Lesson Review: Module Summary

Response to and Request for feedback

If you are resubmitting, include a statement outlining the changes you have made to your submission. This section can be short but should be precise. It is a good idea to quote the feedback you are responding to.

If this is your first submission, include a statement about what part of the lesson review you would most like to receive feedback (and why). Your tutor will take this in consideration when reviewing your work, although they may choose to give you feedback on a different thing if they think it's more appropriate.

Module Learning Objectives

I certify that I achieved the following learning objectives for the module (these objectives can be found in the introduction of the module):

Summarising the content:

- Identify the key terms and concepts in the module. For each of these terms and concepts:

Summary :

PROOF: In mathematics, a proof is a logical argument that confirms the truth of a statement or theorem using accepted axioms, definitions, and logical reasoning.

For example: The sum of the first n positive integers is n(n+1)2.

Proof:

1. **Base Case:** For n=1 , the sum of the first positive integer is 1, which matches 1(1+1)/2
2. **Inductive Step:** Assume the statement is true for k.
3. **Show for k+1:** The sum of the first k+1 positive integers is

   $k(k+1)/2+(k + 1) = (k + 1)(k + 2)/2$.

4. **Conclusion:** By mathematical induction, the statement holds for all positive integers n.

This succinctly demonstrates the proof technique of mathematical induction, affirming the validity of the statement for all positive integers.

1. **Direct proof:**
   The simplest style of proof is a direct proof. For a proof we require a systematic explanation of what everything means. Direct proofs are especially useful when proving implications. We work under the assumption that the hypothesis is true.
2. **Proof by contrapositive:**
   For the statements which are hard to prove directly but their contrapositive can be easily proved directly. So we use this method. It gives a direct proof of the contrapositive of the

implication. This is enough because the contrapositive is logically equivalent to the original implication and , if there are variables and quantifiers, we set them to be arbitrary elements of our domain.

3. **Proof by contradiction :**
   Proof by contradiction is a method in mathematics where one assumes the opposite of what is to be proved, then derives a contradiction from that assumption. This contradiction implies that the original statement must be true.
4. **Proof by counter example:**
   Proof by counterexample is a method of disproving a statement by providing a specific example that contradicts it. It demonstrates that the statement is not universally true by presenting a single instance where it fails to hold.
1. **Proof by cases:**
   Here, we use cases to show that a certain statement is true in each of a set of cases. These cases must cover all possibilities so at least one of them must be true.

- How is this useful? Relate the concepts you learnt in this module to the broader context (other modules, other units within your degree, and more generally)

  This is useful as proofs depend a lot on logic and logic in long run is useful to work with algorithms.

Reflecting on the content:

- What is the most important thing you learnt in this module?

  The most important thing I learned about is the proof by case as it was something easy to understand and much more clearer.

- How does this relate to what you already know?

  I already knew about the direct and indirect proofs so this task helped me to brush up those topics again.

- Why do you think your course team wants you to learn the content of this module for your degree?

  As I mentioned, proofs work with basic logics and logics are required in algorithms. Creating , developing and working with algorithms.