

Algorithms

Key Words

Abstraction	The reduction of a problem to its simplest set of characteristics that are most relevant to producing a solution.
Algorithm	A step-by-step design of a solution to a sub-problem, or the rules to follow to solve the sub-problem.
Computational Thinking	Methods and techniques for analysing a problem aimed at producing a solution that can be developed as a computer program.
Decomposition	The technique of breaking down a large program into a series of more manageable subproblems.
Flowchart	A graphical way of representing an algorithm design.
Iteration	Where a group of instructions is executed repeatedly until a condition is met
Pseudocode	A high-level description of the actions of a program or algorithm, using a mixture of English and informal programming language syntax.
Selection	A condition to decide the path through the program and which set of instructions to execute next.
Sequence	A series of instructions in a specific order.
Trace table	A tool for tracking how the value of each variable changes as you go through an algorithm line by line.

Computational Thinking

- Abstraction**
- Abstraction is about looking at the problem and the patterns and working out what is important and what can be ignored. Unnecessary details are removed so that a model can be formed that will allow a solution to be created.
- Decomposition**
- A problem that seemed confusing will make a lot more sense when broken down into smaller steps that need to be taken. This can help to decide what to do first and allows for a systematic approach.
- Algorithm**
- The algorithm is the list of steps that need to be taken to solve the problem. Used to tell computers what to do, it can also be a useful approach to use with humans.
 - It is the explanation of input steps to be taken, in the order they need to be taken. This will produce the desired output result.

PSEUDOCODE

- When writing an algorithm, the instructions must be clear and in the correct order to produce the required solution to the given problem.
- Algorithms are written in pseudo code. The pseudo code will be presented using the following conventions:

Variables		
Assignment	=	x = 3 name = "Louise" const vat = 0.2 global userID = "Cust001"
Constants	const	
Global Variables	global	
Input/Output		
Input	input (...)	myName = input("Please enter a name")
Output	print (...)	print("My name is Noni") print(myArray[2,3])
Iteration		
FOR loop (Count-controlled)	for ... to ... next ...	for i=0 to 9 print("Loop") next i This will print the word "Loop" 10 times, i.e. 0-9 inclusive.
WHILE loop (Condition-controlled)	while ... endwhile	while answer != "Correct" answer = input("New answer") endwhile Will loop until the user inputs the string "Correct". Check condition is carried out before entering loop.
DO WHILE loop (Condition-controlled)	do until ...	do answer = input("New answer") until answer == "Correct" Will loop until the user inputs the string "Correct". Loop iterates once before a check is carried out.
Selection		
IF-THEN-ELSE	if ... then elseif ... then else endif	if answer == "Yes" then print("Correct") elseif answer == "No" then print("Wrong") else print("Error") endif

Sub programs		
Procedure	procedure name(...) endprocedure	procedure agePass() print("You are old enough to ride") endprocedure procedure printName(name) print(name) endprocedure procedure multiply(num1, num2) print(num1 * num2) endprocedure
Calling a procedure	procedure(parameters)	agePass() printName(parameter) multiply(parameter1, parameter2)
Function	function name(...) ... return ... endfunction	function squared(number) squared = number^2 return squared endfunction
Calling a function	function(parameters)	print(squared(4)) newValue = squared(4) Note: Function returns should be stored in a variable if needed for later use in a program.

A full list of the OCR Exam Reference Language can be found on page 27 of the Exam Specification.



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Algorithms

FLOWCHARTS

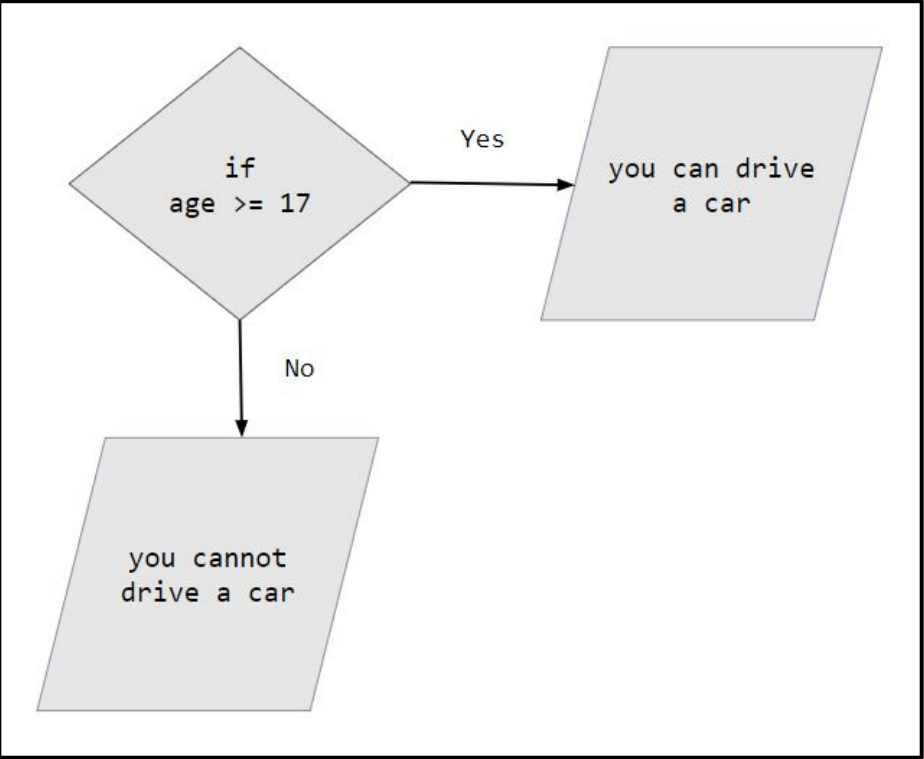
SEQUENCE

- This is the order or sequence in which the instructions must be carried out for the algorithm to work.
- Algorithms can be presented by flowcharts using the following symbols:

Line	
Process	
Sub Program	
Input/Output	
Decision	
Terminal	

SELECTION

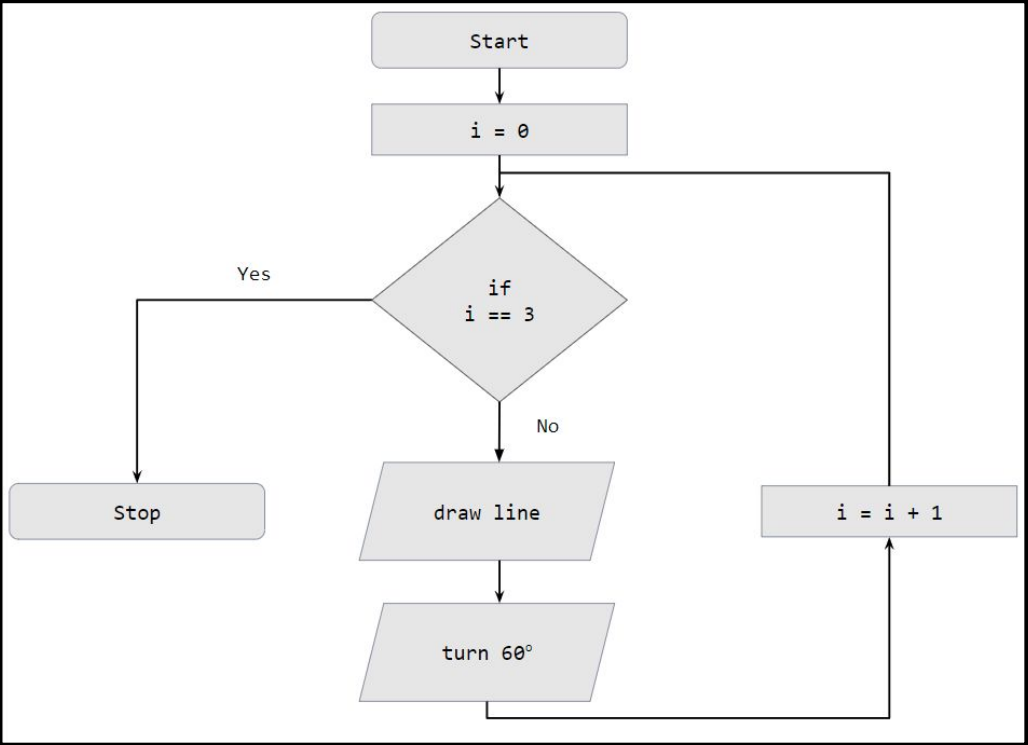
- A selection instruction is one where a decision must be made. An instruction in an algorithm will give different options for the next instruction.



```
if age >= 17 then
    print("you can drive a car")
else
    print("you cannot drive a car")
endif
```

ITERATION

- If a set of steps to be carried out more than once or many times. This is called iteration and often referred to as a loop in the program.



```
i = 0
for i = 0 to 2
    draw line
    turn 60 degrees
next i
```

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