Precalculus   Name _____

8.3 Notes: Geometric Sequences and Series

A sequence is _____ if the ratios of consecutive terms are the same. So

$a_1, a_2, a_3, ..., a_n$ is geometric if there is a number r such that $\dfrac{a_2}{a_1} = \dfrac{a_2}{a_1} = \dfrac{a_2}{a_1} = ... r : r \neq 0$.

Determine whether each sequence is geometric. If so, find *r*.

1. 3, −9, 27, −81, 243…	2. $\dfrac{1}{4}, \dfrac{1}{16}, \dfrac{1}{64}$ …	3. 1, 2, 6, 24, 120…

Fill in the blanks with the missing terms of the geometric sequence.

4.   144, _____, 36, _____, 9, 4.5

5.   5, 15, 45, _____, _____

Part 1:

$a_2 = 5 \cdot$

$a_3 = 5 \cdot$

$a_4 = 5 \cdot$

Part 2:

$a_2 = a_1 \cdot$

$a_3 = a_1 \cdot$

$a_4 = a_1 \cdot$

$a_n =$

Part 3:

Find a_{10}

In a geometric sequence, we repeatedly _____ to get successive terms.
Hence, to write an explicit formula for the nth term, we must have a power of *r*.

$$a_n = \boxed{}$$

Examples

6. Find the nth term of the geometric sequence. Write the first five terms of the geometric sequence whose first term is 2 and whose common ratio is 4.	7. Find the 9th term of the geometric sequence whose first term is 4 and whose common ratio is $\dfrac{1}{2}$.	8. Find the nth term of the geometric sequence and then find the value of the tenth term. 6, −2, $\dfrac{2}{3}$,…

9. Find the value of the sixth term of a sequence whose second term is -18 and the fifth term is $\dfrac{2}{3}$.

A _____ is the sum of the terms of a geometric sequence.

Sum of a *finite* geometric sequence

$$S_n = \sum_{i=1}^{n} a_1 r^{i-1} = a_1\left(\frac{1-r^n}{1-r}\right)$$

$r =$ _____

$n =$ _____

$a_1 =$ _____

Sum of an *infinite* geometric sequence

If $|r| < 1$, then $\quad S_\infty = \sum_{i=0}^{\infty} a_1 r^i = \dfrac{a_1}{1-r}$ 　　　　**If $|r| > 1$, the series does not have a sum.**

Determine whether each series is infinite or finite. Then, find each sum.

10. $\displaystyle\sum_{n=1}^{7} 2^{n-1}$	**11.** $\displaystyle\sum_{n=1}^{\infty} 4(0.6)^{n-1}$	**12.** $\dfrac{3}{4} + \dfrac{15}{8} + \dfrac{75}{16} + \dots$
13. $\dfrac{2}{3} + \dfrac{1}{3} + \dfrac{1}{6}$	**14.** $4 + 2 + 1 + \dfrac{1}{2} + \dots + \dfrac{1}{32}$	**15.** $5 + .5 + .05 + .005\dots$