11-1 Types of Sequences   Page 501

Objective: To determine whether a sequence is arithmetic, geometric, or neither and to supply missing terms of a sequence.
ESLRs: at the end of this document.

Definition: A **sequence** is an ordered set of numbers.

A **sequence** can be defined as a function whose domain (x-values) consists of consecutive positive integers. These numbers are called the "**term number**" of the sequence, where the corresponding value (the range or y-value) is called the "**term**" of the sequence.

A sequence is **finite** if it has a limited number of terms and **infinite** if it does not.

Here is an example of a sequence:
Term Number: 1,   2,   3,   4,   5,   6, ...
Actual Term: 3,   5,   7,   9,   11, 13, ...
The Notation ... indicates an infinite sequence.

Definition: A sequence in which a constant ***d*** can be added to each term to get the next term is called an **arithmetic sequence,** or arithmetic progression. The constant ***d*** is called the **common difference**.

Ex 1) For each arithmetic sequence, find ***d*** the common difference and the next two terms of the sequence.

Ex 1a) 4, 7, 10, 13, 16, . . .

$d = 3$ (7-4, and 10-7, and 13-10, and 16-13)

The next term is:

$16 + 3$ or 19

The next term is:

$19 + 3$ or 22

Ex 1b) 50, 45, 40, 35, 30, . . .

Common difference, d: −5

(45−50, 40−45, 35−40, 30 −35)

The next term: 25 (30 + −5)

The next term: 20 (25 + −5)

Definition: A sequence in which a constant *r* can be **multiplied** by each term to get the next term is called a **geometric sequence**. The constant *r* is called the **common ratio**.

Ex 2) For each geometric sequence, find the common ratio and the next two terms.

Ex 2a) 2, 6, 18, 54, . . .

Common Ratio r: 3 $(6 \div 2,\ 18 \div 6,\ 54 \div 18)$

Next Term: $54 \cdot 3 = 162$

Next Term: $162 \cdot 3 = 486$

Ex 3) Using the given formula for the ***n*th** term (general), find: t_1, t_2, t_3, and t_4 (term numbers 1-4)

3a) $t_n = 5 + 4n$

n	
1	$t_1 = 5 + 4(1) = 9$
2	$t_2 = 5 + 4(2) = 13$
3	$t_3 = 5 + 4(3) = 17$
4	$t_4 = 5 + 4(4) = 21$

$9, 13, 17, 21, \ldots$

3b) $t_n = n^2$

n	
1	$t_1 = (1)^2 = 1$
2	$t_2 = (2)^2 = 4$
3	$t_3 = (3)^2 = 9$
4	$t_4 = (4)^2 = 16$

$1, 4, 9, 16, \ldots$

3c) $t_n = 3 \cdot 2^n$

n	
1	$t_1 = 3 \cdot 2^1 = 6$
2	$t_2 = 3 \cdot 2^2 = 12$
3	$t_3 = 3 \cdot 2^3 = 24$
4	$t_4 = 3 \cdot 2^4 = 48$

6, 12, 24, 48, . . .

Ex 4) Find the next term in the sequence:

2, 6, 12, 20, 30, ? $\rightarrow$ 42 (30+12)

4 6 8 10 12