Specification & learning objectives

A Level	Specification point description
2.1.4a	Identify the points in a solution where a decision has to be taken
2.1.4b	Determine the logical conditions that affect the outcome of a decision
2.1.4c	Determine how decisions affect flow through a program

Resources

PG Online textbook page ref: 272-275
Hodder textbook page ref: 30
CraignDave videos for SLR 21

Logical thinking is an essential quality of any system developer. The problem may be broken into parts and identified but it is the logical thinking that converts the problem into actual solutions.

Decision making

This is where the developer considers what decision points will exist and what happens down each path of choice. Using our entry example, when an entry is made there is a routine to validate it. There is a decision at this point: if the data is valid then it is used; if it is not then it is rejected.

There could be another decision point within this that states how the error is handled.

Does the computer try to fix the code using a best guess?

Does the computer reject the whole data entered or just the code?

Does the computer ask for part to be re-input or the whole code?

Determine the logical conditions

For a computer to perform a logical decision, there must be conditions that are met. These must be written in such a way that the decision is made of fixed outcomes (True or False). The developer will often have to think about the logical parameters needed to determine the decision.

The developer will often have to think about the logical parameters needed to determine the decision. Using our example again, the logical condition could be:

```
IF iscodeValid = False then call procedure ReEnterCode
```

The above logical code is a routine that returns iscodeValid as a true or false response; if it is false then it calls another routine.

Key question: How do decisions affect the flow of a program?

As can be seen in the previous section, the decision has affected how the program will flow. In the case of the code that is entered being invalid, the program will run a ReEnterCode routine, otherwise it will not.

Often programmers will develop flow charts for code which shows how a program flows based on logical decisions.

The flowchart shows a simple Little Man Computer program; the decision will affect the flow of the program such that it will stop if the accumulator reaches zero.

Start

Input

STA – Store Accumulator dec

Input

Loop sub dec

OUT

Brz quit

no

Yes

Quit hlt
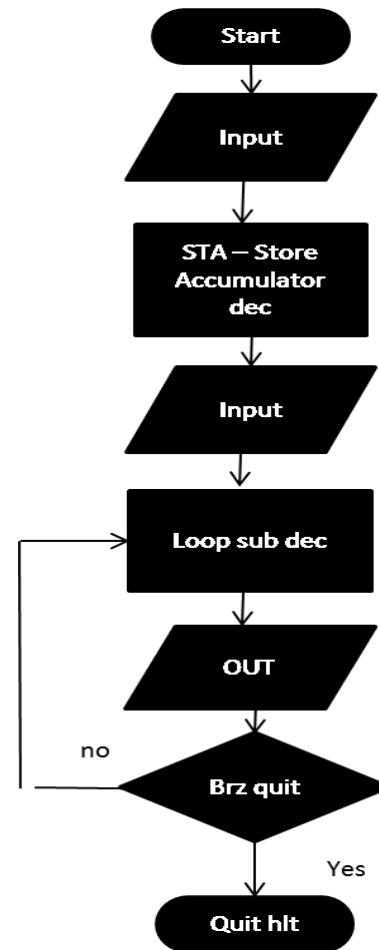
Typical exam questions

The algorithm below is intended to add (push) a new item to a stack.

```
Procedure add_to_stack(new_item)
          If pointer = maximum Then
                      stack_full = True
          Else
                      pointer = pointer + 1
                      stack[pointer] = new_item
          Endif
 Endprocedure
```

1. Identify the parameter that is passed to this procedure. **[1]**

2. Explain the logical decision that is made. **[2]**

3. Write a procedure to remove (pop) an item from the stack. **[4]**

Component 2 | 2.1.4| Thinking logically

Target: [   ]   Overall grade: [   ]

Minimum expectations & learning outcomes

☐	For this Learning Record you must choose a program you have written in a procedural language, and one from assembly language that includes at least one selection statement. Clearly identify the points in your solution where a decision would need to be taken.
☐	Answer the exam questions.

Feedback

Breadth	Depth	Presentation	Understanding
☐ All	☐ Analysed	☐ Excellent	☐ Excellent
☐ Most	☐ Explained	☐ Good	☐ Good
☐ Some	☐ Described	☐ Fair	☐ Fair
☐ Few	☐ Identified	☐ Poor	☐ Poor

Comment & action required

Reflection & Revision checklist

Confidence	Clarification
☹ 😐 ☺	Candidates need to understand that decisions are made within programs, and they need to be able to identify where these decisions will take place within an algorithm or program, and be able to understand what these decisions are and the impact of these decisions on the algorithm/program and the next (and final) outcomes from the algorithm/program.
☹ 😐 ☺	Candidates need to understand that there can be many different routes through a program and understand how decisions influence these routes and outcomes.