Research Methods & Ethics — Exam Solutions with Explanations

Covers: True/False, Fill■in■the■Blank, and Multiple■Choice Questions

1) True/False — Answers & Explanations

1. Research in computing always requires conducting experiments.
Answer: **False**

Why: Computing research can be theoretical, design■science, empirical (observational), or purely literature■based without running experiments.

2. A hypothesis is a testable statement about the relationship between variables.
Answer: **True**

Why: It predicts how an independent variable relates to a dependent variable and can be empirically tested.

3. Pure research is conducted primarily to solve immediate practical problems.
Answer: **False**

Why: Pure (basic) research expands knowledge; applied research solves immediate real■world problems.

4. Anonymizing data helps protect participant privacy.
Answer: **True**

Why: Removing direct/indirect identifiers reduces re■identification risk.

5. Research misconduct includes data fabrication and falsification.
Answer: **True**

Why: Both involve making up or manipulating data and violate integrity policies.

6. Applied research aims to solve specific, real■world problems.
Answer: **True**

Why: Its goal is practical impact (e.g., improving systems, processes, interfaces).

7. Descriptive statistics summarize data using measures like mean and standard deviation.
Answer: **True**

Why: They describe central tendency and dispersion of a dataset.

8. A p■value less than 0.05 typically indicates statistical significance.
Answer: **True**

Why: By convention (not law), $p<0.05$ suggests results unlikely due to chance under H0.

9. A research question must be broad to allow flexibility in findings.
Answer: **False**

Why: Good questions are specific, focused, and answerable.

10. The research process typically begins with identifying a problem.
Answer: **True**

Why: Recognizing a problem or gap frames the entire study.

11. Literature review is optional in computing research.
Answer: **False**

Why: It is essential to justify novelty and avoid duplication.

12. A research gap is an area that has been thoroughly studied.
Answer: **False**

Why: A gap is where prior work is limited, inconsistent, or absent.

13. Logistic regression is used when the outcome variable is continuous.
Answer: **False**

Why: Logistic regression models categorical outcomes (e.g., binary).

14. The abstract should include detailed methodology and statistical results.
Answer: **False**

Why: Abstracts are concise overviews; full details belong in Methods/Results sections.

15. The introduction should end with research questions or hypotheses.
Answer: **True**

Why: This orients the reader to the study's aims and predictions.

16. Reproducibility is not important in computing research.
Answer: **False**

Why: Reproducibility is vital for credibility and cumulative science.

17. Peer■reviewed journals are a reliable source of academic information.
Answer: **True**

Why: They undergo expert scrutiny for rigor and contribution.

18. An abstract summarizes the entire research paper.
Answer: **True**

Why: It concisely covers purpose, methods, main results, and implications.

19. Plagiarism can occur even if you cite the source incorrectly.
Answer: **True**

Why: Misattribution or inadequate citation can still be plagiarism.

20. Peer review always guarantees a paper is correct.
Answer: **False**

Why: It reduces errors but cannot guarantee correctness.

21. Conference papers in computing are often peer■reviewed.
Answer: **True**

Why: Reputable venues (e.g., ACM/IEEE) use stringent review processes.

22. A literature review only includes sources that support your hypothesis.
Answer: **False**

Why: It must be balanced, including conflicting evidence and gaps.

23. Zotero and Mendeley help manage citations and references.
Answer: **True**

Why: They assist with collecting, citing, and formatting sources.

24. LaTeX is used for writing technical documents and research papers.
Answer: **True**

Why: Common in STEM for typesetting equations and references.

25. Independent variables are the outcomes being measured.
Answer: **False**

Why: Independent variables are manipulated or categorized; dependent variables are measured outcomes.

26. Dependent variables are influenced by independent variables.
Answer: **True**

Why: They reflect the effect or response.

27. Qualitative research focuses on numerical data.

Answer: **False**

Why: It focuses on meanings, experiences, and non■numeric data (e.g., interviews).

28. Quantitative research uses statistical analysis.
Answer: **True**

Why: It analyzes numeric data using statistical tests/models.

29. Mixed methods combine qualitative and quantitative approaches.
Answer: **True**

Why: Integration yields a more complete view.

30. A pilot study is a small■scale version of the main study.
Answer: **True**

Why: Used to test feasibility, instruments, and procedures.

31. Case studies are only used in qualitative research.
Answer: **False**

Why: They may include both qualitative and quantitative evidence.

32. Reproducibility means obtaining the same results using the same data and code.
Answer: **True**

Why: Independent re■runs should match prior outcomes.

33. AI■generated text can be used in research papers without disclosure.
Answer: **False**

Why: Best practice and many venues require disclosure/attribution of AI assistance.

34. In qualitative research, sample size is determined by data saturation.
Answer: **True**

Why: Sampling continues until no new themes emerge.

2) Fill■in■the■Blank — Answers & Explanations

1. _____ improves validity by using multiple data sources or methods.
Answer: **Triangulation**

Why: Corroborates findings across methods, data sources, or investigators.

2. A formal plan for conducting research is a research _____.
Answer: **Proposal**

Why: Outlines background, aims, methods, ethics, and timeline.

3. The _____ is a brief summary of the entire research paper.
Answer: **Abstract**

Why: 150–300 words summarizing purpose, methods, key results, and implications.

4. Copying someone else's work without credit is _____.
Answer: **Plagiarism**

Why: An ethical violation; always attribute ideas and wording.

5. The list of all sources cited in a paper is called the _____.
Answer: **References (Bibliography)**

Why: Complete list of works cited and/or consulted.

6. _____ is a version control system often used to track code and collaboration.
Answer: **Git**

Why: Supports branching, merging, and provenance of research code/data.

7. A _____ review ensures quality before publication.
Answer: **Peer**

Why: Experts evaluate rigor, clarity, and contribution.

8. Journals that charge fees without proper review are called _____ journals.
Answer: **Predatory**

Why: Exploitative venues with little or no peer review.

9. A unique identifier for academic papers is a _____.
Answer: **DOI**

Why: Digital Object Identifier provides a persistent link.

10. The _____ section interprets the results and relates them to prior work.
Answer: **Discussion**

Why: Explains meaning, implications, limitations, and future work.

11. The _____ section describes how data was collected and analyzed.
Answer: **Methodology (Methods)**

Why: Details design, sampling, instruments, procedures, and analysis.

12. _____ research aims to explore a topic with little prior knowledge.
Answer: **Exploratory**

Why: Open■ended inquiry to scope the problem space.

13. _____ research tests specific hypotheses using structured methods.
Answer: **Confirmatory (Quantitative)**

Why: Employs predefined measures and statistical tests.

14. A _____ is a broad explanation supported by extensive evidence, while a hypothesis is testable.
Answer: **Theory**

Why: Theories explain phenomena; hypotheses are specific predictions.

15. _____ break down a subject or research question into lower and lower levels of detail.
Answer: **Decomposition techniques**

Why: Used in systems analysis and research planning.

16. The _____ research process model recognizes that research methods evolve and change over time.
Answer: **Dynamic (Iterative) model**

Why: Allows adaptation of methods as evidence and context change.

17. The _____ measures how spread out the data is from the mean.
Answer: **Standard deviation**

Why: A dispersion index; larger values mean more variability.

18. The _____ section of a paper summarizes the entire study in 150–300 words.
Answer: **Abstract**

Why: Concise summary to help readers decide to read the full paper.

19. The _____ section presents the findings without interpretation.
Answer: **Results**

Why: Reports analyses, tables, and figures objectively.

20. A _____ is a formal document submitted for a degree, such as a PhD.
Answer: **Thesis (Dissertation)**

Why: Presents original research to satisfy degree requirements.

21. _____ of a paper is an individual who made a significant intellectual contribution to the work.
Answer: **Author**

Why: Meets authorship criteria (design, analysis, drafting, accountability).

22. Longest■duration path through a network identifying tasks that must not be delayed is called _____.
Answer: **Critical path**

Why: Determines minimum project duration; tasks on it have zero slack.

23. In computing research, _____ diagrams represent task order and inter■dependency of tasks where tasks are rectangular nodes, milestones are diamond■shaped, and arrows show order.
Answer: **PERT (AON network) diagrams**

Why: Program Evaluation and Review Technique; often paired with CPM.

24. A work or invention that is the result of creativity (manuscript, design) to which one has rights is _____.
Answer: **Intellectual Property (IP)**

Why: Protectable via copyright, patent, trademark, etc.

25. _____ is the unethical use of others' ideas or words without credit.
Answer: **Plagiarism**

Why: Always paraphrase appropriately and cite sources.

26. _____ is a tool for managing bibliographic references (e.g., citations).
Answer: **Zotero (or Mendeley)**

Why: Collects, organizes, and formats citations and PDFs.

27. _____ reasoning proceeds from theories and predicts likely observations.
Answer: **Deductive**

Why: Top■down logic: theory → hypothesis → observation.

3) Multiple■Choice Questions — Answers & Explanations

1. What is a hypothesis in research?
Correct answer: **c) A testable statement predicting a relationship**

Why: It specifies a predicted relationship between variables that can be empirically tested.

2. What is the first step in the research process?
Correct answer: **c) Identifying a research problem**

Why: Defining the problem frames the entire study and precedes methods and data collection.

3. Best approach for exploring user interactions with a new software interface?
Correct answer: **a) Qualitative research**

Why: Think■alouds, interviews, and observations capture rich behavioral insights.

4. A literature review helps researchers:
Correct answer: **b) Identify gaps in existing knowledge**

Why: It maps prior work, controversies, and unanswered questions.

5. Example of a primary data source in computing research:
Correct answer: **b) User survey responses**

Why: Primary data are collected first■hand by the researcher.

6. In research, validity refers to:
Correct answer: **b) Accuracy of measuring what is intended**

Why: Internal, construct, and external validity address accuracy at different levels.

7. Reliability refers to:
Correct answer: **b) How consistent the measurement is**

Why: A reliable instrument yields similar results under similar conditions.

8. Design most appropriate for testing performance of two algorithms under controlled conditions:
Correct answer: **b) Experimental design**

Why: Manipulate the algorithm condition and hold others constant.

9. The abstract of a paper is:
Correct answer: **c) A brief summary of the entire paper**

Why: It includes purpose, methods, main results, and implications.

10. Purpose of a literature review in computing research:
Correct answer: **a) Summarize existing knowledge and identify gaps**

Why: It situates your work in the scholarly context.

11. Ethical principle ensuring participants are not harmed:
Correct answer: **b) Beneficence**

Why: Maximize benefits and minimize harms.

12. Main advantage of mixed■methods research:
Correct answer: **b) Combines strengths of qualitative and quantitative approaches**

Why: Triangulation and complementarity of findings.

13. Which is essential in ethical research?
Correct answer: **b) Informed consent**

Why: Participants must voluntarily agree with adequate information.

14. Action research is commonly used in:
Correct answer: **b) Organizational or educational settings**

Why: Collaborative cycles of planning, action, and reflection.

15. Common tool for managing references:
Correct answer: **b) Zotero**

Why: Also Mendeley/EndNote; helps with citations and libraries.

16. Purpose of a null hypothesis in statistical testing:
Correct answer: **b) Assume no effect or relationship exists**

Why: Statistical tests evaluate evidence against H0.

17. Main purpose of a Gantt chart in research planning:
Correct answer: **d) Visualize project timelines and tasks**

Why: Charts task durations, deadlines, and dependencies.

18. What is informed consent in computing research?
Correct answer: **a) Permission from participants after explaining the study**

Why: Disclose purpose, procedures, risks, benefits, and rights.

19. An ethical issue in AI research:
Correct answer: **a) Bias in datasets**

Why: Skewed data can yield unfair or unsafe model behavior.

20. Internal validity refers to:
Correct answer: **b) Accuracy of conclusions within the study**

Why: Are effects attributable to the manipulated variables?

21. Plagiarism in research means:
Correct answer: **b) Copying others' work without credit**

Why: Includes verbatim and close paraphrase without citation.

22. Key characteristic of a good research question:
Correct answer: **d) It is specific and answerable**

Why: Specificity guides design, sampling, and analysis.

23. Purpose of a research design:
Correct answer: **b) To structure the research process**

Why: Blueprint for sampling, instruments, and analysis.

24. Design used to study rare phenomena in cybersecurity:
Correct answer: **a) Case study**

Why: In■depth analysis of unusual or critical incidents.

25. A researcher testing a new algorithm's efficiency uses:
Correct answer: **b) Quantitative research**

Why: Efficiency metrics (time, memory) are numerical.

26. A control group is used for:
Correct answer: **a) To compare results with the experimental group**

Why: It helps isolate the effect of the treatment.

27. Best for studying user behavior with a new app:
Correct answer: **c) Observational study**

Why: Direct observation captures naturalistic interaction patterns.

28. Main purpose of a methodology section:
Correct answer: **c) To describe how the research was conducted**

Why: Enables evaluation and replication.

29. Main advantage of using a survey:

Correct answer: **b) It allows for large■scale data collection**

Why: Efficient for reaching many respondents.

30. Common method for ensuring data privacy:
Correct answer: **a) Data encryption**

Why: Protects stored/transmitted data from unauthorized access.

31. Primary goal of research in computing:
Correct answer: **b) Advancing knowledge systematically**

Why: Development follows from but is not the sole goal.

32. NOT a characteristic of good research:
Correct answer: **b) Subjective**

Why: Good research is empirical, objective, logical, and replicable.

33. Type of research that focuses on solving practical problems:
Correct answer: **b) Applied research**

Why: Targets immediate, real■world applications.

34. A hypothesis in computing research is:
Correct answer: **b) A tentative explanation**

Why: A claim to be tested, not a proven fact.

35. Approach common in AI studies:
Correct answer: **d) All of the above**

Why: AI can involve qualitative, quantitative, and experimental work.

36. Main purpose of a research abstract:
Correct answer: **c) To summarize the entire research paper**

Why: Provides a quick overview for readers.

37. A primary source in computing research:
Correct answer: **b) A research paper on neural networks published in a conference**

Why: Original empirical/theoretical work.

38. “Peer■reviewed” means:
Correct answer: **c) Reviewed by experts in the field before publication**

Why: Quality control via external evaluation.

39. NOT a common computing research domain:
Correct answer: **c) Mechatronics**

Why: Related to mechanical/electrical systems; not a core computing domain.

40. Paradigm emphasizing objective, measurable data:
Correct answer: **c) Positivism**

Why: Seeks quantifiable, observable evidence.

41. Role of theory in research:
Correct answer: **b) To provide a framework for understanding phenomena**

Why: Guides hypotheses, variables, and interpretation.

42. Which is a research objective?
Correct answer: **b) To understand factors affecting software maintainability**

Why: Specific and researchable.

43. Difference between aims and objectives:
Correct answer: **a) Aims are vague, objectives are specific**

Why: Objectives operationalize broader aims.

44. Essential for ethical research:
Correct answer: **b) Informed consent**

Why: Protects autonomy, privacy, and rights.

45. Research design is:
Correct answer: **b) The plan for collecting and analyzing data**

Why: Specifies strategies, instruments, and analyses.

46. Random assignment is important to:
Correct answer: **d) Reduce selection bias**

Why: Creates comparable groups, improving internal validity.

47. Design used to explore a phenomenon in depth:
Correct answer: **b) Case study**

Why: Allows rich contextual understanding.

48. Best design for testing a new ML model's accuracy:
Correct answer: **d) Experimental**

Why: Controls conditions to evaluate performance objectively.

49. Best method for in■depth user feedback on a mobile app:
Correct answer: **c) Interview**

Why: Interviews elicit detailed perceptions and pain points.

50. Tool commonly used to collect data in usability testing:
Correct answer: **d) Eye■tracking device**

Why: Measures gaze to infer attention and difficulties.

51. What is a prototype in computing research?
Correct answer: **b) An early model for testing**

Why: Supports iteration on design and functionality.

52. What is a questionnaire?
Correct answer: **c) A set of written questions for respondents**

Why: Structured instrument for data collection.

53. Main characteristic of quantitative research:
Correct answer: **a) Uses numerical data and statistical analysis**

Why: Focus on measurement and hypothesis testing.

54. In computing research, reproducibility means:
Correct answer: **a) Ability to get the same results when repeating an experiment**

Why: Using the same data/code should yield the same outcomes.

55. What is a research hypothesis?
Correct answer: **b) A testable prediction about the relationship between variables**

Why: Links independent and dependent variables.

56. Approach that starts with observations and develops theories:
Correct answer: **b) Inductive**

Why: Bottom■up reasoning from data to theory.

57. Difference between validity and reliability:
Correct answer: **b) Validity = accuracy; Reliability = consistency**

Why: Both are necessary for trustworthy measurement.

58. What is a research paradigm?
Correct answer: **b) A philosophical framework guiding research methodology**

Why: Examples: positivism, interpretivism, pragmatism.

59. What is grounded theory?
Correct answer: **c) A method to develop theory from qualitative data**

Why: Systematic coding and constant comparison build theory.

60. Which is a source of secondary data?
Correct answer: **c) Using public datasets such as Kaggle**

Why: Data collected by others for reuse.

61. Metric commonly collected in usability testing:
Correct answer: **b) Task completion time**

Why: Assesses efficiency and usability.

62. Main advantage of using sensors in data collection:
Correct answer: **d) They provide objective, continuous data**

Why: Reduce recall bias and capture high■frequency signals.