CAIE Computer Science IGCSE
7 Algorithm design and problem-solving

Flashcards

Name the four stages of the program development life cycle.

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Analysis, design, coding, and testing.

What is the purpose of the analysis stage?

What is the purpose of the analysis stage?

To understand the problem and what the solution needs to achieve.

Name the four tasks that occur in the analysis stage.

Name the four tasks that occur in the analysis stage.

Abstraction, decomposition, identification of the problem, and identification of requirements.

Define abstraction.

Define abstraction.

Removing unnecessary details to focus only on what is important.

Define decomposition.

Define decomposition.

Breaking the overall problem into smaller, more manageable sub-problems.

What is the purpose of the design stage?

What is the purpose of the design stage?

To plan the solution before writing code.

Name the two tasks that occur in the design stage.

Name the two tasks that occur in the design stage.

Further decomposition (if required), and designing the solution.

Name three ways to represent the solution to a problem.

Name three ways to represent the solution to a problem.

Structure diagrams, flowcharts, and pseudocode.

What is the purpose of the coding stage?

What is the purpose of the coding stage?

To translate the design into a working program.

Name the two tasks that occur in the coding stage.

Name the two tasks that occur in the coding stage.

Writing program code and iterative testing.

What is iterative testing?

What is iterative testing?

Testing code repeatedly as it is developed in order to fix errors as they occur and inform future development.

What is the purpose of the testing stage?

What is the purpose of the testing stage?

To check that the program works correctly and meets requirements.

How is the program tested in the testing stage?

How is the program tested in the testing stage?

The program code is ran, using test data to make sure that it produces the correct output.

Name the four components that each part of a decomposed problem will usually involve.

Name the four components that each part of a decomposed problem will usually involve.

Inputs, processes, outputs, and storage.

Does this describe inputs, processes, outputs, or storage? "Information produced by the system".

Does this describe inputs, processes, outputs, or storage? "Information produced by the system".

Outputs.

Does this describe inputs, processes, outputs, or storage? "Data saved for later use".

Does this describe inputs, processes, outputs, or storage? "Data saved for later use".

Storage.

Does this describe inputs, processes, outputs, or storage? "Data that goes into the system".

Does this describe inputs, processes, outputs, or storage? "Data that goes into the system".

Inputs.

Does this describe inputs, processes, outputs, or storage? "Actions or calculations performed on the data".

Does this describe inputs, processes, outputs, or storage? "Actions or calculations performed on the data".

Processes.

What are structure diagrams used to represent?

What are structure diagrams used to represent?

The decomposed problem as a series of connected subproblems.

Moving down a structure diagram, are tasks more or less broken down?

Moving down a structure diagram, are tasks more or less broken down?

More broken down.

What is pseudocode used to represent?

What is pseudocode used to represent?

The set of instructions for a computer program.

True or false: pseudocode keywords are language-specific.

True or false: pseudocode keywords are language-specific.

False. Pseudocode is language independent.

Note: there is a specific set of pseudocode keywords for Cambridge IGCSE Computer Science

What are flowcharts used to represent?

What are flowcharts used to represent?

The step-by-step flow of a process.

Which flowchart symbol represents control passing between the connected shapes?

Which flowchart symbol represents control passing between the connected shapes?

A flow line.

What is this flowchart symbol called, and what does it represent?

What is this flowchart symbol called, and what does it represent?

Process. It represents something being performed or done.

What is this flowchart symbol called, and what does it represent?

What is this flowchart symbol called, and what does it represent?

Subroutine. It represents a subroutine call that will relate to a separate, non-linked flowchart.

Which flowchart symbol represents the input or output of something into or out of the flowchart?
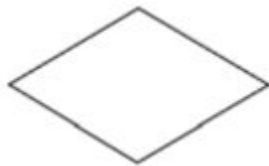
Which flowchart symbol represents the input or output of something into or out of the flowchart?

Input/output.

What is this flowchart symbol called, and what does it represent?

What is this flowchart symbol called, and what does it represent?

Decision. It represents a decision (Yes/No or True/False) that results in two lines representing the different possible outcomes.

Which flowchart symbol represents the 'start' and 'stop' of a process?

Which flowchart symbol represents the 'start' and 'stop' of a process?

Terminator.

What type of searching algorithm is linear search, and what is it used for?

What type of searching algorithm is linear search, and what is it used for?

A searching algorithm - used to find items in a list.

How does a linear search work?

How does a linear search work?

It checks each item in the list one by one until the target is found or the end is reached.

What type of data can linear search be used on?

What type of data can linear search be used on?

Any list - sorted or unsorted.

What is a sorting algorithm?

What is a sorting algorithm?

An algorithm used to arrange data (e.g. numbers or text) into a specific order, usually ascending or descending.

Name a sorting algorithm.

Name a sorting algorithm.

Bubble sort.

How does bubble sort work?

How does bubble sort work?

It repeatedly compares and swaps adjacent items, if they are in the wrong order, until the list is sorted.

What happens during each "pass" of a bubble sort?

What happens during each "pass" of a bubble sort?

Adjacent elements are compared and swapped if needed. Multiple passes are made until no swaps are needed.

What is totalling used to work out?

What is totalling used to work out?

The sum of a set of values.

Give an example of a scenario where totalling is used.

Give an example of a scenario where totalling is used.

Adding up a player's score in each round of a game to find their total score.

How can totalling be implemented?

How can totalling be implemented?

Create a variable that is initialised as 0, and then add each value to the total using a loop.

What is counting used for?

What is counting used for?

To count how many times something occurs.

How can counting be implemented?

How can counting be implemented?

To count the number of times something occurs, create a variable that is initialised as 0. Increase the counter by 1 each time the condition is met.

How can an algorithm that identifies minimum/maximum values be implemented?

How can an algorithm that identifies minimum/maximum values be implemented?

Start with the first value as the current maximum or minimum. Compare each new value with the current maximum / minimum and update if needed.

How can an algorithm to calculate the mean value in a set of numbers be implemented?

How can an algorithm to calculate the mean value in a set of numbers be implemented?

Use totalling to find the sum of all numbers. Then divide the total by the count of numbers.

What is validation?

What is validation?

The process of checking that input data is reasonable and sensible before it is accepted by the system.

Name six types of validation.

Name six types of validation.

Range check, length check, type check, presence check, format check, check digit.

What does a range check do?

Ensures data is between a (0ften numerical) range. E.g., the entered data is between 0 and 120.

What does a length check do?

What does a length check do?

Ensures data has the correct number of characters.

What does a type check do?

What does a type check do?

Ensures data is of the correct data type.

What does a presence check do?

What does a presence check do?

Ensures data is actually entered (not left blank).

What does a format check do?

What does a format check do?

Ensures data is in the correct format or pattern.

What is a check digit?

What is a check digit?

An extra digit calculated from the other digits, used to detect errors in entry.

What is verification?

What is verification?

The process of checking that data has been correctly entered into the system, matching the original source.

What does verification prevent?

What does verification prevent?

Errors that occur during data entry (for example, typing mistakes).

Name two types of verification.

Name two types of verification.

Visual check and double entry check.

How is a visual check carried out?

How is a visual check carried out?

The user compares the data entered with the original source by eye.

How is a double entry check carried out?

How is a double entry check carried out?

Data is entered twice and compared by the system. If the two entries do not match, the user must re-enter the data.

Name four types of test data.

Name four types of test data.

Normal data, abnormal data, extreme data, and boundary data.

What is normal data?

What is normal data?

Data that is typical, valid, and within the expected range.

Why is normal data used?

Why is normal data used?

To check the program works under usual conditions.

What is abnormal data?

What is abnormal data?

Data that is not acceptable and should be rejected.

Why is abnormal data used?

Why is abnormal data used?

To check the program prevents incorrect inputs.

What is extreme data?

What is extreme data?

The largest and smallest values that are still acceptable.

Why is extreme data used?

Why is extreme data used?

To check the program handles the very limits correctly.

What is boundary data?

What is boundary data?

Includes both:

- The largest/smallest acceptable value (extreme).
- The next value just outside the limit (invalid).

Why is boundary data used?

Why is boundary data used?

To ensure the program accepts the correct values and rejects the wrong ones.

What is a dry run?

What is a dry run?

When you manually go through an algorithm step by step without running it on a computer to visualise how variables will change and what outputs will occur.

What are trace tables used for?

What are trace tables used for?

To record what happens during a dry-run. They are useful in testing and debugging, to check how stored values vary line-by-line.

What are the three things that trace tables track at each stage of an algorithm?

What are the three things that trace tables track at each stage of an algorithm?

Variables, any outputs, and any user prompts.