Geometric Sequences and Series

 A **geometric sequence** is a sequence of numbers in which each term can be found by **multiplying** the preceding term by a **common ratio (r).**

Ex1: Find r and the next three terms

1. 2, 4, 6, 8, \_\_\_, \_\_\_, \_\_\_
2. 3, -15, 75, \_\_\_\_, \_\_\_\_\_, \_\_\_\_\_
3. $-\frac{15}{3}$, 5, $-\frac{10}{3}$, $\frac{20}{9}$, \_\_\_\_, \_\_\_\_, \_\_\_\_

The nth term of a geometric sequence is found by:

$$u\_{n} = u\_{1}r^{n-1}$$

Why?

Examples:

* Find the formula for the nth (general) term in the sequence 3, 12, 48… What kind of function is this? Find the 11th term.
* Find the first term in the sequence for which  = 24 and r = 2.
* Find a geometric sequence that has 2 terms between –2 and 54.
* A colony of algae increases its size by 15% each week. The lake will be considered “seriously polluted” when there is an excess of 10,000 grams of algae in the lake. If 10 grams are placed in the lake, how long will it take for the lake to be seriously polluted?

You do these….

Consider the sequence 100 , 50 , 25 , …

 a) Show that the sequence is geometric.

 b) Find the formula for its general term. Find its 15th term.

 d) Is 7 a member of the sequence? How do you know?

 e) Is  a member of the sequence? How do you know?

**Geometric Series**

Stephanie’s parents have decided to negotiate her allowance. They told her that she has two choices:

1. Earn $30 a week.
2. Earn $10 the first week, which will increase by $5 each week.
3. Earn $0.01 the first month and double the amount every month after that.

Which option should she choose? Why? Are there situations where different choices are better?

A geometric series is the sum of terms in a geometric sequence.

The general formula for the sum of the first n terms of a geometric sequence is

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_ or .

Examples:

* Find the sum of the first 8 terms in the sequence 3 – 6 + 12 – …
* Find the sum of the terms in the series 

You try….

1. Find the sum of the first ten terms of 12 + 6 + 3 + …
2. An employee of a company starts on a salary of $20,000 per year with an annual increase of 4% of the previous year’s salary
3. Show that the amounts of the salary form a geometric sequence
4. Find how much the employee earns in the tenth year of employment.
5. Find the total amount the employee makes over all 10 years.

3. A National Lottery is offering prizes in a new competition. The winner may choose one of the following.

 **Option one** $1000 each week for 10 weeks.

**Option two** $250 in the first week, $450 in the second week, $650 in the third week, increasing by $200 each week for a total of 10 weeks.

**Option three** $10 in the first week, $20 in the second week, $40 in the third week continuing to double for a total of 10 weeks.

 a) Calculate the amount you receive in the tenth week for each option.

 b) Calculate the total amount you receive over all ten weeks for each option.