**PRIMO Lesson Three Handout**

**Sequence Theories**

Sequence theory is an essential part of mathematics when studying set theories, statistics, and calculus. There are a few common types of sequences, including **arithmetic sequences** and **geometric sequences**. Other sequences include F**ibonacci sequences**, **relational sequences**, and **functional sequences**. For most of the calculable or occurring sequences, they have an **explicit formula** and/or a **recursive formula**. Explicit formulas are defining the sequence’s *nth* term using only the variable *n* itself, while recursive formulas define the *nth* term using the *(n - 1)th* term or other previous terms. Most of the sequences also have **summation formulas**, which is the formula of finding the sum of the first *n* numbers in the sequence. Of all occurring sequences, they can be classified into **convergent sequences** and **divergent sequences**. Convergent sequences have a sum with a finite limit, while divergent sequences have a sum with either no limit or an infinite limit.

In arithmetic sequences, each term is *d* more than the previous term, and it is a type of linear functional sequence. The formulas of arithmetic sequences are as follows:

Explicit Formula:

Recursive Formula:

Summation Formula:

Properties: 、

In geometric sequences, each term is *r* times the previous term, and it is an exponential functional sequence. Geometric sequences can be either **convergent** or **divergent**, and in convergent sequences, there are both **finite summation** and **infinite summation**. Geometric sequences with finite summations often have an asymptote The formulas of geometric sequences are as follows.

Explicit Formula:

Recursive Formula:

Finite Summation Formula:

Infinite Summation Formula:

Properties:

**Q1.** Prove the finite and infinite summations of a geometric sequence.

**Q2.** In a geometric sequence *gn*, if *g1 + g2 = 114*, *g1 + g4 = 514*, find *r2 - r*.

**Q3.** Jimmy and Leo are building a wall of bricks. Every day, Jimmy stacks 14 more bricks than the number of bricks he stacked yesterday, and Leo stacks twice the number of bricks he stacked yesterday. If Jimmy and Leo both stacked one brick on the first day, and the brick factory has 11451 bricks, on what day will the two workers run out of bricks?