# کامیابی کا تعویذ

NEW Examination POLICY **Annual 2026** پنجاب کے تمام بورڈز کے لیے

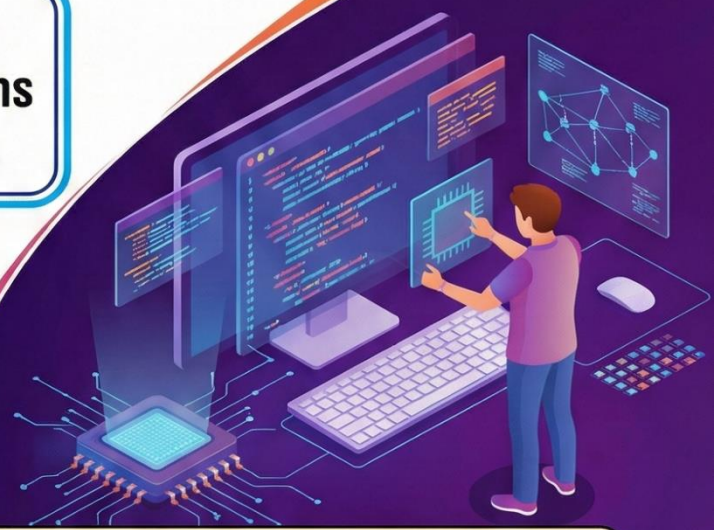
(Complete Solved)

# COMPUTER SCIENCE

## Inter Part-I

اب فیل ہونا بھول جائیں

* Most Imp. 300 MCQs
* Most Imp. 300 Short Questions
* Most Imp. 50 Long Questions



According to ALP

A+ Challenge

صرف 2 ماہ تیاری کر کے پڑھائی میں کمزور طلباء و طالبات A+ گریڈ میں کامیابی حاصل کر سکتے ہیں۔


(محمد قدیر رفیق)

**القدیر جناح سائنس اکیڈمی**

ملیاں کلاں مرید کے روڈ شیخوپورہ

0302-4741124

# Computer Science & Entrepreneurship-11

## Multiple Choice Questions

| Question | A | B | C | C |
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| **1. The primary purpose of the Software Development Life Cycle (SDLC) is to:** | Design websites | **Deliver high-quality software within time and cost estimates ✓** | Manage database systems | Create hardware components |
| **2. A type of requirement specifying system performance is:** | Functional Requirements | **Non-Functional Requirements ✓** | Technical Requirements | Operational Requirements |
| **3. The role of a framework in the context of SDLC is to:** | Write code from scratch | **Provide a structured foundation with predefined components and architectures ✓** | Manage hardware | Perform manual testing |
| **4. The purpose of SDLC is to:** | Reduce computer memory | Make software open-source | **Deliver high-quality software on time and within budget ✓** | Make hardware faster |
| **5. A software framework helps developers by:** | Avoiding user input | Creating electricity | **Reusing code and speeding up development ✓** | Slowing down the process |
| **6. Which of the following is an example of a software development framework?** | Google Chrome | Windows | **Django ✓** | Excel |
| **7. Which of the following is NOT a stage of the Software Development Life Cycle?** | Testing | **Cooking ✓** | Coding | Design |
| **8. What is the goal of requirement gathering in SDLC?** | To test the final product | **To understand user needs ✓** | To design the system interface | To write code |
| **9. Which activity involves asking users about their expectations?** | Observation | Coding | **Interviews and surveys ✓** | Maintenance |

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| **10. What is done during document review in the requirement gathering phase?** | Creating flowcharts | **Reading existing reports and manuals ✓** | Drawing system diagrams | Writing new code |
| **11. Functional requirements are used to describe:** | How fast the software should run | **The specific tasks the software must perform ✓** | The cost of the software | The physical layout of hardware |
| **12. Which of the following is an example of observation during requirement gathering?** | **Watching users work with the current system ✓** | Conducting a survey | Writing user manuals | Holding a team meeting |
| **13. Non-functional requirements focus on:** | What the system should do | **How the system performs tasks ✓** | Number of users using the system | None of the above |
| **14. Which of the following is an example of a non-functional requirement?** | The system must allow users to search books | The system must store user data | **The system must support up to 1000 users at once ✓** | The system must print receipts |
| **15. What does system reliability refer to?** | How fast the system processes requests | **How often the system is available and running ✓** | The number of users who like the system | The color of the user interface |
| **16. Which of these best represents a security requirement?** | System supports different themes | **User data must be encrypted and access-controlled ✓** | System must display reports | System must allow password reset |
| **17. Why are non-functional requirements important?** | They define business goals | They describe hardware costs | **They ensure the system meets quality standards ✓** | They are optional in software projects |
| **18. What is the focus of the design phase in SDLC?** | Writing code | Testing the software | **Planning how the software will work and look ✓** | Collecting user feedback |
| **19. Which of the following is created to show the step-by-step process of a program?** | Database | **Flowchart ✓** | Test plan | Source code |
| **20. What are mockups used for in software design?** | To test user performance | To design database connections | **To show the program's user interface ✓** | To write back-end code |

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| **21. What does architecture planning help with?** | Software pricing | Software advertisements | **Organizing components and their interactions ✓** | Adding multimedia elements |
| **22. Why is requirement specification important in the design phase?** | To reduce the number of team members | To keep users away from the software | **To ensure every part of the software has a clear purpose ✓** | To design colorful backgrounds |
| **23. What happens during the coding phase of software development?** | Requirements are gathered | Software is tested | **Programmers write code based on design ✓** | The system is marketed |
| **24. What is the purpose of writing code in software development?** | To decorate the software | To test the software | **To give the computer instructions ✓** | To create user manuals |
| **25. What guides the programmers during the development phase?** | Marketing plan | **Design specifications ✓** | Testing report | System feedback |
| **26. Which of the following best describes a programming language?** | A way to manage software licenses | A tool to design interfaces only | **A language used to write instructions for computers ✓** | A system for writing reports |
| **27. Why is the development phase important in SDLC?** | It sets project deadlines | It decides the team budget | **It creates the actual working software ✓** | It checks user feedback |
| **28. What is the main goal of the maintenance phase?** | Designing the user interface | **Keeping the software updated and functional ✓** | Writing new requirements | Testing the code |
| **29. Which of the following is NOT part of maintenance?** | Fixing bugs | Upgrading software | **Gathering initial requirements ✓** | Adapting to new technologies |
| **30. Why is maintenance important?** | To redesign the software from scratch | **To keep the software working over time ✓** | To remove all features | To test new hardware |
| **31. Software maintenance may include:** | Creating login systems | Conducting surveys | **Performance improvements and bug fixes ✓** | Writing new installation programs |
| **32. Maintenance happens:** | Before coding | Only during testing | **After deployment ✓** | During requirement gathering |

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| **33. Software development model involving short cycles or sprints is:** | Waterfall Model | **Agile Methodology ✓** | Lean Software Development | Scrum |
| **34. What is a software development methodology?** | A type of programming language | **A structured approach to managing software projects ✓** | A testing tool | A data storage method |
| **35. Which of the following is a benefit of using software process models?** | Increases randomness in coding | Reduces predictability | **Helps manage risks and improve planning ✓** | Avoids teamwork |
| **36. What does a software process model provide?** | Software licenses | Visual design of user interfaces | **A roadmap for how software is developed ✓** | Hardware support |
| **37. Why are structured methodologies useful in software development?** | They allow skipping testing | **They improve organization and reduce wasted effort ✓** | They focus only on design | They increase cost |
| **38. Which one is NOT a benefit of using a software process model?** | Quality control | Faster planning | **Code encryption ✓** | Efficient development |
| **39. What is the Waterfall Model?** | A programming language | A testing method | **A step-by-step software development model ✓** | A type of software |
| **40. Which phase of the Waterfall Model comes after design?** | Requirements | Maintenance | **Implementation ✓** | Deployment |
| **41. Why is the Waterfall Model good for small projects?** | It is very flexible | **Requirements don't usually change ✓** | It skips testing | It works only online |
| **42. What is a limitation of the Waterfall Model?** | Too flexible | Doesn't require planning | **Difficult to go back to previous phases ✓** | No testing is done |
| **43. Which of the following is NOT a phase in the Waterfall Model?** | Design | **Hacking ✓** | Deployment | Testing |
| **44. What is the main goal of Agile methodology?** | To complete the whole project at once | To work without any testing | **To deliver small parts of software quickly and get feedback ✓** | To avoid customer involvement |
| **45. What is an iteration or sprint in Agile?** | A single long development phase | **A short development cycle with** | A testing tool | A type of programming language |

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| | | **focused goals ✓** | | |
| **46. What does "Pair Programming" mean in Agile?** | Writing programs in pairs of languages | **One developer writes code while another reviews it live ✓** | Programming for two software products | Coding with two monitors |
| **47. One limitation of Agile is:** | It doesn't allow changes in requirements | **It is hard to manage in large projects ✓** | It doesn't include testing | It uses no planning |
| **48. Which Agile practice helps detect code problems early?** | **Pair Programming ✓** | Manual Testing | Continuous Integration | Waterfall Modeling |
| **49. Crucial aspect of comprehensive project planning:** | **Understanding the project scope and tasks ✓** | Deciding the project's colour scheme | Hiring a large development team | Ignoring potential risks |
| **50. Factor that does not influence cost estimation of a software project:** | Scope of the project | Technology stack | **Number of meetings held ✓** | Operational costs |
| **51. Which of the following best describes comprehensive project planning?** | Only focusing on coding tasks | Ignoring cost estimation | **Planning all aspects of the project before starting ✓** | Developing the project without a timeline |
| **52. What is the main benefit of setting project timelines?** | It reduces the project cost | **It ensures timely completion of the project ✓** | It eliminates the need for risk management | It guarantees no bugs in the software |
| **53. Which factor does NOT affect the cost estimation of a software project?** | Development Team | Project Duration | Quality Assurance | **Internet Speed ✓** |
| **54. What is the first step in risk management?** | Analysing risks | Monitoring and reviewing risks | **Identifying risks ✓** | Developing code |
| **55. During which phase is the actual software built?** | Planning | **Execution ✓** | Risk Assessment | Cost Estimation |
| **56. What is the Singleton Pattern primarily used for?** | Creating multiple instances of a class | **Ensuring only one instance of a class exists ✓** | Creating a family of objects | Notifying observers about changes |
| **57. Which design pattern allows you to abstract the creation of objects?** | Singleton Pattern | Observer Pattern | **Factory Pattern ✓** | Strategy Pattern |
| **58. What is the main role of the Observer Pattern?** | Selecting the right algorithm for a task | Ensuring only one instance of a class | **Notifying multiple components about changes ✓** | Creating objects in a uniform way |

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| **59. What does the Strategy Pattern allow in terms of algorithm selection?** | Selecting algorithms statically at compile-time | **Allowing runtime selection of algorithms ✓** | Fixing one algorithm for the whole system | Creating algorithms dynamically |
| **60. Which design pattern is useful for creating products that follow a common interface?** | Observer Pattern | Singleton Pattern | **Factory Pattern ✓** | Strategy Pattern |
| **61. What is the main benefit of using design patterns in software development?** | Increased complexity | Reduced code reusability | **Better communication among developers ✓** | Higher software cost |
| **62. Which of the following is a result of applying design patterns to a software system?** | The system becomes more difficult to understand | **The system becomes flexible and easier to maintain ✓** | The system loses its scalability | The code is less reusable |
| **63. How do design patterns help in communication among developers?** | **By providing a shared vocabulary and standardized solutions ✓** | By creating complex and confusing code | By making it harder to understand the system | By discouraging team collaboration |
| **64. What is one way design patterns reduce code complexity?** | By making the code less organized | **By providing standardized solutions that simplify system structure ✓** | By increasing the number of components | By removing all comments and documentation |
| **65. Which of the following benefits does design patterns NOT provide?** | Flexibility in design | Easier onboarding for new developers | **Making the code harder to maintain ✓** | Improved system scalability |
| **66. What does debugging help a software developer do?** | Write more code | **Find and fix errors in the software ✓** | Increase the software's memory usage | Test the software for bugs |
| **67. Which of the following is a tool commonly used for debugging?** | Text editor | **Debugger ✓** | Compiler | Database |
| **68. How do print statements help in debugging?** | **By displaying variable values during program execution ✓** | By automatically fixing errors in the code | By removing all bugs from the software | By compiling the code faster |
| **69. What is the purpose of code reviews in debugging?** | **To spot potential errors and suggest improvements ✓** | To compile the software more efficiently | To write code automatically | To check for compatibility with other systems |

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| **70. Which of the following is NOT a step in the debugging process?** | Identifying bugs | Fixing bugs | **Ignoring bugs ✓** | Monitoring the program's behavior |
| **71. What is the primary goal of Unit Testing?** | To check the performance of the entire system | **To verify that individual components work as expected ✓** | To evaluate the interaction between different modules | To ensure that the software meets user expectations |
| **72. What is the main focus of Integration Testing?** | Testing individual components in isolation | **Checking the interaction between different components ✓** | Evaluating the overall security of the system | Ensuring that the software meets user expectations |
| **73. What does System Testing evaluate?** | The interaction between different modules | **The overall functionality, performance, and security of the software ✓** | The correctness of individual functions | The software's readiness for release |
| **74. Who typically conducts Acceptance Testing?** | Developers | **End-users or clients ✓** | Testers in the development team | System administrators |
| **75. What type of errors are checked during Integration Testing?** | Errors in the individual components | **Interface errors and data flow between modules ✓** | Overall system performance | Bugs in user interfaces |
| **76. What is the primary purpose of a code editor in software development?** | To convert high-level programming languages into machine language | **To write and edit code in different programming languages ✓** | To test the functionality of the software | To manage version control of the software |
| **77. How do interpreters and compilers differ?** | **Interpreters translate code line-by-line, while compilers translate the entire code at once ✓** | Compilers translate code line-by-line, while interpreters translate the entire code at once | Interpreters are used for compiled languages, while compilers are used for interpreted languages | There is no difference between interpreters and compilers |
| **78. Which of the following is an example of a code editor?** | GDB | **VS Code ✓** | GCC | Python Interpreter |
| **79. What is the role of debuggers in software development?** | To convert code into machine language | **To help developers find and fix errors in the code ✓** | To edit code and add new features | To compile the source code into executable code |

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| **80. Which debugger is used primarily for C and C++ programming?** | Visual Studio Debugger | **GDB (GNU Debugger) ✓** | Python Debugger | IntelliJ Debugger |
| **81. What is an Integrated Development Environment (IDE)?** | A tool for converting code into machine language | **A software suite that integrates development tools like editors, compilers, and debuggers ✓** | A programming language used for creating software | A hardware tool for compiling software |
| **82. Which of the following IDEs is primarily used for Python development?** | Visual Studio | Eclipse | **PyCharm ✓** | IntelliJ IDEA |
| **83. What is the main benefit of using an IDE?** | It only provides a text editor for coding | **It integrates various development tools into one platform to streamline development ✓** | It is used for debugging only | It compiles the code into machine language |
| **84. Which IDE is popular for .NET and C++ development?** | PyCharm | **Visual Studio ✓** | Sublime Text | NetBeans |
| **85. How do IDEs improve developer productivity?** | **By providing a single interface for writing, testing, and debugging code ✓** | By compiling code into machine language faster | By offering limited debugging features | By eliminating the need for version control systems |
| **86. What is the main difference between online and offline computing platforms?** | **Online platforms require internet access, while offline platforms do not ✓** | Offline platforms require internet access, while online platforms do not | Online platforms are only for writing code, while offline platforms are for debugging | There is no difference between online and offline platforms |
| **87. Which of the following is an example of an online computing platform?** | Visual Studio | PyCharm | **Gitpod ✓** | Eclipse |
| **88. What is the primary purpose of source code repositories?** | To store software documentation | **To track changes and manage versions of code ✓** | To compile code into machine language | To run code on remote servers |
| **89. Which platform is primarily used for open-source projects?** | **GitHub ✓** | Bitbucket | Gitpod | Repl.it |

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| **90. What is a key benefit of using source code repositories for version control?** | It makes it impossible to change the code once it is committed | **It helps in tracking code changes and facilitates collaboration ✓** | It only allows one developer to work on the code at a time | It eliminates the need for backups |
| **91. An action needed during Python installation to run from the command line easily:** | Uncheck "Add Python to PATH" | Choose a different IDE | **Check "Add Python to PATH" ✓** | Install only the IDE |
| **92. Python is best known for its:** | Complex syntax | Hard learning curve | **Simple and easy-to-read structure ✓** | Hardware management |
| **93. What is the first step in writing a computer program?** | Execute the code | **Write the code ✓** | Debug the program | Install libraries |
| **94. What does compiling or interpreting a program do?** | Deletes the code | **Converts code into machine language ✓** | Displays graphics | Designs websites |
| **95. Where can you download Python officially?** | www.google.com | **www.python.org ✓** | www.github.com | www.stackoverflow.com |
| **96. What is an IDE in programming?** | A type of computer hardware | **A tool to make writing and testing code easier ✓** | A special programming language | A data analysis tool |
| **97. A valid variable name in Python is:** | **Variable1 ✓** | 1 Variable | Variable-name | Variable name |
| **98. What is the output of the following piece of code? age = 25 print(" Age:", age)** | **Age: 25 ✓** | 25 | Age | age |
| **99. What does the print() function do in Python?** | Calculates numbers | **Displays output on the screen ✓** | Stores data in memory | Deletes files |
| **100. How is a single-line comment written in Python?** | // comment | /* comment */ | **# comment ✓** | --comment |
| **101. What symbol is used to start a multi-line comment in Python?** | Double quotes "" | **Triple quotes ✓** | Forward slash / | Curly braces {} |
| **102. What happens if you don't add Python to the PATH during installation?** | Python will not install | **You can't run Python from the command line ✓** | Python will run automatically | The computer will crash |
| **103. Which of the following is a correct way to output text in Python?** | display("Hello") | echo "Hello" | **print("Hello") ✓** | show("Hello") |
| **104. What is the correct way to define a variable in Python?** | 17 = age | **age = 17 ✓** | 17: age | int age = 17 |
| **105. What does the input() function do in Python?** | Displays a message on the screen | **Takes input from the user and returns it as a string ✓** | Executes the code | Converts input data into an integer |

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| **106. Which of the following is used to convert a user input into an integer in Python?** | float() | **int() ✓** | str() | list() |
| **107. How do you display a message in Python?** | display("Hello!") | **print("Hello!") ✓** | show("Hello!") | output("Hello!") |
| **108. The operator used for exponentiation in Python is:** | * | **✓**** | // | / |
| **110. What is the result of 15 // 4 in Python?** | **3 ✓** | 3.75 | 4 | 3.0 |
| **111. Which of the following operators is used to find the remainder of a division in Python?** | // | **% ✓** | ** | / |
| **112. What will be the output of 5 ** 2 in Python?** | 5 | **25 ✓** | 10 | 50 |
| **113. Which operator in Python performs floor division?** | / | * | **// ✓** | % |
| **114. Which comparison operator checks for inequality in Python?** | == | **!= ✓** | \> | <= |
| **115. What will be the result of 'S' <= 's' in Python?** | False | **True ✓** | None | Error |
| **116. What does the > operator do in Python?** | Checks if the first value is less than the second | **Checks if the first value is greater than the second ✓** | Checks if the values are equal | Checks if the values are not equal |
| **117. Which of the following will return False when comparing 10 and 5?** | 10 > 5 | **10 == 5 ✓** | 10 != 5 | 10 >= 5 |
| **118. What is the output of the comparison 10 >= 5?** | **True ✓** | False | Error | None |
| **119. Which of the following assignment operators is used to perform exponentiation?** | *= | += | **= ✓** | /= |
| **120. What will be the output of the following code? a = 5; a *= 2; print(a)** | **10 ✓** | 5 | 7 | 15 |
| **121. What does the -= operator do in Python?** | Adds the right value to the left value | **Subtracts the right value from the left value ✓** | Multiplies the left value by the right value | Divides the left value by the right value |
| **122. Which of the following logical operators returns True if at least one condition is True?** | and | **or ✓** | not | None of the above |
| **123. What will be the output of the following code: x = True; y = False; print(x and y)?** | True | **False ✓** | Error | None of the above |
| **124. What does the not operator do in Python?** | **Negates the value of a Boolean expression ✓** | Combines multiple conditions | Returns True if all conditions are True | Returns True if any condition is True |
| **125. Which of the following statements is correct about the or logical operator?** | It returns True if both | **It returns True if at least** | It returns True only if both | It returns False if both |

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| | conditions are False | **one condition is True ✓** | conditions are True | conditions are True |
| **126. If x = True and y = False, what will be the result of x or y?** | **True ✓** | False | None of the above | Error |
| **127. Which of the following will be evaluated first in the expression (3 + 2) ** 4?** | Addition | Multiplication | **Parentheses ✓** | Subtraction |
| **128. What will be the result of the expression 3 + 2 * 4 in Python?** | 20 | 14 | **11 ✓** | 10 |
| **129. Which operator has the highest precedence in Python?** | + | * | () **✓** | ** |
| **130. In the expression 2 ** 3 * 4, which operation is performed first?** | **Exponentiation ✓** | Multiplication | Parentheses | Addition |
| **131. What is the result of the expression 10 - 4 + 2?** | **8 ✓** | 6 | 12 | 4 |
| **132. A loop used to iterate over a collection such as lists is:** | While | **For ✓** | Do-while | Repeat |
| **133. What does the if statement do in Python?** | **Executes code based on conditions ✓** | Repeats a block of code | Defines functions | Creates variables |
| **134. Which of the following will execute when the condition in an if statement is true?** | **The block of code inside the if statement ✓** | The block of code inside the else statement | The loop | None of the above |
| **135. What is the correct syntax for an if statement in Python?** | **if condition: ✓** | If condition then: | If (condition) { | If (condition) : |
| **136. What will happen if the condition in an if statement is false and there is an else block?** | The code inside the if statement will execute | **The code inside the else statement will execute ✓** | The code will stop running | Nothing happens |
| **137. Which of the following is an example of an if statement in Python?** | **if x > 10: ✓** | if (x > 10) { | if x > 10: return | if x > 10-> |
| **138. What does the else block in an if-else statement do?** | Executes code when the condition is true | **Executes code when the condition is false ✓** | Executes code regardless of the condition | None of the above |
| **139. Which of the following is the correct syntax for the short-hand if-else statement in Python?** | **Action_if_true if condition else action_if_false ✓** | If condition action_if_true else action if false | If condition then action if true else action if false | Action if true else condition if action if false |
| **140. In the following code, what will be printed? temperature = 20; print("Hot day" if temperature > 30 else "Cool day")** | Hot day | **Cool day ✓** | Error | None of the above |
| **141. What happens if the condition in an if-else statement is false?** | The code in the if block executes | **The code in the else block executes ✓** | The program stops | Both blocks execute |
| **142. Which of the following statements is true about the if-else statement in Python?** | The else block is mandatory | The else block runs only when | **The if-else statement** | The else block runs only when |

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| | | the condition is true | **allows for two code blocks, one for true and one for false conditions ✓** | the condition is false |
| **143. What does the elif statement do in an if-elif-else structure?** | It runs only if all previous conditions are false. | **It checks additional conditions if the previous conditions are false. ✓** | It executes the code when the first condition is true. | None of the above. |
| **144. In the code temp=15; if temp>30: print("Hot"); elif temp>20: print("Warm"); else: print("Cool"), what will be printed?** | Hot | Warm | **Cool ✓** | None of the above |
| **145. Which statement is correct about the if-elif-else structure?** | **It allows multiple conditions to be checked sequentially. ✓** | It can only check one condition. | It does not have an else block. | None of the above. |
| **146. What will happen if all conditions in an if-elif-else statement are false?** | The program will stop. | **The code in the else block will run. ✓** | The program will produce an error. | The first condition will run. |
| **147. What happens when the condition in a while loop becomes false?** | The loop continues running. | **The loop stops and the program moves to the next line of code. ✓** | The program produces an error. | The loop restarts from the beginning. |
| **148. In the code number=3; while number<6: print(number); number+=1;, what will be printed?** | 3 | **3, 4, 5 (on separate lines) ✓** | 3, 4, 5, 6 | None of the above |
| **149. What can happen if the condition in a while loop is always true?** | The program will stop working. | **The loop will run indefinitely, leading to an infinite loop. ✓** | The loop will print an error message. | The loop will break automatically. |
| **150. Which of the following is the correct syntax for a while loop?** | **while condition: code ✓** | while condition() (code) | while (condition): code | while (condition): code block |
| **151. What happens after all sub-problems are solved in Divide and Conquer?** | They are ignored | **They are combined to form the final solution ✓** | They are deleted | They are sorted again |

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| **152. What does Dynamic Programming store to avoid redundant work?** | Inputs | Errors | **Results of subproblems ✓** | Full solutions only |
| **153. Which of the following problems is a classic example of using Dynamic Programming?** | Sorting a list | Finding prime numbers | **Calculating Fibonacci numbers ✓** | Drawing a graph |
| **154. What does Backtracking do when it hits a dead end in a problem?** | Stops completely | Jumps to the final answer | **Goes back to the last choice and tries another ✓** | Ignores the mistake |
| **155. Which of the following problems is best solved using Backtracking?** | Sorting numbers | Searching in a sorted list | **Solving a Sudoku puzzle ✓** | Calculating average |
| **156. An algorithm that sorts data by stepping through the list and swapping adjacent elements if needed is:** | Selection Sort | Quick Sort | **Bubble Sort ✓** | Merge Sort |
| **157. Time complexity of Depth-First Search (DFS) in a graph is:** | O(n log n) | O(V) | **O(V + E) ✓** | O(n) |
| **158. Best description of time complexity:** | Amount of memory an algorithm needs | **Time taken as a function of input size ✓** | Efficiency as input size grows | Upper bound of space requirements |
| **159. An algorithm with a time complexity of O(n log n):** | Bubble Sort | Binary Search | **Merge Sort ✓** | Insertion Sort |
| **160. Which of the following is true about the time complexity of Bubble Sort?** | **$O(n^2)$ ✓** | O(n) | O(log n) | O(1) |
| **161. What is the key advantage of Bubble Sort?** | It is very fast for large datasets | **It's simple to understand and implement ✓** | It sorts the list in a single pass | It sorts data without comparing elements |
| **162. What does Selection Sort repeatedly do?** | Swaps the largest element with the first element | **Finds the smallest element in the unsorted section and swaps it ✓** | Sorts by comparing elements in pairs | Sorts the list using a divide and conquer approach |
| **163. What is the time complexity of Selection Sort?** | O(n) | **$O(n^2)$ ✓** | O(log n) | O(1) |
| **164. Which of the following best describes Linear Search?** | It divides the list into halves and searches each half | **It checks each item one by one in the list ✓** | It requires the list to be sorted | It uses logarithmic time complexity |
| **165. What is the main advantage of Binary Search over Linear Search?** | Binary Search is simpler to implement | **Binary Search has a better time complexity, O(log n) ✓** | Binary Search works for unsorted lists | Binary Search checks each element in the list |

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| **166. When is Linear Search more effective than Binary Search?** | When the list is sorted | **When the list is very small or unsorted ✓** | When the list is large | When speed is critical |
| **167. In which scenario would Binary Search NOT work?** | When the list is sorted | **When the list is unsorted ✓** | When the list is very large | When the target element is not in the list |
| **168. What does BFS explore in a graph?** | Nodes one by one | **Nodes level by level ✓** | Nodes randomly | Only leaf nodes |
| **169. Which data structure does BFS use to keep track of nodes that need to be explored?** | Stack | **Queue ✓** | Array | List |
| **170. In which type of graph is BFS particularly useful for finding the shortest path?** | Weighted graph | **Unweighted graph ✓** | Directed graph | Cyclic graph |
| **171. The function used to add an item at the end of a list in Python:** | insert() | **append() ✓** | remove() | pop() |
| **172. The purpose of the in keyword used with a Python list:** | Adds an item to the list | Removes an item from the list | **Checks if an item exists in the list ✓** | Returns the length of the list |
| **173. An operation that removes an item from the top of the stack:** | Push | **Pop ✓** | Peek | Add |
| **174. The operation used to add an item to a queue:** | Dequeue | Peek | **Enqueue ✓** | Remove |
| **175. True statement about the height of a tree:** | **Number of edges from the root to the deepest node ✓** | Number of nodes from the root to the deepest node | Number of children of the root node | Always equal to the number of nodes in the tree |
| **176. A scenario where a graph data structure is most suitable:** | Managing a to-do list | Modeling a line of customers in a store | **Representing connections in a social network ✓** | All of the above |
| **177. What symbol is used to create a list in Python?** | {} | () | **[] ✓** | <> |
| **178. What does the index in a list represent?** | The size of the list | The type of data stored | **The position of an element in the list ✓** | The number of times an element appears |
| **179. Which of the following properties does a Python list have?** | Fixed size | Random order | **Dynamic size ✓** | Cannot remove items |
| **180. What is the index of the first element in a Python list?** | 1 | **0 ✓** | -1 | Depends on the list |
| **181. Which function is used to remove the first occurrence of an item from a list by value?** | Delete() | Pop() | Erase() | **Remove() ✓** |
| **182. Which function is used to insert an element at a specific index in a list?** | add() | **insert() ✓** | append() | push() |

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| **183. Which of the following describes how a stack operates?** | FIFO | **LIFO ✓** | Random Access | Ordered Set |
| **184. What does the 'push' operation do in a stack?** | Removes an item | Sorts the stack | **Adds an item to the top ✓** | Adds an item at the bottom |
| **185. Lists are helpful in implementing which of the following?** | Arrays only | Graphs only | **Stack and Queue ✓** | None of the above |
| **186. What principle does a queue follow?** | LIFO | **FIFO ✓** | Random Access | Priority-Based |
| **187. What happens during a dequeue operation?** | An item is added to the end | **An item is removed from the front ✓** | An item is inserted at a specific index | All items are removed |
| **188. Which node is at the top of a tree structure?** | Leaf | Branch | **Root ✓** | Edge |
| **189. What is the function of edges in a tree?** | Store data | **Connect nodes ✓** | Delete nodes | Sort data |
| **190. Which of the following best represents a leaf node?** | Node with one child | Node with multiple children | **Node without children ✓** | Node with a parent only |
| **191. What are the components of a graph?** | Roots and branches | Nodes and files | **Vertices and edges ✓** | Parents and children |
| **192. Which data structure has a root node and follows a hierarchy?** | Graph | Queue | Stack | **Tree ✓** |
| **193. Which term describes how many connections a vertex has?** | Height | Level | **Degree ✓** | Weight |
| **194. What does a weight on an edge usually represent?** | Age | Direction | **Value like distance or cost ✓** | Level |
| **195. Which graph allows movement in only one direction between two nodes?** | Undirected graph | Weighted graph | Circular graph | **Directed graph ✓** |
| **196. What is the mean of a dataset?** | The middle value | The most frequent value | **The sum of all values divided by the number of values ✓** | The difference between the highest and lowest values |
| **197. Which measure of central tendency is most affected by extreme values (outliers)?** | Mode | Median | **Mean ✓** | All of the above |
| **198. How do you find the median of a dataset with an even number of values?** | Take the middle value | **Average the two middle values ✓** | Use the most frequent value | Add the highest and lowest values |
| **199. Which of the following describes the mode?** | The average of all numbers | **The most frequently occurring value ✓** | The middle value in a dataset | The difference between the highest and lowest values |
| **200. What does variance measure?** | Central value | Total number of values | **Spread of data from the mean ✓** | Frequency of values |

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| **201. What does standard deviation measure?** | The average value of the data | **The spread of data around the mean ✓** | The number of data points | The median of the data |
| **202. Which of the following is true about standard deviation?** | It is always smaller than the variance | **It is the square root of the variance ✓** | It is calculated by adding the squared deviations | It cannot be negative |
| **203. What does a high standard deviation indicate?** | The data is tightly grouped around the mean | The data has a low range | **The data is spread out and varies significantly from the mean ✓** | The mean is significantly larger than the data points |
| **204. What is the probability of getting tails when flipping a fair coin?** | 0 | 1 | **1/2 ✓** | 1/4 |
| **205. In probability, what is the term for the number of favorable outcomes divided by the total number of outcomes?** | Mode | Mean | **Probability ✓** | Variance |
| **206. The activity involved in experimental design in data science:** | Creating visualizations | **Collecting and analyzing data systematically ✓** | Writing code for machine learning | Building databases |
| **207. What is the main purpose of an experiment in data collection?** | To observe behavior | **To test cause-and-effect relationships ✓** | To collect responses to questions | To gather data in natural settings |
| **208. What is the primary advantage of using surveys?** | They provide detailed individual feedback | **They allow for structured and efficient data collection from a large group ✓** | They are only used for scientific research | They do not require any statistical analysis |
| **209. What is the key characteristic of an experiment?** | It only collects qualitative data | **It involves manipulating variables to test their effects ✓** | It only collects responses through surveys | It requires minimal control of the research environment |
| **210. What is the main goal of data preparation?** | To delete all unnecessary data | **To ensure data is formatted, clean, and ready for analysis ✓** | To collect data from websites | To remove surveys from the study |
| **211. Which of the following is NOT a part of data cleaning?** | Fixing missing values | **Repeating data entries ✓** | Removing duplicates | Correcting wrong data |
| **212. What happens if data is not cleaned properly?** | Results become more accurate | Analysis takes less time | **Analysis results can be misleading ✓** | Data becomes more organized |

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| **213. What is imputation in data handling?** | Deleting all data | **Estimating and filling missing values ✓** | Collecting new surveys | Sorting the data alphabetically |
| **214. What does flagging a missing value help with?** | Replacing the value automatically | Hiding the data from view | **Making analysts aware of incomplete information ✓** | Removing incorrect records |
| **215. The option not considered a benefit of data visualization:** | Identifying trends and patterns | Communicating insights effectively | **Making data more complex ✓** | Summarizing large datasets |
| **216. What is the main use of data visualization?** | Writing long reports | Showing data through text | **Representing data visually for better understanding ✓** | Encrypting data |
| **217. What does a line graph mainly show?** | Categories | Distribution of values | **Changes over time ✓** | Outliers |
| **218. Which chart is used to explore the relationship between two variables?** | Histogram | Line graph | **Scatterplot ✓** | Bar chart |
| **219. What type of chart would best show changes in sales over time?** | **Line graph ✓** | Pie chart | Scatterplot | Boxplot |
| **220. Why should we label the axes in a chart?** | To make the chart colorful | To decorate the page | **To make the chart easier to read and understand ✓** | To hide the data |
| **221. Which technology allows computers to perform tasks like humans?** | Blockchain | **Artificial Intelligence (AI) ✓** | 5G | Cloud Computing |
| **222. Which of the following is an example of cloud computing?** | Siri | Bitcoin | **Google Drive ✓** | Thermostat |
| **223. Which technology connects everyday objects like fridges and cars to the internet?** | AR | **IoT ✓** | VR | AI |
| **224. A cloud deployment model with resources shared among organizations with common concerns:** | Public Cloud | Private Cloud | **Community Cloud ✓** | Hybrid Cloud |
| **225. A cloud deployment model combining public and private cloud features:** | Public Cloud | **Hybrid Cloud ✓** | Community Cloud | Multi-Cloud |
| **226. A cloud service offering a platform for developing, running, and managing applications without managing infrastructure:** | Infrastructure as a Service (IaaS) | **Platform as a Service (PaaS) ✓** | Software as a Service (SaaS) | Data as a Service (DaaS) |
| **227. What is cloud computing mainly used for?** | Buying new hardware | **Accessing computing services over the internet ✓** | Printing documents | Making phone calls |

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| **228. What is the benefit of virtualization in cloud computing?** | Slows down performance | Reduces internet speed | **Allows one machine to run multiple virtual systems ✓** | Only works with large data centers |
| **229. Which term describes the ability to add more cloud resources during high traffic?** | On-demand | Virtualization | **Scalability ✓** | Decentralizatio n |
| **230. What does on-demand access mean in cloud computing?** | Buying a new laptop | Waiting weeks for service setup | **Instantly using cloud resources when needed ✓** | Downloading files from social media |
| **231. Which cloud service type allows the most user control over the system?** | SaaS | PaaS | **IaaS ✓** | All of the above |
| **232. Which of the following is an example of SaaS?** | Amazon EC2 | Google App Engine | **Microsoft Office 365 ✓** | Microsoft Azure Virtual Machine |
| **233. Who manages the software updates in SaaS?** | The user | **The cloud provider ✓** | Internet service providers | Computer shops |
| **234. Which of the following is an example of a public cloud provider?** | A bank's internal cloud | **Amazon Web Services (AWS) ✓** | A government's private server | A local school's computer lab |
| **235. What is the main advantage of a private cloud?** | Lower cost | Easy public access | **Higher security and control ✓** | Less maintenance |
| **236. Which of the following services provides cloud storage?** | Microsoft Word | **Dropbox ✓** | Photoshop | VLC Media Player |
| **237. How does cloud computing help with data loss?** | By making physical backups only | By increasing computer speed | **By storing data online so it's not lost if a local device fails ✓** | By printing all data regularly |
| **238. What does scalability allow in cloud computing?** | Fix broken hardware | Change operating systems | **Add or remove resources as needed ✓** | Buy new computers |
| **239. The main benefit of edge computing:** | Lower cost | **Reduced latency ✓** | Increased complexity | Enhanced security |
| **240. The primary advantage of serverless architectures:** | **Cost savings ✓** | Constant server management | Increased hardware needs | Manual scaling |
| **241. Which option is typically included in common Terms of Use clauses?** | User obligations | **Privacy and data use ✓** | Product advertising | Termination of service |
| **242. The purpose of the "Limitations of Liability" clause in Terms:** | Ensures full company responsibility | **Limits company's liability ✓** | Provides user rights for damages | Guarantees constant service availability |

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| **243. The practice considered ethical when using information:** | Copying content without permission | **Respecting copyright and avoiding plagiarism ✓** | Ignoring source attribution | Using unverified information |
| **244. What is the main purpose of Terms of Use?** | To make websites look professional | To provide advertisements | **To set rules and responsibilities for users and service providers ✓** | To increase website traffic |
| **245. What must a user do before using an app or website?** | Call customer support | **Agree to the Terms of Use ✓** | Watch a tutorial | Pay a fee |
| **246. Which clause explains how a company will use your personal data?** | User Obligations | **Privacy and Data Use ✓** | Termination of Service | Intellectual Property |
| **247. What is the purpose of the "Intellectual Property Rights" clause?** | To protect user reviews | To allow copying of articles | **To protect company content like logos and articles ✓** | To delete user data |
| **248. What does software piracy involve?** | Sharing licensed software | Creating your own software | **Using software without a license ✓** | Updating old software |
| **249. What is one purpose of the Personal Data Protection Bill in Pakistan?** | To charge fees on data | To make data public | **To let users access or correct their data ✓** | To store passwords |
| **250. The type of harmful software that secretly monitors user activity:** | Spam | Cookies | **Spyware ✓** | Pharming |
| **251. The threat involving user redirection to fake websites:** | Phishing | Spam | Spyware | **Pharming ✓** |
| **252. Which of the following is an example of spam?** | A secure bank email | A software update | **An unwanted message offering a product ✓** | A message from a friend |
| **253. Cookies are files that:** | Slow down your computer | Save your progress in games | **Remember website details and preferences ✓** | Delete viruses |
| **254. Which of these is a phishing attempt?** | A text from a friend | A message asking you to update software | **A fake email pretending to be your bank ✓** | A password reset you requested |
| **255. Why are privacy and security threats dangerous?** | They help websites load faster | They protect your personal data | **They can expose or steal personal information ✓** | They reduce your phone bill |

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| **256. Antivirus software is used to:** | Send emails | Block websites | **Protect against harmful software ✓** | Manage passwords |
| **257. Phishing is an attack that tries to:** | Speed up the internet | **Steal personal information ✓** | Block websites | Install software |
| **258. How can you tell a website is safe and real?** | It loads quickly | It asks for your password | **It has "https://" and a padlock icon ✓** | It has lots of ads |
| **259. The positive societal impact of computing systems:** | Spread of misinformation | **Improved information accessibility ✓** | Heightened privacy concerns | Widened technology gap |
| **260. What does the digital divide cause in Pakistan?** | Equal access to technology for everyone | Better internet speeds in rural areas | **Unequal access to education and job opportunities ✓** | Universal access to e-commerce |
| **261. What is the primary concern regarding misinformation on social media?** | It promotes useful health information | **It spreads quickly and causes confusion ✓** | It encourages international travel | It boosts social media platform users |
| **262. The behavior considered responsible digital conduct:** | Using secure websites | Spreading false info online | **Respecting online privacy ✓** | Reporting suspicious activity |
| **263. What does responsible digital behavior include?** | Sharing personal information freely | **Using strong passwords and avoiding phishing scams ✓** | Spreading false information | Using simple passwords |
| **264. What is an example of a strong password?** | "12345" | "Password" | **"MySecureP @ssword!" ✓** | "Qwerty" |
| **265. What is the main goal of cybersecurity awareness?** | To make computers faster | **To protect personal information from online threats ✓** | To improve website design | To create new apps |
| **266. The key component of digital literacy:** | Writing poetry | Understanding agricultural methods | **Using digital tools effectively ✓** | Practicing public speaking |
| **267. Boolean operator used to exclude a term from search results:** | OR | AND | **NOT ✓** | NEITHER |
| **268. The essential skill for evaluating online sources:** | Guessing the source's credibility | Knowing the content creator's name | **Checking if content is from a trusted entity ✓** | Reading the content multiple times |

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| **269. What is the main purpose of online research?** | To gather random facts | **To find accurate, reliable, and current information ✓** | To search for images only | To play online games |
| **270. What is an example of a source used in academic research?** | Social media posts | News websites | **Scholarly articles and research papers ✓** | YouTube videos |
| **271. What is digital literacy?** | The ability to use digital tools to create online videos | **The ability to use digital tools to find, understand, create, and share information ✓** | The ability to send emails | The ability to play online games |
| **272. Why is it important to evaluate the sources of information online?** | To find the fastest information | **To make sure the information is accurate and trustworthy ✓** | To watch videos only | To find the cheapest products |
| **273. The meaning of "peer-reviewed" article:** | Edited by a single expert | Published in a magazine | **Reviewed by other experts in the field ✓** | Freely available online |
| **274. What does utilizing digital resources mean?** | Using only books for research | **Effectively using online tools and information to support learning and work ✓** | Watching videos online for entertainment | Using social media for communication |
| **275. An essential component of ethical research:** | Collecting data regardless of participant privacy | **Avoiding plagiarism and giving proper credit ✓** | Publishing only positive results | Ignoring consent if research is important |
| **276. What is the main goal of research ethics?** | To make the research more complex | **To ensure research is fair, honest, and respectful ✓** | To get the research published faster | To hide personal information of researchers |
| **277. What should researchers do before involving participants in a study?** | Hide the purpose of the study from them | Ensure the study causes harm | **Obtain informed consent from the participants ✓** | Share their personal details without permission |
| **278. What does a patent give to an inventor?** | The right to sell their | The right to protect the | **The exclusive right to their** | The ability to distribute their |

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| | invention only in their country | visual design of their invention | **invention and stop others from using it ✓** | invention for free |
| **279. What is the main purpose of a trademark?** | To protect a product's appearance | To prevent copying of inventions | **To identify and distinguish a brand's products from others ✓** | To allow free usage of a company's name |
| **280. Which of the following is protected by copyright?** | An invention | A company logo | **A novel or music composition ✓** | A product design |
| **281. The primary goal of entrepreneurship is:** | To create new technologies | **To solve problems and create value ✓** | To manage finances | To compete with large corporations |
| **282. A principle of Design Thinking is:** | Focusing on profits | **Human-centered approach ✓** | Minimizing risks | Emphasizing short-term |
| **283. Which is the first step in the Design Thinking process?** | Prototype | Test | Define | **Empathize ✓** |
| **284. What is a prototype?** | The final version of the product | **A quick and simple version of the idea ✓** | The problem statement | A tool for testing the market |
| **285. What is the purpose of prototyping in Design Thinking?** | To create a final version of the product | **To test ideas quickly and improve them ✓** | To sell the product | To evaluate customer satisfaction |
| **286. The first step in creating a business plan involves:** | Financial forecasting | Market analysis | **Defining the business idea ✓** | Setting sales targets |
| **287. What is the purpose of the market analysis section in a business plan?** | To list your competitors | To describe your business goals | **To understand your customers' needs and competitors ✓** | To provide a summary of your products |
| **288. The purpose of collecting market insights is:** | To set product prices | **To understand customer needs and market trends ✓** | To calculate taxes | To manage inventory |
| **289. A successful business pitch should be:** | Long and detailed | **Clear and persuasive ✓** | Focused on personal achievements | Directed only at investors |
| **290. What are the two main types of market research techniques?** | Internal and external | Simple and complex | **Qualitative and quantitative ✓** | Local and global |

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| **291. Which of the following is a benefit of quantitative research?** | Understanding emotions | Finding personal stories | **Finding trends and patterns in behavior ✓** | Getting detailed opinions |
| **292. What is the main goal of a focus group?** | To count how many people like a product | To advertise a product | **To collect detailed opinions and suggestions ✓** | To sell products |
| **293. Market segmentation helps businesses to:** | Create random prices | Understand everyone in the same way | **Serve different groups of customers better ✓** | Copy competitors |
| **294. The goal of data-driven decisions is to:** | Avoid customer feedback | Guess what might work | **Make smart choices using information ✓** | Copy other businesses |
| **295. What does communication involve?** | Only speaking | Only writing | **Sharing information, ideas, or feelings with others. ✓** | Only body language. |
| **296. Why is good body language important during a presentation?** | **It helps you look confident and express your message better ✓** | It is not important | It makes the presentation longer | It makes you look Ramy |
| **297. What is the main purpose of storytelling?** | To confuse the audience. | To entertain only. | **To engage the audience and make complex ideas easier to understand. ✓** | To waste time. |
| **298. What is collaboration?** | Working alone on a project | **Sharing ideas and working together to achieve a goal ✓** | Repeating a process until you get the best result. | None of the above |
| **299. Why is iteration important?** | It helps you finish a task faster. | **It helps you improve your work by making changes and taking feedback into account. ✓** | It helps you collaborate with others. | It focuses only on one part of a task |
| **300. What is innovation?** | **Creating new ideas, products, or methods. ✓** | Copying others' work. | Only inventing things that didn't exist before. | None of the above. |

# Short Questions and Answers

## Questions NO.2 (Ch # 1,2,8)

***Q.No. 1: Define software development.***

**Answer:** Software development is the systematic process of creating computer programs designed to perform specific tasks. It involves writing code, testing it, and addressing any issues to help solve problems and make our lives easier.

***Q.No. 2: Differentiate between functional and non-functional requirements.***

**Answer:** Functional requirements describe specific behaviors or functions a system must perform, outlining what the system should do. Non-functional requirements define the quality attributes, performance criteria, and constraints of the system, specifying how the system performs rather than what it does.

***Q.No. 3: Explain why the testing phase is important in the Software Development Life Cycle (SDLC), and provide two reasons for its significance.***

**Answer:** The testing phase serves as a critical quality check to identify bugs, errors, or hidden issues before deployment. Two reasons for its significance are ensuring all features work according to specifications (Functionality Testing) and verifying the software performs well under high traffic or heavy data (Performance Testing).

***Q.No. 4: In which fields can Systems be applied?***

**Answer:** Software systems are versatile and can be applied to communication (social media), financial management (banking apps), and education (educational games). They are designed to transform user needs into functional products across these various domains.

***Q.No. 5: What is the main goal of the Software Development Life Cycle (SDLC)?***

**Answer:** The primary purpose of the SDLC is to deliver high-quality software that meets or exceeds customer expectations. It ensures the software reaches completion within estimated time and cost constraints while working efficiently.

***Q.No. 6: What is a framework in software development?***

**Answer:** A framework is a standardized and reusable set of concepts, practices, and tools that provides a structured foundation for developing software applications. It offers predefined components to facilitate the implementation of specific functionalities, promoting efficiency and code reusability.

***Q.No. 7: What is the purpose of the requirement gathering phase in software development?***

**Answer:** The goal of this initial phase is to understand and collect exactly what the software needs to achieve. This involves engaging with users and stakeholders to find out their specific needs, preferences, and expectations to guide the development process.

***Q.No. 8: Mention any two methods used to collect requirements.***

**Answer:** Two methods used to collect requirements are Interviews and Surveys, which involve asking questions to gather user feedback, and Observations, which involve watching how users interact with current systems to identify problems.

***Q.No. 9: What do non-functional requirements define in a software system?***

**Answer:** Non-functional requirements define the quality attributes, performance criteria, and constraints of the system. They focus on aspects such as usability, reliability, performance, and security.

***Q.No. 10: Give one example of a non-functional requirement related to system performance.***

**Answer:** An example of a non-functional performance requirement is that the system should be able to handle up to 1000 simultaneous users without experiencing any performance degradation.

***Q.No. 11: How are non-functional requirements different from functional requirements.***

**Answer:** Functional requirements detail exactly *what* the system should do, directly relating to user interactions and tasks. Non-functional requirements dictate *how* the system should perform those tasks, focusing on quality attributes like speed, reliability, and security constraints.

***Q.No. 12: What are functional requirements in a software system?***

**Answer:** Functional requirements are the specifications that describe the specific behaviors, tasks, and services a system must perform. They define the explicit interactions between the system and its users or other interconnected systems.

***Q.No. 13: What is the main purpose of the design phase in software development?***

**Answer:** The design phase acts as a blueprint where developers plan out how the software will look and work. Its purpose is to define the overall architecture, specify clear requirements, and organize the structure before coding begins.

***Q.No. 14: Why are diagrams and models created during the design phase?***

**Answer:** Diagrams are created to show how different parts of the software will connect and work together, such as flowcharts mapping out steps. Models are developed to represent the software's structure and user interface, showing exactly how users will interact with it.

***Q.No. 15: What does software architecture planning involve?***

**Answer:** Software architecture planning involves deciding the overall structure of the software. It determines how different components will interact with one another to ensure the program functions smoothly and remains well-organized.

***Q.No. 16: What is the main goal of the coding or development phase?***

**Answer:** The main goal of the development phase is the actual creation of the software by writing code. Programmers translate the planned design specifications into a set of instructions using a programming language so the computer can perform the required tasks.

***Q.No. 17: What do programmers use to guide their work during the coding phase?***

**Answer:** Programmers use the design specifications as a guide during the coding phase. These specifications act like a recipe, outlining what the software should do and how it should look so the programmer can accurately translate it into code.

***Q.No. 18: What is code in the context of software development?***

**Answer:** Code is a set of specific instructions written in a programming language that the computer follows to perform designated tasks. Each line of code ensures the software works correctly and meets the requirements established in the design phase.

***Q.No. 19: What is the main purpose of the maintenance phase?***

**Answer:** The maintenance phase involves ongoing updates and care to ensure the software continues to function correctly over time. It is necessary to address any problems that arise and adapt the software to changes in user needs or new technologies.

***Q.No. 20: Why might software need to be updated after deployment?***

**Answer:** Software needs to be updated after deployment to fix any newly discovered issues or bugs. Additionally, updates are required to adapt to evolving technology or to fulfill changing user needs and expectations.

***Q.No. 21: How does maintenance help with changing user needs?***

**Answer:** Maintenance allows developers to implement updates and modify the existing system to accommodate new requirements. This continuous improvement ensures the software remains relevant, healthy, and capable of adapting to the users' growing demands.

***Q.No. 22: Define SDLC.***

**Answer:** SDLC (Software Development Life Cycle) is a structured framework that defines the systematic processes organizations use to build an application. It covers the entire journey from initial conception through design, development, deployment, and ongoing maintenance.

***Q.No. 23: Illustrate the concept of continuous integration in Agile Methodology and discuss its importance in software development.***

**Answer:** Continuous integration is the practice of regularly merging code changes into a central repository. It is important because it allows teams to detect and fix issues early in the development cycle, leading to higher quality software and faster delivery of working parts.

***Q.No. 24: What are software development methodologies used for?***

**Answer:** Software development methodologies are structured approaches used to guide the planning, creation, and management of software projects. They ensure the development process is systematic, efficient, and ultimately produces high-quality software.

***Q.No. 25: How do software process models help in managing software projects?***

**Answer:** Process models provide an abstract framework for planning, structuring, and controlling the software lifecycle. They help teams predict outcomes, manage risks effectively, streamline development to reduce wasted effort, and ensure quality assurance practices are integrated.

***Q.No. 26: What is one benefit of using a structured development method?***

**Answer:** One major benefit is predictability; following a defined process allows teams to forecast outcomes and manage risks more effectively. It also increases efficiency by streamlining the development process and reducing wasted effort.

***Q.No. 27: What is the main characteristic of the Waterfall Model?***

**Answer:** The main characteristic of the Waterfall Model is its linear and sequential approach. Each distinct phase of the project must be fully completed before the next one begins, flowing downward like a waterfall without going back to previous phases.

***Q.No. 28: Name any two phases of the Waterfall Model.***

**Answer:** Two phases of the Waterfall Model include the Requirements phase (gathering and documenting what the software needs to do) and the Design phase (planning how the software will be built and look).

***Q.No. 29: What are sprints in Agile methodology?***

**Answer:** Sprints are short, time-boxed cycles or iterations in Agile methodology. Teams use these short cycles to work on and deliver small, functional parts of the software rapidly, allowing for early feedback and quick adaptation.

***Q.No. 30: Name one advantage of using Agile for software development.***

**Answer:** One major advantage is high flexibility. Agile easily allows for changes in requirements even after development has started, making it highly adaptable to new needs or stakeholder feedback.

***Q.No. 31: Why can Agile be less predictable than other models?***

**Answer:** Agile can be less predictable because projects continuously evolve through regular feedback and ongoing changes. This dynamic nature makes it harder to forecast the exact timeline and final scope of the product from the very beginning.

***Q.No. 32: Evaluate the main steps involved in risk assessment and management, and assess their importance in*** a software project.

**Answer:** The main steps include Identifying Risks (listing potential technical or operational issues), Analyzing Risks (evaluating likelihood and impact), Developing Mitigation Strategies (planning to reduce impact), and Monitoring/Reviewing. This is crucial for keeping projects on track, within budget, and up to quality standards.

***Q.No. 33: What is the purpose of setting project timelines in software development?***

**Answer:** Setting project timelines involves deciding how long each specific part of the project will take. This crucial step helps keep the entire project on track, ensuring that all phases are completed and delivered on time.

***Q.No. 34: Name two key factors that affect the cost estimation of a software project.***

**Answer:** Two key factors that affect cost estimation are the Development Team (costs depend on the number of developers, their expertise, and hourly rates) and the Technology Stack (certain tools and languages require more resources or specialized knowledge).

***Q.No. 35: What does risk assessment in project management involve?***

**Answer:** Risk assessment involves identifying all potential risks that could affect project success, such as technology changes or resource shortages. It also requires analyzing the likelihood of these risks occurring and their potential impact to prioritize attention.

***Q.No. 36: Describe the Factory Pattern and explain how it differs from directly creating objects, with an*** example.

**Answer:** The Factory Pattern acts like a special workshop that creates different products based on what you need, without you worrying about the creation details. Unlike directly creating objects where the user handles instantiation, you just tell the factory the requirement, and it provides the finished product seamlessly.

***Q.No. 37: What is the purpose of using design patterns in software development?***

**Answer:** Design patterns provide proven, standardized solutions to common problems in software design. They act as adaptable blueprints that make the development process more efficient, consistent, and help create robust, maintainable systems.

***Q.No. 38: What is the main benefit of using the Factory Pattern?***

**Answer:** The main benefit of the Factory Pattern is that it abstracts the object creation process. Developers do not need to worry about the complex details of how products are made; they simply request the needed object, which simplifies code maintenance.

***Q.No. 39: How does the Observer Pattern work in a software system?***

**Answer:** The Observer Pattern works like a group of people interested in updates from one source. Whenever an important event occurs at the source, it automatically notifies all interested observers, keeping the system in sync without continuous manual checking.

***Q.No. 40: What is the advantage of using the Strategy Pattern for algorithm selection?***

**Answer:** The Strategy Pattern acts like a toolbox with different tools for specific jobs. It provides "multiple ways" to solve a problem, allowing developers to switch algorithms or strategies easily based on the current task without altering the rest of the code.

***Q.No. 41: How do design patterns reduce code complexity?***

**Answer:** Design patterns reduce code complexity by providing a clear, widely understood structure for solving recurring problems. They offer proven templates that streamline logic, making systems easier to build, understand, and manage.

***Q.No. 42: What is the main advantage of using design patterns in communication among developers?***

**Answer:** The main advantage is that design patterns provide a common vocabulary. When developers use standardized pattern names, they can instantly communicate complex design structures and intentions clearly and efficiently.

***Q.No. 43: How do design patterns contribute to code reusability?***

**Answer:** Design patterns enhance code reusability by utilizing proven, standardized solutions for common problems. Instead of rewriting complex logic from scratch, developers can adapt these established templates across various projects safely.

***Q.No. 44: How does the Singleton Pattern ensure that only one instance of an object is created?***

**Answer:** The Singleton Pattern restricts a class to guarantee that a specific object or resource is created only once in a program. It acts like a single shared key to a room; no new keys are made, and the program reuses that exact instance whenever needed.

***Q.No. 45: What is debugging in software development?***

**Answer:** Debugging is the critical process of finding and fixing bugs or errors within software code. It involves observing unexpected behaviors, identifying the root cause, and modifying the code to ensure the program functions correctly.

***Q.No. 46: Name two tools commonly used for debugging.***

**Answer:** Two commonly used tools for debugging include software Debuggers (which allow programmers to step through code and inspect variables) and Print Statements (added to code to display variable values at different execution points).

***Q.No. 47: How can code reviews help in debugging?***

**Answer:** Code reviews involve having other developers examine your code. A fresh set of eyes can often spot potential errors, logical flaws, or bugs that the original programmer might have missed, facilitating quicker resolution.

***Q.No. 48: What is the primary goal of Unit Testing?***

**Answer:** The primary goal of Unit Testing is to test individual, small components or modules (like functions) in complete isolation. This verifies that each specific unit works correctly according to its design and expected performance before integration.

***Q.No. 49: How does Integration Testing differ from Unit Testing?***

**Answer:** While Unit Testing focuses on verifying isolated, individual units, Integration Testing evaluates the interactions between those different modules. It checks for interface errors and data flow issues when these components are combined to work together.

***Q.No. 50: What is the purpose of Acceptance Testing?***

**Answer:** Acceptance Testing is the final testing level, often conducted by end-users or clients. Its purpose is to determine if the software is fully ready for release by validating that it meets their specific expectations, usability needs, and real-world requirements.

***Q.No. 51: What is the purpose of a code editor in software development?***

**Answer:** A code editor, or language editor, provides a user-friendly interface designed specifically for developers to write and edit source code efficiently across different programming languages.

***Q.No. 52: How do interpreters differ from compilers?***

**Answer:** Interpreters translate high-level code into machine language line-by-line during execution. In contrast, compilers translate the entire program code at once into an efficient machine code before any execution begins.

***Q.No. 53: What is an Integrated Development Environment (IDE)?***

**Answer:** An IDE is a comprehensive software suite that bundles all necessary development tools—like code editors, compilers, debuggers, and version control—into a single, unified interface to streamline the software creation process.

***Q.No. 54: Name two commonly used IDEs and their primary programming language.***

**Answer:** Two common IDEs are PyCharm, which is highly preferred for Python development, and Eclipse, which is widely used for Java development.

***Q.No. 55: What is the difference between online and offline computing platforms?***

**Answer:** Online computing platforms are cloud-based environments accessible via the internet to write and test code. Offline platforms are local development environments physically installed directly onto a user's computer.

***Q.No. 56: Name two examples of online computing platforms.***

**Answer:** Two examples of cloud-based online computing platforms where developers can write and run code are Repl.it and Gitpod.

***Q.No. 57: What is the purpose of source code repositories in software development?***

**Answer:** Source code repositories are platforms used to store, manage, and track all changes to code. They handle version control, allowing multiple developers to collaborate on the same project simultaneously without causing code conflicts.

***Q.No. 58: What role do debuggers play in the software development process?***

**Answer:** Debuggers are specialized tools that allow developers to deeply test their code to identify where errors occur. They enable programmers to step through code execution and inspect variables to find and fix bugs efficiently.

***Q.No. 59: How do IDEs streamline the software development process?***

**Answer:** IDEs streamline development by integrating essential tools—such as language editors, compilers, and debuggers—into one unified interface. This eliminates the need to switch between different programs, making writing, testing, and debugging highly efficient.

***Q.No. 60: What are the main fields where Python is commonly used?***

**Answer:** Python is a highly versatile language heavily utilized in fields such as web development, data analysis, and artificial intelligence, thanks to its simplicity and clear structure.

***Q.No. 61: What are the basic steps involved in writing a program?***

**Answer:** The basic steps include Writing Code (creating instructions), Compiling/Interpreting (translating code so the computer understands), Executing (running the code), and Output (displaying the results or actions).

***Q.No. 62: What is a development environment in Python programming?***

**Answer:** A development environment refers to the setup required to write, run, and debug Python code effectively. It involves installing the necessary software, IDEs, tools, and libraries to make the coding process smooth and efficient.

***Q.No. 63: Explain the purpose of using comments in Python code.***

**Answer:** Comments are lines in Python code that are entirely ignored by the interpreter. Their purpose is to provide explanations, human-readable notes, or context within the code to make it easier for developers to understand the logic.

***Q.No. 64: What is the purpose of the print() function in Python?***

**Answer:** The print() function in Python is used to perform output operations. It takes one or more arguments and displays that information or text directly onto the user's screen.

***Q.No. 65: How do you write a single-line comment in Python?***

**Answer:** In Python, a single-line comment is created by starting the line with the hashtag symbol (#). Anything following the # on that line is ignored by the Python interpreter.

***Q.No. 66: What is the use of adding Python to the PATH during installation?***

**Answer:** Checking the box to "Add Python to PATH" during installation ensures that the operating system knows exactly where the Python executable is located, making it significantly easier to run Python commands directly from the command line.

***Q.No. 67: What is a variable in Python?***

**Answer:** A variable in Python functions as a named storage container within the computer's memory. It allows data to be stored, retrieved, and manipulated throughout the execution of a program, and its value can change over time.

***Q.No. 68: What are the rules for naming variables in Python?***

**Answer:** Variable names must begin with a letter or an underscore, and subsequent characters can be letters, digits, or underscores. They are case-sensitive and cannot use any of Python's reserved keywords (like if, while, for).

***Q.No. 69: How do you handle integer and float inputs in Python?***

**Answer:** Because the standard input() function returns a string, you must wrap it in specific functions for math. You use the int() function to convert the input into whole numbers, and the float() function for numbers containing decimals.

***Q.No. 70: Define operator precedence and give an example of an expression where operator precedence affects the result.***

**Answer:** Operator precedence dictates the specific order in which mathematical operations are evaluated in an expression. For example, in the expression 3 + 2 * 5, multiplication has higher precedence than addition, so it evaluates to 13, not 25.

***Q.No. 71: What is the purpose of the arithmetic operator // in Python?***

**Answer:** The // operator in Python performs floor division. It divides two numbers and rounds the result down to the nearest whole integer, discarding any fractional remainder.

***Q.No. 72: What does the ** operator do in Python?***

**Answer:** The ** operator is the arithmetic operator for exponentiation. It raises the number on its left to the power of the number on its right (e.g., 10 ** 3 equals 1000).

***Q.No. 73: How is the modulus operator % used in Python?***

**Answer:** The modulus operator (%) is used in arithmetic to find the remainder of a division operation. For example, evaluating 10 % 3 would result in 1, as 3 goes into 10 three times with 1 left over.

***Q.No. 74: What do comparison operators in Python do?***

**Answer:** Comparison operators are used to compare two specific values or expressions to determine their relational logic (like greater than or less than). They always return a boolean value, either True or False, based on that comparison.

***Q.No. 75: What does the == operator do in Python?***

**Answer:** The == operator checks for equality between two values or expressions. If the value on the left is exactly equal to the value on the right, it returns True; otherwise, it returns False.

***Q.No. 76: What is the purpose of the != operator in Python?***

**Answer:** The != operator is the "not equal to" comparison operator. It evaluates two values and returns True if they are different from one another, and False if they are exactly the same.

***Q.No. 77: What is the purpose of assignment operators in Python?***

**Answer:** Assignment operators are used to assign specific values to variables. The most basic is the equal sign (=), but compound operators combine a mathematical operation with the assignment in a single step.

***Q.No. 78: What does the += operator do in Python?***

**Answer:** The += operator is a compound addition assignment operator. It adds the value on the right side to the current value of the variable on the left side, and then assigns that new total back to the variable.

***Q.No. 79: How does the **= operator work in Python?***

**Answer:** The **= operator is the exponentiation assignment operator. It raises the current variable's value to the power of the right-hand value and assigns the computed result back to the original variable.

***Q.No. 80: What is the purpose of logical operators in Python?***

**Answer:** Logical operators (like 'and', 'or', 'not') are used to combine multiple conditions or complex expressions. They perform logical evaluations and return a final Boolean value (True or False) based on those combined conditions.

***Q.No. 81: Which logical operator is used to combine conditions where both must be True?***

**Answer:** The 'and' logical operator is used to combine conditions requiring strict truth. The entire expression will only return True if the condition on the left AND the condition on the right are both True.

***Q.No. 82: What does the not operator do in Python?***

**Answer:** The 'not' logical operator inverses the boolean value of an expression. If an expression evaluates to True, applying 'not' makes it False, and if it is False, 'not' makes it True.

***Q.No. 83: What is an expression in Python?***

**Answer:** An expression in Python is any valid combination of variables, mathematical operators, and values that the interpreter evaluates to produce a single final result or value.

***Q.No. 84: How can parentheses be used in expressions?***

**Answer:** Parentheses () hold the highest precedence in Python math and are used to control the exact order of operations. Operations enclosed inside parentheses are always forced to be evaluated first, clarifying complex expressions.

***Q.No. 85: What is operator precedence in Python?***

**Answer:** Operator precedence is the strict set of rules that determines the sequence in which operations are evaluated within a complex expression. For instance, multiplication is always performed before addition unless overridden by parentheses.

***Q.No. 86: How does the short-hand if-else statement differ from the regular if-else statement?***

**Answer:** The regular if-else spans multiple indented lines to execute blocks of code. The short-hand if-else is a compact structure written entirely on a single line, placing the action for True first, followed by the condition, and then the action for False.

***Q.No. 87: What is the purpose of the if statement in Python?***

**Answer:** The 'if' statement is a decision-making control structure. Its purpose is to evaluate a specific condition and, if that condition is true, execute a designated block of code.

***Q.No. 88: How does the if statement work in Python?***

**Answer:** The interpreter evaluates the condition provided in the 'if' statement. If the condition evaluates to True, the indented block of code immediately beneath it runs. If False, the block is ignored entirely.

***Q.No. 89: Can an if statement be used alone without any other control structures?***

**Answer:** Yes, an 'if' statement can be used entirely on its own. It simply checks a condition and runs code if it is True; if it is False, the program just moves on without needing an 'else' block.

***Q.No. 90: What does the if-else statement do in Python?***

**Answer:** The if-else statement allows a program to choose between two distinct outcomes. It executes one block of code if the given condition evaluates to True, and a completely different alternative block if the condition is False.

***Q.No. 91: What is the syntax of the if-else statement in Python?***

**Answer:** The syntax starts with 'if condition:' followed by an indented block of code. This is directly followed by the keyword 'else:' on the same indentation level as the 'if', containing its own indented block of alternative code.

***Q.No. 92: How is the short-hand if-else statement different from the regular if-else statement in Python?***

**Answer:** The short-hand if-else condenses the logic into a single, compact line of code rather than using multiple lines and indentation blocks. The syntax is formatted as: 'action_if_true if condition else action_if_false'.

***Q.No. 93: What is the purpose of the elif statement in the if-elif-else structure?***

**Answer:** The 'elif' (else if) statement allows developers to chain multiple conditional checks together. It provides secondary and tertiary conditions to test only if the preceding 'if' or 'elif' statements were found to be False.

***Q.No. 94: How does the if-elif-else statement differ from the if-else statement?***

**Answer:** While an if-else statement limits decisions to a binary choice (True or False), an if-elif-else statement handles multiple scenarios. It sequentially checks a series of conditions and executes specific code for the first one that is true.

***Q.No. 95: What happens if none of the conditions in an if-elif-else statement are true?***

**Answer:** If all the 'if' and 'elif' conditions evaluate to False, the program will automatically default to executing the code block located under the final 'else' statement.

***Q.No. 96: What is the purpose of a while loop in Python?***

**Answer:** A while loop is a construct that repeatedly runs a specific block of code as long as a given condition remains True. It is highly efficient for repeating actions when the exact number of iterations is unknown beforehand.

***Q.No. 97: When does a while loop stop executing?***

**Answer:** A while loop continually checks its condition before each iteration and will only stop executing when that specific condition evaluates to False.

***Q.No. 98: What will happen if the condition in a while loop is always true?***

**Answer:** If the condition in a while loop never becomes False (e.g., failing to increment a counter), the loop will run endlessly. This creates an infinite loop, causing the program to hang or crash as it repeats forever.

***Q.No. 99: What is the purpose of a for loop in Python?***

**Answer:** The purpose of a for loop is to repeat a block of code a specific, predetermined number of times. It is most commonly used to efficiently iterate over every item within a sequence, such as a list or a tuple.

***Q.No. 100: Can a for loop be used with a string?***

**Answer:** Yes, a for loop can easily be used with a string. Because a string is considered a sequence of individual characters in Python, the loop will seamlessly iterate over the string, processing it one letter at a time.

# Questions NO.3 ( Ch# 3,6,7)

**Q.No. 1: Differentiate between well-defined and ill-defined problems within the realm of computational problem-solving.**

**Answer:** Well-defined problems have clear goals, inputs, processes, and outputs, making them suitable for algorithmic solutions. Ill-defined problems lack clear definitions and may have ambiguous goals and requirements, making them difficult to solve directly with a computational process.

**Q.No. 2: What is a computational problem?**

**Answer:** A computational problem is a challenge that can be solved through a computational process, which involves using an algorithm or a set of step-by-step instructions that a computer can execute. The objective is to find a solution by following a finite sequence of steps.

**Q.No. 3: What are the three main components of a computational problem?**

**Answer:** The three main components of a computational problem are the input (the data or information given to the algorithm), the output (the solution or result produced), and the process (the specific steps or rules applied to the input to generate the output).

**Q.No. 4: What is the role of the process in solving a computational problem?**

**Answer:** The process represents the core algorithm of the solution; it dictates the explicit steps or rules that must be applied to the given input in order to transform it and generate the desired output.

**Q.No. 5: What type of computational problem has a "yes" or "no" answer?**

**Answer:** Decision Problems are the specific type of computational problem where the task results in a simple "yes" or "no" output.

**Q.No. 6: What are the three main elements needed to solve a computational problem?**

**Answer:** To properly solve a problem computationally, one must understand its characteristics by identifying the inputs, defining the desired outputs, and establishing the process needed to transform those inputs into outputs.

**Q.No. 7: Outline the main steps involved in the Generate-and-Test method.**

**Answer:** The Generate-and-Test method involves two primary steps: first, "Generate," which systematically or randomly creates possible solutions to the problem. Second, "Test," which evaluates each generated potential solution against the problem's specific requirements and constraints to see if it is valid.

**Q.No. 8: What is an algorithm?**

**Answer:** Algorithms are step-by-step procedures for solving problems, much like a recipe provides sequential steps for cooking a dish. They form the fundamental backbone of computer science, enabling machines to perform complex tasks efficiently.

**Q.No. 9: When is the Generate and Test algorithm useful?**

**Answer:** This algorithm is particularly useful in scenarios where the problem space is small, making it feasible to generate and test all possibilities, and when there is no clear strategy for finding a solution, necessitating an exhaustive search.

**Q.No. 10: What are the two main steps in a Generate and Test algorithm?**

**Answer:** The two main steps are "Generate," where the algorithm creates possible solutions to the problem, and "Test," where the algorithm evaluates those solutions against the required conditions.

**Q.No. 11: Compare tractable and intractable problems in the context of computational complexity.**

**Answer:** Tractable problems can be solved efficiently by a computer in polynomial time (Class P), where the time needed grows at a manageable rate relative to the input size. Intractable problems require super-polynomial time to solve, often growing exponentially or factorially, making them completely impractical to solve exactly for large inputs.

**Q.No. 12: What is a solvable problem in computer science?**

**Answer:** A solvable problem is one for which a specific algorithm can be created to solve it within a finite amount of time. These problems have clearly defined inputs and outputs, and a step-by-step procedure exists to reach the final solution.

**Q.No. 13: Give an example of an unsolvable problem.**

**Answer:** The Halting Problem is a famous example of an unsolvable problem. It involves determining whether a given program will eventually finish running or continue forever, and it has been proven that no general algorithm can solve this for all possible inputs.

**Q.No. 14: Why is the GCD problem considered solvable?**

**Answer:** Calculating the greatest common divisor (GCD) of two integers is considered solvable because the Euclidean algorithm provides a clear, step-by-step, and finite method to determine the precise GCD for any given inputs.

**Q.No. 15: Identify the key factors used to evaluate the performance of an algorithm.**

**Answer:** The performance and efficiency of an algorithm are evaluated based on its computational complexity, which primarily involves analyzing the resources required to solve the problem, specifically the time complexity and space/memory requirements.

**Q.No. 16: What does time complexity measure?**

**Answer:** Time complexity measures how the runtime of an algorithm changes and grows relative to the size of the input data.

**Q.No. 17: What is Big O notation used for?**

**Answer:** Big O notation uses specific symbols to describe and classify how the runtime of an algorithm changes in proportion to the size of the input.

**Q.No. 18: What is an example of a logarithmic time algorithm?**

**Answer:** Binary Search is a prime example of an algorithm with logarithmic time complexity, denoted as O(log n), meaning its runtime increases very slowly relative to the input size.

**Q.No. 19: Summarize the key idea behind Greedy Algorithms.**

**Answer:** Greedy algorithms work by making a sequence of choices, each of which is locally optimal at that moment, with the overarching hope that these individual choices will ultimately construct a globally optimal solution.

**Q.No. 20: Discuss the advantages of using Dynamic Programming.**

**Answer:** Dynamic Programming breaks complex problems down into simpler subproblems and stores the results of these subproblems. This allows the algorithm to retrieve previously computed values directly, avoiding redundant calculations and significantly improving overall efficiency.

**Q.No. 21: Explain the importance of breaking down a problem into smaller components in algorithmic thinking.**

**Answer:** Breaking a large problem into smaller parts allows each part to be solved independently and systematically. This approach makes it significantly easier to find a solution step by step and then combine those solutions to resolve the original complex problem.

**Q.No. 22: What does the Divide and Conquer technique do?**

**Answer:** The Divide and Conquer technique is a powerful design approach that works by breaking a large problem into smaller, manageable parts, solving each part independently, and then combining their solutions to solve the original issue.

**Q.No. 23: What are the three steps in Divide and Conquer?**

**Answer:** The three primary steps are: dividing the problem into smaller parts, solving each of those parts independently, and finally, combining the individual solutions to produce the ultimate result.

**Q.No. 24: Name an algorithm that uses Divide and Conquer.**

**Answer:** Merge Sort is a classic and widely used example of a Divide and Conquer algorithm.

**Q.No. 25: What is the main idea behind Divide and Conquer?**

**Answer:** The main concept is that complex problems can be simplified by dividing them into similar smaller problems, solving those independently, and merging the results, making it easier to find a solution step by step.

**Q.No. 26: In which type of problems is Divide and Conquer most effective?**

**Answer:** This approach is particularly effective for problems that possess an optimal substructure where they can be logically divided into similar smaller sub-problems, such as organizing large datasets.

**Q.No. 27: Can you name a sorting algorithm that uses Divide and Conquer?**

**Answer:** Merge Sort is a highly efficient sorting algorithm that utilizes the Divide and Conquer technique.

**Q.No. 28: What is Dynamic Programming used for?**

**Answer:** Dynamic Programming is an optimization technique used to solve complex problems by breaking them down into simpler subproblems and systematically storing the results to prevent redundant recalculations.

**Q.No. 29: When is Dynamic Programming most effective?**

**Answer:** Dynamic Programming is most effective when applied to problems that exhibit overlapping subproblems and possess an optimal substructure.

**Q.No. 30: How does Dynamic Programming improve efficiency? Answer:** It drastically improves efficiency by memorizing or storing the results of each subproblem as it is computed. The algorithm retrieves these values directly when needed later, cutting down on redundant calculations.

**Q.No. 31: What is Backtracking in algorithm design? Answer:** Backtracking is a methodological approach used to build a solution step by step. If the algorithm determines that a particular path doesn't lead to a valid solution, it simply goes back (backtracks) and attempts a different path.

**Q.No. 32: When do we use Backtracking?**

**Answer:** Backtracking is often utilized for solving problems where you must explore all possible options and combinations, such as complex puzzles.

**Q.No. 33: What happens if a path fails in Backtracking?**

**Answer:** If the algorithm discovers that a particular chosen path doesn't lead to a valid solution, it turns back to the previous step and tries a different path.

**Q.No. 34: Compare the advantages of Breadth-First Search (BFS) with Depth-First Search (DFS) in graph traversal.**

**Answer:** BFS efficiently explores graphs level by level, making it ideal for shallow graphs or finding the shortest path. DFS explores as far down a branch as possible before backtracking, making it highly memory-efficient for deep graphs and solving puzzles like mazes.

**Q.No. 35: What is the purpose of sorting algorithms?**

**Answer:** Sorting algorithms are strictly utilized to arrange data in a particular specified order, such as ascending or descending. Sorting is a foundational operation that is often required before executing searching and data analysis tasks.

**Q.No. 36: What does Bubble Sort do?**

**Answer:** Bubble Sort organizes a list by repeatedly stepping through it, comparing adjacent elements, and swapping them if they are in the wrong order until the entire list is correctly sorted.

**Q.No. 37: What is the time complexity of Bubble Sort?**

**Answer:** The time complexity of the Bubble Sort algorithm is O(n^2), meaning it is highly inefficient for sorting large datasets.

**Q.No. 38: How does a Binary Search algorithm work?**

**Answer:** Binary Search finds an item in a sorted list by repeatedly dividing the search interval in half. It checks the middle element and discards the half where the target item cannot be located until the item is found.

**Q.No. 39: What is the time complexity of Binary Search?**

**Answer:** The time complexity of Binary Search is O(log n), making it an extremely fast and efficient search method for large datasets.

**Q.No. 40: How does Linear Search work?**

**Answer:** Linear Search is a straightforward method that involves checking each item in a list one by one, moving in a straight line from start to finish, until the desired target is found.

**Q.No. 41: What does BFS (Breadth-First Search) explore in a graph?**

**Answer:** Breadth-First Search (BFS) explores all the nodes of a graph systematically level by level, starting from a designated root node.

**Q.No. 42: How does BFS keep track that need to be explored?**

**Answer:** To manage the traversal, BFS utilizes a queue data structure to keep track of the vertices or nodes that are waiting to be visited.

**Q.No. 43: What is the main application of BFS in real-world scenarios?**

**Answer:** In real-world scenarios, such as analyzing social networks, BFS is primarily used to find the shortest path between two nodes, like discovering the degree of separation between two users.

**Q.No. 44: What is the main idea behind the selection sort algorithm?**

**Answer:** Selection Sort works by finding the smallest (or largest) element from the unsorted portion of a list and swapping it directly with the first element of that unsorted section.

**Q.No. 45: How does the selection sort process move forward?**

**Answer:** After completing a swap, it advances by moving the boundary between the sorted and unsorted sections forward by one element, repeating the search on the remaining unsorted elements.

**Q.No. 46: What is the time complexity of selection sort?**

**Answer:** The time complexity of the Selection Sort algorithm is O(n^2), rendering it inefficient for processing large datasets.

**Q.No. 47: What is Artificial Intelligence (AI)?**

**Answer:** Artificial Intelligence (AI) refers to machines and software systems designed to think and learn like humans. AI assists with advanced tasks such as recognizing faces, understanding speech, and making automated decisions.

**Q.No. 48: Give one example of cloud computing.**

**Answer:** Notable examples of cloud computing services include Google Drive, Dropbox, and Amazon Web Services (AWS).

**Q.No. 49: What does IoT stand for, and what does it do?**

**Answer:** IoT stands for the Internet of Things. It connects everyday physical objects, such as cars and refrigerators, to the internet so they can send and receive data, enhancing convenience.

**Q.No. 50: Differentiate between Elasticity and On-Demand access in cloud computing.**

**Answer:** On-Demand access represents the ability to instantly obtain and utilize computing resources whenever needed without delays. Elasticity refers to the system's ability to automatically adjust and scale those resources based on real-time traffic to maintain performance and efficiency.

**Q.No. 51: What is cloud computing?**

**Answer:** Cloud computing is a flexible model that allows users easy access to essential computing resources, including servers, storage, and applications, over the internet instead of relying on expensive local hardware.

**Q.No. 52: What does virtualization allow? Answer:** Virtualization is a technology that allows a single physical machine to concurrently run multiple virtual machines. Each virtual machine acts independently, running its own operating system and applications.

**Q.No. 53: How does scalability help in cloud computing?**

**Answer:** Scalability helps system administrators by allowing them to easily add more computing resources, such as servers, to handle sudden spikes in traffic, ensuring websites and services run smoothly without crashing.

**Q.No. 54: What does IaaS provide to users?**

**Answer:** Infrastructure as a Service (IaaS) provides users with basic, scalable computing infrastructure, which includes servers, storage, and networking capabilities on a flexible pay-as-you-go basis.

**Q.No. 55: What is the main benefit of using PaaS for developers?**

**Answer:** Platform as a Service (PaaS) provides a complete environment that allows developers to focus entirely on coding and deploying their applications without having to manage the underlying physical hardware or software layers.

**Q.No. 56: What is SaaS and give one example? Answer:** Software as a Service (SaaS) provides users with internet access to software applications that are entirely hosted and managed by the provider. An example is Google Workspace, which includes Gmail and Google Docs.

**Q.No. 57: What is a public cloud?**

**Answer:** A public cloud is a cloud infrastructure offered over the open internet that is shared among multiple different organizations and managed entirely by a third-party service provider.

**Q.No. 58: Why might a company choose a private cloud? Answer:** A company might choose a private cloud to securely handle and manage sensitive information. Because it is exclusively used by one organization, it provides enhanced control over data security.

**Q.No. 59: How does a hybrid cloud work? Answer:** A hybrid cloud operates by combining both public and private clouds, allowing data and applications to be seamlessly shared between them. This offers organizations greater flexibility, control, and resilience.

**Q.No. 60: What is cloud storage used for?**

**Answer:** Cloud storage is used to save digital data on remote servers, which makes it easier for users to access their files from anywhere, share information, and keep secure backups safe from local hardware failures.

**Q.No. 61: Name two cloud platforms used for web hosting.**

**Answer:** Two prominent cloud platforms widely used for web hosting are Amazon Web Services (AWS) and Microsoft Azure.

**Q.No. 62: Why is cloud computing useful for AI and machine learning?**

**Answer:** Cloud computing provides highly powerful, accessible platforms designed for building, training, and deploying machine learning models, eliminating the need for data scientists to acquire expensive local computing resources.

**Q.No. 63: Why is data security important in cloud computing?**

**Answer:** Data security is a critical concern because storing sensitive information on remote servers inherently introduces significant risks, including unauthorized access, potential data breaches, and data loss.

**Q.No. 64: What is scalability in cloud computing?**

**Answer:** Scalability refers to the cloud service's ability to automatically or manually adjust computing resources—such as scaling servers up during peak demand and down when traffic decreases.

**Q.No. 65: What is compliance in the context of cloud computing?**

**Answer:** Compliance involves ensuring that an organization's use of cloud services adheres strictly to legal and regulatory requirements, including rules related to data privacy, regional security, and industry-specific standards.

**Q.No. 66: What is edge computing and how does it benefit data processing?**

**Answer:** Edge computing brings processing power closer to the data sources (the "edge" of the network) rather than centralized data centers. This minimizes travel time, significantly reduces latency, and allows for highly efficient real-time data processing.

**Q.No. 67: Describe the concept of serverless architectures.**

**Answer:** Serverless architectures are cloud models that allow developers to build and deploy applications without provisioning or managing servers, as the cloud providers automatically allocate computing resources based strictly on actual usage.

**Q.No. 68: What advantages do serverless architectures offer to developers?**

**Answer:** They greatly reduce operational complexity and enhance scalability by enabling developers to focus exclusively on writing code and building applications, while only paying for the exact resources utilized.

**Q.No. 69: How does edge computing improve the efficiency of autonomous vehicles?**

**Answer:** In autonomous vehicles, edge computing enables data generated from sensors and cameras to be processed locally within the vehicle. This facilitates rapid decision-making and immediate responses to changing road conditions, greatly enhancing safety.

**Q.No. 70: What is edge computing, and how does it benefit cloud computing?**

**Answer:** Edge computing is an advancement that places processing power near the data source at the network's edge. It benefits the cloud ecosystem by effectively reducing latency and enabling swift real-time responses without burdening central servers.

**Q.No. 71: How does serverless computing reduce operational complexity for developers?**

**Answer:** By automatically allocating resources and managing the underlying infrastructure, serverless computing frees developers from the tasks of provisioning and maintaining servers, allowing them to focus entirely on application logic.

**Q.No. 72: Why is it important for users to understand Terms of Use?**

**Answer:** Understanding the Terms of Use is crucial because these documents are binding legal agreements that outline the rules of the platform, explain data privacy implications, and prevent misunderstandings regarding the user's obligations.

**Q.No. 73: What are Terms of Use?**

**Answer:** "Terms of Use" (also known as Terms and Conditions) are formal legal agreements presented by service providers that outline the specific rules, conditions, and guidelines users must follow when engaging with a digital service.

**Q.No. 74: Why should users agree to Terms of Use?**

**Answer:** Users must agree to these terms in order to legally access the digital services. Doing so acknowledges their specific obligations, the provider's legal rights, and the conditions of usage.

**Q.No. 75: Can you give an example of Terms of Use in real life?**

**Answer:** In real life, before you can create an account on a social media platform or download a new application, you are presented with a Terms of Use document detailing what content is permissible and how your data will be used.

**Q.No. 76: Why are Terms of Use important for users?**

**Answer:** They are important because they legally protect user rights, provide necessary information about data privacy policies, and clarify what specific behaviors are expected or prohibited while using the digital platform.

**Q.No. 77: How do Terms of Use help prevent misunderstandings?**

**Answer:** They prevent misunderstandings by clearly defining the legal obligations, rights of both parties, and acceptable usage behaviors, thereby providing a clear framework that prevents potential disputes.

**Q.No. 78: What legal benefit do Terms of Use offer to businesses?**

**Answer:** Terms of Use offer businesses protection from liabilities, establish clear intellectual property ownership, and grant service providers the legal right to terminate services for any users who violate the established rules.

**Q.No. 79: What is the purpose of a "User Obligation" clause in Terms of Use?**

**Answer:** The "User Obligation" clause outlines the specific responsibilities and acceptable behaviors required of the user, primarily to ensure they do not abuse the system or engage in any illegal activities.

**Q.No. 80: Why are privacy clauses important in Terms of Use?**

**Answer:** Privacy clauses are vital because they inform the user exactly how their personal data will be collected, safely stored, and utilized by the service provider, thereby addressing key security and ethical concerns.

# Questions NO.4 (Ch # 4,5,9)

**Q.No. 1: Explain how the 'insert()' function works in python lists. Provide an example.**

**Answer:** The insert() function is used to add an item at a specific position or index in a Python list, rather than just appending it to the end. It takes two arguments: the index where the item should be placed, and the item itself. For example, fruits.insert(1, "Orange") will place "Orange" at index 1, shifting all subsequent elements to the right.

**Q.No. 2: Explain the potential issues which could arise when two variables reference the same list in a program? Provide an example.**

**Answer:** When two variables reference the same list, they point to the exact same memory location. This means any modification made through one variable will unexpectedly change the list for the other variable as well. For example, if list_A = [1, 2, 3] and you set list_B = list_A, changing list_B[0] = 9 will also change list_A to [9, 2, 3].

**Q.No. 3: Define a stack and explain the Last-In, First-Out (LIFO) principle.**

**Answer:** A stack is a linear data structure that stores items following the Last-In, First-Out (LIFO) principle . LIFO means that the last item added (pushed) to the stack will be the very first item to be removed (popped). It functions exactly like a stack of plates in a cafeteria, where you can only take the top plate off first.

**Q.No. 4: Differentiate between the Enqueue and Dequeue operations of queue.**

**Answer:** Enqueue and Dequeue are the two primary operations of a queue data structure. The "Enqueue" operation is used to add or insert a new item at the back (end) of the queue. Conversely, the "Dequeue" operation removes and returns the item from the front (beginning) of the queue, strictly following the First-In, First-Out (FIFO) principle.

**Q.No. 5: Name two basic operations performed on stack.**

**Answer:** The two fundamental operations performed on a stack are Push and Pop. The Push operation adds a new element to the top of the stack, while the Pop operation removes and returns the element currently sitting at the top of the stack.

**Q.No. 6: What is difference between enqueue () and dequeue ().**

**Answer:** The difference lies in their function within a queue. enqueue() is responsible for adding a new element to the tail or back of the queue. In contrast, dequeue() is responsible for removing and returning the element that is at the head or front of the queue, ensuring older elements are processed first.

**Q.No. 7: What is a list in Python?**

**Answer:** In Python, a list is a versatile, built-in data structure that holds an ordered collection of items. Lists can contain elements of different data types, such as numbers, strings, or even other lists, and their dynamic size allows them to flexibly grow or shrink as items are added or removed during execution.

**Q.No. 8: How is a list created in Python?**

**Answer:** A list in Python is created by placing a sequence of items inside square brackets [ ], with each individual item separated by a comma. For example, a simple list of fruits can be created and assigned to a variable using the syntax: fruits = ["Apple", "Banana", "Cherry"].

**Q.No. 9: What is an element in a list?**

**Answer:** An element in a list refers to an individual item or specific piece of value stored within that list structure. Each element holds a specific position or index within the list, starting from index 0, allowing it to be independently accessed, modified, or removed by the programmer.

**Q.No. 10: What does it mean that Python lists have dynamic size?**

**Answer:** Having a dynamic size means that a Python list does not have a fixed, predetermined length. The list can automatically expand its memory allocation when new elements are added (e.g., using functions like append()) and seamlessly shrink when elements are removed, providing high flexibility in managing data.

**Q.No. 11: How can you access elements in a list?**

**Answer:** Elements in a list are accessed using their specific index numbers enclosed in square brackets immediately following the list name. Python utilizes zero-based indexing, meaning the first element is accessed with list_name[0], the second with list_name[1], and negative indices like list_name[-1] can be used to access elements starting from the end.

**Q.No. 12: Which function is used to insert an item at a specific position in a list?**

**Answer:** The insert() function is utilized to explicitly add an item at a specific, designated index within a list. When executed, it shifts the existing elements at that index and all subsequent indices to the right to securely accommodate the new item without overwriting existing data.

**Q.No. 13: What are two common applications of lists in programming?**

**Answer:** Lists are commonly used for organizing and dynamically storing collections of related data, such as maintaining a database of student names. They are also frequently combined with stacks and queues to perform sequential operations, manage task lists, or process complex data sequences efficiently.

**Q.No. 14: What does LIFO stand for in the context of stacks?**

**Answer:** In the context of stacks, LIFO stands for Last-In, First-Out. This operational principle dictates that the most recently added item to the stack is the very first one to be accessed and removed, much like taking the top document from a piled stack of papers.

**Q.No. 15: Which operations are used in a stack?**

**Answer:** The primary operations used to manipulate a stack are "Push," which adds a new element to the top, and "Pop," which removes the element from the top. Another common operation is "Peek," which allows the programmer to view the top element's value without actively removing it from the stack.

**Q.No. 16: What does FIFO stand for in queues?**

**Answer:** FIFO stands for First-In, First-Out. It is the guiding, fundamental principle of a queue data structure, explicitly meaning that the first element added to the queue will be the first one to be processed and removed, ensuring fairness and order.

**Q.No. 17: Which two main operations are performed on a queue?**

**Answer:** The two main operations performed on a queue data structure are "Enqueue" and "Dequeue." Enqueue adds a data item to the rear or end of the queue, while Dequeue systematically removes a data item from the front of the queue.

**Q.No. 18: How does a queue work in real life? Answer:** In real life, a queue works exactly like a line of customers waiting at a bank or a checkout counter. The person who arrives first is served first (First-In, First-Out), and any new person joining the line must stand at the very back and wait for their specific turn to be served.

**Q.No. 19: What is a root node in a tree structure?**

**Answer:** The root node is the topmost, fundamental node in a tree data structure from which all other nodes logically descend . It is the single, unique node in the entire tree that does not have a parent node, serving as the definitive starting point for traversing the hierarchy.

**Q.No. 20: What is a leaf in a tree structure?**

**Answer:** A leaf, or leaf node, is a node in a hierarchical tree structure that does not have any child nodes connected below it. It is located at the absolute bottom or end of a branch, representing the final, terminating elements in that particular path of the tree.

**Q.No. 21: How is a tree different from a list?**

**Answer:** A list is a linear data structure that stores elements in a sequential, flat order, processing items one after another. In contrast, a tree is a non-linear, hierarchical data structure that organizes data in complex parent-child relationships, much like a biological family tree or a corporate organizational chart.

**Q.No. 22: What is a graph in data structures?**

**Answer:** A graph is a non-linear data structure consisting of a collection of distinct nodes, called vertices, that are connected to one another by relational lines called edges . Graphs are highly effective for representing complex networks and interconnected relationships.

**Q.No. 23: How is a graph different from a tree?**

**Answer:** While a tree is a strict hierarchical structure with a single root and absolutely no cycles (loops), a graph is a broader network structure that has no specific root node. Furthermore, graphs can contain cycles, meaning their edges can connect any vertex to any other vertex in closed loops.

**Q.No. 24: Give a real-life example of a graph.**

**Answer:** A prominent real-life example of a graph is a city's transportation or railway map. In this scenario, the cities or train stations act as the graphical vertices (nodes), and the physical roads or railway tracks connecting them represent the edges of the network.

**Q.No. 25: What is a vertex in a graph?**

**Answer:** A vertex (plural: vertices) is a fundamental unit, point, or node within a graph structure. It acts as a point of intersection that holds data and can be connected to multiple other vertices through structural edges to form a vast network.

**Q.No. 26: What is the degree of a vertex?**

**Answer:** The degree of a vertex in a graph refers to the total number of edges that are directly connected to it. It essentially indicates exactly how many direct neighbors or immediate connections that specific node has within the overarching network structure.

**Q.No. 27: What is a weighted graph?**

**Answer:** A weighted graph is a specialized type of graph where each connecting edge is assigned a specific numerical value, known as a "weight." These weights are often utilized to represent physical quantities like distance, cost, or time required to travel between the connected vertices.

**Q.No. 28: What is the mean of a dataset, and how is it calculated?**

**Answer:** The mean is the mathematical average of a dataset, representing its core central tendency. It is carefully calculated by adding all the numerical values together to find a total sum, and then dividing that sum by the absolute number of values present in the dataset.

**Q.No. 29: What is the mode of a dataset, and how can it be determined?**

**Answer:** The mode is the specific value that appears most frequently within a dataset. It is determined by systematically counting the occurrences of each number; the number with the highest frequency is the mode. A single dataset can have one, multiple, or no modes at all.

**Q.No. 30: How do you find the median of a dataset with an even number of values?**

**Answer:** To accurately find the median of an even-numbered dataset, first arrange the numbers in ascending numerical order. Then, locate the two exact middle numbers, add them together, and divide by two to calculate their average, which then represents the formal median.

**Q.No. 31: What does a high variance indicate about a dataset?**

**Answer:** A high variance statistically indicates that the data points in the set are widely spread out from the mean (average) and from one another. It means the dataset possesses a large amount of fluctuation, spread, or overall variability.

**Q.No. 32: What is the mean of the dataset: 50, 52, 55, 57, 60?**

**Answer:** The mean is calculated by adding the individual numbers (50 + 52 + 55 + 57 + 60 = 274) and then dividing by the total count of numbers (5). The mean of this dataset is 274 divided by 5, which exactly equals 54.8.

**Q.No. 33: Which class had more scattered scores, Class A(50,52,55,57,60) or Class B(30,45,55,75,90)?**

**Answer:** Class B has significantly more scattered scores. The values in Class B range widely from 30 to 90, indicating a much higher variance and standard deviation compared to Class A, where all scores are tightly and uniformly grouped between 50 and 60.

**Q.No. 34: What is standard deviation?**

**Answer:** Standard deviation is a vital statistical measure that quantifies how much the data points in a dataset are spread out in relation to the mean. It is exactly the square root of the variance and provides a highly practical number for understanding data variation.

**Q.No. 35: What does a high standard deviation indicate?**

**Answer:** A high standard deviation clearly indicates that the values in a dataset are widely scattered or spread out far from the average (mean). It shows that there is a substantially large amount of variation, spread, or unpredictability within the collected data.

**Q.No. 36: What is probability?**

**Answer:** Probability is the formal mathematical study of how likely a specific event is to happen. It fundamentally helps predict outcomes based on known data and is expressed as a fraction, percentage, or decimal ranging from 0 (impossible) to 1 (certain).

**Q.No. 37: What is the probability of getting heads when flipping a fair coin?**

**Answer:** When flipping a standard, fair coin, there are two equally likely possible outcomes: heads or tails. Therefore, the exact probability of getting heads is 1 out of 2, which can be expressed mathematically as 50%, 1/2, or 0.5.

**Q.No. 38: What is the purpose of data collection in research?**

**Answer:** The primary purpose of data collection in research is to purposefully gather accurate, relevant information systematically. This data provides the foundational evidence desperately needed to analyze trends, answer critical research questions, test hypotheses, and make informed, data-driven decisions.

**Q.No. 39: What is the main difference between surveys and observations as data collection methods?**

**Answer:** Surveys actively involve directly asking participants structured questions to gather self-reported data about their thoughts or behaviors. Observations, conversely, involve researchers silently watching and recording subjects in their natural environment without direct interaction or aggressive questioning.

**Q.No. 40: How do experiments help in data collection?**

**Answer:** Experiments help data collection by allowing researchers to strictly control specific variables within a highly controlled environment to observe cause-and-effect relationships. They provide precise, empirical data on exactly how one specific change directly affects a measurable outcome.

**Q.No. 41: What is data preparation?**

**Answer:** Data preparation is the critical, foundational process of cleaning, transforming, and organizing raw data before it is ever analyzed. It ensures the data is accurate, consistent, formatted correctly, and free of errors, making it entirely suitable for reliable statistical analysis.

**Q.No. 42: Why is data cleaning important?**

**Answer:** Data cleaning is essential because raw data often contains severe errors, duplicates, or missing values. Cleaning the data ensures rigorous accuracy; if the data is flawed, any analysis or predictive models built upon it will unfortunately yield misleading or incorrect results.

**Q.No. 43: What are common problems fixed during data cleaning?**

**Answer:** Common, everyday problems fixed during data cleaning include correcting misspelled names or incorrect formatting, filling in or handling missing data (like a missing student grade), and removing exact duplicate entries from the dataset to ensure total accuracy.

**Q.No. 44: What is meant by handling missing data?**

**Answer:** Handling missing data refers to the deliberate techniques used when certain values are absent from a dataset. This can involve safely removing the incomplete records entirely or filling in the gaps using statistical methods like imputation to maintain the dataset's structural integrity.

**Q.No. 45: What is imputation?**

**Answer:** Imputation is a specific statistical technique used during data cleaning where missing or absent data values are intentionally replaced with logically substituted values. Commonly, this involves filling the gap with the calculated mean, median, or mode of the existing data in that category.

**Q.No. 46: What does flagging a missing value mean?**

**Answer:** Flagging a missing value means explicitly assigning a specific placeholder or marker (like 'N/A' or '0') to an empty data entry instead of deleting the row. This allows the analytical software to successfully recognize that the data point was intentionally left blank.

**Q.No. 47: List two types of data visualizations and describe when you would use each.**

**Answer:** Two common types are Bar Charts and Line Graphs. A Bar Chart is utilized to compare distinct quantities across different categories (like the sales of different fruits). A Line Graph is best used to display trends and continuous changes in data over a specific period of time.

**Q.No. 48: What is data visualization?**

**Answer:** Data visualization is the clear graphical representation of data and information. By using strong visual elements like charts, graphs, and maps, it makes complex, dense datasets significantly easier to understand, allowing people to quickly spot patterns, trends, and outliers.

**Q.No. 49: When would you use a bar chart?**

**Answer:** A bar chart is used when you critically need to compare different discrete categories or groups of data side-by-side. It effectively displays the varying quantities or frequencies of each category, making it simple to visually determine which group is largest or smallest.

**Q.No. 50: How does visualizing data help in understanding descriptive statistics?**

**Answer:** Visualizing data powerfully translates abstract descriptive statistics (like mean or variance) into highly clear visual formats. It provides an immediate "overall picture" of the data's distribution and trends, making it easier for human brains to grasp complex summaries instantly without reading raw numbers.

**Q.No. 51: Which two common tools can be used to create data visualizations easily?**

**Answer:** Two widely used, highly accessible software tools for creating data visualizations are Microsoft Excel and Google Sheets. Both platforms offer robust built-in features to easily convert raw spreadsheet data into various accurate charts and graphs.

**Q.No. 52: What is the first step when creating a chart in Excel or Google Sheets?**

**Answer:** The absolute first step is to correctly organize and highlight the specific data you want to visualize. You must meticulously select the relevant rows and columns, including their descriptive headers, before clicking the "Insert Chart" function.

**Q.No. 53: Why is it important to add labels to charts?**

**Answer:** Adding descriptive labels, such as detailed titles and axis descriptions, is crucial because they provide necessary context. Labels immediately tell the viewer exactly what data is being represented, what the units of measurement are, and ensure the chart can be accurately interpreted.

**Q.No. 54: Define entrepreneurship in your own words.**

**Answer:** Entrepreneurship is the process of taking the bold initiative to start, manage, and grow a new business venture. It involves recognizing a problem or market need, developing an innovative solution, and taking on calculated financial risks with the primary goal of creating value and earning a profit.

**Q.No. 55: What is the main focus of Design Thinking?**

**Answer:** The main focus of Design Thinking is a strictly human-centered approach to deep problem-solving. It highly prioritizes deeply understanding the users' needs, empathizing with their unique challenges, and iteratively generating creative solutions and prototypes to solve those specific problems effectively.

**Q.No. 56: What is the first step in Design Thinking?**

**Answer:** The very first step in Design Thinking is "Empathize." It involves conducting thorough research and engaging directly with target users to gain a deep, sympathetic understanding of their experiences, problems, and the specific daily needs you are trying to solve.

**Q.No. 57: Why is it important to create a prototype?**

**Answer:** Creating a prototype is critically important because it turns an abstract conceptual idea into a tangible, testable model. It allows designers to cheaply and rapidly test functionality, gather direct user feedback, and identify necessary improvements before investing heavily in the final product.

**Q.No. 58: How does the "Ideate" step help in the Design Thinking process?**

**Answer:** The "Ideate" step actively helps by encouraging wide brainstorming and out-of-the-box thinking. After fully understanding the problem, the team safely generates a wide variety of creative, potential solutions without judgment, forming the strong foundation for building the best possible prototype.

**Q.No. 59: What is a business solution?**

**Answer:** A business solution is a specific, well-designed product, service, or strategy created to directly address a particular problem or gap in the market. It fundamentally aims to provide vast value to customers while simultaneously generating revenue and ensuring the success of the business.

**Q.No. 60: How does Design Thinking help businesses?**

**Answer:** Design Thinking helps businesses by shifting their core focus directly to actual customer needs. It continuously fosters innovation, dramatically reduces the financial risk of launching unsuccessful products through early prototyping, and ensures that final business solutions genuinely resonate with the target audience.

**Q.No. 61: Give an example of a business solution for a grocery store.**

**Answer:** A strong business solution for a grocery store experiencing exceptionally long checkout lines could be introducing a reliable automated self-checkout system or a mobile app for online ordering and curbside pickup, immediately addressing the customer's need for a faster shopping experience.

**Q.No. 62: List the key steps involved in creating a business plan.**

**Answer:** The key necessary steps include writing an Executive Summary, providing a detailed Business Description, conducting an intensive Market Analysis, detailing Organization and Management, outlining Products or Services, creating a Marketing and Sales Strategy, and developing a comprehensive Financial Plan.

**Q.No. 63: What is a business plan?**

**Answer:** A business plan is a highly formal, written document that clearly outlines a company's core operational objectives and the detailed strategies it will employ to achieve them. It acts as a vital roadmap, heavily covering operational, marketing, and financial plans to guide the business to sustained success.

**Q.No. 64: Why is a market analysis important in a business plan?**

**Answer:** Market analysis is extremely important because it definitively demonstrates a deep understanding of the competitive industry. It identifies the target customers and their needs, evaluates competitors, and clearly proves to investors that there is a viable, highly profitable market for the business's product or service.

**Q.No. 65: What is the purpose of the financial plan in a business plan?**

**Answer:** The financial plan clearly outlines the business's ultimate financial goals, strict budgeting requirements, required initial funding, and carefully projected revenue. Its purpose is to conclusively demonstrate the financial viability of the business and explain exactly how it intends to yield a profit.

**Q.No. 66: What is the main benefit of using business plan software?**

**Answer:** The main benefit of using dedicated business plan software is that it efficiently streamlines the planning process by providing structured writing templates and automated financial calculations. It helps entrepreneurs intelligently organize their ideas professionally and create comprehensive plans much more efficiently.

**Q.No. 67: How do business plan tools like PlanGuru and Enloop help with financial planning?**

**Answer:** Tools like PlanGuru and Enloop aggressively specialize in financial forecasting and complex budgeting. They allow busy entrepreneurs to input raw financial data and automatically generate complex financial statements, projections, and reports, making financial planning much easier and highly accurate.

**Q.No. 68: What type of business is PlanGuru or Enloop software useful for?**

**Answer:** These specialized financial planning tools are highly useful for new startups and small to medium-sized businesses that desperately require accurate financial forecasting, advanced budgeting, and structured business plans to professionally present to banks or potential investors for funding.

**Q.No. 69: What is the main benefit of using collaborative tools like Google Drive or Dropbox Paper?**

**Answer:** The absolute main benefit is real-time, remote teamwork. These powerful tools allow multiple team members to access, deeply edit, and contribute to the exact same document simultaneously from vastly different locations, ensuring everyone stays updated and works together seamlessly.

**Q.No. 70: How can team collaboration improve the business planning process?**

**Answer:** Collaboration naturally brings diverse perspectives and deep expertise to the table. By seamlessly working together, team members can divide complex tasks, provide immediate critical feedback, brainstorm better marketing or financial strategies, and ultimately produce a highly refined business plan.

**Q.No. 71: What kind of work can you do simultaneously using collaborative tools in a business plan?**

**Answer:** Using cloud collaborative tools, one team member can actively write the executive summary or market analysis text, while another simultaneously inputs complex numerical data into financial spreadsheets or directly designs charts within the very same shared workspace document.

**Q.No. 72: Why is market research important for a new business?**

**Answer:** Market research is deeply critical for a new business because it provides highly valuable insights into customer preferences, broad market trends, and specific competitor behavior. It helps entrepreneurs confidently validate their ideas, minimize financial risks, and make highly informed decisions regarding product development.

**Q.No. 73: Explain the importance of a business pitch.**

**Answer:** A business pitch is vital because it is a very brief, highly persuasive presentation specifically designed to quickly communicate the immense value of a business idea. Its primary importance lies in successfully capturing the attention of potential investors, strategic partners, or huge customers to secure critical funding.

**Q.No. 74: What is the main purpose of collecting market insights?**

**Answer:** The absolute main purpose is to actively gather actionable, real-world data about what target customers truly desire and exactly how they behave. These robust insights allow competitive businesses to tailor their products, services, and marketing strategies to meet actual market demands and effectively outsmart competitors.

**Q.No. 75: What are the two main types of market research techniques?**

**Answer:** The two main overarching types of market research techniques are qualitative research and quantitative research. They fundamentally differ in approach; qualitative fiercely focuses on understanding opinions and deep motivations, while quantitative strictly focuses on statistical data and large-scale numerical measurements.

**Q.No. 76: How can market research help with product development?**

**Answer:** Market research directly helps by explicitly identifying the specific features or necessary solutions that customers are currently lacking. By fundamentally understanding customer pain points, a business can design a highly successful product that directly solves those problems, ensuring much higher customer satisfaction.

**Q.No. 77: What is qualitative research?**

**Answer:** Qualitative research is an exploratory, open-ended research method deeply focused on understanding underlying human reasons, raw opinions, and core motivations. It thoroughly involves gathering non-numerical data through extensive conversations, direct interviews, or long observations to gain deep insights into human behavior.

**Q.No. 78: What is quantitative research?**

**Answer:** Quantitative research is a highly structured, objective research method strictly used to gather hard numerical data and definitively uncover statistical patterns. It widely utilizes surveys, polls, and metrics to successfully quantify attitudes or behaviors and accurately generalize results from a significantly larger sample population.

**Q.No. 79: Give one example of qualitative research.**

**Answer:** A classic example of qualitative research is conducting an in-depth, one-on-one interview or holding an extended focus group with a few key customers to ask them highly open-ended questions about exactly how they feel emotionally when using a specific new mobile application.

**Q.No. 80: Give one example of quantitative research. Answer:** A perfect example of quantitative research is securely distributing an online multiple-choice survey to exactly 500 individuals to mathematically calculate the precise percentage of the target population that highly prefers buying their daily groceries online versus in a physical store.

**Q.No. 81: Why is market research important for a business?**

**Answer:** Market research safely prevents modern businesses from operating blindly. By deeply understanding raw customer needs, vast market trends, and aggressive competitor strategies, businesses can rapidly make data-driven decisions that minimize financial risk and heavily increase the overall chances of product success.

**Q.No. 82: What is a customer survey?**

**Answer:** A customer survey is a highly popular quantitative research tool heavily consisting of a structured list of specific questions widely distributed to a target audience. It is routinely used to swiftly gather specific data, immediate feedback, and valuable statistics regarding customer satisfaction and demographics.

**Q.No. 83: How can a business use customer surveys?**

**Answer:** A business can intelligently use customer surveys to precisely measure total customer satisfaction, gather instant feedback on a newly launched product, quickly identify problematic areas for immediate improvement, or effectively collect demographic data to better tailor future digital marketing campaigns.

**Q.No. 84: What is a focus group?**

**Answer:** A focus group is an intense qualitative research method where a remarkably small, highly diverse group of people is physically brought together to intimately discuss a specific product, service, or concept. A trained moderator carefully guides the discussion to capture deep insights and emotional reactions.

**Q.No. 85: How is a focus group helpful in business planning?**

**Answer:** A focus group is exceptionally helpful because it uniquely allows a business to test very raw concepts and prototypes on real consumers before an incredibly expensive public launch. It safely provides rich, deeply detailed feedback on exactly how the product feels, looks, and functions from the user's perspective.

**Q.No. 86: Give an example of using a focus group in a bakery business.**

**Answer:** A bakery might smartly invite an exclusive focus group of 10 local residents to taste-test a brand-new recipe for gluten-free bread. The bakery would ask the group deeply detailed questions about the bread's texture, taste, and packaging appeal to heavily refine the product before selling it publicly.

**Q.No. 87: What does analyzing market data mean?**

**Answer:** Analyzing market data specifically means systematically reviewing and deeply interpreting the massive raw information gathered from rigorous market research. It effectively involves carefully looking for distinct patterns, emerging trends, and hard statistics to firmly draw logical conclusions that heavily guide subsequent business strategies.

**Q.No. 88: What is a market trend?**

**Answer:** A market trend is a clearly perceived, sustained tendency of financial markets or shifting consumer behavior to move steadily in a particular direction over time. For example, the massive increasing consumer preference for eco-friendly or organic products is a highly prominent modern market trend.

**Q.No. 89: What is market segmentation?**

**Answer:** Market segmentation is the incredibly strategic process of precisely dividing a broad target market into significantly smaller, much more manageable groups of consumers who explicitly share similar characteristics, such as specific age, high income, or unique lifestyle, to safely allow for much more personalized marketing.

**Q.No. 90: How does competitor analysis help a business?**

**Answer:** Competitor analysis immensely helps a business by successfully identifying the hidden strengths and glaring weaknesses of rival companies. This critical knowledge actively allows the business to rapidly find open gaps in the market, confidently set competitive pricing, and quickly develop brilliant strategies to offer a far superior product.

**Q.No. 91: What is predictive analysis?**

**Answer:** Predictive analysis is an incredibly advanced mathematical technique that systematically uses historical data, complex statistical algorithms, and modern machine learning to successfully estimate the exact likelihood of future outcomes. In modern business, it is aggressively used to forecast future sales trends and specific customer behaviors.

**Q.No. 92: Give one reason why analyzing data is important.**

**Answer:** Analyzing data is exceptionally crucial because it rapidly turns raw, highly confusing numbers into explicitly actionable insights. It safely allows business owners to heavily rely on solid facts and empirical evidence to instantly make critical financial and operational decisions, rather than relying on dangerous guesswork.

**Q.No. 93: Why do businesses study competitors?**

**Answer:** Businesses rigorously study competitors to fully understand the incredibly dense current market landscape. By carefully analyzing what specific rivals are doing right or wrong, a business can nimbly adapt its own operational strategies to successfully highlight unique selling points and rapidly capture a far larger share of the target audience.

**Q.No. 94: What is predictive analysis used for?**

**Answer:** Predictive analysis is very commonly used for accurately forecasting future business events to directly aid in highly proactive decision-making. Savvy businesses routinely use it to correctly anticipate inventory needs, mathematically predict market trends, rigorously evaluate potential risks, and highly estimate future sales volumes.

**Q.No. 95: What is the main benefit of making data-driven decisions?**

**Answer:** The absolute main benefit is flawless accuracy and massive risk reduction. Superior data-driven decisions are entirely based on highly objective, verifiable statistical evidence rather than mere human intuition, leading to much more efficient operations, drastically better resource allocation, and a significantly higher probability of business success.

**Q.No. 96: Give an example of data-driven decision-making.**

**Answer:** A busy e-commerce store meticulously analyzes its vast website data and explicitly discovers that exactly 80% of its massive sales predictably occur on weekends. As a precise data-driven decision, the store immediately reallocates its marketing budget to explicitly run heavy promotional advertisements exclusively on Fridays and Saturdays to maximize vast profits.

**Q.No. 97: What is a business pitch?**

**Answer:** A dynamic business pitch is an exceptionally short, incredibly compelling verbal presentation confidently delivered by an ambitious entrepreneur to outline a new business idea. Its sole objective is to aggressively persuade a skeptical audience, typically wealthy investors or vital partners, to heavily support, fund, or deeply participate in the lucrative business venture.

**Q.No. 98: What is the first step of pitching a business idea?**

**Answer:** The critically important first step in pitching a complex business idea is to specifically "Start with the Problem." The presenter must crystal clearly explain the exact specific problem or agonizing pain point that currently exists in the target market, thereby perfectly setting the stage for their business as the absolute necessary solution.

**Q.No. 99: Why is it important to know your audience in a pitch?**

**Answer:** Knowing your audience intimately allows you to flawlessly tailor your exact message to their explicit, specific interests. If actively pitching to wealthy investors, you must focus heavily on vast financial returns and massive scalability; if warmly pitching to new customers, you must focus explicitly on the direct personal benefits and brilliant features of the product.

**Q.No. 100: What should you be ready for after giving a pitch?**

**Answer:** After flawlessly delivering a pitch, you absolutely must be fully, mentally prepared to confidently answer tough questions. The audience or sharp investors will highly likely ask for significantly deeper details regarding exact financial projections, thorough competitor analysis, precise pricing, or highly technical aspects of the product to aggressively validate your bold claims.

# Long Questions for Annual 2026

| Question NO. 5 | |
|---|---|
| **1** | Write a Python program using a while loop that prints all the odd numbers between 1 and 100. Also, count and print the total number of odd numbers. |
| **2** | Translate the following Mathematical Expressions to Python Syntax: (a) Math: $15 \times (3+2)/6 - 2 \times 3$(b) Math: $7 + 2^2$ |
| **3** | Discuss the differences between time complexity and space complexity. How do they impact the choice of an algorithm for a specific problem? |
| **4** | What is graph? Explain differences between directed and undirected graphs. |
| **5** | Explain data collection methods. |
| **6** | Explain the common clauses found in terms of use and describe how they protect both the service provider and the user. |
| **7** | Explain the operations on stack with real-life example and Python code. |
| **8** | What is Binary Search, how does its process work, what is its time complexity, and how is it more efficient compared to other search methods? |
| **9** | Write two differences between Linear Search and Binary Search. |
| **10** | Define Bubble Sort. Explain its working with an example. |
| **Question NO. 6** | |
| **11** | Write two difference between Bubble Sort and Selection Sort. |
| **12** | Write a Python program that takes a number as input and checks whether it is positive, negative, or zero using an if-elif-else statement. |
| **13** | What is Time Complexity, how does Big O Notation describe it, and what do $O(1)$, $O(n)$, $O(n^2)$, and $O(\log n)$mean in real-world examples? |
| **14** | Write a simple program to implement a queue (insertion and deletion). |
| **15** | How does a tree data structure organize information, and why is it better than a list for representing hierarchical relationships like those in a family tree? |
| **16** | Differentiate between a Tree and a Graph. |
| **17** | Differentiate between Tractable Problems and Intractable Problems. |
| **18** | Write two differences between Time Complexity and Space Complexity of an algorithm. |
| **19** | Differentiate Solvable and Unsolvable Problems. |
| **20** | Differentiate between Decision Problems and Search Problems. |

| Question NO. 7 | |
|---|---|
| **21** | What are operators? List different types of operators in Python? Give examples. |
| **22** | What are logical operators in Python? Explain with examples. |
| **23** | What is operator precedence in Python? Explain with examples. |
| **24** | How does the if-elif-else statement work in Python for decision making with multiple condition? |
| **25** | What are 2 key differences between if-else statement and short hand if-else? |
| **26** | What is the range () function in Python, how is it used in for loops, and what are its different forms with example? |
| **27** | What is different between while and for loop in Python. |
| **28** | Explain how to define and invoke a function in Python with example. |
| **29** | Explain function parameters and return values in Python with example. |
| **30** | Explain how to import and use libraries in Python with examples. |
| **Question NO. 8** | |
| **31** | How can we perform different operations like slicing, concatenation, sorting, and removing items on lists in Python? |
| **32** | How do indexing and slicing help in accessing and manipulating sequences like lists, tuples, and strings in Python? |
| **33** | What are algorithm design techniques, and how does the Divide and Conquer method work, as seen in Merge Sort? |
| **34** | What are Greedy Algorithms, and how do they build a solution by making locally optimal choice to read a globally optimal result? |
| **35** | What is Dynamic Programming, how does it work, and in which type of problems is it used? Give one example to explain its use. |
| **36** | What is Breadth-First Search (BFS)? Explain its working process, give one real-world example, and mention its time complexity. |
| **37** | What is Depth-First Search (DFS)? Explain how it works, give a real-world example, and mention its time complexity. |
| **38** | Write two differences between BFS (Breadth-First Search) and DFS (Depth-First Search). |
| **39** | Differentiate between list and stack. |
| **40** | Discuss the concept of measure of tendency with example. |
| **Question NO. 9** | |
| **41** | Differentiate between Mean and Median. |
| **42** | What is Standard Deviation, and how does it help us understand how much data values differ from the mean? Explain with example. |
| **43** | Differentiate between Data Cleaning and Data Transformation. |
| **44** | Compare Bar Charts with Line Graphs. |
| **45** | Differentiate between Histograms and Scatterplots. |
| **46** | Differentiate between phishing and pharming. |
| **47** | Differentiate between spam and phishing. |
| **48** | What are the positive and negative impacts of computing on individuals and society, with examples? |
| **49** | What is Digital Citizenship and what are the important ethical, responsible behaviors and Cybersecurity Awareness when using digital technologies and information? |
| **50** | What is Collaborative Problem Solving, and how does human-machine collaborative and teamwork help in solving problems? |