JK Board Class 12, 2026 Statistics Question Paper with Solutions

Time Allowed :3 Hours	**Maximum Marks :**70	**Total questions :**38

General Instructions

Read the following instructions very carefully and strictly follow them:

1. The paper is divided into Section A and Section B.
2. Section A includes objective-type questions.
3. All questions in Section A are compulsory.
4. Section B includes short answer, and long answer type questions.
5. Answers must be written legibly within the word limit.
6. Use of unfair means or electronic devices is prohibited.
7. Follow the correct format and instructions for each section.

Section - A

1. Variance of Poisson distribution is 4, its mean is:

(A) 2

(B) 4

(C) 1

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

Correct Answer: (B) 4

Solution:

Step 1: Understanding Poisson distribution.

In a Poisson distribution, the mean (denoted λ) and variance are equal. That is, if the variance is given as 4, then the mean must also be 4.

Step 2: Analysis of options.

- **(A) 2:** Incorrect. Since the variance and mean are equal in a Poisson distribution, the mean cannot be 2 if the variance is 4.
- **(B) 4:** Correct. The mean of a Poisson distribution is equal to the variance, so the mean is also 4.
- **(C) 1:** Incorrect. The mean cannot be 1 when the variance is 4.
- **(D) $\frac{1}{2}$:** Incorrect. The mean is equal to the variance, so it cannot be $\frac{1}{2}$ when the variance is 4.

Step 3: Conclusion.

The mean of the Poisson distribution is 4, as it is equal to the variance.

Final Answer: 4.

Quick Tip

In Poisson distribution, the mean is always equal to the variance. If the variance is 4, the mean is also 4.

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2. If $P(X) = 0.15$, $P(Y) = 0.25$, $P(X \cap Y) = 0.10$, then $P(X \cup Y)$ is

(A) 0.10

(B) 0.30

(C) 0.40

(D) 0.20

Correct Answer: (C) 0.40

Solution:

Step 1: Using the formula for $P(X \cup Y)$.

We know that:

$$P(X \cup Y) = P(X) + P(Y) - P(X \cap Y)$$

Step 2: Substituting the given values.

Substitute $P(X) = 0.15$, $P(Y) = 0.25$, and $P(X \cap Y) = 0.10$ into the formula:

$$P(X \cup Y) = 0.15 + 0.25 - 0.10 = 0.40$$

Step 3: Conclusion.

Therefore, $P(X \cup Y) = 0.40$.

Final Answer: 0.40.

> **Quick Tip**
>
> Remember that the probability of the union of two events X and Y is given by $P(X \cup Y) = P(X) + P(Y) - P(X \cap Y)$.

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3. For Poisson distribution

(i) Mean $>$ variance

(ii) Mean $=$ variance

(iii) Mean $<$ variance

(iv) None of the above

Correct Answer: (ii) Mean $=$ variance

Solution:

Step 1: Understanding Poisson distribution.

In a Poisson distribution, the mean is equal to the variance. This is a defining characteristic of the Poisson distribution, where the mean (λ) and variance are both equal to λ.

Step 2: Analysis of options.

- **(i) Mean $>$ variance:** Incorrect. In a Poisson distribution, the mean is equal to the variance, not greater.
- **(ii) Mean $=$ variance:** Correct. The mean is always equal to the variance in a Poisson distribution.
- **(iii) Mean $<$ variance:** Incorrect. The mean cannot be less than the variance in a Poisson distribution.

- **(iv) None of the above:** Incorrect. The correct option is (ii), so this option is not correct.

Step 3: Conclusion.

For the Poisson distribution, the mean is always equal to the variance.

Final Answer: Mean = variance.

> Quick Tip
>
> In a Poisson distribution, the mean and variance are always equal, which is a key characteristic of this distribution.

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4. When the correlation coefficient $r = 0$, then the two regression lines:

(A) Are perpendicular to each other

(B) Coincide

(C) Are parallel to each other

(D) None of these

Correct Answer: (C) Are parallel to each other

Solution:

Step 1: Understanding correlation coefficient.

The correlation coefficient $r = 0$ indicates no linear relationship between the variables. In this case, the two regression lines would be parallel because no linear relationship means the lines do not intersect or vary with each other.

Step 2: Analysis of other options.

- **(A) Are perpendicular to each other:** Incorrect. When $r = 0$, the regression lines are parallel, not perpendicular.
- **(B) Coincide:** Incorrect. The regression lines would not coincide because $r = 0$ indicates no linear correlation, meaning they do not overlap.
- **(C) Are parallel to each other:** Correct. The regression lines are parallel when $r = 0$, indicating no correlation.

- **(D) None of these:** Incorrect. The correct answer is (C).

Step 3: Conclusion.

Thus, when $r = 0$, the two regression lines are parallel to each other.

Final Answer: Are parallel to each other.

> Quick Tip
>
> When the correlation coefficient $r = 0$, the regression lines are parallel because there is no linear relationship between the variables.

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5. The two lines of regression intersect at a point:

(A) (X, Y)

(B) $(\bar{X}, \bar{Y})$

(C) (0, 0)

(D) None of these

Correct Answer: (B) $(\bar{X}, \bar{Y})$

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Solution:

Step 1: Understanding the point of intersection.

The two regression lines intersect at the point $(\bar{X}, \bar{Y})$, which is the mean of the X and Y values, respectively. This is the point where both regression lines will cross because they both pass through the point of means.

Step 2: Analysis of other options.

- **(A) (X, Y):** Incorrect. This is the general form for any data point, not necessarily where the regression lines intersect.
- **(B)** $(\bar{X}, \bar{Y})$**:** Correct. The two regression lines intersect at the mean values of X and Y.
- **(C) (0, 0):** Incorrect. The regression lines do not necessarily intersect at the origin.

- **(D) None of these:** Incorrect. The correct answer is (B).

Step 3: Conclusion.

Thus, the two lines of regression intersect at $(\bar{X}, \bar{Y})$.

Final Answer: $(\bar{X}, \bar{Y})$.

> **Quick Tip**
>
> The two regression lines intersect at the point of means $(\bar{X}, \bar{Y})$, which represents the average values of X and Y.

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6. When the correlation coefficient $r = 0$, then the two regression lines:

(A) Are perpendicular to each other

(B) Coincide

(C) Are parallel to each other

(D) None of these

Correct Answer: (C) Are parallel to each other

Solution:

Step 1: Understanding correlation coefficient.

The correlation coefficient $r = 0$ indicates no linear relationship between the variables. In this case, the two regression lines would be parallel because no linear relationship means the lines do not intersect or vary with each other.

Step 2: Analysis of other options.

- **(A) Are perpendicular to each other:** Incorrect. When $r = 0$, the regression lines are parallel, not perpendicular.
- **(B) Coincide:** Incorrect. The regression lines would not coincide because $r = 0$ indicates no linear correlation, meaning they do not overlap.
- **(C) Are parallel to each other:** Correct. The regression lines are parallel when $r = 0$, indicating no correlation.

- **(D) None of these:** Incorrect. The correct answer is (C).

Step 3: Conclusion.

Thus, when $r = 0$, the two regression lines are parallel to each other.

Final Answer: Are parallel to each other.

> Quick Tip
>
> When the correlation coefficient $r = 0$, the regression lines are parallel because there is no linear relationship between the variables.

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7. The two lines of regression intersect at a point:

(A) (X, Y)

(B) $(\bar{X}, \bar{Y})$

(C) (0, 0)

(D) None of these

Correct Answer: (B) $(\bar{X}, \bar{Y})$

)

Solution:

Step 1: Understanding the point of intersection.

The two regression lines intersect at the point $(\bar{X}, \bar{Y})$, which is the mean of the X and Y values, respectively. This is the point where both regression lines will cross because they both pass through the point of means.

Step 2: Analysis of other options.

- **(A) (X, Y):** Incorrect. This is the general form for any data point, not necessarily where the regression lines intersect.
- **(B)** $(\bar{X}, \bar{Y})$**:** Correct. The two regression lines intersect at the mean values of X and Y.
- **(C) (0, 0):** Incorrect. The regression lines do not necessarily intersect at the origin.

- **(D) None of these:** Incorrect. The correct answer is (B).

Step 3: Conclusion.

Thus, the two lines of regression intersect at $(\bar{X}, \bar{Y})$.

Final Answer: $(\bar{X}, \bar{Y})$.

> **Quick Tip**
>
> The two regression lines intersect at the point of means $(\bar{X}, \bar{Y})$, which represents the average values of X and Y.

Section - B

8. A card is drawn at random from a well shuffled pack of 52 cards. What is the probability that it is:

(i) an ace card

(ii) a diamond card.

Solution:

Step 1: Total number of cards.

A well-shuffled pack of 52 cards has 52 cards in total, with 13 cards in each of the four suits (hearts, diamonds, clubs, spades).

Step 2: Probability of drawing an Ace.

There are 4 aces in a deck (one in each suit). So, the probability of drawing an ace card is:

$$P(\text{Ace}) = \frac{4}{52} = \frac{1}{13}$$

Step 3: Probability of drawing a Diamond card.

There are 13 diamond cards in the deck. So, the probability of drawing a diamond card is:

$$P(\text{Diamond}) = \frac{13}{52} = \frac{1}{4}$$

Quick Tip

In probability, the likelihood of an event is calculated by dividing the favorable outcomes by the total possible outcomes.

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9. Write down the probability mass function of Binomial distribution.

Solution:

Step 1: Define Binomial Distribution.

A binomial distribution models the number of successes in a fixed number of trials of a binary experiment (success or failure). It is defined by two parameters: n (the number of trials) and p (the probability of success in a single trial).

Step 2: Probability Mass Function (PMF).

The probability mass function of a binomial distribution is given by:

$$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$$

Where:

- X is the number of successes,
- k is the number of successes we are calculating the probability for,
- $\binom{n}{k}$ is the binomial coefficient, calculated as $\frac{n!}{k!(n-k)!}$,
- p is the probability of success,
- n is the number of trials,
- $1-p$ is the probability of failure.

Quick Tip

In a binomial distribution, the outcomes are binary (success/failure), and the trials are independent with the same probability of success.

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10. If $N = 600$, $A = 50$, $B = 70$, $AB = 30$. Find all missing frequencies.

Solution:

Step 1: Understand the problem.

We are given the total frequency $N = 600$, the frequencies of events A, B, and their intersection AB. The goal is to find the missing frequencies, specifically those of A, B, and their complements.

Step 2: Use the principle of inclusion-exclusion.

The principle of inclusion-exclusion states that:

$$A \cup B = A + B - AB$$

We are given:

$$A = 50, \quad B = 70, \quad AB = 30$$

Substitute the values into the formula:

$$A \cup B = 50 + 70 - 30 = 90$$

Step 3: Calculate the missing frequencies.

We know the total frequency $N = 600$, so:

- The frequency of A' (complement of A) is $600 - A = 600 - 50 = 550$.
- The frequency of B' (complement of B) is $600 - B = 600 - 70 = 530$.
- The frequency of $A' \cup B'$ is $N - (A \cup B) = 600 - 90 = 510$.

Thus, the missing frequencies are:

- $A' = 550$
- $B' = 530$
- $A' \cup B' = 510$

Quick Tip

In set theory, the principle of inclusion-exclusion helps calculate the total frequency of two overlapping sets by considering the overlap.

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11. What do you understand by consistency of data?

Solution:

Step 1: Definition of Data Consistency.

Consistency of data refers to the accuracy and reliability of data across different sources or over time. Consistent data is free from contradictions and follows a predictable pattern that can be relied upon for analysis and decision-making.

Step 2: Importance of Consistent Data.

- Ensures that data is accurate and trustworthy.
- Facilitates smooth data analysis, as discrepancies are avoided.
- Helps in making informed decisions based on reliable data.

Step 3: Achieving Data Consistency.

Data consistency can be achieved through various methods such as: 1. Data Validation: Ensuring that data is entered in the correct format. 2. Data Cleaning: Removing any duplicate, outdated, or erroneous data. 3. Standardization: Ensuring that data follows uniform guidelines for structure and format.

Quick Tip

Maintaining data consistency is critical in any system that requires accurate reporting or decision-making.

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12. What is cyclic variation in time series?

Solution:

Step 1: Define Cyclic Variation.

Cyclic variation in a time series refers to the long-term fluctuations that occur due to external factors, such as economic cycles, political changes, or other systematic influences. Unlike seasonal variation, cyclic variations do not occur at fixed intervals but are based on underlying cycles in the data.

Step 2: Characteristics of Cyclic Variation.

- Cyclic variations are often longer than seasonal variations.
- They are typically irregular and are not predictable.
- They are influenced by broader factors such as economic conditions, technological

advancements, or political events.

Step 3: Importance of Cyclic Variation.

Cyclic variations are important because they help identify long-term trends and fluctuations in a time series. Understanding these cycles can assist in making long-term predictions and planning.

> Quick Tip
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> Cyclic variations in time series are influenced by economic, political, or other broad factors and are usually not predictable like seasonal variations.

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13. Define feasible region in LPP.

Solution:

Step 1: Define Linear Programming Problem (LPP).

In a Linear Programming Problem (LPP), the objective is to maximize or minimize a linear function subject to a set of linear constraints.

Step 2: Feasible Region.

The feasible region in LPP is the set of all possible points that satisfy the given constraints of the problem. It represents all the feasible solutions to the problem.

Step 3: Characteristics of Feasible Region.

- The feasible region is typically a convex polygon or polyhedron.
- It is bounded by the constraints of the problem.
- Any point within the feasible region is a potential solution, and the optimal solution lies at one of the corner points (vertices) of the feasible region.

Step 4: Importance of Feasible Region.

The feasible region helps determine the range of solutions that meet all the constraints. The optimal solution is found by evaluating the objective function at the corner points of the feasible region.

Quick Tip

In Linear Programming, the feasible region is the area where all constraints are satisfied, and the optimal solution lies at one of the corner points.

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14. If θ is the angle between two regression lines, deduce the expression for $\tan\theta$. Find θ when $r = 0$ and $r = 1$.

Solution:

Step 1: Expression for $\tan\theta$.

The angle θ between two regression lines is given by the formula:

$$\tan\theta = \frac{|r_{xy} - r_{yx}|}{\sqrt{(1 - r_{xy}^2)(1 - r_{yx}^2)}}$$

where r_{xy} and r_{yx} are the regression coefficients for y on x and x on y, respectively.

Step 2: Find θ when $r = 0$.

When the correlation coefficient $r = 0$, it means there is no linear relationship between the variables. Substituting $r = 0$ in the formula:

$$\tan\theta = \frac{|0 - 0|}{\sqrt{(1 - 0^2)(1 - 0^2)}} = \frac{0}{1} = 0$$

Thus, $\theta = 0^\circ$ when $r = 0$.

Step 3: Find θ when $r = 1$.

When $r = 1$, it indicates a perfect positive linear relationship. Substituting $r = 1$ in the formula:

$$\tan\theta = \frac{|1 - 1|}{\sqrt{(1 - 1^2)(1 - 1^2)}} = \frac{0}{\sqrt{0}} = 0$$

Thus, $\theta = 0^\circ$ when $r = 1$.

Quick Tip

The angle between the regression lines is zero when the correlation coefficient is either 0 or 1, indicating no or perfect linear relationship, respectively.

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15. Prove that regression coefficients are independent upon change of origin but not scale.

Solution:

Step 1: Definition of Regression Coefficients.

The regression coefficients b_{xy} and b_{yx} represent the slope of the regression lines of y on x and x on y, respectively. They are given by the formulas:

$$b_{xy} = \frac{\text{Cov}(x, y)}{\text{Var}(x)} \quad \text{and} \quad b_{yx} = \frac{\text{Cov}(x, y)}{\text{Var}(y)}$$

where $\text{Cov}(x, y)$ is the covariance between x and y, and $\text{Var}(x)$ and $\text{Var}(y)$ are the variances of x and y, respectively.

Step 2: Change of Origin.

Let the origin of both variables x and y be shifted by a constant a and b, respectively. So, we define new variables $x' = x - a$ and $y' = y - b$.

Now, calculate the new regression coefficients for x' and y': - The covariance between x' and y' remains unchanged:

$$\text{Cov}(x', y') = \text{Cov}(x - a, y - b) = \text{Cov}(x, y)$$

- The variances of x' and y' also remain the same:

$$\text{Var}(x') = \text{Var}(x) \quad \text{and} \quad \text{Var}(y') = \text{Var}(y)$$

Thus, the regression coefficients $b_{x'y'}$ and $b_{y'x'}$ remain the same as b_{xy} and b_{yx}, proving that regression coefficients are independent of changes in the origin.

Step 3: Change of Scale.

Now, consider the case where the scale of the variables is changed. Let the new variables be $x'' = kx$ and $y'' = ly$, where k and l are scaling constants.

- The covariance becomes:

$$\text{Cov}(x'', y'') = \text{Cov}(kx, ly) = kl\,\text{Cov}(x, y)$$

- The variances become:

$$\text{Var}(x'') = k^2\,\text{Var}(x) \quad \text{and} \quad \text{Var}(y'') = l^2\,\text{Var}(y)$$

Thus, the new regression coefficients are:

$$b_{x''y''} = \frac{\text{Cov}(x'', y'')}{\text{Var}(x'')} = \frac{kl\,\text{Cov}(x, y)}{k^2\,\text{Var}(x)} = \frac{l}{k}\,b_{xy}$$

$$b_{y''x''} = \frac{\text{Cov}(x'', y'')}{\text{Var}(y'')} = \frac{kl\,\text{Cov}(x, y)}{l^2\,\text{Var}(y)} = \frac{k}{l}\,b_{yx}$$

Since the regression coefficients change with scaling, they are not independent of changes in scale.

Quick Tip

Regression coefficients remain unchanged when the origin is shifted but change when the scale of the variables is altered.
