

WB Board Class 12 Statistics Question Paper with Solutions(Memory Based)

Time Allowed :3 Hours	Maximum Marks :70	Total questions :37
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General Instructions

Read the following instructions very carefully and strictly follow them:

1. Please check that this question paper contains 23 printed pages.
2. Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
3. Please check that this question paper contains 37 questions.
4. 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.

1. Define Crude Birth Rate (CBR) and Crude Death Rate (CDR).

Solution: Concept: Crude Birth Rate and Crude Death Rate are important demographic indicators used to study population growth and structure.

Crude Birth Rate (CBR):

Definition: Crude Birth Rate is the number of live births per 1000 people in a population in a given year.

Formula:

$$\text{CBR} = \frac{\text{Number of live births in a year}}{\text{Mid-year population}} \times 1000$$

It indicates the fertility level of a population.

Crude Death Rate (CDR):

Definition: Crude Death Rate is the number of deaths per 1000 people in a population in a given year.

Formula:

$$\text{CDR} = \frac{\text{Number of deaths in a year}}{\text{Mid-year population}} \times 1000$$

It reflects the mortality level of a population.

Importance:

- Used in population studies and census data
- Helps measure population growth
- Useful in planning health and development policies

Quick Tip

CBR → Births per 1000 people CDR → Deaths per 1000 people

2. What is the difference between Neonatal Mortality Rate and Infant Mortality Rate?

Solution: Concept: Both Neonatal Mortality Rate (NMR) and Infant Mortality Rate (IMR) are indicators of child health and healthcare quality, but they differ based on the age group considered.

Difference between NMR and IMR:

Feature	Neonatal Mortality Rate (NMR)	Infant Mortality Rate (IMR)
Definition	Deaths of newborns within first 28 days	Deaths of children under 1 year
Age group	0–28 days after birth	0–1 year after birth
Formula	$\frac{\text{Neonatal deaths}}{\text{Live births}} \times 1000$	$\frac{\text{Infant deaths}}{\text{Live births}} \times 1000$
Scope	Narrower indicator	Broader indicator
Focus	Maternal care, delivery conditions	Overall infant health and nutrition

Explanation:

Neonatal Mortality Rate (NMR): It measures deaths occurring within the first 28 days of life. It mainly reflects the quality of prenatal care, childbirth practices, and immediate postnatal care.

Infant Mortality Rate (IMR): It includes all deaths of children before completing one year of age. It reflects overall healthcare, nutrition, sanitation, and immunization.

Quick Tip

NMR → Deaths within 28 days IMR → Deaths within 1 year

3. Explain the term "Cohort" as used in life tables.

Solution: Concept: In demography and population studies, life tables are used to analyze survival and mortality patterns of a population. The term "cohort" is fundamental in constructing life tables.

Definition of Cohort:

A **cohort** refers to a group of individuals who share a common characteristic and are followed over a period of time.

In life tables, it usually means:

- A group of people born in the same year or period
- Tracked throughout their lifetime to study survival and mortality

Cohort in Life Tables:

In a life table, a hypothetical cohort (often 1000 or 100,000 births) is used to:

- Observe how many survive to each age
- Calculate life expectancy
- Study mortality patterns

Example: If a life table starts with 100,000 newborns, this entire group is treated as a single cohort and their survival is tracked across different ages.

Importance:

- Helps estimate life expectancy
- Used in insurance and public health planning
- Useful in demographic analysis

Quick Tip

Cohort = A group born at the same time and followed through life in a life table.

4. Name two primary methods for collecting vital statistics (e.g., Census and Registration).

Solution: Concept: Vital statistics include data related to births, deaths, marriages, and population changes. These are collected using systematic demographic methods.

Two Primary Methods of Collecting Vital Statistics:

1. Census Method: A census is a complete enumeration of the population conducted at regular intervals (usually every 10 years).

- Covers the entire population
- Provides comprehensive demographic data
- Conducted by the government

2. Civil Registration System (Registration Method): This method involves continuous and permanent recording of vital events.

- Records births, deaths, marriages, etc.
- Maintained by local authorities
- Provides real-time data

Explanation: The census provides periodic population data, while registration systems provide continuous and up-to-date vital statistics.

Quick Tip

Census → Periodic population count Registration → Continuous recording of births and deaths

5. In a town of 1,20,000 people, there were 1,500 births and 1,200 deaths in a year. Calculate the CBR and CDR.

Solution: Concept: Crude Birth Rate (CBR) and Crude Death Rate (CDR) are calculated as the number of births or deaths per 1000 population per year.

$$\text{CBR} = \frac{\text{Number of live births}}{\text{Mid-year population}} \times 1000$$

$$\text{CDR} = \frac{\text{Number of deaths}}{\text{Mid-year population}} \times 1000$$

Given:

- Total population = 1,20,000
- Number of births = 1,500
- Number of deaths = 1,200

Step 1: Calculate CBR

$$\text{CBR} = \frac{1500}{120000} \times 1000$$

$$\text{CBR} = 12.5$$

Step 2: Calculate CDR

$$\text{CDR} = \frac{1200}{120000} \times 1000$$

$$\text{CDR} = 10$$

Final Answers:

- Crude Birth Rate (CBR) = 12.5 per 1000 population
- Crude Death Rate (CDR) = 10 per 1000 population

Quick Tip

CBR/CDR formula: $\frac{\text{Events}}{\text{Population}} \times 1000$

6. Calculate the Standardised Death Rate (SDR) for two towns and determine which town is healthier based on a provided age-distribution table.

Solution: Concept: The Standardised Death Rate (SDR) is used to compare mortality between populations with different age structures. It removes the effect of age distribution by applying a standard population.

Formula:

$$\text{SDR} = \frac{\text{Total expected deaths}}{\text{Total standard population}} \times 1000$$

Where,

- Expected deaths = Age-specific death rate \times Standard population in that age group

Step-by-Step Method:

Step 1: Obtain age-specific death rates for each town:

$$\text{Age-specific death rate} = \frac{\text{Deaths in age group}}{\text{Population in age group}}$$

Step 2: Multiply each age-specific rate by the standard population of the same age group:

$$\text{Expected deaths} = \text{Rate} \times \text{Standard population}$$

Step 3: Add expected deaths across all age groups:

$$\text{Total expected deaths} = \sum (\text{Expected deaths})$$

Step 4: Compute SDR:

$$\text{SDR} = \frac{\text{Total expected deaths}}{\text{Total standard population}} \times 1000$$

Comparison of Towns:

- Calculate SDR separately for both towns

- The town with the **lower SDR** is considered healthier

Conclusion: After computing SDR for both towns using the given table:

- Lower SDR \Rightarrow Better health conditions
- Higher SDR \Rightarrow Poorer health conditions

Quick Tip

SDR removes age bias. Lower SDR = Healthier population.

7. If there were 4,000 live births and 100 neonatal deaths in a city, calculate the Neonatal Mortality Rate (NMR).

Solution: Concept: Neonatal Mortality Rate (NMR) is the number of deaths of infants within the first 28 days of life per 1000 live births in a given year.

Formula:

$$\text{NMR} = \frac{\text{Number of neonatal deaths}}{\text{Number of live births}} \times 1000$$

Given:

- Live births = 4,000
- Neonatal deaths = 100

Step 1: Substitute values into the formula

$$\text{NMR} = \frac{100}{4000} \times 1000$$

Step 2: Calculate

$$\text{NMR} = 0.025 \times 1000 = 25$$

Final Answer:

Neonatal Mortality Rate (NMR) = 25 per 1000 live births

Quick Tip

$$\text{NMR} = \frac{\text{Neonatal deaths}}{\text{Live births}} \times 1000$$

8. Why are index numbers often called "Economic Barometers"?

Solution: Concept: Index numbers are statistical measures that show changes in economic variables such as prices, production, wages, and cost of living over time.

Reason for being called "Economic Barometers":

Index numbers are called economic barometers because they indicate the overall condition and direction of an economy, similar to how a barometer indicates weather changes.

Explanation:

- They measure economic trends such as inflation and deflation.
- Price index numbers (e.g., CPI, WPI) reflect changes in the cost of living.
- Production index numbers indicate industrial growth or decline.
- Help track purchasing power of money.
- Assist governments in policy-making and economic planning.

Examples:

- Consumer Price Index (CPI) → Measures inflation
- Wholesale Price Index (WPI) → Indicates price trends
- Industrial Production Index → Shows industrial growth

Conclusion: Since index numbers provide a quick and reliable picture of economic conditions and trends, they are known as **economic barometers**.

Quick Tip

Index numbers show economic trends like inflation and growth — hence called economic barometers.

9. State the difference between a Simple Index Number and a Weighted Index Number.

Solution: Concept: Index numbers measure changes in variables such as prices or quantities over time. They can be constructed either without weights (simple) or with importance assigned to items (weighted).

Difference between Simple and Weighted Index Numbers:

Feature	Simple Index Number	Weighted Index Number
Definition	No weights assigned to items	Weights assigned based on importance
Importance of items	All items treated equally	Different importance to different items
Accuracy	Less accurate	More accurate and realistic
Complexity	Easy to calculate	More complex calculations
Use	Preliminary analysis	Economic and policy analysis
Example	Simple price index	CPI, WPI, Cost of Living Index

Explanation:

Simple Index Number: Constructed by taking a simple average of price relatives without considering the relative importance of commodities.

Weighted Index Number: Assigns weights to items according to their importance (e.g., consumption level), giving a more reliable measure of change.

Quick Tip

Simple index → No weights Weighted index → Includes importance (weights)