Geometric Assignment: Due Saturday before 3pm

Name(s): ____

**Remember to each include a 300-word paragraph describing what your partner did when submitting work with a partner. Only one assignment is needed but both partners need to write an explanation what the other did.

This assessment is focused on the following competencies:

- **Thinking & Understanding:** Do you understand how the common ratio stays the same between successive terms? Do you understand what is necessary for an infinite series to converge?
- **Communicating & Representing:** Can you use sigma notation to express sums? Can you express a sum in sigma notation as a sum of a list?
- **Modelling & Solving:** Can you build geometric sequences for real problems and solve them? Can you find the common ratio given non successive terms?

1. (1.3 Thinking) A geometric sequence is formed where the third term is the sum of the first two. If the first term is 1, what is the second term?

2. (1.3 Modelling) A saltwater tank is being flushed with fresh water while the volume of water in the tank remains constant (only the concentration changes). After 5 minutes of being flushed, the concentration of salt in the tank was 20%, and then after 30 minutes the concentration was 5.5%. The concentration each minute after being flushed can be modelled by a geometric sequence. Determine the common ratio and determine the concentration after 80 minutes.

3. (1.4 Modelling) During March, the global reported Covid cases approximated a geometric sequence. On March 15^{th} there were 20 thousand new cases and on March 31^{st} there were 70 thousand new cases. How many total reported cases were there in March?

4. (1.4 Communication) Evaluate the following:

$$\sum_{k=1}^{2020} 3\left(-\frac{3}{2}\right)^{k}$$

5. (1.4 Communication) Show the following statements are true

$$\sum_{k=1}^{n} A \cdot f(k) = A \sum_{k=1}^{n} f(k)$$

$$\sum_{k=1}^{n} f(k) + \sum_{k=1}^{n} g(k) = \sum_{k=1}^{n} \big(f(k) + g(k)\big)$$

$$\sum_{k=1}^{n} f(k) = \sum_{i=1}^{n} f(i)$$

$$\sum_{k=1}^{n} f(k) = \sum_{k=0}^{n-1} f(k-1)$$

6. (1.5 Thinking) Why can we only find the sum of an infinite geometric series when $-1 < r < 1$?

7. (1.5 Modelling) When you retire with a pension, the pension will be paid for the remainder of your lifetime. You are paid the same amount each month, but the value of the money is not the same because of inflation. If you are paid $3,000 for the first month of retirement and the value drops 0.2% every month due to inflation, what is the lifetime value of the pension?