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Computer Science Grade 9 — Chapter 2

Computational Thinking and Algorithms

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Independent practice MCQs from the supplied Class 9 Computer Science notes pack. Total: 50 questions. Each item has four options, the correct letter, and a short explanation.

A. Important / Main Topics

1. What is a problem in computer science?

(A) A challenge or situation that needs to be overcome using some action
(B) A mathematical equation
(C) A type of software
(D) A hardware component

Correct Answer: A

Explanation: In computer science, a problem is a challenge or situation that needs to be overcome using some action.

2. Which type of computing problem requires a Yes or No answer?

(A) Search Problem
(B) Decision Problem
(C) Counting Problem
(D) Sorting Problem

Correct Answer: B

Explanation: A decision problem occurs when a given input requires a binary response, either Yes or No.

3. What is the first step in problem solving?

(A) Design a plan
(B) Implement the plan
(C) Define and analyze the problem
(D) Evaluate

Correct Answer: C

Explanation: For simple problems, the first step is to define and analyze the problem: What is the problem and why is it happening?.

4. In the IPO model, what does the "P" stand for?

(A) Program
(B) Plan
(C) Protocol
(D) Processing

Correct Answer: D

Explanation: The IPO model stands for Input-Processing-Output. Processing refers to the operations the system performs on the input.

5. Which property of computational thinking involves breaking down larger problems into smaller, manageable ones?

(A) Decomposition
(B) Abstraction
(C) Pattern Recognition
(D) Algorithm Design

Correct Answer: A

Explanation: Decomposition — this correctly answers the question.

6. What is a flowchart?

(A) A type of software
(B) A diagrammatic representation of an algorithm
(C) A mathematical formula
(D) A network device

Correct Answer: B

Explanation: A flowchart is a diagrammatic representation of an algorithm. It describes what operations are required to solve a given problem.

7. Which symbol is used for decision making in a flowchart?

(A) Oval
(B) Parallelogram
(C) Diamond
(D) Rectangle

Correct Answer: C

Explanation: Graphically, the decision is represented with a diamond.

8. What is the primary purpose of logical thinking?

(A) To memorize facts
(B) To draw pictures
(C) To write code
(D) To analyze situations using reason and facts

Correct Answer: D

Explanation: Logical thinking refers to analyzing a particular situation or problem using reason and accordingly reaching up to one or more decisions that are sensible.

9. Which of the following is a counting problem?

(A) How many ways can you arrange 3 books?
(B) Is this number prime?
(C) Find the largest number in a list
(D) Is "aa" present in the sequence?

Correct Answer: A

Explanation: How many ways can you arrange 3 books? — this correctly answers the question.

10. What is the formula for the counting principle?

(A) A + B
(B) A × B
(C) A - B
(D) A ÷ B

Correct Answer: B

Explanation: The counting principle states that if an event/decision has A number of choices and another decision/event has B number of choices, then the total number of possible unique combinations would be A × B.

11. What does the "I" in IPO stand for?

(A) Internet
(B) Instruction
(C) Input
(D) Integer

Correct Answer: C

Explanation: The IPO model stands for Input-Processing-Output. I stands for Input.

12. Which of the following is an example of a decision problem?

(A) Find the maximum number in a list
(B) Count the number of students
(C) Sort the list in ascending order
(D) Is the number divisible by 5?

Correct Answer: D

Explanation: A decision problem requires a Yes or No answer. "Is the number divisible by 5?" is a decision problem.

13. What is an IPO chart?

(A) A tabular representation of Input, Process, and Output
(B) A type of flowchart
(C) A mathematical formula
(D) A network protocol

Correct Answer: A

Explanation: An IPO chart is a tabular representation of the Input, Process, and Output of a system.

14. What is the purpose of the oval symbol in a flowchart?

(A) Input/Output
(B) Start/End
(C) Process
(D) Decision

Correct Answer: B

Explanation: The oval symbol is used for the start and end of a flowchart.

15. What is algorithmic thinking?

(A) Breaking down problems
(B) Finding patterns
(C) Identifying steps and implementing them logically and efficiently
(D) Removing unnecessary details

Correct Answer: C

Explanation: Algorithmic thinking is a process that involves identifying the steps needed and then implementing those steps in a logical and efficient manner.

16. A student is asked to determine whether a given number is divisible by 5. What type of computing problem is this?

(A) Search Problem
(B) Counting Problem
(C) Sorting Problem
(D) Decision Problem

Correct Answer: D

Explanation: This is a decision problem because it requires a Yes or No answer (divisible or not divisible).

17. In the IPO model, what does "Output" refer to?

(A) Data that has been turned into information
(B) Data entered into the system
(C) Operations applied to the input
(D) The hardware used

Correct Answer: A

Explanation: Output is the thing that is presented to the environment. It is the data that has been turned into information.

18. Why is logical thinking important in computational thinking?

(A) It helps in memorizing facts
(B) It helps in analyzing situations using reason and facts
(C) It helps in drawing pictures
(D) It helps in writing code faster

Correct Answer: B

Explanation: It helps in analyzing situations using reason and facts — this correctly answers the question.

19. A student is creating a concept map for a science project. What is the primary purpose of a concept map?

(A) To show a sequence of steps
(B) To perform calculations
(C) To represent concepts and relationships between them
(D) To store data

Correct Answer: C

Explanation: A concept map is a graphical tool that represents concepts and relationships between them.

20. Which of the following best describes pattern recognition in computational thinking?

(A) Breaking down a problem into smaller parts
(B) Removing unnecessary details
(C) Creating a step-by-step plan
(D) Examining the problem for similarities with previously solved problems

Correct Answer: D

Explanation: Pattern Recognition involves examining the problem for a pattern or similarities between previously solved problems.

21. In a flowchart, what does a parallelogram represent?

(A) Input/Output
(B) Start/End
(C) Process
(D) Decision

Correct Answer: A

Explanation: The graphical representation of input and output is a parallelogram.

22. A student is asked to find the largest of three numbers. What type of problem is this?

(A) Decision Problem
(B) Search Problem
(C) Counting Problem
(D) Sorting Problem

Correct Answer: B

Explanation: This is a search problem because it involves finding a specific element (the largest number) within a set of possibilities.

23. What is the primary difference between a simple problem and a complex problem in problem-solving?

(A) Simple problems have no solution
(B) Simple problems require coding
(C) Complex problems require decomposition into sub-problems
(D) Complex problems cannot be solved

Correct Answer: C

Explanation: Complex problems require decomposition into sub-problems — this correctly answers the question.

24. In the context of computational thinking, what does abstraction involve?

(A) Breaking down problems
(B) Finding patterns
(C) Creating step-by-step plans
(D) Removing unnecessary details to identify essential information

Correct Answer: D

Explanation: Abstraction involves removing the unnecessary details from the solution so you can identify essential information.

25. A student uses an IPO chart to plan a program. What does the "Process" column contain?

(A) Operations that will be applied on the input
(B) Data entered in the system
(C) Data that has been turned into information
(D) The final result

Correct Answer: A

Explanation: The Process column contains the operations that the system will perform on the input to generate information.

B. Less Important / Secondary Topics

26. What is the output of the following logical reasoning? Fact: Islamabad is a city. Fact: Cities have a mayor. Inferred: ?

(A) Islamabad has a mayor
(B) Islamabad is a country
(C) Islamabad is not a city
(D) Cities do not have mayors

Correct Answer: A

Explanation: Using logical thinking, we infer that Islamabad has a mayor based on the facts that it is a city and cities have mayors.

27. Which of the following is a search problem?

(A) Is the number even?
(B) Find the largest number in a list
(C) How many outfits can you make?
(D) Is "ab" in the string?

Correct Answer: B

Explanation: Find the largest number in a list — this correctly answers the question.

28. What is the difference between a flowchart and a concept map?

(A) Flowchart shows relationships; concept map shows steps
(B) Both show steps
(C) Flowchart shows steps; concept map shows relationships
(D) Both show relationships

Correct Answer: C

Explanation: A flowchart is a diagrammatic representation of an algorithm (steps), while a concept map represents concepts and relationships.

29. A student is asked to solve a complex problem. They break it into smaller sub-problems and solve each one. Which property of computational thinking are they applying?

(A) Abstraction
(B) Pattern Recognition
(C) Algorithm Design
(D) Decomposition

Correct Answer: D

Explanation: Decomposition — this correctly answers the question.

30. What does the "O" in IPO stand for?

(A) Output
(B) Operation
(C) Object
(D) Order

Correct Answer: A

Explanation: The IPO model stands for Input-Processing-Output. O stands for Output.

31. In a flowchart, what does a rectangle represent?

(A) Start/End
(B) Process
(C) Input/Output
(D) Decision

Correct Answer: B

Explanation: The graphical representation of processing is a rectangle.

32. Which of the following is an example of a counting problem?

(A) Is this number prime?
(B) Find the largest number
(C) How many ways can you arrange 4 books?
(D) Is "aa" present?

Correct Answer: C

Explanation: How many ways can you arrange 4 books? — this correctly answers the question.

33. What is the 4-step problem-solving process for simple problems?

(A) Decompose, Design, Implement, Evaluate
(B) Define, Decompose, Implement, Evaluate
(C) Design, Implement, Evaluate, Repeat
(D) Define, Design, Implement, Evaluate

Correct Answer: D

Explanation: For simple problems, the 4 steps are: define and analyze, design a plan, implement the plan, and evaluate.

34. A student is analyzing a problem and realizes it is similar to a problem they solved last week. Which computational thinking property are they using?

(A) Pattern Recognition
(B) Decomposition
(C) Abstraction
(D) Algorithm Design

Correct Answer: A

Explanation: Pattern Recognition involves examining the problem for a pattern or similarities between previously solved problems.

35. What is the purpose of the `prompt()` function in JavaScript?

(A) To display an alert box
(B) To take user input
(C) To change the background color
(D) To create a loop

Correct Answer: B

Explanation: The `prompt()` function pops up a message window that takes input from the user.

36. A student is asked to determine whether a given string contains the sequence "ab". What type of computing problem is this?

(A) Counting Problem
(B) Search Problem
(C) Decision Problem
(D) Sorting Problem

Correct Answer: C

Explanation: This is a decision problem because it requires a Yes or No answer (the sequence is present or not present).

37. A student needs to find the largest number in a list of 100 numbers. What type of problem is this, and what approach should they use?

(A) Decision Problem; Yes/No answer
(B) Counting Problem; count combinations
(C) Sorting Problem; arrange numbers
(D) Search Problem; find the maximum

Correct Answer: D

Explanation: This is a search problem because it involves finding a specific element (the largest number) within a set of possibilities.

38. A company wants to determine how many different combinations of products they can offer if they have 3 types of shirts and 4 types of pants. What is the total number of combinations?

(A) 12
(B) 7
(C) 34
(D) 43

Correct Answer: A

Explanation: 12 — this correctly answers the question.

39. A student is designing a flowchart for a program that checks if a number is even or odd. Which symbol should they use for the decision?

(A) Oval
(B) Diamond
(C) Parallelogram
(D) Rectangle

Correct Answer: B

Explanation: The diamond symbol is used for decision making in a flowchart.

40. A student is creating a concept map for the water cycle. Which of the following correctly represents the relationship between evaporation and condensation?

(A) Evaporation determines Condensation
(B) Evaporation includes Condensation
(C) Evaporation leads to Condensation
(D) Evaporation is unrelated to Condensation

Correct Answer: C

Explanation: Evaporation leads to Condensation — this correctly answers the question.

41. A programmer is writing an algorithm to find the largest of three numbers. They write: "Check if A › B and A › C, then A is the largest." What step of the problem-solving process does this represent?

(A) Define and analyze
(B) Implement
(C) Evaluate
(D) Design a plan

Correct Answer: D

Explanation: This represents designing a plan (algorithm) for solving the problem.

42. A student is asked to solve a complex problem. They break it into smaller sub-problems and solve each one. Which property of computational thinking are they applying?

(A) Decomposition
(B) Abstraction
(C) Pattern Recognition
(D) Algorithm Design

Correct Answer: A

Explanation: Decomposition — this correctly answers the question.

43. In the context of a video game, what would be considered "unnecessary information" according to the principle of abstraction?

(A) Location of the exit
(B) Weather conditions
(C) Position of enemies
(D) Location of items

Correct Answer: B

Explanation: In the game example, unnecessary information includes the weather, as it does not affect gameplay.

44. A student is analyzing a problem and realizes it is similar to a problem they solved last week. Which computational thinking property are they using?

(A) Decomposition
(B) Abstraction
(C) Pattern Recognition
(D) Algorithm Design

Correct Answer: C

Explanation: Pattern Recognition involves examining the problem for a pattern or similarities between previously solved problems.

45. A flowchart for finding the sum of five numbers includes: Start → Input A, B, C, D, E → SUM = A + B + C + D + E → Output SUM → End. What does the rectangle symbol represent?

(A) Start
(B) Input
(C) Output
(D) Process

Correct Answer: D

Explanation: Process — this correctly answers the question.

46. A school wants to create a timetable for exams. Which component of the IPO model would contain the operations like assigning subjects to dates and allocating students to halls?

(A) Process
(B) Input
(C) Output
(D) Storage

Correct Answer: A

Explanation: Process — this correctly answers the question.

47. A student wants to plan a birthday party. They break the task into smaller tasks: guest list, invitations, food, decorations, activities. Which computational thinking property are they applying?

(A) Abstraction
(B) Decomposition
(C) Pattern Recognition
(D) Algorithm Design

Correct Answer: B

Explanation: Decomposition — this correctly answers the question.

48. In a flowchart to determine if a student passes or fails (passing marks = 40), what should the decision symbol check?

(A) Input marks
(B) Output "Pass"
(C) Marks ›= 40
(D) Start

Correct Answer: C

Explanation: The decision symbol checks the condition. In this case, it checks if marks are greater than or equal to 40.

49. A company has 3 types of shirts and 4 types of pants. Using the counting principle, what is the total number of unique outfits?

(A) 7
(B) 34
(C) 43
(D) 12

Correct Answer: D

Explanation: 12 — this correctly answers the question.

50. Which of the following best describes the relationship between logical thinking and algorithmic thinking?

(A) Logical thinking provides reasoning; algorithmic thinking provides steps
(B) They are the same thing
(C) Algorithmic thinking provides reasoning; logical thinking provides steps
(D) They are unrelated

Correct Answer: A

Explanation: Logical thinking provides reasoning; algorithmic thinking provides steps — this correctly answers the question.