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):

1. find the elements of a sequence given in closed form or in recurrence form
2. evaluate partial sums of sequences
3. solve linear recurrence of order 1 and of order 2.

Summarising the content:

- Identify the key terms and concepts in the module. For each of these terms and concepts:
  - Define the term and explain the concept **in your own words** (beware plagiarism – this is an assessment task).
  - Summarise the most important results related to these concepts, including theorems and propositions, algorithms and procedures, etc.
  - You can provide examples, figures, diagrams, but only if they help illustrate your point. This is a summary, so it's best to restrict the explanations to the main points.
  - :Make sure you include references to the Module Learning Objectives.

SEQUENCES:

A sequence is an ongoing list of numbers. Another formal definition could be

For example: . • 1,2,3,4,… (the list of natural numbers, which we use when counting things) • 1,3,5,7,9,… (the list of odd numbers) • 2,4,8,16,32,… (the list of powers of 2)

NOTE: The numbers appearing in the sequence are called its elements.

3,7,11 and 415 are all elements of the sequence of odd numbers

• The index of an element indicates its position in the sequence. Usually (by convention) indices start from 0. The index of 5 in the sequence of odd numbers is 2

CLOSED FORM :

In a closed form of a sequence, the values of the elements are given as the function on the domain $\mathbb{N} \cup \{0\}$: $a_n = f(n)$

RECURRENCE FORM:

A sequence can be defined by recurrence, when each element is given as a function of the elements preceding it.

$A_n = (a_{n-1}, a_{n-1}, \ldots)$

ARITHMETIC SEQUENCES:

. An arithmetic sequence is defined by the recurrence relation

$an = an-1 + d$, for some number d.

In other words, we move from one element of the sequence to the next element by always adding the same number:

For example: • 1,3,5,7,9,… (d = 2)

• 3,7,11,15,19,… (d = 4)

FIRST DIFFERENCE:

The first difference of a sequence (an) is defined as $bn = an+1 - an$.

SECOND DIFFERENCE:

The second difference of a sequence is the first difference of its first difference:

• $bn = an+1 - an$

• $cn = bn+1 - bn$

In the same vein, we can define the third, fourth, fifth, … differences.

LINEAR RECURRENCE

GEOMETRIC SEQUENCES:

geometric sequence is defined by the recurrence relation

$an = kan-1$,

for some number k.

In other words each element is obtained by multiplying the previous element by the same number k:

For example:. • 2,4,8,16,32 (k = 2)

• 5,15,45,135,405,1215,… (k = 3)

LINEAR RECURRENCE OF ORDER 1:

A linear recurrence relation of order 1 is defined by an equation of the form:

$a_n = ka_{N-1} + d$

LINEAR RECURRENCE OF ORDER 2:

A linear recurrence of Order 2 has the recurrence form:

$A_n = k_1 a_{n-1} + k_2 a_{n-2} + d$

Reflecting on the content:

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

  The most important thing I learned in this module is the concept of sequences, particularly arithmetic and geometric sequences, as well as linear recurrence relations. Understanding these concepts provides a fundamental framework for comprehending various numerical patterns and progressions.

- How does this relate to what you already know?

  This module relates to what I already know, particularly in mathematics and computer science, as it builds upon foundational knowledge of algebra and mathematical modeling. Concepts such as sequences and recurrence relations are frequently encountered in various mathematical and computational contexts, making this module highly relevant to my existing knowledge base.

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

  I believe my course team wants me to learn the content of this module for my degree because it equips me with essential analytical and problem-solving skills that are applicable across multiple disciplines within the field of science and engineering. Mastery of these concepts enables me to better understand and solve complex problems, both in theoretical and practical scenarios, enhancing my ability to contribute effectively in my chosen field of study and future career.