MATH LOVE INSTITUTE

CBSE Class 9 Artificial Intelligence (Code: 417)

Home Exam 2025-26 - Sample Paper 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. Draw neat diagrams wherever required.

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

Q1. Which of the following is NOT a domain of AI? **[1]**

(a) Data

(b) Computer Vision

(c) Natural Language Processing

(d) Manual Processing

Q2. What does NLP stand for in AI? **[1]**

(a) Natural Learning Process

(b) Natural Language Processing

(c) New Language Program

(d) Network Learning Protocol

Q3. Which type of data is "Age = 25"? **[1]**

(a) Qualitative

(b) Quantitative

(c) Categorical

(d) Nominal

Q4. Mean is a measure of: **[1]**

(a) Dispersion

(b) Central tendency

(c) Range

(d) Variance

Q5. If a coin is tossed once, the probability of getting heads is: **[1]**

(a) 0

(b) 1/4

(c) 1/2

(d) 1

Q6. Which of the following is an example of Generative AI? **[1]**

(a) Calculator

(b) ChatGPT

(c) MS Paint

(d) Notepad

Q7. In Python, which symbol is used for comments? **[1]**

(a) //

(b) /* */

(c) #

(d) --

Q8. What is the correct syntax to output "Hello World" in Python? **[1]**

(a) echo("Hello World")

(b) print("Hello World")

(c) printf("Hello World")

(d) cout<<"Hello World"

Q9. Which data type is used to store "True" or "False" in Python? **[1]**

(a) int

(b) str

(c) bool

(d) float

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

(a) Data Acquisition

(b) Problem Scoping

(c) Modeling

(d) Evaluation

Q11. Which Python function is used to take input from user? **[1]**

(a) get()

(b) input()

(c) scan()

(d) read()

Q12. Which of the following is a valid variable name in Python? **[1]**

(a) 2variable

(b) my-variable

(c) my_variable

(d) my variable

Q13. What will be the output of: print(type(5))? **[1]**

(a)

(b)

(c)

(d)

Q14. Which chart is best for showing parts of a whole? **[1]**

(a) Line chart

(b) Bar chart

(c) Pie chart

(d) Scatter plot

Q15. AI bias occurs when: **[1]**

(a) AI system is trained on incomplete or biased data

(b) AI system is very accurate

(c) AI system uses Python

(d) AI system is fast

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

Q16. Define Artificial Intelligence and give one real-life application. **[2]**

Q17. Differentiate between qualitative and quantitative data with one example each. **[2]**

Q18. Calculate the mean of: 12, 15, 18, 20, 25 **[2]**

Q19. Write a Python program to add two numbers entered by user. **[2]**

Q20. What is Generative AI? Give one example. **[2]**

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

Q21. Explain the three domains of AI with one example each. **[3]**

Q22. What is Problem Scoping in AI Project Cycle? Why is it important? **[3]**

Q23. Find the median and mode of the following data: 5, 7, 9, 7, 12, 15, 7, 20 **[3]**

OR

A bag contains 3 red, 4 blue, and 5 green balls. Find the probability of drawing (i) a red ball (ii) a blue or green ball.

Q24. Write a Python program to check whether a number is even or odd. **[3]**

Q25. What is data preprocessing? Explain any two techniques of data preprocessing. **[3]**

Q26. Discuss any three ethical considerations while using Generative AI. **[3]**

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

Q27. Explain the complete AI Project Cycle with all its stages in detail. **[5]**

OR

What is a Neural Network? Explain how it mimics the human brain with a suitable diagram.

Q28. (a) Write a Python program to create a list of 5 fruits and perform the following operations: **[5]**

(i) Add a new fruit at the end

(ii) Remove a fruit from the list

(iii) Display the final list

(b) Explain the difference between list and tuple in Python.

Q29. The marks obtained by 10 students in AI test are: 45, 52, 78, 65, 90, 72, 68, 55, 82, 76 **[5]**

(a) Calculate the mean marks

(b) Find the median

(c) What is the range of the data?

(d) How many students scored above the mean?

SECTION E - CASE STUDY BASED QUESTIONS (4 × 3 = 12 Marks + 3 Internal Choice Marks = 15 Marks + Practical 30 = 80 Marks)

Q30. **[4]**

CASE STUDY 1: Smart City Project

A city wants to implement an AI-based smart traffic management system. The system will use computer vision to detect traffic density and automatically adjust signal timings. The project team needs to collect data from various traffic cameras installed at 50 intersections. The data includes vehicle count, time of day, day of week, and average waiting time.

Based on the above information, answer the following questions:

(i) Which domain of AI is primarily being used in this project? **[1 mark]**

(ii) What type of data is "vehicle count" - qualitative or quantitative? **[1 mark]**
OR
What type of data is "day of week" - qualitative or quantitative?

(iii) Name two ethical considerations that should be addressed while implementing this AI system. **[2 marks]**

Q31. **[4]**

CASE STUDY 2: Healthcare AI Assistant

A hospital is developing an AI chatbot to help patients with basic health queries and appointment booking. The chatbot uses Natural Language Processing to understand patient questions and provide appropriate responses. The development team follows the AI Project Cycle:

1. Problem Scoping: Identify patient needs
2. Data Acquisition: Collect medical FAQs and conversation data
3. Data Exploration: Analyze common queries
4. Modeling: Train NLP model
5. Evaluation: Test accuracy and patient satisfaction

Based on the above information, answer the following questions:

(i) Which domain of AI is being used for this chatbot? **[1 mark]**

(ii) Why is Problem Scoping the first and most important step? **[1 mark]**

OR

What is the purpose of the Evaluation stage?

(iii) Suggest two ways to ensure the chatbot provides accurate health information. **[2 marks]**

Q32. **[4]**

CASE STUDY 3: Student Performance Analysis

A school uses an AI system to analyze student performance data. The data collected includes:

Student	Marks in Maths	Marks in AI	Attendance %
A	85	90	95
B	75	80	88
C	90	85	92
D	80	88	90

Based on the above information, answer the following questions:

(i) Calculate the mean marks in AI. **[1 mark]**

(ii) Which data visualization would be best to compare marks of all students - Bar chart or Pie chart? **[1 mark]**

OR

What is the range of marks in Mathematics?

(iii) Write a simple Python code to store the AI marks in a list and print the highest marks. **[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

All questions cover important topics from the curriculum

🎯 DETAILED ANSWER KEY WITH SOLUTIONS

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

Q1. Answer: (d) Manual Processing

Explanation: The three domains of AI are Data, Computer Vision, and Natural Language Processing (NLP). Manual Processing is not a domain of AI.

Q2. Answer: (b) Natural Language Processing

Explanation: NLP stands for Natural Language Processing, which enables machines to understand and process human language.

Q3. Answer: (b) Quantitative

Explanation: Age = 25 is quantitative data because it represents a numerical value that can be measured.

Q4. Answer: (b) Central tendency

Explanation: Mean, median, and mode are measures of central tendency that represent the central or typical value in a dataset.

Q5. Answer: (c) 1/2

Solution: When a coin is tossed, there are 2 possible outcomes: Heads or Tails
P(Heads) = 1/2 = 0.5

Q6. Answer: (b) ChatGPT

Explanation: ChatGPT is a Generative AI tool that can generate human-like text responses based on input prompts.

Q7. Answer: (c)

Explanation: In Python, the hash symbol (#) is used for single-line comments.

Q8. Answer: (b) print("Hello World")

Explanation: The print() function is used in Python to display output.

Q9. Answer: (c) bool

Explanation: Boolean (bool) data type is used to store True or False values in Python.

Q10. Answer: (b) Problem Scoping

Explanation: Problem Scoping is the first stage of AI Project Cycle where we define and understand the problem.

Q11. Answer: (b) input()

Explanation: The input() function is used to take input from the user in Python.

Q12. Answer: (c) my_variable

Explanation: Valid variable names can contain letters, numbers, and underscores, but cannot start with a number or contain spaces/hyphens.

Q13. Answer: (b)

Explanation: The type() function returns the data type. Since 5 is an integer, it returns .

Q14. Answer: (c) Pie chart

Explanation: Pie charts are best suited for showing parts of a whole as percentages.

Q15. Answer: (a) AI system is trained on incomplete or biased data

Explanation: AI bias occurs when the training data is incomplete, unrepresentative, or contains biases, leading to unfair outcomes.

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

Q16. Solution:

Marking Scheme: 1 mark for definition + 1 mark for application

Definition: Artificial Intelligence (AI) is the simulation of human intelligence in machines that are programmed to think and learn like humans.

Real-life Application: Virtual assistants like Siri, Alexa, or Google Assistant that understand voice commands and respond to user queries.
(Other examples: Self-driving cars, Face recognition in smartphones, Netflix recommendations, Medical diagnosis systems)

Q17. Solution:

> **Marking Scheme:** 1 mark for each type with example

Qualitative Data: Data that describes qualities or characteristics and cannot be measured numerically.
Example: Color of a car (Red, Blue, Green), Gender (Male/Female), Satisfaction level (Good/Bad)

Quantitative Data: Data that can be measured numerically and expressed in numbers.
Example: Height of students (160 cm, 175 cm), Temperature (25°C), Number of books (50)

Q18. Solution:

> **Marking Scheme:** 1 mark for formula + 1 mark for correct answer

Data: 12, 15, 18, 20, 25
Mean = Sum of all values / Number of values
Mean = (12 + 15 + 18 + 20 + 25) / 5
Mean = 90 / 5
Mean = 18

Q19. Solution:

Marking Scheme: 1 mark for taking input + 1 mark for calculation and output

Python Program:

```
# Program to add two numbers
num1 = int(input("Enter first number: "))
num2 = int(input("Enter second number: "))
sum = num1 + num2
print("Sum =", sum)
```

Q20. Solution:

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

Generative AI: Generative AI refers to artificial intelligence systems that can create new content such as text, images, audio, or video based on the data they have been trained on.

Example: ChatGPT (generates text responses), DALL-E (generates images from text descriptions), Midjourney (creates artwork), GitHub Copilot (generates code)

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

Q21. Solution:

Marking Scheme: 1 mark for each domain with example

Three Domains of AI:

1. Data: This domain deals with processing and analyzing large amounts of data to extract meaningful information and patterns.

Example: Recommendation systems on Netflix/Amazon that suggest products based on user behavior and preferences.

2. Computer Vision (CV): This domain enables machines to interpret and understand visual information from the world, such as images and videos.
Example: Face recognition systems in smartphones, Self-driving cars that detect objects and pedestrians, Medical image analysis for disease detection.

3. Natural Language Processing (NLP): This domain focuses on enabling machines to understand, interpret, and generate human language.
Example: Virtual assistants (Siri, Alexa), Language translation apps (Google Translate), Chatbots for customer service.

Q22. Solution:

> **Marking Scheme:** 1.5 marks for explanation + 1.5 marks for importance

Problem Scoping: Problem Scoping is the first and most critical stage of the AI Project Cycle where we clearly define and understand the problem that needs to be solved using AI. It involves identifying the goals, constraints, and success criteria for the project.

Key Activities in Problem Scoping:
• Identifying the problem statement
• Understanding the stakeholders and their needs
• Defining project goals and objectives
• Determining what success looks like

Importance:
1. **Clarity:** It provides clear direction for the entire project
2. **Resource Optimization:** Helps in efficient allocation of time, money, and resources
3. **Avoiding Waste:** Prevents working on wrong or irrelevant problems
4. **Measurable Success:** Establishes clear criteria to evaluate project success
5. **Foundation:** All subsequent stages depend on proper problem scoping

Q23. Solution:

> **Marking Scheme:** 1.5 marks for median + 1.5 marks for mode

Data: 5, 7, 9, 7, 12, 15, 7, 20

Finding Median:

First, arrange in ascending order: 5, 7, 7, 7, 9, 12, 15, 20

Number of values = 8 (even)

Median = Average of 4th and 5th terms

Median = (7 + 9) / 2 = 16 / 2

Median = 8

Finding Mode:

Mode is the value that appears most frequently

7 appears 3 times (most frequent)

Mode = 7

OR

Total balls = 3 red + 4 blue + 5 green = 12 balls

(i) P(red ball):

P(red) = Number of red balls / Total balls

P(red) = 3/12 = 1/4

(ii) P(blue or green ball):

Blue or green balls = 4 + 5 = 9

P(blue or green) = 9/12 = 3/4

Q24. Solution:

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

Python Program to check Even or Odd:

```
# Program to check even or odd
num = int(input("Enter a number: "))

if num % 2 == 0:
    print(num, "is Even")
else:
    print(num, "is Odd")
```

Explanation:
• We use modulo operator (%) to find remainder
• If remainder is 0 when divided by 2, number is even
• Otherwise, number is odd

Q25. Solution:

> **Marking Scheme:** 1 mark for definition + 1 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 modeling. It is a crucial step before applying AI/ML algorithms.

Two Techniques of Data Preprocessing:

1. Data Cleaning:
• Removing duplicate entries
• Handling missing values (filling with mean/median or removing rows)
• Correcting errors and inconsistencies
• Removing outliers (extreme values)
Example: If a dataset has student ages and one entry shows 200 years, it should be corrected or removed.

2. Data Normalization/Standardization:
• Scaling numerical data to a common range (e.g., 0-1)
• Ensuring all features have similar scales
• Helps in better model performance

Example: Converting heights from different units (cm, feet) to a single unit.

(Other techniques: Data Transformation, Feature Selection, Data Integration)

Q26. Solution:

> **Marking Scheme:** 1 mark for each ethical consideration (3 points)

Ethical Considerations while using Generative AI:

1. Privacy and Data Security:
• Generative AI systems should not violate user privacy
• Personal data used for training should be protected
• Consent should be obtained before using someone's data

2. Misinformation and Deepfakes:
• AI can generate fake news, images, or videos (deepfakes)
• This can be misused to spread false information
• Need to verify authenticity of AI-generated content

3. Intellectual Property and Copyright:
• AI-generated content may violate copyright laws
• Questions about ownership of AI-created work
• Need to respect original creators' rights

(Other considerations: Bias and Fairness, Transparency, Accountability, Job Displacement, Environmental Impact)

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

Q27. Solution:

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

AI Project Cycle - Complete Stages:

The AI Project Cycle is a structured approach to develop AI solutions. It consists of 5 stages:

Stage 1: Problem Scoping
• Define the problem clearly
• Identify goals and objectives
• Understand stakeholders and their needs
• Determine success criteria
• Set project scope and limitations

Stage 2: Data Acquisition
• Identify what data is needed
• Collect data from reliable sources
• Ensure data quality and relevance
• Methods: Surveys, sensors, web scraping, public datasets

Stage 3: Data Exploration
• Analyze and understand the data
• Clean and preprocess the data
• Visualize data using charts and graphs
• Identify patterns and relationships
• Handle missing values and outliers

Stage 4: Modeling
• Select appropriate AI/ML algorithm
• Train the model using prepared data
• Test the model with validation data
• Fine-tune parameters for better accuracy

Stage 5: Evaluation
• Test model performance on new data
• Measure accuracy and effectiveness
• Identify areas for improvement

• Deploy if satisfactory, otherwise iterate
• Get feedback from users

Note: The cycle is iterative - we may need to go back to previous stages based on evaluation results.

OR

Neural Network:

A Neural Network is an AI system inspired by the structure and functioning of the human brain. It consists of interconnected nodes (neurons) that process information.

How it mimics the Human Brain:

1. Neurons:
• Human Brain: Has billions of neurons that process information
• Neural Network: Has artificial neurons (nodes) that perform calculations

2. Connections (Synapses):
• Human Brain: Neurons connect through synapses
• Neural Network: Nodes connect through weighted connections

3. Layers:
• Input Layer: Receives information (like sensory input in brain)
• Hidden Layers: Process information (like brain processing)
• Output Layer: Gives final result (like brain's decision)

4. Learning:
• Brain learns from experience by strengthening/weakening connections
• Neural Network adjusts weights during training to improve accuracy

Simple Diagram:
[Students should draw a diagram showing Input Layer → Hidden Layer(s) → Output Layer with interconnected nodes]

Q28. Solution:

> **Marking Scheme:** 3 marks for program + 2 marks for difference between list and tuple

(a) Python Program for List Operations:

```
# Create a list of 5 fruits
fruits = ["Apple", "Banana", "Mango", "Orange", "Grapes
print("Original list:", fruits)

# (i) Add a new fruit at the end
fruits.append("Pineapple")
print("After adding:", fruits)

# (ii) Remove a fruit from the list
fruits.remove("Banana")
print("After removing Banana:", fruits)

# (iii) Display the final list
print("Final list:", fruits)
```

Output:

Original list: ['Apple', 'Banana', 'Mango', 'Orange', 'Grapes']
After adding: ['Apple', 'Banana', 'Mango', 'Orange', 'Grapes', 'Pineapple']
After removing Banana: ['Apple', 'Mango', 'Orange', 'Grapes', 'Pineapple']
Final list: ['Apple', 'Mango', 'Orange', 'Grapes', 'Pineapple']

(b) Difference between List and Tuple:

Feature	List	Tuple
Mutability	Mutable (can be modified)	Immutable (cannot be modified)
Syntax	Uses square brackets [ ]	Uses round brackets ( )
Speed	Slower	Faster

Example	my_list = [1, 2, 3]	my_tuple = (1, 2, 3)

Q29. Solution:

> **Marking Scheme:** 1 mark for mean + 1.5 marks for median + 1 mark for range + 1.5 marks for count

Marks: 45, 52, 78, 65, 90, 72, 68, 55, 82, 76

(a) Calculate Mean:

Mean = Sum of all marks / Number of students

Mean = (45 + 52 + 78 + 65 + 90 + 72 + 68 + 55 + 82 + 76) / 10

Mean = 683 / 10

Mean = 68.3 marks

(b) Find Median:

First arrange in ascending order: 45, 52, 55, 65, 68, 72, 76, 78, 82, 90

Number of values = 10 (even)

Median = Average of 5th and 6th terms

Median = (68 + 72) / 2

Median = 70 marks

(c) Range:

Range = Highest value - Lowest value

Range = 90 - 45

Range = 45

(d) Students above mean:

Mean = 68.3

Students with marks > 68.3: 78, 90, 72, 82, 76

5 students scored above the mean

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

Q30. Solution: CASE STUDY 1 - Smart City Project

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

(i) The domain of AI being used is **Computer Vision**.
Explanation: Computer Vision allows the system to analyze traffic camera images/videos to detect vehicles and estimate traffic density.

(ii) "Vehicle count" is **Quantitative data**.
Explanation: It represents a numerical value that can be counted and measured.

OR
"Day of week" is **Qualitative data**.
Explanation: It represents categories (Monday, Tuesday, etc.) and describes qualities rather than quantities.

(iii) Two ethical considerations:

1. Privacy Concerns:
• Traffic cameras may capture personal information and vehicle details
• Need to ensure data is used only for traffic management
• Proper anonymization of personal data required

2. Bias and Fairness:
• System should not discriminate based on vehicle type or location
• Equal priority to all areas, not just affluent neighborhoods
• Fair signal timing for all roads

(Other valid answers: Data security, Transparency in decision-making, Accountability for system failures)

Q31. Solution: CASE STUDY 2 - Healthcare AI Assistant

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

(i) The domain being used is **Natural Language Processing (NLP)**.
Explanation: NLP enables the chatbot to understand patient questions in natural language and generate appropriate responses.

(ii) Problem Scoping is the first and most important step because:
• It defines what problem we are solving and why
• Ensures we understand patient needs correctly
• Prevents wasting time and resources on wrong solution
• Sets clear goals and success criteria for the project

OR
Purpose of Evaluation stage:
• Test if the chatbot provides accurate responses
• Measure patient satisfaction and usability
• Identify errors and areas for improvement
• Decide if the system is ready for deployment

(iii) Two ways to ensure accuracy:

1. Use Verified Medical Data:
• Train the chatbot using information from trusted medical sources
• Include databases from hospitals and medical journals
• Regular updates with latest medical knowledge

2. Human Expert Review:
• Have medical professionals review chatbot responses
• Include disclaimer to consult doctors for serious issues
• Continuous monitoring and feedback system

Q32. Solution: CASE STUDY 3 - Student Performance Analysis

Marking Scheme: 1 + 1 + 2 = 4 marks

(i) Mean marks in AI:
AI marks: 90, 80, 85, 88
Mean = (90 + 80 + 85 + 88) / 4

Mean = 343 / 4

Mean = 85.75 marks

(ii) Bar chart would be best to compare marks of all students.

Explanation: Bar charts allow easy comparison of individual student performance across different subjects.

OR

Range of marks in Mathematics:

Maths marks: 85, 75, 90, 80

Range = Highest - Lowest

Range = 90 - 75

Range = 15

(iii) Python code to store AI marks and print highest:

```
# Store AI marks in a list
ai_marks = [90, 80, 85, 88]

# Find and print highest marks
highest = max(ai_marks)
print("Highest marks in AI:", highest)
```

Output: Highest marks in AI: 90

✅ END OF ANSWER KEY ✅

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

Complete step-by-step solutions with marking schemes

Practical Component (30 marks):

• Python Programming Practicals: 15 marks

• Project Work: 10 marks

• Viva Voce: 5 marks

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