# Kennesaw State University

College of Computing and Software Engineering

Department of Computer Science

CS 5070, Mathematical Structures for Computer Science, Section W01

Quiz

Amrit Singh, [asingh59@students.kennesaw.edu](mailto:asingh59@students.kennesaw.edu)

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## Problem Statement

Problem of this document is to solve the following problem set.

1. Question: Determine the 10th term of the sequence defined by (an = 3n + 2).
2. Question: Find the sum of the first 20 terms of the arithmetic sequence where the first term (a1) is 5 and the common difference d is 3.
3. Question: Given a geometric sequence with (a1 = 2\) and common ratio (r = 3), find the 6th term.
4. Question: Translate the following statement into symbolic logic: "If it rains, then the ground will be wet."
5. Question: Prove by contradiction: "If (n) is an odd integer, then (n2) is odd."

## Summary / Purpose

Purpose of this document is to provide solutions to the problem set outlined in the Problem Statement section.

## Solutions

1. Question: Determine the 10th term of the sequence defined by (an = 3n + 2).

The 10th term in the sequence can be determined by plugging in for n.

If n = 0;

If n = 1;

If n = 2;

…

If n = 2;

Therefore, the 10th term is 32.

1. Question: Find the sum of the first 20 terms of the arithmetic sequence where the first term (a1) is 5 and the common difference d is 3.

If the terms of a sequence differ by a constant, then the sequence is an arithmetic sequence. If the initial term is 5 and the common difference, *d*, between the terms is 5. We can use the closed formula to determine the 20th term. Note that n here is going to be 19 because we already have the initial term, thus equaling 20 terms

Now, we can use the technique of reversing and adding to get the sum of the sequence.

Therefore, the sum of the first 20 terms is 670.

1. Question: Given a geometric sequence with (a1 = 2) and common ratio (r = 3), find the 6th term.

A sequence is called geometric if the **ratio** between successive terms is constant. For this geometric sequence, we know the initial term is 2 and the common ratio, *r*, is 3. We can use the closed formula to determine the 6th term. Note again that n here is 5 since we already have the initial term.

Therefore, the 6th term is 486.

1. Question: Translate the following statement into symbolic logic: "If it rains, then the ground will be wet."

Suppose we have two propositions, *P* and *Q*. This statement can be broken down into two propositions and can translate to an implication. We can write this this way:

*P* = it rains

*Q*  = the ground is wet

Therefore, an implication can be made such that

1. Question: Prove by contradiction: "If (n) is an odd integer, then (n2) is odd."

A proof by contradiction is when we prove that the statement is true by proving the negation of the proposed implication is false. Here we can say that *P* is if n is an odd integer, and *Q* is that n2 is odd. So, we try to prove the following is true: if n is an odd integer, then n2 is even.

Suppose n is an odd number, then for some integer *k*. Then we can see that . Here we can see that is just an integer, so let’s call it *m*. Then , which we can see is odd. Therefore, must be odd if *n* is odd.

## References

[1] Garrido, J. (2021, August 14). *CS5070 Mathematical Structures for Computer Science - Notes*  [Slide show; Powerpoint]. D2L.

[2] Kennesaw State University, College of Computing and Software Engineering, Department of Computer Science, Mathematical Structures for Computer Science. (n.d.). Quiz.

[3] Levin, O. (2016). *Discrete mathematics: An Open Introduction*.