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Probability — CBSE Class 12 Mathematics Chapter Test

FREE CHAPTER TEST · CLASS XII · MATHEMATICS (041) · PATTERN OF THE CBSE SAMPLE QUESTION PAPER 2026-27

TIME ALLOWED	MAXIMUM MARKS	QUESTIONS	NAME / ROLL NO.
1½ hours	40	19 (A 10 · B 3 · C 2 · D 2 · E 2)	

GENERAL INSTRUCTIONS

Read the following instructions very carefully and strictly follow them:

1. This question paper contains 19 questions. All questions are compulsory.
2. This question paper is divided into five sections: A, B, C, D and E.
3. In Section A, Questions 1 to 8 are multiple choice questions (MCQs) and Questions 9 and 10 are assertion-reason based questions of 1 mark each.
4. In Section B, Q11–13 are very short answer (VSA) type questions, carrying 2 marks each.
5. In Section C, Q14–15 are short answer (SA) type questions, carrying 3 marks each.
6. In Section D, Q16–17 are long answer (LA) type questions, carrying 5 marks each.
7. In Section E, Q18–19 are case study based questions, carrying 4 marks each, with sub-parts of the values of 1, 1 and 2 marks.
8. There is no overall choice. However, an internal choice has been provided in 1 question of Section B, 1 question of Section C, 1 question of Section D and in the 2-mark sub-part of each question of Section E.
9. Use of calculators is not allowed. log x denotes the natural logarithm of x.
10. This chapter test follows the section structure, question types and marks per question of the CBSE Class XII Mathematics (041) Sample Question Paper 2026-27, released on 21 September 2026 at cbseacademic.nic.in, at half the length of the 80-mark board paper: 40 marks in 1½ hours.
11. The answer key and the marking scheme are at the end of this booklet. Attempt the paper in 1½ hours before you look at them.

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Chapter: Probability · **Topics:** Conditional probability · Multiplication theorem · Independent events · Theorem of total probability · Bayes' theorem · Random variable, probability distribution and mean

SECTION A

This section comprises 10 questions of 1 mark each: 8 multiple choice questions (MCQs) and 2 assertion-reason based questions.

1. If $P(A) = \frac{5}{12}$, $P(B) = \frac{7}{12}$ and $P(A \cap B) = \frac{1}{4}$, then $P(A \mid B)$ is 1

(A) $\frac{3}{5}$ (B) $\frac{3}{7}$

(C) $\frac{7}{12}$ (D) $\frac{1}{4}$

2. Two fair coins are tossed. The probability that both show heads, given that at least one shows a head, is 1

(A) $\frac{1}{2}$ (B) $\frac{1}{4}$

(C) $\frac{1}{3}$ (D) $\frac{3}{4}$

3. A and B are independent events with $P(A) = 0.2$ and $P(B) = 0.5$. Then $P(A \cup B)$ is 1

(A) 0.6 (B) 0.7

(C) 0.1 (D) 0.4

4. A and B are independent events with $P(A) = \frac{1}{4}$ and $P(B) = \frac{2}{5}$. Then $P(A' \cap B')$ is 1

(A) $\frac{1}{10}$ (B) $\frac{3}{5}$

(C) $\frac{3}{4}$ (D) $\frac{9}{20}$

5. A random variable X takes the values 0, 1, 2 with probabilities k, 2k, 3k respectively. The value of k is 1

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$

(C) $\frac{1}{2}$ (D) $\frac{1}{4}$

6. For the random variable X of the previous question, the mean E(X) is 1

(A) 1 (B) $\frac{4}{3}$

(C) 2 (D) $\frac{5}{3}$

7. A bag contains 4 red and 6 black balls. Two balls are drawn one after the other without replacement. The probability that both are red is 1

(A) $\frac{4}{25}$ (B) $\frac{4}{15}$

(C) $\frac{2}{15}$ (D) $\frac{2}{5}$

8. If $P(A) = 0.4$ and $P(B \mid A) = 0.5$, then $P(A \cap B)$ is 1

(A) 0.9 (B) 0.1

(C) 0.8 (D) 0.2

9. **Assertion (A):** If A and B are mutually exclusive events with P(A) > 0 and P(B) > 0, then A and B are not independent. 1

Reason (R): For mutually exclusive events A and B, $P(A \cap B) = 0$.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

10. **Assertion (A):** For any events E and F with P(F) > 0, $P(E \mid F) + P(E' \mid F) = 1$. 1

Reason (R): For any events E and F, $P(E \mid F) = P(E) \cdot P(F)$.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises 3 very short answer (VSA) type questions of 2 marks each.

11. Given P(E) = 0.5, P(F) = 0.4 and $P(E \cap F) = 0.3$, find $P(E \mid F)$ and $P(F \mid E)$. 2

12. (a) A fair die is thrown twice. Find the probability that the sum of the numbers is 7, given that at least one of the numbers is 5. 2

OR

(b) A fair coin is tossed three times. Find the mean of the number of heads.

13. A and B are independent events with P(A) = 0.4 and P(B) = 0.7. Find P(A and not B) and P(neither A nor B). 2

SECTION C

This section comprises 2 short answer (SA) type questions of 3 marks each.

14. (a) Bag I contains 4 red and 2 black balls and Bag II contains 3 red and 5 black balls. A bag is chosen at random and one ball is drawn from it. The ball is red. Find the probability that it was drawn from Bag II. 3

OR

(b) Two cards are drawn one after the other with replacement from a well-shuffled pack of 52 cards. Find the probability distribution of the number of spades, and its mean.

15. The probability that a student passes in Mathematics is 0.8 and in English is 0.6, the two being independent. Find the probability that the student passes (a) in both subjects, (b) in at least one subject, (c) in exactly one subject. 3

SECTION D

This section comprises 2 long answer (LA) type questions of 5 marks each.

16. (a) A factory has three machines A, B and C, which produce 50%, 30% and 20% of the total output. Of their outputs, 3%, 4% and 5% respectively are defective. An item is picked at random and found to be defective. Find the probability that it was produced by machine B. 5

OR

(b) A random variable X takes the values 0, 1, 2, 3, 4 with probabilities 0.1, k, 2k, 2k, k respectively. Find k, P(X < 3) and the mean of X.

17. In a town, 0.2% of the people have a certain disease. A blood test detects the disease in 95% of the people who have it, but also gives a positive result for 1% of the healthy people tested. A person tested at random gets a positive result. Find the probability that the person has the disease. 5

SECTION E

This section comprises 2 case study based questions of 4 marks each, with sub-parts of 1, 1 and 2 marks.

18. A shop gets 60% of its bulbs from supplier X and 40% from supplier Y. 3% of the bulbs from X and 5% of the bulbs from Y are defective. A bulb is chosen at random from the shop.

(i) Find the probability that the bulb is from X and is defective. [1]

(ii) Find the probability that the bulb is defective. [1]

(iii) The bulb is found to be defective. Find the probability that it is from Y. [2]

OR

(iii) The bulb is found to be not defective. Find the probability that it is from X. [2]

19. In a quiz game at a school fair, a player rolls a fair die once. The player scores 10 points for a six, 4 points for a four or a five, and 0 points otherwise. Let X be the points scored.

(i) Find P(X = 4). [1]

(ii) Write the probability distribution of X. [1]

(iii) Find the mean score E(X). [2]

OR

(iii) Find the probability that the player scores at least 4 points. [2]

END OF THE QUESTION PAPER

ANSWER KEY — SECTION A

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
(B)	(C)	(A)	(D)	(A)	(B)	(C)	(D)	(A)	(C)

MARKING SCHEME AND WORKED SOLUTIONS

Marks for each step are shown in brackets, as in the CBSE marking scheme. Any correct alternative method earns full marks.

Q1. Answer (B). $P(A \mid B) = P(A \cap B)/P(B) = (3/12)/(7/12) = 3/7$.

Q2. Answer (C). Of HH, HT, TH (at least one head), one is HH: 1/3.

Q3. Answer (A). $P(A \cup B) = 0.2 + 0.5 - 0.2 \times 0.5 = 0.6$.

Q4. Answer (D). A' and B' are also independent: $(3/4)(3/5) = 9/20$.

Q5. Answer (A). $k + 2k + 3k = 1 \Rightarrow k = 1/6$.

Q6. Answer (B). $E(X) = 0(1/6) + 1(2/6) + 2(3/6) = 8/6 = 4/3$.

Q7. Answer (C). $(4/10)(3/9) = 12/90 = 2/15$.

Q8. Answer (D). $P(A \cap B) = P(A)\,P(B \mid A) = 0.4 \times 0.5 = 0.2$.

Q9. Answer (A). $P(A \cap B) = 0$ (R) while $P(A)P(B) > 0$, so $P(A \cap B) \neq P(A)P(B)$: A follows from R. Answer (A).

Q10. Answer (C). $P(E \mid F) + P(E' \mid F) = (P(E \cap F) + P(E' \cap F))/P(F) = 1$, so A is true. R holds only in special cases (it is not even the condition for independence), so R is false. Answer (C).

Q11. (2 marks) Answer: 3/4 and 3/5.
$P(E \mid F) = 0.3/0.4 = 3/4$. [1]
$P(F \mid E) = 0.3/0.5 = 3/5$. [1]

Q12. (2 marks) Answer: (a) 2/11; (b) 3/2.
(a) Outcomes with at least one 5: $6 + 6 - 1 = 11$. [1] Among them the sum is 7 for (5, 2) and (2, 5), so the probability is 2/11. [1]
OR (b) X = number of heads: $P(0) = 1/8$, $P(1) = 3/8$, $P(2) = 3/8$, $P(3) = 1/8$. [1] Mean $= (0 + 3 + 6 + 3)/8 = 3/2$. [1]

Q13. (2 marks) Answer: 0.12 and 0.18.
$P(A \cap B') = P(A)\,P(B') = 0.4 \times 0.3 = 0.12$. [1]
$P(A' \cap B') = 0.6 \times 0.3 = 0.18$. [1]

Q14. (3 marks) Answer: (a) 9/25; (b) 9/16, 3/8, 1/16; mean 1/2.
(a) Let E_1, E_2 be the choice of Bag I, Bag II (each 1/2), and A the event 'red'. $P(A \mid E_1) = 4/6 = 2/3$, $P(A \mid E_2) = 3/8$. [1] By Bayes' theorem, $P(E_2 \mid A) = (1/2)(3/8)/[(1/2)(2/3) + (1/2)(3/8)]$ [1] $= (9/24)/(25/24) = 9/25$. [1]
OR (b) X = number of spades; P(spade) = 1/4 on each draw, independently. [1] $P(X = 0) = (3/4)^2 = 9/16$, $P(X = 1) = 2(1/4)(3/4) = 6/16 = 3/8$, $P(X = 2) = 1/16$. [1] Mean $= 0 + 6/16 + 2/16 = 8/16 = 1/2$. [1]

Q15. (3 marks) Answer: 0.48, 0.92, 0.44.
(a) $0.8 \times 0.6 = 0.48$. [1]
(b) $1 - (0.2)(0.4) = 1 - 0.08 = 0.92$. [1]
(c) $0.8 \times 0.4 + 0.2 \times 0.6 = 0.32 + 0.12 = 0.44$. [1]

Q16. (5 marks) Answer: (a) 12/37; (b) k = 0.15, P(X < 3) = 0.55, E(X) = 2.25.

(a) Let E_1, E_2, E_3 be 'made by A, B, C' and D 'defective'. $P(E_i) = 0.50, 0.30, 0.20$; $P(D \mid E_i) = 0.03, 0.04, 0.05$. [1] P(D) = 0.015 + 0.012 + 0.010 = 0.037 (total probability). [2] By Bayes' theorem, $P(E_2 \mid D) = 0.012/0.037$ [1] = 12/37. [1]

OR (b) 0.1 + k + 2k + 2k + k = 1 ⇒ 6k = 0.9 ⇒ k = 0.15. [2] P(X < 3) = 0.1 + 0.15 + 0.3 = 0.55. [1] E(X) = 0 + 0.15 + 2(0.3) + 3(0.3) + 4(0.15) = 2.25. [2]

Q17. (5 marks) Answer: 95/594.

Let E_1 = 'has the disease', E_2 = 'healthy', A = 'test positive'. $P(E_1) = 0.002$, $P(E_2) = 0.998$. [1]

$P(A \mid E_1) = 0.95$, $P(A \mid E_2) = 0.01$. [1]

P(A) = 0.002 × 0.95 + 0.998 × 0.01 = 0.0019 + 0.00998 = 0.01188. [1]

$P(E_1 \mid A) = 0.0019/0.01188$ [1] = 1900/11880 = 95/594. [1]

Q18. (4 marks) Answer: (i) 0.018; (ii) 0.038; (iii) 10/19, or 291/481.

(i) 0.6 × 0.03 = 0.018. [1]

(ii) 0.018 + 0.4 × 0.05 = 0.018 + 0.02 = 0.038. [1]

(iii)(a) By Bayes' theorem, P(Y | defective) = 0.02/0.038 [1] = 10/19. [1]

OR (iii)(b) P(X | good) = (0.6 × 0.97)/(1 − 0.038) = 0.582/0.962 [1] = 291/481. [1]

Q19. (4 marks) Answer: (i) 1/3; (ii) 1/2, 1/3, 1/6; (iii) 3, or 1/2.

(i) Two of the six outcomes: 1/3. [1]

(ii) X = 0, 4, 10 with probabilities 1/2, 1/3, 1/6. [1]

(iii)(a) E(X) = 0(1/2) + 4(1/3) + 10(1/6) [1] = 4/3 + 5/3 = 3 points. [1]

OR (iii)(b) $P(X \geq 4) = P(X = 4) + P(X = 10)$ [1] = 1/3 + 1/6 = 1/2. [1]

All questions are original and © Master Testing Agency. Free to download and use for personal practice; not for resale. Every answer in this paper was checked independently by computer in exact fractions, by listing and counting the whole sample space wherever possible and otherwise by applying the theorems step by step.