Algebra 2 Geometric Sequences Notes

Consider the sequence 2, 4, 8, 16, 32, …

In this sequence, to find the next term, you must **multiply** the term before it by 2.

In the sequence 500, -100, 20, -4, 0.8, … you must **multiply** by -1/5.

Definition: A ***geometric sequence*** is a sequence such that for all n, there is a constant r, such that $\frac{a_n}{a_{n-1}} = r$.

The constant r is called the common ratio and is the number that you multiply by to get the next term.

We can write this formula in terms of a_1 so that we can use it to find any term of the sequence.

$$a_n = a_1 r^{n-1}$$ → Reference Sheet

Written as a ***recursive*** definition this is $a_n = a_{n-1} r$

(Recall that ***recursive*** means that you must know the previous term in order to find the next term.)

Examples: For each sequence below,

a) determine if it is a geometric or arithmetic sequence
b) if it is geometric, find the common ratio
c) find the indicated term

1) 4, 12, 36, 108, 324, … Find the 10th term.

×3

→ Geometric

→ $r = 3$

→ $a_n = a_1(r)^{n-1}$

$a_n = 4(3)^{n-1}$

$a_{10} = 4(3)^{10-1}$

$a_{10} = 78{,}732$

2) 81, 27, 9, 3, 1, … Find the 8th term.

×1/3 ×3 ×3

→ Geometric

→ $r = 1/3$

→ $a_n = 81(1/3)^{n-1}$

$a_8 = 81(1/3)^{8-1}$

$a_8 = 1/27$

$a_1 = 5$

3) 5, 10, 15, 20, … Find the 12th term.

→ Arithmetic

→ $d = 5$

→ $a_n = 5 + 5(n-1)$

$a_{12} = 5 + 5(12-1)$

$a_{12} = 60$

$\times \frac{2}{3}$

4) $12, 8, \frac{16}{3}, \frac{32}{9}, \ldots$ Find the 6th term.

→ Geometric

→ $r = 2/3$

→ $a_n = 12(2/3)^{n-1}$

$a_6 = 12(2/3)^{6-1}$

$a_6 = 128/81$