

ALGEBRA: SEQUENCES AND SERIES (2)

11 FEBRUARY 2013

Lesson Description

In this lesson, we will:

- Identify the different types of number patterns
- Look at the formulae needed to generate the general term
- Use formulae to do different calculations
- Identify converging number patterns
- Place special emphasis on geometric number patterns

Key Concepts

In grade 11 quadratic number patterns were studied.

This year we will also look at linear (arithmetic) number patterns and exponential (geometric) number patterns.

Arithmetic Number Patterns

- $T_2 - T_1 = T_3 - T_2$
- *There is a constant difference between terms*
- $T_n = a + (n - 1)d$
- $S_n = \frac{n}{2}(2a + (n - 1)d)$

Geometric Number Patterns

- $\frac{T_3}{T_2} = \frac{T_2}{T_1}$
- *There is a constant ratio between terms*
- $T_n = ar^{n-1}$
- $S_n = \frac{a(r^n - 1)}{r - 1}$

Convergent Geometric Number Patterns

- $-1 < r < 1$
- $S_\infty = \frac{a}{1 - r}$

Questions

Question 1

In a geometric sequence the first 3 terms are: $t - 4$; $t - 3$; and $t - 1$ respectively. Calculate t and the tenth term.

Question 2

Marc is preparing for the comrades marathon. In the first week he runs 50 km. He increases the distance he runs by 14 km per week. How far does he run during the tenth week?

Question 3

3.1 Calculate n if: $\sum_{k=1}^n (3k - 5) = 1715$ (5)

3.2 For which values of k will the series:

$$(2k + 1) + (2k + 1)^2 + (2k + 1)^3 \quad \text{Converge?} \quad (3)$$

3.3 Represent in sigma notation to n terms $\frac{1}{2} + \frac{2}{3} + \frac{4}{4} \dots \dots \dots$ (4)

Question 4

The length of each pipe of an organ is $\frac{7}{8}$ the length of the previous one. The longest pipe is 300cm.

4.1 Find the length of the 20th pipe. (4)

4.2 Calculate how many metres of pipe is needed for an organ with 20 pipes. (4)

4.3 Determine in metres the length of pipe needed if an indefinite number of pipes are needed. (3)