. Probability = $\frac{1}{3}$.

4. Exactly 2 heads in 5 tosses

Ans: (d) $\frac{5}{16}$

P(X = 2) = $^5C_2(\frac{1}{2})^5 = \frac{10}{32} = \frac{5}{16}$.

5. E(X)

Ans: (b) $\frac{7}{3}$

k + 2k + 3k = 1, so k = $\frac{1}{6}$. E(X) = (1·1 + 2·2 + 3·3)/6 = $\frac{14}{6} = \frac{7}{3}$.

6. Variance of binomial

Ans: (c) 2.1

Variance = npq = 10 × 0.3 × 0.7 = 2.1.

7. P(A ∩ B)

Ans: (d) 0.2

P(A ∩ B) = P(A) · P(B | A) = 0.4 × 0.5 = 0.2.

8. P(A | B) + P(A′ | B)

Ans: (b) 1

Since P(S | B) = 1 and A, A′ are disjoint with union S, P(A | B) + P(A′ | B) = 1.

9. Assertion–Reason

Ans: (a) Both A and R are true and R is the correct explanation of A

If A and B are mutually exclusive, P(A ∩ B) = 0, but P(A) · P(B) > 0. By R, they are not independent. R explains A.

10. Assertion–Reason

Ans: (d) A is false but R is true

P(A ∩ B) = 0.3 × 0.4 = 0.12, so P(A ∪ B) = 0.3 + 0.4 − 0.12 = 0.58, not 0.7. A is false; R is true.

SECTION – B

Questions 11 to 14 carry 2 marks each.

11. P(sum 8 | equal numbers)

Let E: sum is 8 and F: both numbers are equal. F = {(1,1), (2,2), …, (6,6)}, so n(F) = 6, and E ∩ F = {(4, 4)}, so n(E ∩ F) = 1. (1)

$P(E \mid F) = P(E \cap F) / P(F) = \left(\frac{1}{36}\right) / \left(\frac{6}{36}\right) = \frac{1}{6}$. (1)

12. P(A ∩ B) and independence

P(A ∩ B) = P(A) + P(B) − P(A ∪ B) = 0.5 + 0.4 − 0.7 = **0.2**. (1)

P(A) · P(B) = 0.5 × 0.4 = 0.2 = P(A ∩ B), so A and B are **independent**. (1)

13. P(X = x) = kx

The sum of probabilities is 1: k(1 + 2 + 3 + 4) = 1, so **k =** $\frac{1}{10}$. (1)

E(X) = Σ x·P(x) = (1 + 4 + 9 + 16)/10 = **3**. (1)

14. Exactly one six in 4 throws

n = 4, p = $\frac{1}{6}$, q = $\frac{5}{6}$. (1)

$P(X = 1) = {}^4C_1\left(\frac{1}{6}\right)\left(\frac{5}{6}\right)^3 = \frac{125}{324}$. (1)

SECTION – C

Questions 15 to 17 carry 3 marks each.

15. 5 red, 3 blue; two balls without replacement

P(R then B) = $\frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$. (1)

P(B then R) = $\frac{3}{8} \times \frac{5}{7} = \frac{15}{56}$. (1)

The two orders are mutually exclusive, so P(different colours) = $\frac{15}{56} + \frac{15}{56} = \frac{30}{56} = \frac{15}{28}$. (1)

16. Bag I (3R, 4B), Bag II (5R, 6B); ball is red

Let E_1, E_2: Bag I, Bag II chosen; R: red ball. $P(E_1) = P(E_2) = \frac{1}{2}$, $P(R \mid E_1) = \frac{3}{7}$, $P(R \mid E_2) = \frac{5}{11}$. (1)

$P(R) = \frac{1}{2} \cdot \frac{3}{7} + \frac{1}{2} \cdot \frac{5}{11} = \frac{3}{14} + \frac{5}{22} = \frac{68}{154} = \frac{34}{77}$. (1)

By Bayes' theorem, $P(E_2 \mid R) = \left(\frac{5}{22}\right) / \left(\frac{34}{77}\right) = \frac{35}{68}$. (1)

17. X = number of kings in 2 draws with replacement

X takes values 0, 1, 2 with p = $\frac{1}{13}$, q = $\frac{12}{13}$. $P(X = 0) = \frac{144}{169}$, $P(X = 1) = 2 \cdot \frac{1}{13} \cdot \frac{12}{13} = \frac{24}{169}$, $P(X = 2) = \frac{1}{169}$. (1½)

x	P(x)	x·P(x)
0	144/169	0
1	24/169	24/169
2	1/169	2/169

Mean E(X) = $\frac{24}{169} + \frac{2}{169} = \frac{26}{169} = \frac{2}{13}$ (also np = $2 \times \frac{1}{13}$). (1½)

SECTION – D

Question 18 carries 5 marks.

18. Machines A, B, C; item is defective

Let E_1, E_2, E_3: item from A, B, C; D: item defective. $P(E_1) = 0.25$, $P(E_2) = 0.35$, $P(E_3) = 0.40$. (1)

$P(D \mid E_1) = 0.05$, $P(D \mid E_2) = 0.04$, $P(D \mid E_3) = 0.02$. (1)

$P(D) = 0.25 \times 0.05 + 0.35 \times 0.04 + 0.40 \times 0.02 = 0.0125 + 0.014 + 0.008 = 0.0345$. (1½)

$P(E_2 \mid D) = P(E_2)P(D \mid E_2) / P(D) = 0.014 / 0.0345 = \frac{140}{345} = \frac{28}{69}$. (1½)

OR

Let X be the number of heads in 5 tosses: n = 5, p = $\frac{3}{4}$, q = $\frac{1}{4}$. (1)

$P(X = 4) = {}^5C_4(\frac{3}{4})^4(\frac{1}{4}) = 5 \cdot \frac{81}{256} \cdot \frac{1}{4} = \frac{405}{1024}$. (1½)

$P(X = 5) = (\frac{3}{4})^5 = \frac{243}{1024}$. (1)

$P(X \geq 4) = \frac{405}{1024} + \frac{243}{1024} = \frac{648}{1024} = \frac{81}{128}$. (1½)

SECTION – E (Case Study Based Questions)

Questions 19 and 20 carry 4 marks each.

19. Disease screening

(i) $P(D) = 0.02$, $P(T \mid D) = 0.95$, $P(T \mid D') = 0.04$. (1)

(ii) $P(T) = P(D)P(T \mid D) + P(D')P(T \mid D') = 0.02 \times 0.95 + 0.98 \times 0.04 = 0.019 + 0.0392 =$ **0.0582**. (1)

(iii) $P(D \mid T) = P(D)P(T \mid D) / P(T) = 0.019 / 0.0582 = \frac{190}{582} = \frac{95}{291}$ (≈ 0.326). (2)

OR

(iii) $P(T') = 1 - 0.0582 = 0.9418$. (1)

$P(D \mid T') = P(D)P(T' \mid D) / P(T') = 0.02 \times 0.05 / 0.9418 = 0.001 / 0.9418 = \frac{5}{4709}$ (≈ 0.0011). (1)

20. Free throws

(i) X follows a **binomial distribution** with n = 4, p = 0.7, q = 0.3. (1)

(ii) $P(X = 2) = {}^4C_2(0.7)^2(0.3)^2 = 6 \times 0.49 \times 0.09 =$ **0.2646**. (1)

(iii) $P(X = 3) = {}^4C_3(0.7)^3(0.3) = 4 \times 0.343 \times 0.3 = 0.4116$. (1)

$P(X = 4) = (0.7)^4 = 0.2401$. $P(X \geq 3) = 0.4116 + 0.2401 =$ **0.6517**. (1)

OR

(iii) Mean = np = $4 \times 0.7 =$ **2.8**. (1)

Variance = npq = $4 \times 0.7 \times 0.3 =$ **0.84**. (1)

— End of Solutions —