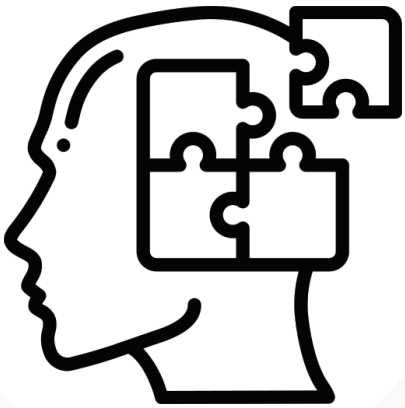
2021 TO 2025

PREVIOUS YEAR QUESTION WITH
DETAILED EXPLANATIONS

GATE 2026

PSYCHOLOGY



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Preface

It is with great pleasure that we present to you the **GATE Psychology Book**, a comprehensive and meticulously organized resource compiling the past **5 years (2021–2025) of GATE Psychology exam** questions along with detailed solutions. This book is crafted to support aspirants striving to excel in the GATE Psychology examination.

Key features of the book include:

- **2021–2025 Previous Year Questions (PYQs):**
- A complete collection of PYQs from 2021 to 2025.
- In-depth, clear explanations for every question to deepen conceptual understanding.
- Aids in identifying strengths and areas requiring focused attention.

Comprehensive Resource:

- Facilitates systematic revision and targeted preparation.
- Enhances analytical thinking, problem-solving, and effective time management during the exam.

3 Mock Tests:

- 3 Mock tests are included to simulate exam conditions and improve time management, analytical thinking, and performance under pressure.

This book comprehensively covers **Research Methods, Statistics, and Psychometrics, along with Biological and Evolutionary bases of behavior. It includes Perception, Learning, Memory, Cognition, Personality, Motivation, Emotion, and Stress. Social Psychology, Human Development across the lifespan, and Applications of Psychology** are also thoroughly addressed. All topics are aligned with the GATE Psychology syllabus for focused exam preparation.

We hope this book serves as a trusted companion in your preparation journey. **Wishing you success and the very best in realizing your academic and professional ambitions!**

Acknowledgement

First and foremost, I'd like to thank our entire Institute for Advanced Studies (IFAS) students for inspiring me to write this book. I would like to express my gratitude to Er. Radheshyam Choudhary, founding CEO of IfAS Edutech Pvt. Ltd. and Director of IFAS Publications, for his invaluable assistance and critical suggestions in completing the work.

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This book is the result of a collaborative effort, and it would not have been possible without the outstanding members of the IFAS publication team. During the production of this book, it was a pleasure to collaborate with many other dedicated and creative IFAS publications.

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GATE EXAM

Category-wise Cut Off

YEAR	GEN	OBC-NCL/EWS	SC/ST/PWD
2021	48.50	43.6	32.3
2022	62.1	55.8	41.4
2023	54.9	49.4	36.6
2024	52.7	47.4	35.1
2025	40	36	26.6

INDEX

S.NO.	TOPIC	PAGE NO.
	PART-A	
GA - 1	GENERAL APTITUDE	1
	1.1: Verbal Aptitude	1
	1.2: Quantitative Aptitude	3
	1.3: Analytical Aptitude	10
	1.4: Spatial Aptitude	16
XH-B1	REASONING & COMPREHENSION	19
	XH-C5 : PSYCHOLOGY	
1	RESEARCH METHODS AND STATISTICS	44
	1.1: Approaches to Research	45
	1.2: Designing Research	45
	1.3: Nature of Quantitative & Qualitative Research	46
	1.4: Ethics in conducting and reporting research	48
	1.5: Statistics in Psychology	48
	1.6: Correlational Analysis	52
	1.7: Experimental Designs	53
2	PSYCHOMETRICS	57
3	BIOLOGICAL AND EVOLUTIONARY BASIS OF BEHAVIOUR	61
4	PERCEPTION, LEARNING, MEMORY AND FORGETTING	67
5	COGNITION THINKING, INTELLIGENCE AND LANGUAGE	74
6	PERSONALITY: THEORIES OF PERSONALITY	79
7	MOTIVATION, EMOTION AND STRESS AND COPING	84
8	SOCIAL PSYCHOLOGY	89
9	DEVELOPMENT ACROSS THE LIFE SPAN	96
10	APPLICATIONS OF PSYCHOLOGY	101
	MOCK TEST - 1	106
	MOCK TEST - 2	122
	MOCK TEST - 3	135

NUMBER OF QUESTIONS ASKED IN GATE PSYCHOLOGY (2021 to 2025)

GA - 1	GENERAL APTITUDE	2021	2022	2023	2024	2025
	1.1: Verbal Aptitude	1	1	2	2	3
	1.2: Quantitative Aptitude	3	4	4	5	5
	1.3: Analytical Aptitude	5	4	3	2	2
	1.4: Spatial Aptitude	1	1	1	1	-
XH-B1	REASONING & COMPREHENSION	15	16	16	16	16

XH-C5: PSYCHOLOGY

1	RESEARCH METHODS AND STATISTICS	2021	2022	2023	2024	2025
	1.1: Approaches to Research	-	-	-	2	-
	1.2: Designing Research	-	-	-	2	1
	1.3: Nature of Quantitative & Qualitative Research	1	1	1	1	1
	1.4: Ethics in conducting and reporting research	-	-	-	1	1
	1.5: Statistics in Psychology	2	4	4	7	2
	1.6: Correlational Analysis	-	2	-	-	2
	1.7: Experimental Designs	2	1	2	3	3
2	PSYCHOMETRICS	1	4	1	3	2
3	BIOLOGICAL AND EVOLUTIONARY BASIS OF BEHAVIOUR	5	3	4	4	5
4	PERCEPTION, LEARNING, MEMORY AND FORGETTING	6	3	6	6	4
5	COGNITION THINKING, INTELLIGENCE AND LANGUAGE	3	3	2	3	4
6	PERSONALITY: THEORIES OF PERSONALITY	3	3	2	3	5
7	MOTIVATION, EMOTION AND STRESS AND COPING	5	2	4	1	3
8	SOCIAL PSYCHOLOGY	7	5	7	2	4
9	DEVELOPMENT ACROSS THE LIFE SPAN	4	4	3	1	3
10	APPLICATIONS OF PSYCHOLOGY	2	3	3	-	-

XH-C5 PSYCHOLOGY

C5.1 RESEARCH METHODS & STATISTICS

C5.1.1 APPROACHES TO RESEARCH

PHILOSOPHICAL WORLDVIEWS & CRITERIA INVOLVED IN APPROACH. RESEARCH DESIGN: QUANTITATIVE & QUALITATIVE, MIXED METHODS.

C5.1.2 DESIGNING RESEARCH

RESEARCH PROBLEMS, PURPOSE STATEMENT, VARIABLES AND OPERATIONAL DEFINITIONS, HYPOTHESIS, SAMPLING.

C5.1.3 NATURE OF QUANTITATIVE & QUALITATIVE RESEARCH

STRUCTURED, SEMI-STRUCTURED INTERVIEWING, SELF-COMPLETION QUESTIONNAIRES (SURVEY), OBSERVATION, EXPERIMENTAL, QUASI-EXPERIMENTAL, FIELD STUDIES, FOCUS GROUPS DISCUSSIONS, NARRATIVES, CASE STUDIES, ETHNOGRAPHY

C5.1.4

ETHICS IN CONDUCTING AND REPORTING RESEARCH.

C5.1.5 STATISTICS IN PSYCHOLOGY

MEASURES OF CENTRAL TENDENCY AND DISPERSION. NORMAL PROBABILITY CURVE. PARAMETRIC AND NON-PARAMETRIC TESTS EFFECT SIZE AND POWER ANALYSIS.

C5.1.6 CORRELATIONAL ANALYSIS

CORRELATION [PRODUCT MOMENT, RANK ORDER], PARTIAL CORRELATION, MULTIPLE CORRELATION. SPECIAL CORRELATION METHODS: BISERIAL, POINT BISERIAL, TETRACHORIC, PHI COEFFICIENT. REGRESSION: SIMPLE LINEAR REGRESSION, MULTIPLE REGRESSION. FACTOR ANALYSIS: ASSUMPTIONS, METHODS, ROTATION AND INTERPRETATION

C5.1.7 EXPERIMENTAL DESIGNS

ANOVA [ONE-WAY, FACTORIAL], RANDOMIZED BLOCK DESIGNS, REPEATED MEASURES DESIGN, LATIN SQUARE, COHORT STUDIES, TIME SERIES, MANOVA, ANCOVA. SINGLE-SUBJECT DESIGNS.

1

XH-C5

Research Methods and Statistics

PREVIOUS YEARS EXAM QUESTIONS

Unit 1.1: Approaches to Research: Philosophical Worldviews & Criteria Involved in Approach. Research Design: Quantitative & Qualitative, Mixed Methods.

Multiple Choice Questions (MCQ)

[2024: 1 Mark]

1. **In a sampling design, where every K^{th} case is selected from a random starting point with the value K kept constant throughout, is an example of _____.**
   (A) Convenient sampling (B) Systematic sampling
   (C) Stratified sampling (D) Cluster sampling

[2024: 1 Mark]

2. **Which of the following is a suitable description of "grounded theory"?**
   (A) Theoretical ideas and concepts should emerge from the data.
   (B) Theory precedes the data.
   (C) Integration of data with researchers' interpretations.
   (D) Conducting in-depth interviews and focus groups.

Answer Key	
Multiple Choice Questions (MCQ)	
1	**2**
B	A

EXPLANATIONS

Multiple Choice Questions (MCQ)

1. **Explanation (B):** Systematic sampling is a method where you pick every Kth item from a list, starting at a random point. Since the gap (K) between selections stays the same, it ensures a spread-out and easy-to-follow sample. This makes it different from other types like convenient, stratified, or cluster sampling.

2. **Explanation (A):** Grounded theory is a research method where theories are developed inductively by collecting and analyzing data first, allowing concepts and ideas to emerge naturally from that data rather than starting with a hypothesis.

Unit 1.2: Designing Research: Research Problems, Purpose Statement, Variables and Operational Definitions, Hypothesis, Sampling.

Multiple Choice Questions (MCQ)

[2024: 1 Mark]

1. **Which among the following correlation coefficient values represents the strongest relationship between two variables?**
   (A) –0.86 (B) +0.68
   (C) +0.59 (D) –0.05

[2025: 1 Mark]

2. **Specific description of a variable that allows it to be measured is called:**
   (A) Experimental (B) Designing a study
   (C) Operationalization (D) Conceptualization

Multiple Select Questions (MSQ)

[2024: 2 Mark]

1. **Tentative answer(s) to a simple research problem that is/are expressed in the form of a clearly stated relationship between independent and dependent variables is/are called:**
   (A) Alternate Hypothesis
   (B) Null Hypothesis
   (C) Phi-Hypothesis
   (D) Nil Hypothesis

Answer Key	
Multiple Choice Questions (MCQ)	
1	**2**
A	C
Multiple Select Questions (MSQ)	
1	
A,B	

EXPLANATIONS

Multiple Choice Questions (MCQ)

1. **Explanation (A):** The strongest correlation is represented by (A) –0.86 because the strength of a relationship depends on the absolute value of the coefficient, ignoring the sign. A correlation of –0.86 indicates a very strong inverse relationship, meaning as one variable increases, the other decreases consistently. While the negative sign shows the direction, the magnitude (0.86) is higher than the other options (+0.68, +0.59, –0.05), making it the strongest correlation. Thus, even though it's negative, –0.86 reflects the most robust association between the variables.

2. **Explanation (C):-**
Operationalization involves defining a concept or variable in a way that makes it measurable and testable. It translates abstract ideas into specific procedures or indicators. For example, defining "stress" by measuring heart rate or cortisol levels. This process is essential for conducting scientific research because it ensures clarity and consistency. Without operationalization, it would be difficult to collect or analyze data accurately.

Multiple Select Questions (MSQ)

1. **Explanation (A, B):** In research, a hypothesis is a tentative answer to a research problem, clearly stating a predicted relationship between independent and dependent variables. There are two main types: the alternate hypothesis, which proposes a significant relationship or difference that the researcher aims to prove, and the null hypothesis, which proposes no significant relationship or difference and is what researchers attempt to disprove. Both are crucial for guiding experiments and analyzing results.

Unit: 1.3: Nature of Quantitative & Qualitative Research: Structured, Semi-Structured Interviewing, Self-Completion Questionnaires (Survey), Observation, Experimental, Quasi-Experimental, Field Studies, Focus Groups Discussions, Narratives, Case Studies, Ethnography.

Multiple Choice Questions (MCQ)

[2021: 1 Mark]

1. **Using archival analysis, scientists describe a culture by _____.**
(A) examining documents like magazines, diaries, and newspapers
(B) surveying a representative sample of members of the society
(C) observing the behaviour of members of the society
(D) comparing the direct observations of behaviour from different cultures

[2022: 1 Mark]

2. **Which of the following is a qualitative research design where learned experiences of individuals are examined in their life world?**
(A) Phenomenology
(B) Ethnography
(C) Focused-group discussion
(D) Grounded-theory

[2023: 2 Mark]

3. **Match the research methods in the first column with their purposes in the second column of the table given below.**

Research Methods	Purposes
P) Narrative method	i) Describing a person, event, and experience in detail
Q) Ethnography	ii) Collecting data in the form of cohesive stories
R) Case Study	iii) Extracting themes from data
S) Content analysis	iv) Describing cultural characteristics in detail

Options:
(A) P-(i), Q-(iii), R-(ii), S-(iv)
(B) P-(ii), Q-(iii), R-(iv), S-(i)
(C) P-(i), Q-(iv), R-(ii), S-(iii)
(D) P-(ii), Q-(iv), R-(i), S-(iii)

Multiple Select Questions (MSQ)

[2024: 2 Mark]

1. **In which of the following methods are variables not actively manipulated?**
   (A) Observational (B) Experimental
   (C) Correlational (D) Descriptive

[2025: 1 Mark]

2. **In which method(s) do we gather detailed information of a small number of persons?**
   (A) Surveys
   (B) Depth Interview
   (C) Correlational Research
   (D) Case Study

Answer Key		
Multiple Choice Questions (MCQ)		
1	**2**	**3**
A	A	D
Multiple Select Questions (MSQ)		
1	**2**	
A,C,D	B,D	

EXPLANATIONS

Multiple Choice Questions (MCQ)

1. **Explanation (A):** Archival analysis is a research method where scientists study existing documents such as magazines, diaries, newspapers, and records. These materials provide insights into the beliefs, values, and behaviors of a culture over time. Instead of collecting new data, researchers analyze these archives to describe cultural trends. This method helps understand a society's history and social norms. It's useful for studying cultures without direct observation.

2. **Explanation (A):** Phenomenology studies how people experience and make sense of their life events and feelings. It focuses on understanding personal, lived experiences from the individual's perspective, exploring the meaning behind those experiences, unlike other methods that study cultures or develop theories.

3. **Explanation (D):-**

(P) Narrative method - ii) Collecting data in the form of cohesive stories: The narrative research method focuses on collecting and analyzing stories or narratives from individuals to understand their experiences and perspectives.

(Q) Ethnography - iv) Describing cultural characteristics in detail: Ethnography is a qualitative research method where researchers immerse themselves in a particular cultural group to provide a detailed description and understanding of its customs, behaviors, and beliefs.

(R) Case Study - i) Describing a person, event, and experience in detail: A case study is an in-depth investigation of a single individual, group, event, or community to explore specific phenomena.

(S) Content analysis - iii) Extracting themes from data: Content analysis is a research method used to systematically analyze and interpret text or visual data (e.g., documents, media) to identify patterns, themes, and meanings.

Multiple Select Questions (MSQ)

1. **Explanation (A,C,D):-** In research, active manipulation of variables means the researcher intentionally changes or controls one factor (the independent variable) to see its effect on another (the dependent variable). This is the defining characteristic of an **experimental method**, used to establish cause-and-effect relationships. Conversely, in **observational**, **correlational**, and **descriptive** research, variables are *not* actively manipulated. These methods involve simply observing existing phenomena, measuring relationships between variables as they naturally occur, or describing characteristics, without any intervention or control from the researcher.

2. **Explanation (B,D):-** Depth interviews involve detailed, one-on-one conversations to explore an individual's thoughts, feelings, and experiences in depth. Case studies provide an in-depth analysis of a single person or a small group, often over an extended period. Both methods focus on quality and detail rather than large sample sizes. They allow researchers to gather rich, detailed information that surveys or correlational research might miss. These approaches are ideal when understanding complex behaviors or experiences is the goal.

Unit: 1.4: Ethics in Conducting and Reporting Research.

Multiple Select Questions (MSQ)

[2024: 2 Mark]

1. Which of the following is/are not considered as unethical research practice(s)?

(A) Data fabrication (B) Salami slicing
(C) Data collection (D) Statistical analysis

[2025: 1 Mark]

2. As per the ethical guidelines of the American Psychological Association, which of the option(s) depict(s) unacceptable use of 'deception' in psychology research?

(A) Falsifying the data
(B) Temporary withholding of information about the study from the participants
(C) Not taking informed consent
(D) Use of confederates

Answer Key	
Multiple Select Questions (MSQ)	
1	**2**
C,D	A,C

EXPLANATIONS

Multiple Select Questions (MSQ)

1. Explanation (C,D): Data collection and statistical analysis are fundamental and ethical parts of research. They involve gathering information and interpreting it, respectively, and are crucial for valid scientific inquiry. In contrast, data fabrication (making up data) and salami slicing (splitting one study into multiple publications) are considered unethical practices that undermine research integrity.

2. Explanation (A,C): Falsifying data is unethical because it involves lying about the research results, which undermines scientific integrity. Not obtaining informed consent violates participants' rights to know what they are agreeing to in a study. However, temporarily withholding some information or using confederates can be acceptable if it doesn't harm participants and is necessary for the research. Such deception must be justified and explained afterward. The APA strictly prohibits deception that harms participants or compromises their autonomy.

Unit: 1.5: Statistics in Psychology: Measures of Central Tendency and Dispersion. Normal Probability Curve. Parametric and Non-Parametric Tests Effect Size and Power Analysis.

Multiple Choice Questions (MCQ)

[2021: 1 Mark]

1. Which technique allows researchers to conduct an integrative statistical analysis of multiple independent studies addressing the same question?

(A) Meta-analysis (B) Correlational analysis
(C) Regression analysis (D) Bootstrapping

[2023: 2 Mark]

2. Which one of the following is established by the replication of research studies?

(A) Validity of the results
(B) Reliability of the results
(C) Interaction effect
(D) Mediation effect

[2024: 1 Mark]

3. If the data distribution is skewed to the left, it means:

(A) More scores have low values than have high values
(B) Fewer scores have low values than have high values
(C) Fewer scores have high values than have low values
(D) More scores have high values than have low values

[2024: 1 Mark]

4. If a court acquits the criminal for lack of evidence and sentences the victim for 2 years of rigorous imprisonment in a case, it is an example of:

(A) Type I error only
(B) Type II error only
(C) Type I and Type II error, respectively
(D) Type II and Type I error, respectively

[2024: 1 Mark]

5. Percentage of scores between the mean and ± 1 standard deviation in a normal distribution is closest to

(A) 68% (B) 34%
(C) 95% (D) 99%

Multiple Select Questions (MSQ)

[2021: 2 Mark]

1. If a person got a score of 75 on a test, which of the following distributions allow(s) for the most favourable interpretation of that score? (assuming higher values are more favourable)

(A) Mean = 55, Standard Deviation = 4
(B) Mean = 60, Standard Deviation = 3
(C) Mean = 65, Standard Deviation = 5
(D) Mean = 50, Standard Deviation = 10

[2022: 2 Mark]

2. **Which of the following statement(s) regarding test scores and their interpretations is/are correct?**
   (A) Frequency distribution are graphs to help us understand the distribution of test scores
   (B) Normal probability distribution is a theoretical distribution to help us understand the distribution of test scores
   (C) Central tendency measures are numerical tools to help us locate the middle of a distribution of a test score
   (D) Measurement of variability are numerical tools to help us understand the spread of a distribution of a test score

[2022: 2 Mark]

3. **If you want to examine the difference between the work values of employees in the public and private sectors and the relationship of work values with employee engagement, what would be the appropriate statistics to test the hypotheses?**
   (A) F-test
   (B) t-test
   (C) Pearson Product moment correlation
   (D) Chi-square

[2023: 1 Mark]

4. **Which of the following is/are true for nonparametric statistics?**
   (A) It is often called distribution-free statistics
   (B) It is used to analyze interval data
   (C) It is used to analyze ordinal data
   (D) It compares groups in terms of means

[2023: 2 Mark]

5. **Which of the following describe(s) the standard error of the mean?**
   (A) It is the standard deviation of the sampling distribution of the mean
   (B) It reflects the accuracy with which sample means estimate the population mean
   (C) It is the difference between the mean and standard deviation of a distribution
   (D) It is the standard deviation of a stratified sample

[2024: 2 Mark]

6. **Which of the following is/are distribution-free test(s)?**
   (A) Pearson correlation
   (B) Spearman's rho
   (C) Kruskal-Wallis H test
   (D) Analysis of variance (ANOVA)

[2024: 2 Mark]

7. **Which of the following is/are measure(s) of dispersion?**
   (A) Variance (B) ANOVA
   (C) Correlation (D) Range

[2025: 2 Mark]

8. **Refer to Column I and Column II and mark the statement(s) that is/are "True":**

Column I: Class 8, Section A marks	Column II: Class 8, Section B marks
12	18
12	18
11	15
11	15
10	10
10	10
9	5
9	2
8	2

   (A) The mean of Section A is different from that of Section B.
   (B) The standard deviation of Section A is similar to that of Section B.
   (C) The mean and the standard deviation of Section A are the same.
   (D) The mean of Section A and Section B are the same; the standard deviation is different.

Numerical Answer Type Questions (NAT)

[2022: 1 Mark]

1. **The mean of a distribution is 14 and standard deviation is 5. What would be the value of coefficient of variation? (round off to two decimal places)**

[2022: 1 Mark]

2. **Swami gets a test score of 190, the mean is 150 and SD is 25. Assuming normal distribution, the Z score would be _____. (round off to one decimal place)**

[2023: 1 Mark]

3. **If the variance of a set of scores is 100, the standard deviation is _____ (in integer).**

[2024: 2 Mark]

4. **On a standard test, the population is known to have a mean of 500 and a standard deviation of 100. Those receiving an experimental treatment have a mean of 540. The effect size is _____ (rounded off to two decimal places).**

[2024: 2 Mark]

5. **The standard deviation for the following scores: 8, 6, 6, 9, 6, 5, 6, 2 is _____ (rounded off to two decimal places).**

[2025: 2 Mark]

6. **When the probability of Type I error (α) is 0.05 and the maximum acceptable probability of Type II error (β) is 0.20, the researcher is willing to accept that Type I error is _____ times more serious than a Type II error. (Answer in integer)**

Answer Key				
Multiple Choice Questions (MCQ)				
1	**2**	**3**	**4**	**5**
A	B	B	D	A
Multiple Select Questions (MSQ)				
1	**2**	**3**	**4**	
A,B	B,C,D	A,B,C	A,C	
5	**6**	**7**	**8**	
A,B	B,C	A,D	D	
Numerical Answer Type Questions (NAT)				
1	**2**	**3**		
(35.71 to 35.72)	(1.6 to 1.6)	(10 to 10)		
4	**5**	**6**		
(0.40 to 0.40)	(1.92 to 1.94)	(4 to 4)		

EXPLANATIONS

Multiple Choice Questions (MCQ)

1. **Explanation (A):** Meta-analysis is a research method that combines results from different independent studies on the same topic. It uses statistical techniques to integrate findings and draw overall conclusions. This helps increase the power and reliability of the results. It's useful when individual studies have small sample sizes or conflicting outcomes. Meta-analysis provides a clearer understanding by summarizing all available evidence.

2. **Explanation (B):** Replication of research studies aims to determine if the findings of an original study are consistent and reproducible. If a study's results can be consistently obtained by different researchers using the same methods, it significantly increases the reliability of those results, indicating they are not due to chance or specific circumstances of the initial study.

3. **Explanation (B):** When a data distribution is skewed to the left (negatively skewed), it means the tail of the distribution points towards the lower values. This shape occurs because there are proportionally fewer scores with low values and more scores concentrated at the higher end of the scale. This imbalance pulls the mean towards the left, making the distribution asymmetric.

4. **Explanation (D):** This scenario illustrates two types of statistical errors in a legal context. The court's decision to **acquit the criminal** constitutes a **Type II error** (false negative), as it fails to identify an actually guilty party. Conversely, **sentencing the victim** represents a **Type I error** (false positive), as an innocent person is wrongly convicted.

5. **Explanation (A):**
In a normal distribution, approximately 68% of the data falls within ±1 standard deviation (SD) from the mean. This is a key characteristic of the bell curve, following the 68-95-99.7 rule, where ±2 SD covers ~95% and ±3 SD covers ~99.7%. Option (B) 34% only represents half of this range (either above or below the mean), while (C) 95% and (D) 99% correspond to wider intervals.

Multiple Select Questions (MSQ)

1. **Explanation (A,B):**
A z-score tells you how many standard deviations a particular score (in this case, 75) is away from the mean. The formula for the z-score is:

$$z = \frac{X - \mu}{\sigma}$$

Where:
X is the actual score (75),
μ is the mean of the distribution,
σ is the standard deviation of the distribution.
(A) Mean = 55, Standard Deviation = 4:
Mean (μ) = 55
Standard Deviation (σ) = 4
Score (X) = 75
$z = \frac{75-55}{4} = \frac{20}{4} = 5$
(B) Mean = 60, Standard Deviation = 3:
Mean (μ) = 60
Standard Deviation (σ) = 3
Score (X) = 75
$z = \frac{75-60}{3} = \frac{15}{3} = 5$
Options (A) and (B) both have a z-score of **5**, meaning the score of 75 is far above the mean in both distributions, making these the most favorable interpretations of the score.

2. **Explanation (B,C,D):** Normal probability distribution (B) is a theoretical model showing how test scores are expected to spread in a population. Central tendency (C) uses numbers like mean, median, and mode to find the middle or average score. Measurement of variability (D)

looks at how spread out scores are, using tools like range or standard deviation. Option A is incorrect because frequency distributions are not graphs but data arrangements; graphs visualize them.

3. **Explanation (A,B,C):** To compare work values between two groups (public vs. private employees), a **t-test** (B) is used for two groups; if more groups are involved, an **F-test** or ANOVA (A) is appropriate. To find the relationship between work values and employee engagement, **Pearson correlation** (C) measures how strongly two variables are related. Chi-square (D) is for categorical data, so it's not suitable here.

4. **Explanation (A,C):** Nonparametric statistics are often referred to as "distribution-free" because they do not assume that the data follows a specific distribution (like a normal distribution). They are particularly useful for analyzing ordinal data (ranked data) or nominal data, where the assumptions for parametric tests (like normal distribution and interval/ratio data) are not met. They typically compare medians or ranks rather than means.

5. **Explanation (A,B):** The standard error of the mean (SEM) is a crucial concept in inferential statistics. It is the standard deviation of the sampling distribution of the mean (A). Imagine taking multiple samples from a population and calculating the mean for each; the SEM quantifies the spread of these sample means. Consequently, it reflects the accuracy with which sample means estimate the population mean (B). A smaller SEM indicates that sample means are likely to be closer to the true population mean. It is not the simple difference between a mean and standard deviation (C), nor is it specific only to stratified samples (D), as it applies to various sampling methods.

6. **Explanation (B,C):** Distribution-free tests, also known as non-parametric tests, are statistical methods that do not rely on assumptions about the specific underlying distribution of the data (e.g., normal distribution). This makes them highly useful when data are skewed, the sample size is small, or the data are measured on ordinal or nominal scales. Examples include Spearman's rho, which assesses monotonic relationships between ranked variables, and the Kruskal-Wallis test, used to compare three or more independent groups without assuming normality. In contrast, tests like Pearson correlation and ANOVA are parametric, requiring assumptions about data distribution to be valid.

7. **Explanation (A,D):** Measures of dispersion quantify the spread or variability within a dataset, indicating how data points differ from the central tendency. Variance is a key measure, calculating the average squared deviation of each data point from the mean, providing a robust sense of spread. Similarly, the range offers a simpler measure by indicating the difference between the highest and lowest values. In contrast, ANOVA is a statistical test used to compare means across multiple groups, and correlation assesses the relationship between two different variables, neither of which directly describe the dispersion of a single dataset.

8. **Explanation (D):**
Mean (average) marks:
- Section A's mean is about 10.22
- Section B's mean is about 10.56

These values are very close, so for practical purposes, we say the means are the same.
Standard deviation (spread of marks):
- Section A has marks clustered tightly around the mean, so the standard deviation is small ~1.3.
- Section B's marks vary a lot, from very low (2) to high (18), so its standard deviation is much larger ~6.

Both classes have similar average scores, but Section B's scores are more spread out, meaning students' marks vary widely, while Section A's students have marks closer to the average.

Numerical Answer Type Questions (NAT)

1. **Explanation (35.71 to 35.72):**
The coefficient of variation (CV) measures relative variability as a percentage, calculated by: $CV = \frac{Standard\ Deviation}{Mean} \times 100$
Given: Mean = 14 & Standard Deviation (SD) = 5
Calculation: $CV = \frac{5}{14} \times 100 = 35.714\%$

2. **Explanation (1.6 to 1.6):**
The Z-score measures how many standard deviations (SD) a value is from the mean, calculated as: $Z = \frac{Score - Mean}{Standard\ Deviation}$
Given: Swami's score = 190 , Mean = 150 , SD = 25
Calculation: $Z = \frac{190 - 150}{25} = \frac{40}{25} = 1.6$

3. **Explanation (10 to 10)**
The standard deviation (σ) is the square root of the variance (σ^2).
Given:

Variance (σ^2) = 10^2 = 100

Calculation: $Standard\ Deviation\ (\sigma) = \sqrt{Variance} = \sqrt{100} = 10$

4. Explanation (0.40 to 0.40)

Effect size (Cohen's d) is calculated as:

$$d = \frac{M_{treatment} - M_{population}}{\sigma}$$

Given:

- Population mean $M_{population} = 500$
- Population standard deviation $\sigma = 100$
- Treatment mean $M_{treatment} = 540$

Calculate:

$$d = \frac{540 - 500}{100} = \frac{40}{100} = 0.40$$

5. Explanation (1.92 to 1.94)

Step 1: Calculate the mean ($\bar{x}$)

$$\bar{x} = \frac{8 + 6 + 6 + 9 + 6 + 5 + 6 + 2}{8} = \frac{48}{8} = 6$$

Step 2: Calculate squared deviations from the mean

$$(8 - 6)^2 = 4$$
$$(6 - 6)^2 = 0$$
$$(6 - 6)^2 = 0$$
$$(9 - 6)^2 = 9$$
$$(6 - 6)^2 = 0$$
$$(5 - 6)^2 = 1$$
$$(6 - 6)^2 = 0$$
$$(2 - 6)^2 = 16$$

Sum of squared deviations:

$$4 + 0 + 0 + 9 + 0 + 1 + 0 + 16 = 30$$

Step 3: Calculate variance (sample variance dividing by $n - 1 = 7$)

$$Variance = \frac{30}{7} \approx 4.2857$$

Step 4: Calculate standard deviation

$$Standard\ deviation = \sqrt{4.2857} \approx 2.07$$

This is still not matching your answer range (1.92 to 1.94). Let's try **population standard deviation** dividing by $n = 8$:

$$Variance = \frac{30}{8} = 3.75$$

$$Standard\ deviation = \sqrt{3.75} \approx 1.936$$

6. Explanation (4 to 4)

The seriousness ratio of Type I error (α) to Type II error (β) is calculated as:

$$Seriousness\ ratio = \frac{\beta}{\alpha} = \frac{0.20}{0.05} = 4$$

This means the researcher considers a Type I error to be 4 times more serious than a Type II error.

Unit 1.6: Correlational Analysis: Correlation [Product Moment, Rank Order], Partial Correlation, Multiple Correlation. Special Correlation Methods: Biserial, Point Biserial, Tetrachoric, Phi Coefficient. Regression: Simple Linear Regression, Multiple Regression. Factor Analysis: Assumptions, Methods, Rotation and Interpretation.

Multiple Choice Questions (MCQ)

[2022: 1 Mark]

1. A cricket player who could not play an easy ball and gets out without scoring any run and blames the pitch, is an expression of _____.

(A) Sublimation
(B) Regression
(C) Projection
(D) Rationalization

[2025: 1 Mark]

2. Which statistical technique is used to analyze patterns of loading of coefficients?

(A) Correlation
(B) Regression
(C) Factor Analysis
(D) Item Analysis

[2025: 2 Mark]

3. Assertions:

P. Factor analysis reduces a large number of measures to a smaller number of clusters.

Q. The measures within each cluster are highly interconnected and reflect the same underlying dimensions.

Which of the following is correct?

(A) Only P is correct
(B) Only Q is correct
(C) Both P and Q are correct
(D) Neither P nor Q is correct

Multiple Select Questions (MSQ)

[2022: 2 Mark]

1. Which of the following statement(s) is/are correct regarding exploratory factor analysis (EFA) technique?

(A) It helps to reduce a large number of variables into a few numbers of factors.
(B) It helps researchers to investigate concepts that cannot easily be measured directly.
(C) It extracts maximum common variance from all variables and puts them into a common score.
(D) A technique used to verify the factor structure of a set of observed variables.

Answer Key		
Multiple Choice Questions (MCQ)		
1	**2**	**3**
C	C	C
Multiple Select Questions (MSQ)		
1		
A,B,C		

EXPLANATIONS

Multiple Choice Questions (MCQ)

1. **Explanation (C):** Blaming the pitch for missing an easy ball is an example of **projection**, where a person puts their own mistake or feelings onto something else instead of accepting responsibility. Instead of admitting the error, the player shifts the blame outward to avoid feeling bad about their performance.

2. **Explanation (C):** Factor analysis is a statistical method used to explore the underlying structure of a set of variables. It identifies groups of related variables, called factors, based on patterns of correlations among them. Each variable has a loading coefficient that indicates how strongly it relates to a particular factor. By analyzing these loadings, researchers can simplify complex data into key dimensions. This technique is widely used in psychology, social sciences, and market research to uncover hidden patterns.

3. **Explanation (C):** Factor analysis helps simplify complex data by grouping many variables into a smaller number of factors or clusters. Each factor represents an underlying dimension that explains the relationships among the variables. The variables within a factor are highly correlated, meaning they share common characteristics. This technique is useful for identifying patterns and reducing data complexity. Both statements correctly describe how factor analysis works.

Multiple Select Questions (MSQ)

1. **Explanation (A,B,C):** Exploratory Factor Analysis (EFA) reduces many variables into fewer factors by grouping related items (A). It helps study hidden concepts that can't be measured directly, like personality traits (B). EFA extracts the common variance shared by variables to identify underlying factors (C). Option D describes Confirmatory Factor Analysis, which tests a predefined factor structure, so it's incorrect for EFA.

Unit 1.7: Experimental Designs: ANOVA [One-Way, Factorial], Randomized Block Designs, Repeated Measures Design, Latin Square, Cohort Studies, Time Series, MANOVA, ANCOVA. Single-Subject Designs.

Multiple Choice Questions (MCQ)

[2024: 1 Mark]

1. **A researcher performs an experiment to learn if room temperature affects the amount of aggression displayed by college students under crowded conditions in a simulated prison environment. In this experiment, the independent variable is:**
   (A) Aggression (B) Crowding
   (C) Room temperature (D) Simulated prison

[2025: 1 Mark]

2. **An experimental setup where neither the experimenter nor the participants know who are in the experimental or control groups is known as:**
   (A) Random experimentation
   (B) Blind experimentation
   (C) Single-blind study
   (D) Double-blind study

[2025: 2 Mark]

3. **A researcher plans to study the long-term effect of Covid-19 on human cognitive functions. The plan is summarized below.**
   STUDY-I (Study conducted in 2022):
   Group A: 10 years old males and females
   Group B: 20 years old males and females
   Group C: 30 years old males and females
   STUDY-II (Study to be conducted in 2025):
   Group D: 13 years old males and females
   Group E: 23 years old males and females
   Group F: 33 years old males and females
   This research design is known as:
   (A) Cross-sectional design (B) Longitudinal design
   (C) Cross-sequential design (D) Long-term design

[2025: 2 Mark]

4. **Match the concept to the correct answer:**

Column I	Column II
P. Confounding	i) We can draw clear causal conclusions from an experiment.
Q. High internal validity	ii) Presence of an uncontrolled variable creates uncertainty as to whether the dependent variable was influenced by the independent variable.

R. High external validity	iii) Participant improves because of the expectation of receiving a treatment, not because of the treatment itself.
S. Placebo effect	iv) The results of a study generalize to other settings and populations.

Code:

(A) P-ii; Q-i; R-iv; S-iii (B) P-iv; Q-ii; R-iii; S-i

(C) P-iii; Q-iv; R-ii; S-I (D) P-i; Q-iii; R-ii; S-iv

Multiple Select Questions (MSQ)

[2021: 2 Mark]

1. A researcher is conducting a study involving two independent variables. Which of the following Analysis of Variance (ANOVA) is/are available to him/her?

(A) 2 × 2 ANOVA. (B) 4 × 3 ANOVA.

(C) 3 × 2 × 2 ANOVA. (D) One-way ANOVA.

[2021: 2 Mark]

2. A study is conducted to see the effectiveness of volume levels of commercials. In the graph given below, values of mean effectiveness (dependent variable) are presented on the Y-axis, and three levels of volume, namely soft, medium, and loud are presented on the X-axis. The graph shows the relationship between volume and mean effectiveness for males in the continuous line and for females in the dashed line. Which of the following interpretation(s) is/are correct from the graph?

(A) A linear relationship exists for males and a nonlinear relationship for females.

(B) The effect of increasing volume on effectiveness depends on whether the participant is a male or a female.

(C) No interaction effect is seen.

(D) A linear relationship exists for both males and females.

[2022: 2 Mark]

3. Which of the following statement(s) is/are correct regarding Multiple Analysis of Variance (MANOVA)?

(A) Tests the mean difference of more than two groups on one dependent variable.

(B) Tests the mean difference of more than two groups across several dependent variables.

(C) The independent variable is measured on a nominal scale and dependent variable on an interval or ratio scale.

(D) The dependent variable is measured on nominal scale and independent variable on an interval or ratio scale.

[2023: 1 Mark]

4. According to the review of research on stress and the immune system, which of the following statement(s) has/have substantial evidence?

(A) There is a negative relationship between stress and functional immune measures

(B) There is no measurable impact of stress on functional immune measures

(C) Loneliness impacts the relationship between stress and functional immune measures

(D) There is a positive relationship between long-term stressors and functional immune measures

[2024: 2 Mark]

5. Independent variable(s) is/are also known as:

(A) Explanatory variable (B) Explainable variable

(C) Exogenous variable (D) Explicit variable

[2024: 2 Mark]

6. Which of the following tests are post hoc?

(A) Neuman-Keuls test

(B) *t*-test

(C) Duncan Multiple Range test

(D) Tukey test

Numerical Answer Type Questions (NAT)

[2 Mark 2023]

1. The value of F calculated from the data given in the table below is _____ (rounded off to one decimal place).

Source	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)
Between	54	3	18
Within	100	20	5

Answer Key					
Multiple Choice Questions (MCQ)					
1	**2**		**3**		**4**
C	D		C		A
Multiple Select Questions (MSQ)					
1	**2**	**3**	**4**	**5**	**6**
A,B	A,B	B,C	A,C	A,C	A,C,D
Numerical Answer Type Questions (NAT)					
1					
3.6 to 3.6					