

Geometric Sequence Day 5 Notes

"r" x

I. A geometric sequence has a common ratio, or multiplier, between the terms:

- e.g. 2, 4, 8, 16...  $r=2$  when  $r < 1$  (fraction or decimal)  
 3, -9, 27, -81...  $r=-3$  27, 9, 3...  $r=\frac{1}{3}$

To calculate the ratio, r, divide a term by the previous term.

$r = \frac{T_2}{T_1}$  e.g. -16, 4, -1...  
 $r = \frac{T_2}{T_1} = \frac{4}{-16} = \boxed{-\frac{1}{4}}$

II. The formula for the general term ( $t_n$ ) is:

$t_n = t_1 r^{n-1}$  ← exponent

-16, 4, -1... What is the 9th term?

$t_n = t_1 r^{n-1}$   
 $t_9 = -16 \cdot \left(-\frac{1}{4}\right)^{9-1}$   
 $t_9 = -16 \cdot \left(-\frac{1}{4}\right)^8$  1.525E-5  
 $t_9 = -16 \cdot \left(\frac{1}{4}\right)^8$  0.00001525  
 $t_9 = -16 \times 1.525 \times 10^{-5}$

III. Sample problems:

1. In the sequence 6, -3,  $\frac{3}{2}$ ,  $-\frac{3}{4}$ , ...

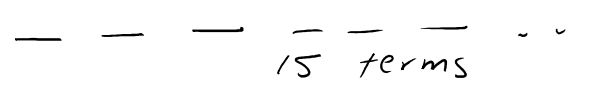
a) Calculate the common ratio

$R = \frac{T_2}{T_1}$   
 $R = \frac{-3}{6}$   
 $R = -\frac{1}{2}$

$t_{11} = T_1 r^{n-1}$   
 $t_{11} = 6 \left(-\frac{1}{2}\right)^{11-1}$   
 $t_{11} = 6 \left(-\frac{1}{2}\right)^{10}$   
 $t_{11} = 0.0058$

b) The 11th term is?

$t_{11} = 24 \times 10^{-4}$   
 or  
 $t_{11} = 0.00024$



2. Bacteria can double by cell division every 20 minutes. If 10 bacteria cells were present at the back of your throat at the start, how many will there be in 5 hours?

$t_1 = 10$   
 $r = 2$   
 $n = 15$

$t_{15} = t_1 \cdot 2^{15-1}$   
 $t_{15} = 10 \cdot 2^{14}$   
 $t_{15} = 163,840$

Day 5:

78% → 0.78  
 reduce by 18%  $r = 0.82$

