1. **The statement `x=input()` assigns 4 to variable `x`. Identify the datatype of `x` ?**
   a) `int`
   b) `str`
   c) `list`
   d) `bool`

2. **What will the following code print?**

```
print(3 * 'hello ')
```

a) hellohellohello
b) hello hello hello
c) hellohello hello
d) hello hellohello

3. **Which of the following is NOT a valid variable name?**
   a) _name
   b) 2name
   c) name_2
   d) Name

4. **What is the output of the following code?**

```
a = [1, 2, 3]
b = a
b.append(4)
print(a)
```

a) [1, 2, 3]
b) [1, 2, 3, 4]
c) [4]
d) Error

5. **Which loop is better suited for processing a fixed number of items in a shopping cart?**
   a) `for` loop
   b) `while` loop
   c) `do-while` loop
   d) Infinite loop

6. **When a function that processes a payment doesn't specify a return statement, what value does it return by default?**
   a) 0
   b) None
   c) False
   d) Empty string

7. **What will the following code output?**

```
try:
    print(5 / 0)
except ZeroDivisionError:
    print("Error")
```

a) 0
b) None
c) Error
d) ZeroDivisionError

8. **If a function opens a log file to record new data, which mode will erase any existing content in the file when opened?**
   a) `r`
   b) `w`
   c) `a`
   d) `r+`

9. **When loading a customer order file, which method reads the entire file content into a single string?**
   a) `read()`
   b) `readline()`
   c) `readlines()`
   d) `write()`

10. **In a product inventory system, which data structure allows storing duplicate product names when the same item is stocked in multiple locations?**
    a) Set
    b) List
    c) String
    d) Tuple

11. **In a customer queue system, which function is used to add a new customer to the end of the waiting list?**
    a) `write()`
    b) `add()`
    c) `append()`
    d) `extend()`

12. **In which of the following situations would you use the elimination method to solve simultaneous equations?**
    a) When the equations are linear
    b) When the equations are non-linear
    c) When the equations are inconsistent
    d) When you need to find the determinant

13. **In a list of customer IDs, which search algorithm would divide the list in half at each step to quickly locate a specific ID?**

a) Linear Search
b) Bubble Sort
c) Binary Search
d) Merge Sort

14. **In a record-keeping system where employee IDs should not change, which of the following data structures is immutable?**
    a) List
    b) Dictionary
    c) Set
    d) Tuple

15. **In a classroom, a teacher records the test scores of 30 students across 4 subjects: Math, Science, English, and History. If each student's scores are arranged in a table with each row representing a student and each column representing a subject, what are the dimensions of this table?**
    a) 30 x 3
    b) 30 x 4
    c) 4 x 30
    d) 4 x 40

16. **What is the result of multiplying a matrix by the identity matrix?**
    a) A zero matrix
    b) The original matrix
    c) A scalar value
    d) The transpose of the matrix

17. **A data analyst is given a dataset in matrix form where each row represents a unique city and each column represents a different environmental metric, such as temperature, humidity, and air quality index. To analyze trends across metrics rather than cities, the analyst decides to swap the rows and columns of the matrix. Which matrix operation**

would the analyst perform?

a) Transpose

b) Inverse

c) Determinant

d) Trace

18. **What will be the output of the following code?**

```
lst = [1, 2, 3]
lst[1] = 5
print(lst)
```

a) [1, 5, 3]

b) [1, 2, 5]

c) [5, 2, 3]

d) Error

19. **What is the dot product of two perpendicular vectors?**

a) 1

b) -1

c) 0

d) Infinity

20. **What is the probability of getting a head in a fair coin toss?**

a) 0

b) 0.5

c) 1

d) 0.25

21. **In a recent survey, a teacher collected the test scores of her 30 students to evaluate their overall performance. Which statistical measure would she use to represent the average value of these test scores?**

a) Mean
b) Median
c) Mode
d) Range

22. **In a quality control process, a manufacturer records the heights of a sample of 1,000 products. Upon plotting the distribution of these heights, the manager notices that it forms a symmetric bell-shaped curve. Which type of distribution does this bell shape represent?**
    a) Uniform distribution
    b) Normal distribution
    c) Poisson distribution
    d) Binomial distribution

23. **A marketing analyst is reviewing a dataset containing customer purchase histories. They need to find out which customers made purchases exceeding $500. Which Python library is best suited for this data manipulation task?**
    a) Math
    b) Pandas
    c) SciPy
    d) Seaborn

24. **A data analyst wants to import a CSV file containing sales data into their Python environment for analysis. Which function from the Pandas library should they use to read the CSV file??**
    a) `read_file()`
    b) `read_csv()`
    c) `read_data()`
    d) `load_csv()`

25. **If** $x + y + z = 9$, $x - y + z = 3$, **and** $x + y - z = 1$, **find** $x + y$.

26. **In a data analysis project to visualise sales trends, which library is commonly used for creating plots in Python??**
    a) Pandas
    b) NumPy
    c) Matplotlib
    d) SciPy

27. **In a data visualisation project analysing monthly temperature changes, how do you create a line plot using Matplotlib?**
    a) `plot()`
    b) `line()`
    c) `scatter()`
    d) `draw()`

28. **What is the result of $2A + 3B$ if $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$?**

a) $\begin{bmatrix} 17 & 22 \\ 27 & 32 \end{bmatrix}$

b) $\begin{bmatrix} 16 & 22 \\ 27 & 32 \end{bmatrix}$

c) $\begin{bmatrix} 17 & 23 \\ 27 & 32 \end{bmatrix}$

d) $\begin{bmatrix} 17 & 10 \\ 27 & 32 \end{bmatrix}$

29. **A data analyst is working on a project that involves analyzing temperature data from different cities. To store the temperature readings in a structured way, they decide to use NumPy. Which function should they use to create a NumPy array for storing these temperature readings??**
    a) `np.create_array()`
    b) `np.array()`

c) `np.new_array()`

d) `np.initialize_array()`

30. **How many times will "Python" be printed by the following code?**

```
for i in range(2, 4):
    print("Python")
```

31. **Solve for x:**

$4x + 7 = 3x + 12$

32. **A software developer needs to log user activity in an application. They decide to open a log file in append mode to add new entries while also being able to read the existing entries. If they open the file using the mode 'a+', what operations can they perform regarding reading and writing in the log file??**

a) Only write operations

b) Only read operations

c) Both read and write operations

d) No operations

33. **Which method can be used to solve simultaneous equations?**

a) Graphical method

b) Substitution method

c) Elimination method

d) All of the above

34. **If the system of equations $ax + by = c$ and $dx + ey = f$ has a unique solution, then:**

a) $ae - bd \neq 0$

b) $ae - bd = 0$

c) The lines are parallel

d) Both a and c

35. **In Python, which of the following is used to install external libraries?**

a) `pip install`

b) `python install`

c) `import`

d) `load`

36. **What will be the output of the following code?**

```
def func(x):
    return x**2
print(func(3))
```

a) 6

b) 9

c) 3

d) 0

37. **Determine the intersection point of the lines $y = 2x + 2$ and $y = -x + 5$.**

a) (1, 4)

b) (2, 3)

c) (1, 5)

d) (7, 7)

38. **If a list has 5 elements and you insert a new element at index 3, how many elements will the list contain after the operation?**

39. **What is the determinant of the following 2x2 matrix?**

$$\begin{pmatrix} 4 & 3 \\ 2 & 1 \end{pmatrix}$$

40. **Which of the following is an immutable data type in Python?**

a) [1, 2, 3]
b) {'name': 'Alice'}
c) ('a', 'b', 'c')
d) 'apple'

41. **What will be the output of the following code?**

```
import numpy as np
a = np.array([1, 2, 3, 4])
print(a.sum())
```

42. **What will be the output of the following code?**

```
x = 10
y = 5
print(x // y)
```

a) 2
b) 2.0
c) 1
d) 0

43. **How many elements are in the range** `range(3, 10)` **?**

44. **A user needs to store their full name in a program as part of a registration form. Which data type should be used in Python to store this sequence of characters?**
    a) list
    b) int
    c) str
    d) tuple

45. **If a file named "data.txt" contains 3 lines, how many lines will it contain after adding 2 more using append mode?**

46. **Which of the following are valid file modes in Python? Select all that apply.**
    a) `r+`
    b) `a`
    c) `write`
    d) `w+`

47. **What will happen if an exception is not handled in Python?**
    a) The code will execute successfully.
    b) The program will stop immediately.
    c) Python will retry the operation automatically.
    d) A warning message will be shown, but the code will continue.

48. **What will be the length of the following list?**

```
my_list = [2, 3] + [4]
```

49. **Which sorting algorithm has the best time complexity for sorted data?**
    a) Bubble Sort
    b) Quick Sort

c) Insertion Sort
d) Merge Sort

50. **Calculate the magnitude of the following vector: $\vec{v} = (3, 4)$.**

51. **Which of the following operations are valid on matrices? Select all that apply.**
    a) Matrix addition
    b) Matrix division
    c) Matrix multiplication
    d) Transposition

52. **What is the mean of the numbers: 4, 5, 6, 7?**

53. **How many subplots are created by the following code?**

```
fig, ax = plt.subplots(2, 2)
```

54. **What is the value of the following expression?**

```
np.array([1, 2, 3]) * 2
```

55. **What will be the output of the following code?**

```
def multiply(a, b=2):
    return a * b
print(multiply(3))
```

a) 6
b) 3
c) 5
d) Error

56. **How many times will the loop run?**

```
for i in range(1, 10, 2):
    print(i)
```

57. **Which function from the `NumPy` library creates an array filled with zeros?**
    a) `np.ones()`
    b) `np.zeros()`
    c) `np.empty()`
    d) `np.fill()`

58. **What is the median of the following numbers: 10, 2, 5, 8, 3?**

59. **A linear combination of the vectors $\mathbf{a}$ and $\mathbf{b}$ is expressed as:**
    a) $c_1\mathbf{a} + c_2\mathbf{b}$
    b) $c_1\mathbf{b} - c_2\mathbf{a}$
    c) $\mathbf{a} \cdot \mathbf{b}$
    d) None of the above

60. **Which of the following represents a system of linear equations?**
    a) $x + y = 5$
    b) $2x - y = 3$
    c) $3x + 4y = 7$
    d) All of the above

61. **What is the solution to the system of equations $2x + 3y = 6$ and $x - y = 1$?**
    a) $(\frac{9}{5}, \frac{4}{5})$
    b) $(3, 3)$
    c) $(2, 0)$
    d) $(0, 2)$

62. **If a system of equations has infinitely many solutions, it is classified as:**
    a) Inconsistent
    b) Consistent
    c) Dependent
    d) Both b and c

63. **The coefficient matrix of a system of linear equations is used to determine:**
    a) The number of solutions
    b) The existence of solutions
    c) The linear independence of vectors
    d) All of the above

64. **Which of the following are valid ways to create a list in Python? Select all that apply.**
    a) `list1 = []`
    b) `list2 = list()`
    c) `list3 = [1, 2, 3]`
    d) `list4 = (1, 2, 3)`

65. **Which of the following methods can be used to add elements to a list in Python? Select all that apply.**
    a) `list.append()`
    b) `list.add()`
    c) `list.insert()`
    d) `list.extend()`

66. **Which of the following are valid ways to define a function in Python? Select all that apply.**
    a) `def function_name():`
    b) `function_name() = def`
    c) `def function_name(param):`
    d) `function_name(param) =>`

67. **Solve the simultaneous equations:**
    $2x + 3y = 12$
    $x - 4y = -14$
    a) $(x, y) = (\frac{6}{11}, \frac{40}{11})$
    b) (x, y) = (4, 2)
    c) (x, y) = (2, 4)
    d) (x, y) = (0, 0)

68. **What is the linear combination of the vectors $\mathbf{u} = (2, 3)$ and $\mathbf{v} = (1, 4)$ with coefficients 3 and 2 respectively?**
    a) $(8, 17)$
    b) $(8, 8)$
    c) $(17, 17)$
    d) $(1, 9)$

69. **What is the determinant of the matrix:**

$$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

70. **Find the solution for $3x + 4y = 10$ when $y = 2$.**
    a) x = 2/3
    b) x = 1/3

c) x = 3/3

d) x = 4/3

71. Given a sorted array of size n=16, how many comparisons are made in the worst-case scenario when using the binary search algorithm to find a target value?

a) 2

b) 4

c) 5

d) 8

72. What will be the output of the following Python code snippet?

```
even_numbers = [x for x in range(20) if x % 2 == 0] print("Even numbers:", even_numbers)
```

a) Even numbers: [1, 3, 5, 7, 9]

b) Even numbers: [0, 2, 4, 6, 8, 10, 12, 14, 16, 18]

c) Even numbers: [0, 1, 2, 3, 4]

d) Even numbers: [2, 4, 6, 8, 10]

73. **What is the range of the dataset: 18, 21, 15, 22, 25?**

74. **What will be the output of the following code?**

```
def func(a, b=[]):
    b.append(a)
    return b

x = func(1)
y = func(2, [])
z = func(3)
print(x, y, z)
```

a) `[1] [2] [3]`

b) `[1, 3] [2] [1, 3]`

c) `[1, 3] [2] [1, 2, 3]`

d) `[1, 2, 3] [2] [1, 3]`

75. **Given a DataFrame `df` with a column `Age`, what command would filter rows where `Age` is greater than 30?**

a) `df.Age > 30`

b) `df['Age'] >= 30`

c) `df[df['Age'] > 30]`

76. **What will the following code print if executed?**

```
a = [1, 2, [3, 4]]
b = a[:]
b[2][0] = 9
print(a)
```

a) `[1, 2, [3, 4]]`

b) `[1, 2, [9, 4]]`

c) `[9, 2, [3, 4]]`

d) `[1, 9, [3, 4]]`

77. **Calculate the dot product of the vectors $\mathbf{u} = (3, 5)$ and $\mathbf{v} = (2, 4)$.**

78. **Which of the following will sort a dictionary `d` by its values in ascending order?**

a) `sorted(d.keys())`

b) `sorted(d.items(), key=lambda x: x[1])`

c) `sorted(d.values())`

d) `sorted(d, key=lambda x: x[0])`

79. **Consider the following matrix A:**

$$A = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 2 & 3 \\ 3 & 6 & 9 \end{bmatrix}$$

Which of the following statements is true regarding the columns of matrix A?

a) The columns of A are linearly independent.
b) The columns of A are linearly dependent.
c) The columns of A span $\mathbb{R}^3$.
d) The columns of A form a basis for $\mathbb{R}^3$.

80. **Consider the following list of numbers:**

$$[3, 1, 4, 2]$$

After performing one pass of the insertion sort algorithm (in ascending order), what will the list look like?

a) [1, 3, 4, 2]
b) [3, 1, 2, 4]
c) [1, 2, 3, 4]
d) [1, 4, 2, 3]

81. **Consider the following Python code:**

```
try:
    num = int("abc")
    print(num)
except ValueError:
    print("There was an error in converting the string to an integer.")
```

What will be the output of this code?

a) abc
b) There was an error in converting the string to an integer.
c) None
d) 0

82. **How many points will be plotted by the following code?**

```
import numpy as np
import matplotlib.pyplot as plt
x = np.arange(0, 11)
y = x**2
plt.plot(x, y)
plt.show()
```

a) 10
b) 11
c) 12
d) 13

83. **What will be the output of the following code snippet?**

```
a = 10
b = 5
if a > b and b != 0:
    print("Condition met")
else:
    print("Condition not met")
```

a) Condition met
b) Condition not met
c) Error
d) No output

84. **What will be the final value of `x` after the following loop executes?**

```
x = 0
for i in range(1, 6):
    if i % 2 == 0:
        x += i
    else:
        x -= i
```

a) -3
b) -1
c) 1
d) 3

85. **What will be the output of the following code snippet?**

```
x = 2
y = 3
for i in range(4):
    x *= y
    y += 1
print(x)
```

a) 36
b) 144
c) 216
d) 720

86. **What will be the output of the following code?**

```
result = 0
for i in range(1, 6):
    for j in range(1, i+1):
        result += j * i
print(result)
```

a) 70
b) 85

c) 140

d) 120

87. **Given two vectors $\mathbf{A} = [3, 4]$ and $\mathbf{B} = [1, 2]$, what is the result of their dot product $\mathbf{A} \cdot \mathbf{B}$?**

    a) 7

    b) 8

    c) 11

    d) 10

88. **If matrix $\mathbf{M} = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$ and vector $\mathbf{V} = \begin{bmatrix} 5 \\ 6 \end{bmatrix}$, what is the result of the matrix-vector multiplication $\mathbf{M} \times \mathbf{V}$?**

a) $\begin{bmatrix} 23 \\ 29 \end{bmatrix}$

b) $\begin{bmatrix} 20 \\ 24 \end{bmatrix}$

c) $\begin{bmatrix} 28 \\ 29 \end{bmatrix}$

d) $\begin{bmatrix} 27 \\ 18 \end{bmatrix}$

89. **A baker needs to schedule the production of two types of cakes: chocolate and vanilla. He has limited resources for mixing ingredients and baking time. Each chocolate cake requires 1 hour of mixing and 2 hours of baking, while each vanilla cake requires 1.5 hours of mixing and 1 hour of baking. If he has a total of 5 hours for mixing and 6 hours for baking, what is the maximum number of chocolate cakes he can bake if he chooses to bake only chocolate cakes?**

    a) 3

    b) 2

c) 4
d) 5

90. **The baker decides to bake a mix of chocolate and vanilla cakes to maximize his profit. Chocolate cakes provide a profit of `$5` each, while vanilla cakes provide a profit of `$3` each. If he can only bake a maximum of 3 cakes in total (of either type) due to oven constraints, and he has the resources to bake any mix of the two types, what is the combination that maximizes his profit?**
    a) 3 chocolate cakes
    b) 2 chocolate cakes and 1 vanilla cake
    c) 1 chocolate cake and 2 vanilla cakes
    d) 3 vanilla cakes

91. **A company has employee data stored in a dictionary called `employees`, where each key is an employee's ID and the value is another dictionary with the employee's details, such as name, department, and salary.**

Example:

```
employees = {
    101: {"name": "Alice", "department": "Sales", "salary": 50000},
    102: {"name": "Bob", "department": "Engineering", "salary": 60000},
    103: {"name": "Charlie", "department": "Marketing", "salary": 55000},
}
```

The company wants to give a 10% raise to all employees in the Engineering department. After implementing the raise, what will be the new salary of employee 102 (Bob)?

a) 60000
b) 66000
c) 61000
d) 70000

92. **Given a dictionary `inventory` that keeps track of products in a store, where keys are product names and values are the number of items in stock. The store owner wants to check if any product's stock has dropped below a threshold of 5 and, if so, update a list `low_stock_items` with the names of these products.**

Example:

```
inventory = {
    "apples": 10,
    "bananas": 3,
    "oranges": 7,
    "pears": 2
}
```

What will be the content of `low_stock_items` after performing the check?

a) ["apples", "oranges"]
b) ["bananas", "pears"]
c) ["apples", "bananas", "pears"]
d) ["bananas"]

93. **What will be the output when evaluating the following code?**

```
result = 5 + 3 * 2 ** 2 + 10 // 5
print(result)
```

94. **In the following code:**

```
for i in range(3):
    for j in range(2):
        if i == j:
            continue
        if i == 1:
            break
        print(i, j)
```

How many times will the print(i, j) statement execute?

95. **What will be the output of the following code snippet?**

```
a = (1, 2, 3)
b = (a, 4)
b[0] = 10
print(b)
```

a) (10, 2, 3), 4
b) (1, 2, 3), 4
c) Error
d) (10, 4)

96. **What will be the output of the following code snippet:**

Python Code:

```
with open('data.txt', 'r') as f:
    print(f.readline(5))
```

Content of `data.txt` file:

```
Hello World!
```

a) Hello
b) Hello World!
c) Error
d) World!

97. **Which of the following statements are true regarding Python's exception handling?**
    a) The `finally` block is executed only if an exception is raised.
    b) The `finally` block is executed only if an exception is not raised.

c) `try` block can have multiple `except` blocks.

d) You can define custom exceptions by inheriting from `Exception`.

98. **Given an unsorted list of 8 elements, how many comparisons will the Bubble Sort algorithm require in the worst case?**

99. In a Caesar cipher with a shift of `3`, what will the encrypted form of the word "HELLO" be?

a) KHOOR

b) EKRRJ

c) HELLO3

d) IGOPT

100. **What will be the output of the following code snippet?**

```
def func(nums):
    for i in range(len(nums)):
        if nums[i] % 2 == 0:
            nums[i] += 1
    return sum(nums)

nums = [1, 2, 3, 4]
print(func(nums))
```

a) 11

b) 12

c) 13

d) 14

101. **What will be the output of the following code snippet?**

```
def outer(x):
    def inner():
        return x + 1
    return inner

f = outer(5)
print(f())
```

a) 5
b) 6
c) 7
d) Error

102. **What is the result of the following code snippet using list comprehension?**

```
lst = [1, 2, 3, 4, 5]
result = [x**2 for x in lst if x > 2]
print(result)
```

a) `[1, 4, 9, 16, 25]`
b) `[1, 4]`
c) `[9, 16, 25]`
d) `[1, 2, 3]`

103. **What will be the output of the following code?**

```
my_list = [10, 20, 30, 40, 50]
new_list = [x for x in my_list if x % 20 == 0]
print(new_list)
```

a) `[10, 30, 50]`
b) `[20, 40]`
c) `[20]`

104. **What does the following code output?**

```
nums = [1, 2, 3]
matrix = [[n * m for m in nums] for n in nums]
print(matrix)
```

a) `[[1, 2, 3], [4, 5, 6], [7, 8, 9]]`
b) `[[1, 4, 9], [1, 4, 9], [1, 4, 9]]`
c) `[[1, 2, 3], [2, 4, 6], [3, 6, 9]]`
d) `error`

105. **What will be the final value of `count` after executing this code?**

```
count = 0
for i in range(1, 10):
    if i % 3 == 0:
        count += i
print(count)
```

a) `12`
b) `18`
c) `24`
d) `9`

106. **What is the output of the following code when slicing a string?**

```
s = "Python Programming"
print(s[::-1][7:])
```

a) `gnimmargorp`
b) `gnimmargorp nohtyp`
c) `gnimmargorp gnohtyp`
d) `gorP nohtyP`

107. **What does the following code output if `nums = [1, 2, 3, 4, 5]` ?**

```
result = [x for x in nums if x > 2 and x % 2 == 0]
print(result)
```

a) `[4]`
b) `[2, 4]`
c) `[4, 5]`
d) `[3, 5]`

108. **What does the following code snippet output?**

```
def mystery(val):
    return val % 3 == 0 and val % 5 == 0

result = [mystery(x) for x in range(1, 16)].count(True)
print(result)
```

a) `1`
b) `2`
c) `3`
d) `4`

109. **What will be printed by this code involving string slicing and list comprehension?**

```
text = "ABCDEFG"
result = [text[i] for i in range(len(text)) if i % 2 == 0]
print("".join(result))
```

a) `ACEG`
b) `BDF`
c) `ACE`
d) `BDFH`