## **Geometric Sequence**

- A *geometric sequence* is formed by multiplying each term after the first by a constant called the *common ratio* (*r*).
- Ex: 4, 12, 36, 108, ...
- *r* can be positive or negative.
- The common ratio can be found by dividing any term by the term before it.

**Ex:** What is *r* in each sequence:

1, 4, 16, 64, 256 r = 424, 36, 54, 81, 121.5  $r = \frac{36}{24} = \frac{3}{2}$ 2000, 500, 125, 31.25  $r = \frac{500}{2000} = \frac{1}{4}$ 

**<u>Ex:</u>** Find the next three terms: 2, -4, 8, ...

-16,32,-64

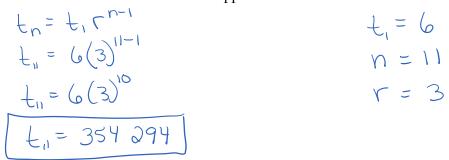
• The general term of a geometric sequence is:

$$t_n = t_1 r^{n-1}$$

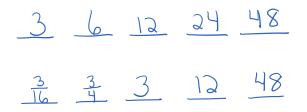
$$t_n = General term$$
  
 $t_1 = First term$   
 $r = common ratio$   
 $n = number of terms$ 

**Examples:** 

1. Given the sequence 6, 18, 54, ..., find  $t_{11}$  (Find the 11<sup>th</sup> term)



2. Create a geometric sequence whose 5<sup>th</sup> term is 48.



- 3. Find the number of terms in 3, 6, 12, ..., 384.
- $t_n = t_n r^{n-1}$ t, = 3  $\frac{384}{3} = \frac{3(2)^{n-1}}{3}$   $128 = 2^{n-1}$ r = 2n = ?En = 384  $2^7 = 2^{n-1}$ 4. In a geometric sequence, the first term is 4 and the third term is

324. Find 
$$t_2$$
  
 $t_n = t_1 r^{n-1}$   
 $3_{2} = 4(r)^{3-1}$   
 $t_1 = 4$   
 $3_{2} = 4(r)^{3-1}$   
 $t_3 = 3_{2} = 3$ 

5. In a geometric sequence, the second term is 28 and the fifth term is 1792. Determine the values of  $t_1$  and r, and list the first three terms of the sequence.  $I_1, J_2, J_4, J_7, J_2, J_1 = 28$   $t_n = t_1 r^{n-1}$   $1792 = 28 r^{4-1}$   $64 = r^3$  $4 = r^3$ 

6. In nature, bacteria reproduce by splitting in two so that one cell gives rise to 2, then 4, then 8, and so on. Suppose there were three bacteria originally present in a sample. Determine the general term that relates the number of the bacteria to the doubling period of the bacteria. State the values of t<sub>1</sub> and r in the geometric sequence formed.

 $t_n = 3$  r = 2 $(t_n = 3(2)^{n-1})$  General Term.