

Probability — Assignment 1

Class 12 Maths · Topic-wise question bank covering every concept of the chapter · Narayan Gurukul Academy

Instructions: (1) Attempt all questions. This worksheet walks through every concept of the chapter, topic by topic.
(2) The interactive MCQ version of these questions (with instant answer reveal) is available on the notes page.
(3) Universal values: $g = 10 \text{ m/s}^2$ unless stated. Give answers with correct SI units.

Conditional Probability and the Multiplication Theorem

MCQ Questions (choose the correct option)

- The conditional probability $P(A|B)$ equals
 - $P(A \cap B)/P(B)$
 - $P(A)P(B)$
 - $P(A \cdot B)$
 - $P(A)/P(B)$
- If A and B are independent, then $P(A \cap B) =$
 - $P(A)P(B)$
 - $P(A) + P(B)$
 - 0
 - $P(A|B)$
- The multiplication theorem states $P(A \cap B) =$
 - $P(A)P(B|A)$
 - $P(A) + P(B)$
 - $P(A) - P(B)$
 - $P(A)/P(B)$
- For independent events A and B, $P(A|B)$ equals
 - $P(A)$
 - $P(B)$
 - $P(A)P(B)$
 - 1

1 Mark Questions

- Write the formula for $P(A|B)$.
- State the condition for two events to be independent.
- Write the multiplication theorem of probability.

2 Mark Questions

- If $P(A) = 0.5$, $P(B) = 0.4$ and A, B are independent, find $P(A \cap B)$.
- If $P(A) = 0.3$ and $P(B|A) = 0.4$, find $P(A \cap B)$.

3 Mark Questions

- Given $P(A) = 0.6$, $P(B) = 0.5$ and $P(A \cap B) = 0.3$, find $P(A|B)$ and $P(B|A)$.
- A die is thrown twice. Find the probability that the sum is 8, given the first throw is 3.

Total Probability and Bayes' Theorem

MCQ Questions (choose the correct option)

- The theorem of total probability computes
 - $P(A)$
 - $P(A \cap B)$
 - $P(A|B)$
 - $P(A \cap B)$
- Bayes' theorem gives
 - $P(E_i|A)$
 - $P(A|E_i)$ only
 - $P(A \cap E_i)$
 - $P(A)$
- The events $E_1, E_2, \dots, E_n$ in Bayes' theorem form a
 - partition of the sample space
 - single event
 - mutually inclusive set
 - null set
- The denominator in Bayes' theorem is
 - $P(A)$
 - $P(E_i)$
 - $P(A|E_i)$
 - $P(E_i)A$

1 Mark Questions

- State the theorem of total probability.
- Write Bayes' theorem.
- What is meant by a partition of the sample space?

2 Mark Questions

- Given $P(E_1) = 0.4$, $P(E_2) = 0.6$, $P(A|E_1) = 0.5$, $P(A|E_2) = 0.3$, find $P(A)$.
- State the partition condition for Bayes' theorem.

3 Mark Questions

- Bag I has 3 red 4 black, Bag II has 5 red 6 black. A bag is chosen and a ball drawn is red. Find $P(\text{Bag I chosen})$.
- Two machines produce 60% and 40% of items; defect rates 2% and 5%. An item is defective, find $P(\text{it came from machine 1})$.

Random Variables and Their Distribution

MCQ Questions (choose the correct option)

- A random variable assigns a real number to each
 - outcome of a random experiment
 - event of probability 1
 - sample point twice
 - impossible event
- The probability distribution of a random variable X satisfies

- (A) $\sum P(X = x) = 1$
 (B) $\sum P(X = x) = 0$
 (C) $P(X = x) < 0$
 (D) $\sum P(X = x) > 1$
3. The mean of a random variable X is
 (A) $\sum x P(X = x)$
 (B) $\sum P(X = x)$
 (C) $\sum x$
 (D) $\sum x^2 P(X = x)$
4. The variance of X is
 (A) $E(X^2) - [E(X)]^2$
 (B) $E(X^2)$
 (C) $E(X)$
 (D) $[E(X)]^2$

1 Mark Questions

1. Define a random variable.
2. Write the condition for a valid probability distribution.
3. Write the formula for the mean of a random variable.

2 Mark Questions

1. Find the mean of X with $P(X = 0) = 0.3$, $P(X = 1) = 0.5$, $P(X = 2) = 0.2$.
2. Write the formula for the variance of X .

3 Mark Questions

1. For the distribution above, find $E(X^2)$ and $\text{Var}(X)$.
2. Two cards are drawn; let X be the number of aces. Find the probability distribution of X .

Bernoulli Trials and the Binomial Distribution

MCQ Questions (choose the correct option)

1. A Bernoulli trial has
 (A) two outcomes, success and failure
 (B) three outcomes
 (C) infinitely many outcomes
 (D) one outcome
2. The binomial distribution gives $P(X = r) =$
 (A) ${}^nC_r p^r q^{n-r}$
 (B) $p^r q^{n-r}$
 (C) ${}^nC_r p^n q^r$
 (D) $p + q$
3. In a binomial distribution, the trials are
 (A) independent
 (B) dependent
 (C) mutually exclusive

(D) exhaustive only

4. The sum of p and q in a binomial distribution is

(A) 1

(B) 0

(C) p

(D) q

1 Mark Questions

1. Define a Bernoulli trial.
2. Write the binomial probability formula.
3. What is the relation between p and q ?

2 Mark Questions

1. A coin is tossed 5 times. Find the probability of exactly 3 heads.
2. A die is thrown 4 times. Find the probability of getting a 6 exactly once.

3 Mark Questions

1. In 10 tosses of a fair coin, find the probability of at least 8 heads.
2. The probability that a bulb is defective is 0.1. Find the probability that in a lot of 5 bulbs exactly 2 are defective.