MATH LOVE INSTITUTE

CBSE Class 9 Artificial Intelligence (Code: 417)

Home Exam 2025-26 - Sample Paper Set 4 with Solutions

Based on Latest CBSE Syllabus 2025-26

Maximum Marks	80 (Theory: 50 + Practical/Viva: 30)
Time Allowed	3 Hours
Class	IX (Nine)
Subject	Artificial Intelligence (417)

📋 GENERAL INSTRUCTIONS:

1. This question paper contains **35 questions** divided into **Five Sections A, B, C, D and E**.
2. **Section A** comprises of 15 MCQs of 1 mark each.
3. **Section B** comprises of 5 Very Short Answer questions of 2 marks each.
4. **Section C** comprises of 6 Short Answer questions of 3 marks each.
5. **Section D** comprises of 3 Long Answer questions of 5 marks each.
6. **Section E** comprises of 3 case study based questions of 4 marks each with internal choice.
7. All questions are **compulsory**. However, internal choices have been provided in some questions.
8. Write Python code with proper syntax and indentation.

SECTION A - MULTIPLE CHOICE QUESTIONS (1 × 15 = 15 Marks)

Q1. Google Translate uses which domain of AI? **[1]**

(a) Data

(b) Computer Vision

(c) Natural Language Processing

(d) Robotics

Q2. Which of the following is NOT a real-world application of AI? **[1]**

(a) Spam email filtering

(b) Voice assistants like Siri

(c) Traditional calculator

(d) Self-driving cars

Q3. "Gender: Male/Female" is an example of: **[1]**

(a) Quantitative data

(b) Qualitative data

(c) Numerical data

(d) Continuous data

Q4. The range of the data: 15, 20, 12, 25, 18 is: **[1]**

(a) 10

(b) 12

(c) 13

(d) 15

Q5. A bag contains 5 red, 3 blue, and 2 green balls. The probability of drawing a blue ball is: **[1]**

(a) 1/10

(b) 3/10

(c) 5/10

(d) 7/10

Q6. Which generative AI tool is developed by Google? **[1]**

(a) ChatGPT

(b) Gemini

(c) DALL-E

(d) Midjourney

Q7. What is the output of: print(15 % 4)? **[1]**

(a) 3

(b) 3.75

(c) 4

(d) 15

Q8. Which method removes the last element from a list in Python? **[1]**

(a) remove()

(b) delete()

(c) pop()

(d) clear()

Q9. Which Python keyword is used for conditional statements? **[1]**

(a) when

(b) if

(c) check

(d) condition

Q10. The last stage of AI Project Cycle is: **[1]**

(a) Modeling

(b) Data Exploration

(c) Evaluation

(d) Problem Scoping

Q11. Which operator is used to check equality in Python? **[1]**

(a) =

(b) ==

(c) !=

(d) <>

Q12. What will be the value of x after: x = "Hello" + "World"? **[1]**

(a) Hello World

(b) HelloWorld

(c) Error

(d) None

Q13. Which measure of central tendency is most affected by extreme values? **[1]**

(a) Mode

(b) Median

(c) Mean

(d) Range

Q14. Bar charts are most suitable for: **[1]**

(a) Showing parts of a whole

(b) Comparing different categories

(c) Showing trends over time

(d) Showing probability

Q15. Netflix's movie recommendation system uses: **[1]**

(a) Manual selection

(b) Random selection

(c) AI-based recommendation

(d) Alphabetical order

SECTION B - VERY SHORT ANSWER QUESTIONS (2 × 5 = 10 Marks)

Q16. What is Natural Language Processing (NLP)? Give one real-world example. **[2]**

Q17. Define the term "Artificial Intelligence." How is it different from traditional programming? **[2]**

Q18. Calculate the median of: 10, 15, 8, 22, 18, 12, 20 **[2]**

Q19. Write a Python program to convert temperature from Celsius to Fahrenheit. (Formula: F = (C × 9/5) + 32) **[2]**

Q20. What is the AI Project Cycle? List all five stages in order. **[2]**

SECTION C - SHORT ANSWER QUESTIONS (3 × 6 = 18 Marks)

Q21. Explain how AI is transforming transportation, finance, and agriculture sectors (one example from each). **[3]**

Q22. What is data preprocessing? Explain any three techniques used in data preprocessing. **[3]**

Q23. A box contains cards numbered 1 to 10. If one card is drawn at random, find the probability of: **[3]**

(i) Getting an even number

(ii) Getting a prime number

OR

Find the mean, median, and mode of: 5, 8, 5, 12, 15, 5, 20

Q24. Write a Python program to check if a number is positive, negative, or zero. **[3]**

Q25. What are the ethical concerns related to Generative AI? Explain any three concerns. **[3]**

Q26. Explain the Modeling stage of AI Project Cycle. What activities are performed in this stage? **[3]**

SECTION D - LONG ANSWER QUESTIONS (5 × 3 = 15 Marks)

Q27. Explain all five stages of the AI Project Cycle with an example project of "Predicting Student Performance." **[5]**

OR

What is a Neural Network? Explain its structure and working with a suitable diagram. How is it inspired by the human brain?

Q28. Write a Python program that: **[5]**

(a) Takes marks of 5 subjects from user

(b) Stores them in a list

(c) Calculates total marks

(d) Calculates percentage

(e) Displays grade based on percentage:

• Above 90%: A+

• 80-90%: A

• 70-80%: B

• 60-70%: C

• Below 60%: D

Q29. The following table shows the number of electric vehicles (EVs) sold in different months: **[5]**

Month	Jan	Feb	Mar	Apr	May
EVs Sold	150	180	220	200	250

(a) Calculate the mean number of EVs sold per month.

(b) Find the median value.

(c) What is the range of the data?

(d) Which month had the highest sales? Calculate by what percentage it is higher than the lowest month.

SECTION E - CASE STUDY BASED QUESTIONS (4 × 3 = 12 Marks + 3 Internal Choice = 15 Marks)

Q30. **[4]**

CASE STUDY 1: AI in Banking - Fraud Detection System

A bank implements an AI system to detect fraudulent credit card transactions. The system analyzes:

- Transaction amount
- Transaction location
- Time of transaction
- Merchant category
- Customer's usual spending pattern

The AI model was trained on 1 million transactions (950,000 legitimate and 50,000 fraudulent). When a transaction occurs, the system gives it a fraud risk score between 0-100. Transactions with score above 70 are flagged for manual review. The system has 95% accuracy in detecting fraud.

Based on the above information, answer the following questions:

(i) Which domain of AI is primarily used for this fraud detection? **[1 mark]**

(ii) Is "transaction amount" qualitative or quantitative data? **[1 mark]**

OR

What does 95% accuracy mean in this context?

(iii) Why is it important for the bank to have high accuracy in fraud detection? What could happen with low accuracy? **[2 marks]**

Q31. **[4]**

CASE STUDY 2: Smart Home Automation System

A family installs a smart home system that uses AI. The system controls:
• Lighting based on time of day and occupancy
• Temperature based on weather and preferences
• Security cameras with face recognition
• Voice-controlled appliances

The system learns family members' routines over time. For example, it automatically:
• Turns on lights when someone enters a room (Computer Vision)
• Adjusts AC temperature based on past preferences (Data Analysis)
• Responds to voice commands like "Turn off all lights" (NLP)

Based on the above information, answer the following questions:

(i) How many domains of AI are being used in this smart home system? Name them. **[1 mark]**

(ii) Which stage of AI Project Cycle is the system in when it "learns family routines over time"? **[1 mark]**
OR
Give one ethical concern about using face recognition in home security.

(iii) Explain how the system uses two different AI domains to control lights and respond to voice commands. **[2 marks]**

Q32. **[4]**

CASE STUDY 3: Climate Change Data Analysis

Scientists use AI to analyze climate change data. The average temperature (°C) recorded over 6 years is:

Year	2019	2020	2021	2022	2023	2024
Temp (°C)	28.5	29.0	29.5	30.0	30.5	31.0

Based on the above information, answer the following questions:

(i) Calculate the mean temperature over these 6 years. **[1 mark]**

(ii) What type of graph would best show the temperature trend - Bar chart or Line graph? **[1 mark]**

OR

Calculate the range of temperature data.

(iii) Write Python code to store temperatures in a list and find the temperature increase from 2019 to 2024. **[2 marks]**

📚 END OF QUESTION PAPER 📚

Theory Total Marks: 50

Section A: 15 marks | Section B: 10 marks | Section C: 18 marks (including OR)

Section D: 15 marks (including OR) | Section E: 12 marks (including OR)

Practical/Viva/Project: 30 marks

Grand Total: 80 marks

Based on Latest CBSE Class 9 AI Syllabus 2025-26

Comprehensive coverage of all examination topics

🎯 DETAILED ANSWER KEY WITH SOLUTIONS

SECTION A - ANSWERS (1 × 15 = 15 Marks)

Q1. Answer: (c) Natural Language Processing

Explanation: Google Translate uses NLP to understand text in one language and convert it to another language while maintaining meaning.

Q2. Answer: (c) Traditional calculator

Explanation: Traditional calculators perform fixed mathematical operations based on programmed formulas, not AI. They don't learn or adapt.

Q3. Answer: (b) Qualitative data

Explanation: Gender represents categories or qualities (Male/Female), not numerical measurements, making it qualitative/categorical data.

Q4. Answer: (c) 13

Solution:
Data: 15, 20, 12, 25, 18
Range = Highest value - Lowest value
Range = 25 - 12 = 13

Q5. Answer: (b) 3/10

Solution:

Total balls = 5 + 3 + 2 = 10

Blue balls = 3

P(blue) = 3/10

Q6. Answer: (b) Gemini

Explanation: Gemini (formerly Bard) is Google's generative AI chatbot. ChatGPT is by OpenAI, DALL-E by OpenAI, Midjourney is independent.

Q7. Answer: (a) 3

Solution: The % operator gives the remainder (modulo operation)

15 % 4 = 3 (because 15 ÷ 4 = 3 remainder 3)

Q8. Answer: (c) pop()

Explanation: The pop() method removes and returns the last element from a list. Without an index, it removes the last item.

Q9. Answer: (b) if

Explanation: The 'if' keyword is used for conditional statements in Python to execute code based on conditions.

Q10. Answer: (c) Evaluation

Explanation: The five stages in order are: Problem Scoping → Data Acquisition → Data Exploration → Modeling → Evaluation (last stage).

Q11. Answer: (b) ==

Explanation: The == operator checks for equality. Single = is for assignment, != is for not equal.

Q12. Answer: (b) HelloWorld

Explanation: The + operator concatenates (joins) strings in Python. "Hello" + "World" = "HelloWorld" (no space).

Q13. Answer: (c) Mean

Explanation: Mean is most affected by extreme values (outliers) because it uses all values in calculation. Median and mode are more resistant to outliers.

Q14. Answer: (b) Comparing different categories

Explanation: Bar charts are ideal for comparing values across different categories. Pie charts show parts of whole, line graphs show trends.

Q15. Answer: (c) AI-based recommendation

Explanation: Netflix uses AI algorithms to analyze viewing history and recommend movies/shows that match user preferences.

SECTION B - ANSWERS (2 × 5 = 10 Marks)

Q16. Solution:

> **Marking Scheme:** 1 mark for definition + 1 mark for example

Natural Language Processing (NLP): NLP is a branch of AI that enables computers to understand, interpret, and generate human language (both spoken and written). It allows machines to process text and speech in a way that is valuable and meaningful.

Real-world Example:
• Language Translation: Google Translate converts text from one language to another
• Voice Assistants: Siri, Alexa understand and respond to voice commands
• Chatbots: Customer service bots understand queries and provide answers
• Autocorrect/Autocomplete: Email and messaging apps suggest words
• Sentiment Analysis: Analyzing customer reviews to determine positive/negative feedback

Q17. Solution:

> **Marking Scheme:** 1 mark for definition + 1 mark for difference

Artificial Intelligence: AI is the simulation of human intelligence in machines that are programmed to think, learn, and make decisions like humans. It enables computers to perform tasks that typically require human intelligence.

Difference from Traditional Programming:

Traditional Programming:
• Follows explicit instructions (if-then rules)
• Programmer writes step-by-step logic
• Cannot adapt to new situations
• Example: Calculator follows fixed formulas

AI:
• Learns from data and experience

• Can adapt to new situations
• Improves performance over time
• Example: AI learns to recognize faces from thousands of images

Q18. Solution:

> **Marking Scheme:** 1 mark for arranging data + 1 mark for median

Data: 10, 15, 8, 22, 18, 12, 20

Step 1: Arrange in ascending order
8, 10, 12, 15, 18, 20, 22

Step 2: Find median
Number of values = 7 (odd)
Median = Middle value = 4th term
Median = 15

Q19. Solution:

> **Marking Scheme:** 1 mark for input and formula + 1 mark for calculation and output

Python Program:

```
# Program to convert Celsius to Fahrenheit
celsius = float(input("Enter temperature in Celsius: ")

fahrenheit = (celsius * 9/5) + 32

print("Temperature in Fahrenheit:", fahrenheit)
```

Sample Output:
Enter temperature in Celsius: 37

Temperature in Fahrenheit: 98.6

Q20. Solution:

Marking Scheme: 0.5 mark for definition + 1.5 marks for all stages in order

AI Project Cycle: The AI Project Cycle is a structured approach to develop AI solutions, consisting of systematic stages from problem identification to solution evaluation.

Five Stages in Order:

1. **Problem Scoping** - Define the problem clearly
2. **Data Acquisition** - Collect relevant data
3. **Data Exploration** - Analyze and prepare data
4. **Modeling** - Train the AI model
5. **Evaluation** - Test and validate the model

SECTION C - ANSWERS (3 × 6 = 18 Marks)

Q21. Solution:

Marking Scheme: 1 mark for each sector

AI in Different Sectors:

1. Transportation - Self-Driving Cars:
Companies like Tesla and Waymo use AI for autonomous vehicles. The AI system uses Computer Vision to detect obstacles, pedestrians, traffic signals, and lane markings. It processes sensor data in real-time to make driving decisions, navigate routes, and ensure passenger safety. This reduces accidents caused by human error and enables mobility for people who cannot drive.

2. Finance - Fraud Detection:

Banks use AI to detect fraudulent transactions by analyzing patterns in spending behavior. The system learns normal transaction patterns for each customer and flags unusual activities (like transactions from unexpected locations or unusually large amounts). For example, if your card is used in Mumbai and New York within 2 hours, AI will detect this as suspicious and block the transaction.

3. Agriculture - Crop Monitoring:
AI-powered drones equipped with cameras monitor crop health by analyzing images. Computer Vision algorithms detect diseases, pest infestations, and nutrient deficiencies early by examining leaf color, texture, and patterns. This allows farmers to take timely action, reduce crop losses, and optimize pesticide/fertilizer use, leading to sustainable farming.

Q22. Solution:

> **Marking Scheme:** 1 mark for definition + 0.5 mark for each technique

Data Preprocessing: Data preprocessing is the process of cleaning, transforming, and organizing raw data into a format suitable for analysis and machine learning. It improves data quality and ensures better model performance.

Three Data Preprocessing Techniques:

1. Data Cleaning:
• Removing duplicate entries
• Handling missing values (fill with mean/median or remove)
• Correcting errors and typos
• Removing or handling outliers (extreme values)
Example: If student age dataset has entry "200 years", it should be corrected or removed.

2. Data Normalization/Scaling:
• Converting data to a common scale (usually 0-1 or -1 to 1)
• Ensures all features have similar ranges
• Prevents features with large values from dominating
Example: Normalizing height (in cm) and weight (in kg) to same scale for fair

comparison.

3. Data Encoding:

• Converting categorical data to numerical format

• Machines can only process numbers, not text

• Methods: Label encoding, One-hot encoding

Example: Converting "Red", "Blue", "Green" to 0, 1, 2 or creating separate binary columns.

Q23. Solution:

> **Marking Scheme:** 1.5 marks for each part

Cards numbered: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

Total cards = 10

(i) P(even number):

Even numbers: 2, 4, 6, 8, 10 = 5 outcomes

P(even) = 5/10 = 1/2

(ii) P(prime number):

Prime numbers: 2, 3, 5, 7 = 4 outcomes

(Note: 1 is not prime)

P(prime) = 4/10 = 2/5

OR

Data: 5, 8, 5, 12, 15, 5, 20

Mean:

Mean = (5 + 8 + 5 + 12 + 15 + 5 + 20) / 7

Mean = 70 / 7 = 10

Median:

Arrange: 5, 5, 5, 8, 12, 15, 20

Median = 4th term = 8

Mode:
5 appears 3 times (most frequent)
Mode = 5

Q24. Solution:

> **Marking Scheme:** 1 mark for input + 1 mark for conditions + 1 mark for output

Python Program:

```
# Program to check positive, negative, or zero
num = float(input("Enter a number: "))

if num > 0:
    print(num, "is Positive")
elif num < 0:
    print(num, "is Negative")
else:
    print("The number is Zero")
```

Sample Outputs:
Enter a number: 15
15.0 is Positive

Enter a number: -7
-7.0 is Negative

Enter a number: 0
The number is Zero

Q25. Solution:

> **Marking Scheme:** 1 mark for each concern (3 concerns)

Ethical Concerns Related to Generative AI:

1. Misinformation and Deepfakes:
• Generative AI can create highly realistic fake images, videos, and audio
• Deepfakes can be used to impersonate people and spread false information
• Can damage reputations and mislead the public
• Used for creating fake news and manipulating public opinion
Example: Creating fake videos of politicians saying things they never said.

2. Copyright and Intellectual Property Violations:
• AI models are trained on copyrighted content without permission
• Generated content may closely resemble original artists' work
• Unclear ownership of AI-generated content
• Artists and creators lose control over their work
Example: AI generating artwork in the style of a specific artist without credit.

3. Privacy Violations:
• Training data may contain personal information without consent
• AI might reproduce sensitive data it was trained on
• Facial recognition in generated images raises privacy concerns
• Personal photos used without permission for training

Other Concerns:
• Job displacement for creative professionals
• Bias in generated content reflecting training data biases
• Academic dishonesty (students using AI for assignments)
• Environmental impact from energy-intensive training

Q26. Solution:

Marking Scheme: 1.5 marks for explanation + 1.5 marks for activities

Modeling Stage of AI Project Cycle:

Modeling is the fourth stage of the AI Project Cycle where we select appropriate machine learning algorithms, train the AI model using the prepared data, and

optimize it for better performance. This is where the actual "intelligence" is created.

Activities Performed in Modeling Stage:

1. Algorithm Selection:
• Choose suitable ML algorithms based on problem type
• Consider: supervised vs unsupervised, classification vs regression
• Examples: Decision Trees, Neural Networks, Linear Regression

2. Data Splitting:
• Divide data into training set (70-80%) and testing set (20-30%)
• Training set: Used to train the model
• Testing set: Used to evaluate model performance

3. Model Training:
• Feed training data to the algorithm
• Model learns patterns and relationships
• Adjust internal parameters (weights) automatically
• Process repeated multiple times (epochs/iterations)

4. Parameter Tuning:
• Adjust hyperparameters for optimal performance
• Examples: learning rate, number of layers, regularization
• Experimentation to find best configuration

5. Model Optimization:
• Improve accuracy and reduce errors
• Handle overfitting (too specific) or underfitting (too general)
• Balance between model complexity and performance

SECTION D - ANSWERS (5 × 3 = 15 Marks)

Q27. Solution:

> **Marking Scheme:** 1 mark for each stage with example (5 stages)

AI Project Cycle with Example: "Predicting Student Performance"

Stage 1: Problem Scoping

• Define problem: Predict which students are at risk of failing
• Goal: Identify struggling students early for intervention
• Success criteria: Achieve 85% accuracy in predictions
• Stakeholders: Teachers, students, parents, school administration
• Constraints: Limited data, privacy concerns

Stage 2: Data Acquisition

• Collect student data from various sources:
• Academic: Previous exam scores, assignment grades, attendance
• Behavioral: Class participation, homework submission rate
• Demographic: Age, previous school performance
• Total: Gather data from 1000 students over 3 years
• Ensure data quality and student privacy

Stage 3: Data Exploration

• Clean data: Remove incomplete records, handle missing values
• Analyze patterns: Students with <75% attendance tend to score lower
• Visualize: Create graphs showing correlation between attendance and performance
• Feature selection: Identify most important factors (attendance, mid-term scores, assignment completion)
• Balance dataset: Ensure equal representation of passing/failing students

Stage 4: Modeling

• Choose algorithm: Decision Tree (easy to interpret for teachers)
• Split data: 800 students for training, 200 for testing
• Train model: Model learns that students with attendance >75% AND mid-term >60% usually pass
• Tune parameters: Adjust tree depth for optimal accuracy
• Create prediction rules based on learned patterns

Stage 5: Evaluation

• Test on 200 new students
• Achieve 87% accuracy (exceeds 85% goal)
• Analyze errors: Model struggles with students having personal issues
• Get teacher feedback: Teachers validate predictions
• Deploy: Use model to identify at-risk students each term
• Monitor and update: Retrain model annually with new data

OR

Neural Network:

A Neural Network is an AI system inspired by the biological neural networks in the human brain. It consists of interconnected artificial neurons that process information in layers to learn complex patterns and make predictions.

Structure of Neural Network:

1. Input Layer:

• Receives initial data
• Each neuron represents one feature/input
• Example: For image recognition - pixel values

2. Hidden Layers:

• Process and transform data
• Can have multiple hidden layers (deep learning)
• Each neuron performs calculations
• Extract increasingly complex features

3. Output Layer:

• Produces final prediction/result
• Number of neurons depends on task
• Example: For cat/dog classification - 2 neurons

4. Connections (Weights):

• Each connection has a weight

• Weights determine importance of inputs
• Adjusted during training (learning)

How it Works:
1. Input data enters through input layer
2. Each neuron processes inputs: multiplies by weights, adds bias
3. Applies activation function (decides if neuron "fires")
4. Passes output to next layer
5. Process repeats through hidden layers
6. Final layer produces prediction
7. Error calculated, weights adjusted (backpropagation)
8. Process repeated thousands of times for learning

Inspiration from Human Brain:

Human Brain → Neural Network
• Neurons → Artificial neurons/nodes
• Synapses → Connections with weights
• Signal strength → Weight values
• Learning → Adjusting weights
• Neuron firing → Activation function
• Complex thinking → Multiple hidden layers

[Students should draw a diagram showing Input Layer → Hidden Layer(s) → Output Layer with interconnected circles representing neurons]

Q28. Solution:

> **Marking Scheme:** 1 mark for each part (a to e)

Complete Python Program:

```
# Program to calculate marks and grade

# (a) and (b) - Take marks and store in list
marks = []
```

```
subjects = ["Subject 1", "Subject 2", "Subject 3", "Sub

print("Enter marks out of 100 for 5 subjects:")
for i in range(5):
    mark = float(input(f"Enter marks for {subjects[i]}:
    marks.append(mark)

# (c) Calculate total marks
total = sum(marks)
print("\nTotal Marks:", total)

# (d) Calculate percentage
percentage = (total / 500) * 100
print("Percentage:", percentage, "%")

# (e) Display grade based on percentage
if percentage >= 90:
    grade = "A+"
elif percentage >= 80:
    grade = "A"
elif percentage >= 70:
    grade = "B"
elif percentage >= 60:
    grade = "C"
else:
    grade = "D"

print("Grade:", grade)
```

Sample Output:

Enter marks out of 100 for 5 subjects:
Enter marks for Subject 1: 85
Enter marks for Subject 2: 90
Enter marks for Subject 3: 78
Enter marks for Subject 4: 88
Enter marks for Subject 5: 82

Total Marks: 423.0
Percentage: 84.6 %
Grade: A

Q29. Solution:

> **Marking Scheme:** 1 mark for mean + 1 mark for median + 1 mark for range + 2 marks for part (d)

EV Sales Data: 150, 180, 220, 200, 250

(a) Mean number of EVs:
Mean = (150 + 180 + 220 + 200 + 250) / 5
Mean = 1000 / 5
Mean = 200 EVs per month

(b) Median:
Arrange in order: 150, 180, 200, 220, 250
Number of values = 5 (odd)
Median = Middle value = 3rd term
Median = 200 EVs

(c) Range:
Range = Highest - Lowest
Range = 250 - 150
Range = 100 EVs

(d) Highest and percentage increase:
Highest sales: May with 250 EVs
Lowest sales: January with 150 EVs

Increase = 250 - 150 = 100 EVs
Percentage increase = (Increase / Lowest) × 100
= (100 / 150) × 100
= 66.67%

May had highest sales, 66.67% higher than January (lowest month)

SECTION E - ANSWERS (4 × 3 = 12 Marks)

Q30. Solution: CASE STUDY 1 - Banking Fraud Detection

Marking Scheme: 1 + 1 + 2 = 4 marks

(i) The domain primarily used is **Data / Data Analytics**.
Explanation: The system analyzes various data points (transaction amount, location, time, spending patterns) to identify fraudulent patterns. This involves processing and analyzing large datasets.

(ii) "Transaction amount" is **Quantitative data**.
Explanation: It represents a numerical value (₹500, ₹10,000) that can be measured and used in calculations.

OR
95% accuracy means:
• Out of 100 transactions analyzed, the system correctly identifies 95 as either fraud or legitimate
• If the system analyzes 1000 transactions, it will correctly classify 950 and make errors on 50
• High accuracy indicates the system is reliable in detecting fraud

(iii) Importance of high accuracy:

High Accuracy Benefits:
1. **Protects Customers:**
• Prevents financial losses from fraud
• Maintains customer trust in banking system
• Reduces unauthorized transactions

2. **Reduces Bank Losses:**
• Bank liable for fraudulent transactions
• High accuracy saves millions in fraud prevention
• Protects bank's reputation

Problems with Low Accuracy:
1. **False Negatives (Missing Real Fraud):**
• Fraudulent transactions go undetected
• Customers lose money
• Bank faces liability and lawsuits

2. **False Positives (Blocking Legitimate Transactions):**
• Genuine customer transactions blocked
• Customer inconvenience and frustration
• Loss of customer trust and business
• Emergency situations where cards needed

Q31. Solution: CASE STUDY 2 - Smart Home Automation

> **Marking Scheme:** 1 + 1 + 2 = 4 marks

(i) Three domains of AI are being used:
1. **Computer Vision** - Face recognition in security cameras, detecting room occupancy
2. **Data/Data Analytics** - Learning routines, temperature preferences based on past behavior
3. **Natural Language Processing (NLP)** - Understanding voice commands

(ii) The system is in **Modeling stage** (continuous learning).
Explanation: When the system "learns family routines over time," it's continuously training and updating its model based on new data (family behavior patterns). This is an ongoing modeling process.

OR
Ethical concern about face recognition:
• **Privacy Violation:** Constant surveillance of family members at home

• Data could be hacked and misused
• Visitors' faces captured without consent
• Potential for unauthorized access to facial data
• Children's biometric data collected raises special privacy concerns

(iii) Two AI domains for different functions:

1. Computer Vision for Lighting Control:
• Security cameras with Computer Vision detect when someone enters a room
• CV algorithms analyze video feed in real-time
• Identify presence of humans through object detection
• Distinguish between humans and pets
• Once presence detected, system automatically turns on lights
• CV also determines room occupancy to turn lights off when empty

2. NLP for Voice Commands:
• Microphones capture voice command "Turn off all lights"
• NLP converts speech to text (Speech Recognition)
• Analyzes text to understand intent (Natural Language Understanding)
• Identifies action ("turn off") and object ("all lights")
• Executes command by sending signals to all light switches
• Can understand variations like "Switch off lights" or "Lights off"

Q32. Solution: CASE STUDY 3 - Climate Change Data

> **Marking Scheme:** 1 + 1 + 2 = 4 marks

(i) Mean temperature:
Temperatures: 28.5, 29.0, 29.5, 30.0, 30.5, 31.0
Mean = (28.5 + 29.0 + 29.5 + 30.0 + 30.5 + 31.0) / 6
Mean = 178.5 / 6
Mean = 29.75°C

(ii) Line graph would be best.
Explanation: Line graphs are ideal for showing trends over time. Temperature data is time-series data (increasing year by year), and a line graph clearly shows the

rising trend of climate change.

OR

Range of temperature:

Range = Highest - Lowest

Range = 31.0 - 28.5

Range = 2.5°C

(iii) Python code:

```
# Store temperatures in a list
temperatures = [28.5, 29.0, 29.5, 30.0, 30.5, 31.0]
years = [2019, 2020, 2021, 2022, 2023, 2024]

# Find temperature increase from 2019 to 2024
temp_2019 = temperatures[0]
temp_2024 = temperatures[5]

increase = temp_2024 - temp_2019

print("Temperature in 2019:", temp_2019, "°C")
print("Temperature in 2024:", temp_2024, "°C")
print("Temperature increase:", increase, "°C")
```

Output:

Temperature in 2019: 28.5 °C

Temperature in 2024: 31.0 °C

Temperature increase: 2.5 °C

✅ END OF ANSWER KEY ✅

All solutions based on CBSE Class 9 AI Syllabus 2025-26

Comprehensive step-by-step solutions with detailed explanations

Practical Component (30 marks):

• Python Programming Practicals (15 programs): 15 marks

• AI Project Work aligned with SDGs: 10 marks

• Viva Voce & Portfolio Assessment: 5 marks

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