Multiple-Choice Questions

for AS & A Level OCR Computer Science

Component 2:
Algorithms and Programming (A Level)
Algorithms and Problem Solving (AS)

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Contents

Teacher's Introduction

This pack of multiple-choice questions has been produced specifically for use with the AS and A Level OCR Computer Science specification, for first teaching 2015; exams from 2016 (AS) and 2017 (A Level) onwards.

The prescribed content for **Component 2: Algorithms and Probem Solving** (AS) and **Component 2: Algorithms and Programming** (A Level) is covered by eight sets of quick-fire multiple-choice questions. Each question bank consists of exactly 20 questions, each worth a single mark for simplicity. For every question, there is only one valid answer; for some questions there will be red herrings, so students should be encouraged to read each question carefully. The questions are text-based, although some include pseudocode and Boolean logic.

The best use for these questions is as an introduction to the topic, perhaps as a starter activity, as well as a revision aid. The nature of Component 2 is such that multiple-choice questions provide an entry point, before more in-depth activities including programming and discussion work. In terms of computational thinking, for instance, use of multiple-choice questions to pin down the differences between thinking procedurally and thinking concurrently would lay a foundation and pre-empt misconceptions.

The Answers section includes the answers in a concise grid format, to facilitate quick and easy marking, either by the teacher or by the students themselves. There is also additional commentary for many of the questions, to support understanding and potentially prompt further discussion.

November 2023

Note about electronic versions (.docx/.pdf)

If you have purchased the electronic upgrade for this resource, you will find that the question banks have been created as forms, enabling students to complete each test on screen by ticking the check boxes.

If you have not upgraded to electronic format(s) but would like to, please contact ZigZag Education customer services (0117 950 3199), who will be happy to assist you.

3 Expand the acronym CISC

☐ Computing Interrupt Scheduling Core Ⓐ
☒ Complex Instruction Set Computer Ⓑ
☐ Central Instruction Set Computer Ⓒ
☐ Core Interrupt Selection Computing Ⓓ

AS and A Level OCR Computer Science (H046/H

Title	Covers
1 – Categories of Thinking	• Thinking abstractly • Thinking ahead • Thinking procedurally • Thinking logically • Thinking concurrently **A Level only**
2 – Thinking Logically	Thinking logically
3 – Programming Techniques	• Programming constructs: sequence, iteration, branching • Recursion, how it can be used and how it compares to an iterative
4 – Modularity and Object Orientation	• Global and local variables • Modularity, functions and procedures, parameter passing by value • Use of object-oriented techniques **A Level only**
5 – Integrated Development Environments	• Use of an IDE to develop/debug a program
6 – Computational Methods	• Problem decomposition • Use of divide and conquer • Backtracking, data mining, heuristics, modelling, pipelining and visu
7 – Big O Notation	• Measures and methods to determine the efficiency of different alg • Comparison of the complexity of algorithms **A Level only**
8 – Algorithms	• Analysis and design of algorithms for a given situation • The suitability of different algorithm for a given task and data se • Algorithms for the main data structure • Standard algorithms

1 – Computational Thinking

Due to the nature of this topic, some answers in this test are not as clear-cut as elsewhere in Computer Science. Where you believe there is more than one answer that could be considered correct, choose the **most appropriate** answer.

1 A hiker looks at a map of a mountain range they are planning to explore over the course of the next week. On the map, a cross symbol represents the highest point of a mountain. This cross is an example of which of the following?

☐ Thinking abstractly Ⓐ
☐ Thinking ～～ Ⓑ
☐ Thinki～～ency Ⓒ
☐ Thinking～～urally Ⓓ

2 A commuter is running late, and would like to leave their house in the next three minutes with a cup of coffee and a slice of toast. Since both the toaster and the kettle require two minutes to run, which of the following will be necessary if the commuter is to leave the house when intended?

☐ Thinking abstractly Ⓐ
☐ Thinking concurrently Ⓑ
☐ Thinking logically Ⓒ
☐ Thinking procedurally Ⓓ

3 A multiprocessing system uses caching and library methods to make complex decisions. Which of the following elements of computational thinking is <u>not</u> involved in the development of such a system?

☐ Thinking abstractly Ⓐ
☐ Thinking ahead Ⓑ
☐ Thinking concurrently Ⓒ
☐ Thinking logically Ⓓ

4 Which of the following categories of computational thinking is most clearly evident in the programming instruction `while (x < 5)`?

☐ Thinking ～～ Ⓐ
☐ Thinking concurrently Ⓑ
☐ Thinking logically Ⓒ
☐ Thinking procedurally Ⓓ

5 Sometime～
considerin～
the followi～

☐ Thinkin～
☐ Thinkin～
☐ Thinkin～
☐ Thinkin～

6 When peo～
looking at～
single line～
at all. Wh～

☐ Thinkin～
☐ Thinkin～
☐ Thinkin～
☐ Thinkin～

7 Which cate～
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☐ Thinkin～
☐ Thinkin～
☐ Thinkin～
☐ Thinkin～

8 The Boolea～
running or～

☐ Thinkin～
☐ Thinkin～
☐ Thinkin～
☐ Thinkin～

9 Decompos～
closely rel～

☐ Thinkin～
☐ Thinkin～
☐ Thinkin～
☐ Thinkin～

10 When instructions for self-assembly furniture are being devised for use by one person, what is the category of computational thinking being used?

☐ Thinking abstractly Ⓐ
☐ Thinking concurrently Ⓑ
☐ Thinking logically Ⓒ
☐ Thinking procedurally Ⓓ

11 Often, computer science textbooks re̶͟ ̵̶ ̵ ̵ ̶net as a cloud. When this is done, it's usually ̶ ̵ ̶ ̵ th̶ ̵ ̵net is part of what's being described, but not the ̶ ̵ ̶ ̵ ̶ ̵ng a picture of a cloud in this way, what is the ̶ ̵ ̶ d̶

☐ Thinki̶ ̵ ̵ly Ⓐ
☐ Thinking ̶ ̵rently Ⓑ
☐ Thinking logically Ⓒ
☐ Thinking procedurally Ⓓ

12 With which category of computational thinking does the use of cache memory most closely align?

☐ Thinking ahead Ⓐ
☐ Thinking concurrently Ⓑ
☐ Thinking logically Ⓒ
☐ Thinking procedurally Ⓓ

13 Icons often represent the action with which they are associated. For example, the 'print' icon typically looks like a printer. Which form of computational thinking does this principle exploit?

☐ Thinking abstractly Ⓐ
☐ Thinking concurrently Ⓑ
☐ Thinking logically Ⓒ
☐ Thinking procedurally Ⓒ

14 A nested '̶ ̵ ̶er ̵ ̶ ̵s part of which category of computati̶ ̵ ̶king?

☐ Thinking ̶ ̵ ̶actly Ⓐ
☐ Thinking ahead Ⓑ
☐ Thinking concurrently Ⓒ
☐ Thinking logically Ⓓ

15 Which of t̶
to creatin̶
imported i̶

☐ Thinkin̶
☐ Thinkin̶
☐ Thinkin̶
☐ Thinkin̶

16 Which of t̶

☐ Thinkin̶
comple̶
☐ Thinkin̶
☐ Thinkin̶
order ̶
☐ Thinkin̶
sub-pr̶

17 Which of t̶

☐ Thinkin̶
class's ̶
☐ Thinkin̶
progra̶
☐ Thinkin̶
☐ Thinkin̶

18 Which cate̶
Boolean a̶

☐ Thinkin̶
☐ Thinkin̶
☐ Thinkin̶
☐ Thinkin̶

19 A system at an airport is used to handle immigration issues followed by customs issues. Following a review, customs issues will be handled before immigration issues. Which form of computational thinking is being engaged with here?

☐ Thinking abstractly Ⓐ

☐ Thinking concurrently Ⓑ

☐ Thinking logically Ⓒ

☐ Thinking procedurally Ⓓ

20 An instruc
are comple
described
thinking d

☐ Thinkin

☐ Thinkin

☐ Thinkin

☐ Thinkin

2 - Thinking Logically

1 Which of the following Boolean expressions will always evaluate to 'true'?

☐ x < 5 OR x > 5 Ⓐ

☐ x > 5 AND x < 50 Ⓑ

☐ x < 5 AND x > 5 Ⓒ

☐ x < 5 OR x >= 5 Ⓓ

2 Which of the following Boolean expres~~~~ evaluate to 'false'?

☐ x < 5 OR x >= 5 Ⓐ

☐ x < 5 AND x ~ 5 Ⓟ

☐ x < 5 ~~~~ Ⓒ

☐ x > 5 A~~~~ Ⓓ

3 A loop begins with the statement while x != 10. Assuming x had previously been initialised as 0, and during each iteration of the loop it is incremented twice, how many times will the loop run?

☐ 5 Ⓐ

☐ 6 Ⓑ

☐ 10 Ⓒ

☐ This would be an infinite loop Ⓓ

4 A loop begins with the statement while x != 10. Assuming x had previously been initialised as 1, and during each iteration of the loop it is incremented twice, how many times will the loop run?

☐ 0 Ⓐ

☐ 5 Ⓑ

☐ 6 Ⓒ

☐ This would be an infinite loop Ⓓ

5 A loop begins with the stat~~~~ ~~~~ 10. Within the loop, the value of x is de~~~~ ~~~~ of the following values of x, if initialised ~~~~ ~~~~ would cause an infinite loop?

☐ 9 Ⓐ

☐ 10 Ⓑ

☐ 11 Ⓒ

☐ All of these Ⓓ

6 A loop beg~~~~ value of x ~~~~ would cau~~~~

☐ 9 Ⓐ

☐ 10 Ⓑ

☐ 11 Ⓒ

☐ None o~~~~

7 The variab~~~~ logic expr~~~~

☐ a OR b~~~~

☐ (a AND~~~~

☐ a OR (N~~~~

☐ a AND~~~~

8 The variab~~~~ expression~~~~

☐ a AND~~~~

☐ a OR (b~~~~

☐ b AND~~~~

☐ b OR (a~~~~

9 The variab~~~~ expression~~~~

☐ a OR b~~~~

☐ b OR b~~~~

☐ (a AND~~~~

☐ (a AND~~~~

10 A financial bonus can be awarded to staff if they meet any one of three sales targets. If their sales exceed 100,000, they receive the bonus. If they have at least 10 new customers, they receive the bonus. If their sales exceed 50,000 with at least 5 new customers, they receive their bonus. Which 'if' statement best describes this logic?

☐ if (sales > 100000) AND (customers > 9) OR (sales > 50000 AND customers > 5) Ⓐ

☐ if (sales > 100000) OR (customers > 10) OR (sales > 50000 AND customers >= 5) Ⓑ

☐ if (sales > 100000) OR (customers > 10) OR (sales > 50000 AND customers >= 5) Ⓒ

☐ if (sales > 100000) OR (customers > 10) OR (sales > 50000 AND customers >= 5) Ⓓ

11 Which of the following lines of code marks the beginning of a loop that will never run?

☐ while (x <= 10 and x >= 10) Ⓐ

☐ while (x < 10 and x != 10) Ⓑ

☐ while (x < 10 and x > 10) Ⓒ

☐ while (x >= 10 and x == 10) Ⓓ

12 Which of the following 'if' statements would be the least likely to compile?

☐ if (x < 12 OR y > 50 AND z != 6) Ⓐ

☐ if (x > 5 AND y < 10 AND z + 2) Ⓑ

☐ if (x > 12 AND y <= 1 AND z == 14) Ⓒ

☐ if (x != 3 OR y >= 3 OR z <= 3) Ⓓ

13 A level of a computer game is won if either all of the coins are collected or all enemies defeated. Assuming self-documenting identifiers are in use, which of the following selection statements is the most likely to correctly model the logic?

☐ if (enemiesRemaining < 1) AND (coinsRemaining == 0) Ⓐ

☐ if (enemiesKilled == initialEnemyCount) AND (coinsRemaining <= 0) Ⓑ

☐ if (enemiesRemaining < 1) OR (coinsCollected == initialCoinCount) Ⓒ

☐ if (enemiesKilled == initialEnemyCount) OR (coinsRemaining < 0) Ⓓ

14 A pay-to-p
subsequen
deposit a c
loop, and a
should the

☐ At the
☐ At the e
☐ At both
☐ No logi

15 Which of t

☐ a * b Ⓐ
☐ a < b Ⓑ
☐ a Ⓒ
☐ NOT b

16 To win a p
2 bullseye
Which of t

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☐ if (score
☐ if (score
☐ if (score

17 What is th

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☐ One of
☐ One of
☐ One of
☐ One of

18 What is th

☐ The loo
☐ The loo
☐ The loo
☐ The loo

19 What is the nature of pre-check iteration?

- ☐ The loop will always run at least once, but might not run a second time Ⓐ
- ☐ The loop will run a fixed, finite number of times Ⓑ
- ☐ The loop will not begin unless the condition is met Ⓒ
- ☐ The loop will run an infinite number of times Ⓓ

20 Which of t

- ☐ It's pos
- ☐ It's pos
- ☐ If the if
- ☐ If the if

3 – Programming Techniques

1 The command `x = (int) y` is an example of which combination of programming techniques?

- [ ] Casting and comparison Ⓐ
- [ ] Casting and assignment Ⓑ
- [ ] Switching and comparison Ⓒ
- [ ] Switching and assignment Ⓓ

2 Which of the following pseudocode keywords is not indicative of a selection structure?

- [ ] case Ⓐ
- [ ] else Ⓑ
- [ ] next Ⓒ
- [ ] switch Ⓓ

3 Which of the following pseudocode keywords identifies a subroutine that returns a value?

- [ ] procedure Ⓐ
- [ ] output Ⓑ
- [ ] proc Ⓒ
- [ ] function Ⓓ

4 What is the result of the arithmetic operation 28 DIV 4?

- [ ] 0 Ⓐ
- [ ] 4 Ⓑ
- [ ] 7 Ⓒ
- [ ] 28 Ⓓ

5 What is the result of the arithmetic operation ... OD 12?

- [ ] 0 Ⓐ
- [ ] 1 Ⓑ
- [ ] 5 Ⓒ
- [ ] 12 Ⓓ

6 What is th

- [ ] 16 Ⓐ
- [ ] 24 Ⓑ
- [ ] 32 Ⓒ
- [ ] 64 Ⓓ

7 What is th

- [ ] 24 Ⓐ
- [ ] 48 Ⓑ
- [ ] 96 Ⓒ
- [ ] 1296 Ⓓ

8 The string speech ma command

- [ ] ll Ⓐ
- [ ] ell Ⓑ
- [ ] llo Ⓒ
- [ ] el Ⓓ

9 Which pro

- [ ] Selectic
- [ ] Sequen
- [ ] Iteratio
- [ ] Recursi

10 In which p during exe

- [ ] Selectic
- [ ] Sequen
- [ ] Iteratio
- [ ] Recursi

11 Which programming structure can be characterised by being (among other things) pre-check or post-check?

☐ Selection Ⓐ
☐ Sequence Ⓑ
☐ Iteration Ⓒ
☐ Recursion Ⓓ

12 What term is given to the connecting together _____ more strings in order to form a larger string?

☐ Exponentiation Ⓐ
☐ Concatenation Ⓑ
☐ Instant...
☐ Constr...

13 What can be said of an iteration structure that begins with the pseudocode instruction 'do'?

☐ The code within the structure will only execute once Ⓐ
☐ The code within the structure will loop infinitely Ⓑ
☐ The code within the structure will always execute at least once Ⓒ
☐ The code within the structure will repeat a fixed number of times Ⓓ

14 Which type of operation cannot be the basis for the condition within an 'if' statement?

☐ Relational Ⓐ
☐ Arithmetic Ⓑ
☐ Boolean Ⓒ
☐ Comparison Ⓓ

15 A loop is set to iterate while x < 1. Given th... is ... ...ed as 0 before the loop, and is incremented within ... ...oo... ...many times will the code within the loop execut...?

☐ Not at all Ⓐ
☐ It depe... ...her ...e condition is in relation to the loop Ⓑ
☐ An infin... ...er of times Ⓒ
☐ Once Ⓓ

16 A loop is s...
before the...
the code w...

☐ Not at ...
☐ It depe...
☐ An infi...
☐ Once Ⓓ

17 Three iter...
loop B rep...
loop B, an...
that loops...
statement...

☐ 42 Ⓐ
☐ 22 Ⓑ
☐ 40 Ⓒ
☐ 60 Ⓓ

18 Which of t...
programm...

☐ A for lo...
☐ A do u...
☐ A do w...
☐ A while...

19 Which pro...
in a two-d...

☐ Recursi...
☐ A neste...
☐ A pre-...
☐ A post-...

20 What is th...

☐ The las...
☐ The co...
☐ The co...
☐ It's pos...

4 – Modularity and Object Orientation

1 Which of the following statements regarding inheritance in object-oriented programming is false?

☐ A public method in a subclass is accessible from anywhere in the pro... with access to the class Ⓐ

☐ A superclass inherits protected attributes from a subcl... ...

☐ Private methods can only be called from wit... ... in which they are written Ⓒ

☐ The private attributes of a ... ...le to any subclasses Ⓓ

2 What nam... ... ...s declared within a class, and visible throughou... ...s i... which they are declared?

☐ Constan...

☐ Local variables Ⓑ

☐ Attributes Ⓒ

☐ Global variables Ⓓ

3 Which of the following statements about constructors in object-orientated programming is true?

☐ In most circumstances, a constructor should be declared with private visibility Ⓐ

☐ Constructors should be written with the return type of the class in which they are written Ⓑ

☐ There is no limit to the number of constructors that a single class can have Ⓒ

☐ A constructor's parameter list should always be empty Ⓓ

4 What is the name of the method that is calle... ... ... new object based on a class?

☐ Procedure Ⓐ

☐ Constructo...

☐ Main r...

☐ Functio...

5 How many

☐ Exactly...

☐ Any nu...

☐ At least...

☐ Exactly...

6 A program including ... statement...

☐ Mamm...

☐ Mamm...

☐ Mamm...

☐ Mamm...

7 Which of t...

☐ A point...

☐ A copy...

☐ A copy...

☐ A point...

8 Which of t...

☐ A point...

☐ A copy...

☐ A copy...

☐ A point...

9 Which of t...

☐ It can a...

☐ It alway...

☐ It retur...

☐ None –...

10 Which of t...

☐ It can a...

☐ It can a...

☐ It can c...

☐ None –...

11 Which of these statements best describes the visibility of a variable that is declared as part of a FOR loop? An example in Python would be for x in range(1,5) where x is the variable.

☐ It behaves as a local variable Ⓐ

☐ It behaves as a global variable Ⓑ

☐ It is no longer accessible once the loop has terminated Ⓒ

☐ It exists until another variable with the same name is declared

12 A class called Vehicle is the superclass of two classes called Car and Bus. A protected attribute is added to the Bus class. From where is this attribute accessible?

☐ Only in the Bus class

☐ In the Bus and Car classes Ⓑ

☐ In the Bus and Vehicle classes Ⓒ

☐ In the Bus, Car, and Vehicle classes Ⓓ

13 A class called Animal is the superclass of two other classes called Mammal and Bird. The Mammal class is in turn the superclass of another class called Rodent. A private attribute is added to the Mammal class. From where is this attribute accessible?

☐ In the Mammal and Rodent classes Ⓐ

☐ In the Mammal and Animal classes Ⓑ

☐ Only in the Mammal class Ⓒ

☐ In the Mammal and Bird classes Ⓓ

14 Which of the following statements regarding classes and objects is f...

☐ A program can consist of any number of objects Ⓐ

☐ A class is a specific instance of an object Ⓑ

☐ A program can consist of any number of ... Ⓒ

☐ A class can be considered a da... Ⓓ

15 Consider the following ... 'abc is an object of type xyz'. In this instance, ... example for which programming concept?

☐ A const...

☐ A parame... Ⓑ

☐ A class Ⓒ

☐ An attribute Ⓓ

16 Two meth...
parameter...
Which prir...

☐ Polymo...

☐ Inherita...

☐ Abstrac...

☐ Encaps...

17 One class ...
behaviour ...
of the first ...
orientatio...

☐ Polymo...

☐ Abstrac...

☐ Inherita...

☐ Encaps...

18 A class is v...
of the met...
are needed...
Which prir...

☐ Polymo...

☐ Abstrac...

☐ Instanti...

☐ Encaps...

19 A class cal...
and Maga...
stored in t...

☐ Objects...

☐ Objects...

☐ Objects...

☐ It depe...

20 Methods t...
known as ...

☐ Final Ⓐ

☐ Static Ⓑ

☐ Public Ⓒ

☐ Global Ⓓ

5 - IDEs

This topic includes questions on compilation. Although compilation is not part of topic 2, it is closely related to IDEs. Students are encouraged to make connections wherever possible between components, and this is one such opportunity.

1 Which feature of an IDE allows for rolling back to a previous version, perhaps before a series of bugs were introduced into the code?

☐ Version control Ⓐ
☐ Loaders Ⓑ
☐ Runtime environment ⒸⒸ
☐ Refactoring tools Ⓓ

2 Which feature of an IDE enables a developer to see how a program would operate on the system for which it is intended?

☐ Interpreter Ⓐ
☐ Compiler Ⓑ
☐ Syntax highlighting Ⓒ
☐ Runtime environment Ⓓ

3 Which of the following features of an IDE does not exist primarily to aid the developer in writing code?

☐ Syntax highlighting Ⓐ
☐ Linkers and loaders Ⓑ
☐ Autocomplete Ⓒ
☐ Syntax checking Ⓓ

4 Which of the following statements regarding translation tools is true?

☐ Once a compiler has translated the source code, the source code is no longer needed Ⓐ
☐ Interpreted code generally runs more slowly than compiled code Ⓑ
☐ Interpreters, compilers and assemblers are specific types of translator Ⓒ
☐ An interpreter will only stop translating when all syntax errors have been resolved Ⓓ

5 Which of the following is not part of the compilation process?

☐ Tokenisation of the input string Ⓐ
☐ Syntax analysis Ⓑ
☐ Semantic analysis Ⓒ
☐ Autocompletion of code Ⓓ

6 Which cate

☐ Syntax
☐ Breakp
☐ Compil
☐ Debugc

7 Which of t typical det

☐ Line nu
☐ Variabl
☐ Code c
☐ Lexical

8 Which of t typical det

☐ Linker
☐ Loader
☐ Refacto
☐ Breakp

9 Which of t refactorin

☐ Moving
☐ Making
☐ Increas
☐ Combir

10 Which of t

☐ Connec
☐ Ensurin begins
☐ Manag
☐ Providi

11 Which of the following is the responsibility of a linker?

☐ Allowing one executable to initialise another executable Ⓐ

☐ Providing indices to allow methods to call one another Ⓑ

☐ Combining multiple object files into a single executable Ⓒ

☐ Enforcing visibility so that public and private methods behave as expected Ⓓ

12 Which of the following tools would be used to c○₊ᵥ ᵗ ᵃᵥ. ᵣ₊ᵣce code to byte code?

☐ Assembler Ⓐ

☐ Linker Ⓑ

☐ Interpret₊ Ⓒ

☐ Compi Ⓓ

13 The acronyⁱ ₊ ₊stands for what?

☐ Intermediate development environment Ⓐ

☐ Imperative development environment Ⓑ

☐ Interpreted development environment Ⓒ

☐ Integrated development environment Ⓓ

14 Which of the following features would not make changes to the source code?

☐ Compiler Ⓐ

☐ Auto-documentation Ⓑ

☐ Auto-completion Ⓒ

☐ Find-and-replace Ⓓ

15 How would a compiler interact with comments in code?

☐ It would ignore them Ⓐ

☐ It would transfer them, without changes, t₊ ᵗₕ ₊ᵤᵤ ₊ ₊ de Ⓑ

☐ It would tokenise them to minimis₊ ₊ᵣᵤᵤ Ⓒ

☐ It would use them to gen₊₊ ₊ ₊ ᵃᵗⁱ𝗈n Ⓓ

16 Which of tₕ ₊wiₙ ₊ ₊ ₊ ges is least likely to be created using an IDE?

☐ Python Ⓐ

☐ Machine code Ⓑ

☐ Java Ⓒ

☐ Assembly Ⓓ

17 What is thₑ

☐ To help

☐ To prev

☐ To corr

☐ To info

18 Which of t changing t

☐ Version

☐ Refactₒ

☐ Runtim

☐ Debugₒ

19 Which feaₜ 'while' staₜ

☐ Syntax

☐ Debugₒ

☐ Auto-dₑ

☐ Auto-cₒ

20 Which of t

☐ Producₜ time elₑ

☐ Ensurinₔ highligₕ

☐ Resolviₔ

☐ Creatinₔ other iₙ

6 - Computational Methods

The specification refers to performance modelling, but not modelling in general.
This topic includes questions on more generic aspects of modelling, in order to help
establish a baseline knowledge when attempting to address performance modelling.
'Modelling' here is considered a prerequisite to 'performance modelling'.

1 **What is the main purpose of data mining?**
   ☐ To identify and remove unnecessary data from a data store Ⓐ
   ☐ To identify patterns in a large volume of data Ⓑ
   ☐ To generate large volumes of data in time Ⓒ
   ☐ To store a large amount of data Ⓓ

2 **Which of the following computational methods might involve
   abandoning a partial solution in order to find a more complete solution?**
   ☐ Backtracking Ⓐ
   ☐ Pipelining Ⓑ
   ☐ Heuristics Ⓒ
   ☐ Visualisation Ⓓ

3 **Which of the following computational methods would be best suited to
   analysing combinations of many sources of data in order to predict
   crime hotspots?**
   ☐ Abstraction Ⓐ
   ☐ Pipelining Ⓑ
   ☐ Data mining Ⓒ
   ☐ Visualisation Ⓓ

4 **Which of the following computational methods would be best applied to
   identifying the quickest route through a maze?**
   ☐ Abstraction Ⓐ
   ☐ Pipelining Ⓑ
   ☐ Backtracking Ⓒ
   ☐ Visualisation Ⓓ

5 **Which of the following techniques is characterised by an understanding
   that a solution does not need to be perfect in order to be good enough?**
   ☐ Abstraction Ⓐ
   ☐ Data mining Ⓑ
   ☐ Generalisation Ⓒ
   ☐ Heuristics Ⓓ

6 Which of t…
   find a roo…
   ☐ Assumi…
     room, t…
   ☐ Searchi…
   ☐ Plannin…
     the bui…
   ☐ Carryin…

7 Which tec…
   of thumb'…
   ☐ Abstrac…
   ☐ Heurist…
   ☐ Pipelini…
   ☐ Visualis…

8 Which of t…
   ☐ Runnin…
     the pro…
   ☐ Storing…
     retrieva…
   ☐ Ensurin…
     saving…
   ☐ Arrangi…

9 Which of t…
   ☐ Progra…
   ☐ Pseudo…
   ☐ A flow…
   ☐ A descr…

10 Which of t…
   predict the…
   ☐ Abstrac…
   ☐ Modula…
   ☐ Visualis…
   ☐ Perform…

11 A lab produces a chemical using a multistage process, and it is the role of one technician to mix two chemicals in a test tube, then leave the mixture to settle for 60 seconds. While the first batch settles, the technician prepares another test tube for the second batch. Which computational method is being demonstrated here?

- ☐ Abstraction Ⓐ
- ☐ Pipelining Ⓑ
- ☐ Backtracking Ⓒ
- ☐ Heuristics Ⓓ

12 Which of the following is ☐ ☐ ☐ ☐ ☐ ☐ ☐ ata mining?

- ☐ Applying ☐ ☐ ne ☐ ☐ ☐ ☐ ☐ niques to identify trends in data Ⓐ
- ☐ Transn ☐ ☐ e v ☐ ☐ ☐ mes of data across a distributed system Ⓑ
- ☐ Storing ☐ ☐ ☐ d and unstructured data in a readily retrievable way Ⓒ
- ☐ Reading la ☐ ge amounts of data, potentially from a wide range of sources Ⓓ

13 A company wishes to determine the impact of a combination of circumstances on their servers' capabilities. These circumstances include a spike in international demand, drastically reduced bandwidth, and a power cut at a critical location. Which technique would be of most use to the company?

- ☐ Heuristics Ⓐ
- ☐ Performance modelling Ⓑ
- ☐ Visualisation Ⓒ
- ☐ Pipelining Ⓓ

14 Which technique would be of most use when there is a need to communicate complex information to a person as quickly ☐ ☐ ☐ sib ☐ ☐

- ☐ Hashing Ⓐ
- ☐ Performance modelling Ⓑ
- ☐ Visualisation Ⓒ
- ☐ Pipelining Ⓓ

15 Which of t ☐ ☐ ☐ ☐ tw ☐ ☐ ☐ ☐ ☐ es is an example of abstraction?

- ☐ The cap ☐ ☐ ☐ ultitask Ⓐ
- ☐ The on-☐ ☐ ☐ desktop' of an operating system, which isn't really a desktop Ⓑ
- ☐ The use of separate device drivers for each device Ⓒ
- ☐ A program which is able to run another program Ⓓ

16 When a co ☐
making or ☐
undesirabl ☐
is disregar ☐

- ☐ Backtra ☐
- ☐ Decom ☐
- ☐ Pipelin ☐
- ☐ Visualis ☐

17 What is a f ☐
Dijkstra's ☐

- ☐ Visualis ☐
- ☐ Indexin ☐
- ☐ Pipelin ☐
- ☐ Heurist ☐

18 Which tecl ☐
traffic at a ☐
light is sho ☐

- ☐ Modell ☐
- ☐ Backtra ☐
- ☐ Heurist ☐
- ☐ Pipelin ☐

19 Which of t ☐

- ☐ A visua ☐
- ☐ A line c ☐
- ☐ The sof ☐
- ☐ An opti ☐

20 Which of t ☐
an input to ☐

- ☐ Backtra ☐
- ☐ Decom ☐
- ☐ Pipelin ☐
- ☐ Heurist ☐

7 - Big O Notation

1. **Which of the following operations would be characterised by constant time complexity?**

   ☐ Accessing the last element in a linked list Ⓐ
   ☐ Accessing the first element in an array Ⓑ
   ☐ Accessing a leaf node of a tree Ⓒ
   ☐ All of these Ⓓ

2. **Which of the following operations would be characterised by linear time complexity?**

   ☐ Accessing _ide _ _ _ _ent of an array Ⓐ
   ☐ Accessing _ _ t element in an array Ⓑ
   ☐ Accessing _ _ast element in a linked list Ⓒ
   ☐ All of these Ⓓ

3. **Which of the following descriptions of an algorithm would be most likely to be characterised by quadratic complexity?**

   ☐ A loop followed by another loop Ⓐ
   ☐ A loop nested within another loop Ⓑ
   ☐ The absence of a loop Ⓒ
   ☐ A loop nested within another loop, nested within another loop Ⓓ

4. **What is the big O notation to describe the time complexity of a bubble sort at average performance?**

   ☐ $O(2^n)$ Ⓐ
   ☐ $O(n)$ Ⓑ
   ☐ $O(n^2)$ Ⓒ
   ☐ $O(2)$ Ⓓ

5. **What is the big O notation _ _ _ _ _ _ _ time complexity of a bubble sort at worst-_ _ pe _ _ _ _ _?**

   ☐ $O(2^n)$ Ⓐ
   ☐ $O(n)$ Ⓑ
   ☐ $O(n^2)$ Ⓒ
   ☐ $O(2)$ Ⓓ

6. **What is th_ _ _ _ sort at bes_**

   ☐ $O(2^n)$ Ⓐ
   ☐ $O(n)$ Ⓑ
   ☐ $O(2)$ Ⓒ
   ☐ $O(n^2)$ Ⓓ

7. **Which of t_ _ level of co_**

   ☐ $O(n^2)$ Ⓐ
   ☐ $O(2^n)$ Ⓑ
   ☐ $O(n)$ Ⓒ
   ☐ $O(\log n$ Ⓓ

8. **Which of t_**

   ☐ Polyno_
   ☐ Linear _
   ☐ Logarit_
   ☐ Consta_

9. **Which of t_ binary sea_**

   ☐ Quadra_
   ☐ Linear _
   ☐ Polyno_
   ☐ Logarit_

10. **What is th_ search at v_**

    ☐ $O(n)$ Ⓐ
    ☐ $O(n^2)$ Ⓑ
    ☐ $O(1)$ Ⓒ
    ☐ $O(\log n$

11 What is the big O notation to describe the time complexity of a linear search at best-case performance?

☐ O(n) Ⓐ
☐ O(n²) Ⓑ
☐ O(1) Ⓒ
☐ O(log n) Ⓓ

12 Which of the following algorithms has the bett⋯⋯mp⋯xity in a worst-case performance scenario?

☐ Their worst-case complexit⋯⋯⋯ Ⓐ
☐ Linear search Ⓑ
☐ Binary ⋯ Ⓒ
☐ More i⋯ is needed Ⓓ

13 Which big O notation can be roughly translated as 'the number of instructions executed is roughly proportional to the number of inputs'?

☐ Exponential Ⓐ
☐ Logarithmic Ⓑ
☐ Constant Ⓒ
☐ Linear Ⓓ

14 Given input sizes of 1, 2, 3, 4 and 5, a particular algorithm executes 2, 5, 10, 17 and 26 instructions respectively. What is the time complexity of this algorithm?

☐ Exponential Ⓐ
☐ Linear Ⓑ
☐ Logarithmic Ⓒ
☐ Quadratic Ⓓ

15 Given input sizes of 1, 2 and 3, a p⋯⋯⋯m executes 4, 8 and 12 instructions respectively. W⋯⋯⋯complexity of this algorithm?

☐ Quadratic Ⓐ
☐ Linear Ⓑ
☐ Consta⋯ Ⓒ
☐ Logarithmic Ⓓ

16 A particul⋯
sizes of 2, ⋯
this algori⋯

☐ Quadra⋯
☐ Linear ⋯
☐ Consta⋯
☐ Logarit⋯

17 An array i⋯
is the time⋯
given that⋯

☐ Quadra⋯
☐ Linear ⋯
☐ Consta⋯
☐ Expone⋯

18 An algorit⋯
comparing⋯
complexity⋯

☐ Expone⋯
☐ Linear ⋯
☐ Logarit⋯
☐ Quadra⋯

19 A single su⋯
each time ⋯
operation?⋯

☐ Linear ⋯
☐ Polyno⋯
☐ Logarit⋯
☐ Consta⋯

20 Which of t⋯
complexity⋯

☐ A while⋯
☐ A while⋯
☐ An if st⋯
☐ A while⋯

8 - Algorithms

1 When traversing a binary tree, which specific method of traversal accesses the left subtree after accessing the current node?

- ☐ Breadth first Ⓐ
- ☐ Pre-order Ⓑ
- ☐ Post-order Ⓒ
- ☐ Depth first Ⓓ

2 When traversing a binary tree, which specific method of traversal accesses the current node after accessing the left and right subtrees?

- ☐ In-order
- ☐ Post-order
- ☐ Pre-order
- ☐ Breadth first Ⓓ

3 When traversing a binary tree, which specific method of traversal would take the longest to access the most distant leaf node?

- ☐ A Ⓐ
- ☐ B Ⓑ
- ☐ C Ⓒ
- ☐ Breadth first Ⓓ

4 What should be the first step in dequeuing a data item from a circular queue that has been implemented as an array?

- ☐ Increment the front pointer Ⓐ
- ☐ Check whether the front pointer is at the end of the array Ⓑ
- ☐ Check whether the queue is empty Ⓒ
- ☐ Reset the front pointer to the start of the array Ⓓ

5 Which of the following algorithms uses a heuristic?

- ☐ Dijkstra's algorithm
- ☐ A* algorithm
- ☐ Binary search
- ☐ Merge sort Ⓓ

6 How many ... sort imple...

- ☐ n Ⓐ
- ☐ n² Ⓑ
- ☐ n – 1 Ⓒ
- ☐ (n – 1) ...

7 A binary s... 31 sorted i... need to be... data item'...

- ☐ 5 Ⓐ
- ☐ 15 Ⓑ
- ☐ 16 Ⓒ
- ☐ 31 Ⓓ

8 A linear se... 31 sorted i... need to be... data item'...

- ☐ 5 Ⓐ
- ☐ 15 Ⓑ
- ☐ 16 Ⓒ
- ☐ 31 Ⓓ

9 What wou...

- ☐ Compa...
- ☐ Compa...
- ☐ Identify...
- ☐ Compa...

10 What wou...

- ☐ Compa...
- ☐ Compa...
- ☐ Identify...
- ☐ Compa...

11 A data structure containing six items is currently in descending order. Using a bubble sort, how many individual comparisons would be made in order for the data to be sorted in ascending order?

- ☐ 21 Ⓐ
- ☐ 36 Ⓑ
- ☐ 25 Ⓒ
- ☐ 15 Ⓓ

12 What is the requirement of a data stru... ... ..r a binary search to be applicable?

- ☐ The data must be n... Ⓐ
- ☐ The da... ...e ... Ⓑ
- ☐ The da... ordered Ⓒ
- ☐ The data... contain no duplicates Ⓓ

13 Which of the following is a disadvantage of a bubble sort?

- ☐ It has a relatively high space complexity Ⓐ
- ☐ It has a relatively high time complexity Ⓑ
- ☐ It cannot deal with duplicate data items Ⓒ
- ☐ Its recursive calls can cause a stack overflow Ⓓ

14 A data structure contains n items. Assuming it is already sorted into the correct order, how many passes will be conducted by a well-written bubble sort?

- ☐ 0 Ⓐ
- ☐ 1 Ⓑ
- ☐ n Ⓒ
- ☐ n − 1 Ⓓ

15 What is the first step of performing a ...ick ... ...a data structure?

- ☐ Identify a pivot value Ⓐ
- ☐ Compare ...rst ... ...ns Ⓑ
- ☐ Deter... ...id... of the data structure Ⓒ
- ☐ Compar... ...t and last data items Ⓓ

16 What com... bubble sor...

- ☐ Selectic...
- ☐ Iteratio...
- ☐ Selectic...
- ☐ Iteratio...

17 Which typ...

- ☐ Pre-or...
- ☐ Post-or...
- ☐ In-orde...
- ☐ None o...

18 Which typ...

- ☐ Pre-or...
- ☐ Post-or...
- ☐ In-orde...
- ☐ None o...

19 Upon whic... performed...

- ☐ Queue...
- ☐ Stack Ⓑ
- ☐ Tree Ⓒ
- ☐ Any of...

20 Which of t... complexity...

- ☐ Binary...
- ☐ Bubble...
- ☐ Linear s...
- ☐ Insertic...

Component 2 Multiple-choice Questions – A

1 – Computational Thinking

1	A	✓	Correct – use of symbols is a common form of abstraction.
	B	✗	Plotting a route would be planning ahead, not an individual symbol
	C	✗	Concurrency is when two or more tasks happen alongside one an
	D	✗	There is no procedure at all here – it's all about representation

2	A	✗	
	B	✓	for at least one minute, both the toaster and the kettle
	C		The term 'logically' in computational thinking usually applies to B
	D	✗	Procedural thinking identifies the nature of the individual tasks, b

3	A	✓	Correct – there is no abstraction in this example.
	B	✗	Caching is part of thinking ahead.
	C	✗	Concurrency is part of any multiprocessing system.
	D	✗	The complex decisions will require the application of logic.

4	A	✗	Determining whether a loop will run or not is not really 'ahead' en
	B	✗	Concurrency is when two or more tasks happen alongside one an
	C	✓	Correct – a decision is being made here with Boolean logic.
	D	✗	No decomposition or ordering of stages is implied here.

5	A	✓	Correct – abstraction can entail focusing on one level of complexi
	B	✗	There is no implication of multitasking here.
	C	✗	The term 'logically' in computational thinking usually applies to B
	D	✗	Procedural thinking here would be breaking the whole system int

6	A	✓	Correct – that extraneous detail is hidden as it's not relevant to th
	B	✗	There is no specific future timing planned for in this situation.
	C	✗	The term 'logically' in computational thinking usually applies to B
	D	✗	There are no procedures to consider here.

7	A		There is no forward planning implied here.
	B	✓	Correct – thinking concurrently relates to tasks being completed a
	C	✗	The term 'logically' in computational thinking usually applies to B
	D	✗	This is less about the ordering of tasks than about identifying whi

8	A	✗	No, since a decision is being made right now, based on informatio
	B	✗	There is no concurrency implied here.
	C	✓	Correct – a decision must be made here, based on Boolean criteri
	D	✗	Thinking procedurally would involve the contents of the loop, and

9	A	✗	Abstraction might entail focusing on a specific part, but not identi
	B	✗	This might follow decomposition, where the decomposed parts ar
	C	✗	The term 'logically' in computational thinking usually applies to B
	D	✓	Correct – decomposition is an aspect of procedural thinking.

10	A	✗	Abstraction here would entail focusing on specific tools or compo
	B	✗	This would be related, if there were two people or more assemblin
	C	✗	The term 'logically' in computational thinking usually applies to B
	D	✓	Correct – the instructions are broken into appropriate levels and p

11	A	✓	Correct – complexity of the Internet (which is not needed here
	B		There are no tasks implied, so there is nothing that can be run co
	C	✗	The term 'logically' in computational thinking usually applies to B
	D	✗	There are no procedures involved here.

Preview of Answers Ends Here