Question 1 (MCQ) - Smart Fridge Temperature Control

A smart fridge adjusts its cooling based on the items stored. If the fridge contains "milk" or "meat", the temperature should be set to 2°C. Otherwise, it can be set to 4°C.

Which Python code correctly implements this logic?

Options:

A)

```
if "milk" in items or "meat" in items:
    temp = 2
else:
    temp = 4
```

B)

```
if "milk" and "meat" in items:
    temp = 2
else:
    temp = 4
```

C)

```
if items.contains("milk") or items.contains("meat"):
    temp = 2
else:
    temp = 4
```

D)

```
if "milk" or "meat" in items:
    temp = 2
else:
    temp = 4
```

Correct Answer: A

Question 2 (MSQ) - E-Voting System Data Validation

An e-voting portal ensures the voter's age is at least 18, and the voter ID is a 10-character alphanumeric string.

Which code snippets correctly validate both conditions?

Options:

A)

```
if age >= 18 and len(voter_id) == 10 and voter_id.isalnum():
    valid = True
```

B)

```
if age > 18 and len(voter_id) == 10:
    valid = True
```

C)

```
if len(voter_id) == 10 and voter_id.isalnum() and age >= 18:
    valid = True
```

D)

```
if voter_id.isalnum() and len(voter_id) == 10:
    valid = True
```

Correct Answers: A, C

Question 3 (NAT) - Coffee Machine Loop Count

A coffee machine dispenses coffee every 10 seconds for 5 minutes.

How many times does the following loop execute?

```
for i in range(0, 300, 10):
    dispense_coffee()
```

Numeric Answer: 30

Question 4 (MCQ) - Weather Data File Logging

A weather station logs temperature data every hour into a file named "weather.txt" without overwriting previous logs.

Which mode should be used for file writing?

Options:

A) `"r"`

B) `"w"`

C) `"a"`

D) `"x"`

Correct Answer: C

Question 5 (MSQ) - Personalized Greeting Input

A fitness app asks users for their name and prints a personalized greeting.

Which code correctly achieves this?

Options:

A)

```
name = input("Enter your name: ")
print("Hello, " + name)
```

B)

```
print("Hello, " + input("Enter your name: "))
```

C)

```
name = raw_input("Enter your name: ")
print(f"Hello, {name}")
```

D)

```
name = input("Enter your name: ")
print(f"Hello, {name}")
```

Correct Answers: A, B, D

Question 6 (MCQ) - List vs Tuple for Weekly Menu

A restaurant sets a fixed weekly menu. Which data type should be used for the menu that won't change?

Options:
A) List
B) Tuple
C) Dictionary
D) Set

Correct Answer: B

Question 7 (MSQ) - Ride Sharing App (Dictionary)

A ride-sharing app stores user data as:

```
user = {"name": "Ravi", "rating": 4.9}
```

How do you access Ravi's rating?

Options:
A) `user["rating"]`

B) `user.get("rating")`

C) `user.rating`

D) `user.get.rating()`

Correct Answers: A, B

Question 8 (MCQ) - Inheritance: Class Hierarchy

```
class Animal:
    def sound(self):
        return "Generic sound"

class Dog(Animal):
    def sound(self):
        return "Bark"

a = Animal()
d = Dog()
print(a.sound(), d.sound())
```

What is the output?

Options:

A) Generic sound Generic sound

B) Bark Bark

C) Generic sound Bark

D) Error

Correct Answer: C

Question 9 (MCQ) - Median Calculation

```
import numpy as np
arr = np.array([4, 8, 6, 2, 10])
print(np.median(arr))
```

What is the output?

Options:

A) 6

B) 4

C) 8

D) 5

Correct Answer: A

Question 10 (MCQ) - Markov Chain Matrix Multiplication

```
import numpy as np

transition = np.array([[0.7, 0.3], [0.4, 0.6]])
state = np.array([1, 0])
next_state = np.dot(state, transition)
print(next_state)
```

What is the output?

Options:

A) [0.7 0.3]

B) [1.0 0.0]

C) [0.4 0.6]

D) [0.5 0.5]

Correct Answer: A

Question 11 (MCQ) - Sorting App Ratings (Insertion Sort)

A mobile app wants to sort daily user ratings using **Insertion Sort** as the ratings are mostly sorted.

Which property of insertion sort makes it suitable for this case?

Options:

A) It has $O(n^2)$ time complexity for all cases
B) It is efficient for small or nearly sorted datasets
C) It uses divide-and-conquer approach
D) It randomly selects a pivot for partitioning

Correct Answer: B

Question 12 (MCQ) - Movie Search Feature (Linear vs Binary Search)

A movie streaming platform allows users to search movies. The **title list is sorted alphabetically**.

Which search technique is most efficient for this scenario?

Options:

A) Linear Search
B) Binary Search
C) Hashing
D) Depth First Search

Correct Answer: B

Question 13 (MCQ) - Baker’s Problem - Dough Mixing (Linear Algebra)

A baker mixes flour, sugar, and butter in fixed ratios. To compute quantities for multiple batches, **matrix multiplication** is used.

Which operation best models this?

Options:

A) Element-wise addition
B) Dot product of matrices

C) Determinant of matrix
D) Matrix inversion

Correct Answer: B

Question 14 (MCQ) - Robotics Arm Movement (Vectors)

A robotic arm moves in **3D space** represented by a vector `[x, y, z]`. Which NumPy operation computes its **magnitude**?

Options:
A) `np.sum(vector)`
B) `np.linalg.norm(vector)`
C) `np.mean(vector)`
D) `np.dot(vector, vector)`

Correct Answer: B

Question 15 (MSQ) - Matrix Operations in AI

Which of the following are valid **NumPy matrix operations**?

Options:
A) `np.dot(A, B)`
B) `np.transpose(A)`
C) `np.linalg.inv(A)`
D) `A * B`

Correct Answers: A, B, C, D

Question 16 (MCQ) - AI Model Accuracy (Probability)

An AI model has a **90% probability** of correctly classifying an image.

What is the probability it correctly classifies **3 independent images** in a row?

Options:
A) 0.9
B) 0.729
C) 0.81
D) 0.91

Correct Answer: B

Question 17 (MCQ) - Ride Time Analysis (Descriptive Statistics)

Given ride times in minutes: `[10, 17, 10, 20, 15]` . What is the **mode**?

Options:
A) 10
B) 15
C) 12
D) 20

Correct Answer: A

Question 18 (MCQ) - Data Spread (Standard Deviation)

In a dataset, **higher standard deviation** implies:

Options:
A) Data is more spread out
B) Data is tightly clustered
C) Data has zero variance
D) Mean equals median

Correct Answer: A

Question 19 (MSQ) - Numpy Array Operations

Which operations can be performed on a NumPy array `arr = np.array([1,2,3])` ?

Options:

A) `arr.mean()`

B) `arr + 2`

C) `np.append(arr, 4)`

D) `arr / 0`

Correct Answers: A, B, C

Question 20 (MCQ) - Dictionary: Counting Words

```
sentence = "AI is the future and AI is powerful"
words = sentence.split()
freq = {}
for word in words:
    freq[word] = freq.get(word, 0) + 1
print(freq["AI"], freq["is"])
```

What is the output?

Options:

A) 2 1

B) 1 2

C) 2 2

D) 1 1

Correct Answer: C

Question 21 (MCQ) - Sales Analysis with Pandas

A company wants to analyze monthly sales stored in a CSV file. Which code correctly reads the file using Pandas?

Options:

A) `df = pandas.load("sales.csv")`

B) `df = pd.read_csv("sales.csv")`

C) `df = read.csv("sales.csv")`

D) `df = pd.load_csv("sales.csv")`

Correct Answer: B

Question 22 (MSQ) - Data Visualization (Matplotlib)

Which code snippets can create a **bar chart** using Matplotlib?

Options:

A)

```
import matplotlib.pyplot as plt
plt.bar(x, y)
plt.show()
```

B)

```
plt.plot(x, y, kind='bar')
```

C)

```
df.plot(kind='bar')
plt.show()
```

D)

```
plt.hist(x)
plt.show()
```

Correct Answers: A, C

Question 23 (MCQ) - Seaborn Visualization

Which Seaborn function plots the **distribution of a numeric variable**?

Options:

A) `sns.barplot()`

B) `sns.histplot()`

C) `sns.lineplot()`

D) `sns.pieplot()`

Correct Answer: B

Question 24 (MCQ) - Encapsulation in OOP

Which statement best defines **encapsulation** in Python?

Options:

A) Inheriting properties from another class

B) Wrapping data and methods into a class and restricting access

C) Overriding methods in child classes

D) Using loops to access class variables

Correct Answer: B

Question 25 (MSQ) - Object Design for E-Commerce System

Consider an e-commerce system with classes: `Product`, `Order`, `Customer`. Which attributes and methods are appropriate?

Options:

A) Product: name, price

B) Order: add_product(), total_amount()

C) Customer: name, email

D) Product: place_order()

Correct Answers: A, B, C

Question 26 (MCQ) - Basic Operations

In linear search and Bubbloe sort, which of the below are basic operations respectively?

Options:

A) Comparison and for loops

B) Comparison and comparison

C) Array bound check and swapping

D) Comparison and Swapping

Correct Answer: B

Question 27 (MCQ) - Smart Grocery Billing (Dictionary and Condition)

A **smart grocery store** uses a dictionary to store prices and applies a **discount** if the total bill exceeds ₹1000.

```
cart = {"apple": 200, "milk": 100, "bread": 150, "rice": 700}
total = 0
for item, price in cart.items():
    total += price
if total > 1000:
    total *= 0.9  # 10% discount
print(int(total))
```

What is the output?

Options:

A) 1150

B) 900

C) 1035

D) 945

Correct Answer: C

Question 28 (MCQ) - Transition Matrix Validity

A valid **transition matrix** in a Markov chain has:

Options:
A) Negative values
B) Row sums equal to 1
C) Columns sum to 1
D) Only integers

Correct Answer: B

Question 29 (MCQ) - Hypothesis Testing - Z Test

A study tests whether a new drug reduces blood pressure. The **z-test** result is **p = 0.03** and alpha = 0.05.

What is the correct conclusion?

Options:
A) Accept null hypothesis
B) Reject null hypothesis
C) Type II error occurred
D) Increase alpha to 0.1

Correct Answer: B

Question 30 (MCQ) - Type I and Type II Error

In hypothesis testing, a **Type I error** means:

Options:

A) Failing to reject a false null hypothesis

B) Rejecting a true null hypothesis

C) Correctly rejecting a false null hypothesis

D) Accepting a true alternate hypothesis

Correct Answer: B