OCR Computer Science A Level

2.1.4 Thinking Logically
Advanced Notes

Specification

2.1.4 a)

- Identify the points in a solution where a decision has to be taken.

2.1.4 b)

- Determine the logical conditions that affect the outcome of a decision.

2.1.4 c)

- Determine how decisions affect flow through a program.

Decision making in problem solving

A decision is a result reached after some consideration. When solving problems and designing programs, many decisions have to be made. One of the first and biggest decisions that is made is choosing the approach or paradigm used when developing a piece of software. Another example of decision making within software development is deciding how different pieces of information are collected.

Synoptic Link

A **programming paradigm** is a particular **approach** to programming.

Different paradigms are covered in 1.2.4, Types of Programming Language.

Imagine you were set the task of building a program which switches on a light when a button is pressed. What questions come to mind?
- Which programming paradigm will I use?
- Which programming language will I use?
- What input devices will I need?
- What output devices will I need?
- How can I interact with these devices?

To answer each of these questions, decisions have to be made. To simplify the decision making process, we begin by trying to limit the possible solutions we can pick from. When deciding on a programming language, for example, you should first consider which programming languages it is feasible for you to use. This decision should be based on the language's suitability to the problem you are solving and whether it provides enough functionality to solve the problem. It is also important to consider which languages you are comfortable with using, or how easy it is to learn a new language given time constraints.

It is important for us to try and identify where decisions will need to be made when building our solutions, as this allows us to gather enough information about our options. This enables for an informed decision to be made.

When drawing flow charts, a decision is usually shown by a diamond shaped icon. This can have two results, yes or no (true/false).
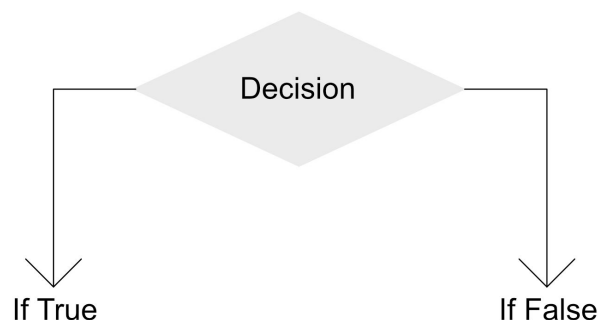
Conditions that affect the outcome of a decision

When you make a decision, there are certain factors which ultimately determine the outcome you choose. There are several key factors that you should take into account:
- What is most effective?
- What is most convenient?
- Is this option reasonable?

To make an appropriate decision, you need to evaluate these conditions and order them from most important to least important. Once you have done this, it becomes easier to pick the best option for your solution. By prioritising either effectiveness, convenience or feasibility, it should become clearer what sort of approach is best for achieving your solution. This might vary depending on the purpose and end-users of the software.

Decisions affecting the flow of a program

Decisions are made to determine how different parts of the program are completed. Say we are tasked with designing a simple runner game. We could design the game to be endless, or make the game level-based.

Again, we would evaluate these conditions using the methods described above. It is important to understand that both decisions produce completely different results, and therefore produce different routes through the program.
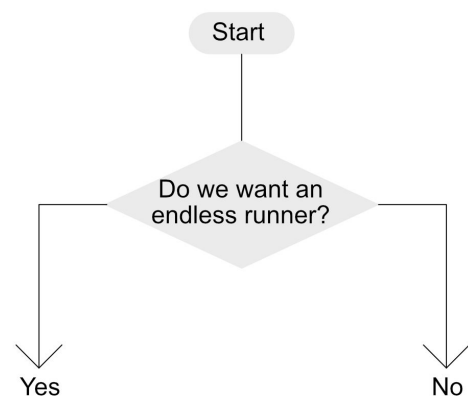
Thinking logically also involves identifying where decisions need to be made by the user within the program, and planning out the outcomes of the decision made. The program will follow a different route depending on the decision made by the user.

Putting it all together:
Thinking logically allows you to plan and prepare for different scenarios, as it provides a foresight of the decisions made through the whole program. Decision making is one of the most important aspects of problem solving; good decision making is the key to solving problems effectively.