

### Section 3.3: Geometric Sequences and Series

#### Exercises

State whether the following sequences are geometric or not. If they are, state the first term and common ratio.

1. 8, 9, 11, 13, 16, ...
2. -3, -10, -17, -24, ...
3. 3, 6, 12, 24, ...
4. 1, 2, 6, 24, ...
5. 81, 72, 63, 54, ...
6. 72, 48, 32, ...

Give both the general formula (or  $n^{\text{th}}$  term  $a_n$ ) and the recursive formula for the following geometric sequences.

7. 1, 3, 9, 27, ...
8. 64, 16, 4, 1, ...
9. 2, -6, 12, -24, ...
10. 24, 2.4, 0.24, ...

For the following sequences, calculate  $a_{50}$  and  $a_{261}$ .

11. 12, 18, 27, ...
12. 12, 8,  $\frac{16}{3}$ , ...

State whether the following recursively defined sequences are geometric or not. (Is there an easy way to tell?)

13. 
$$\begin{cases} a_1 = 5 \\ a_n = a_{n-1} + 4 \end{cases}$$

14. 
$$\begin{cases} a_1 = 12 \\ a_n = 2a_{n-1} \end{cases}$$

$$15. \begin{cases} a_1 = 75 \\ a_n = 10a_{n-1} \end{cases}$$

$$16. \begin{cases} a_1 = 7 \\ a_n = 2 - a_{n-1} \end{cases}$$

$$17. \begin{cases} a_1 = 8 \\ a_n = -a_{n-1} \end{cases}$$

$$18. \begin{cases} a_1 = 3 \\ a_n = (a_{n-1})^2 \end{cases}$$

19. For the following sequence, calculate the 201<sup>st</sup> term: 5, 15, 45, ...

20. For the following sequence, calculate the 20<sup>th</sup> term: 7, -14, 28, ...

21. Calculate  $S_{20}$  for the series  $100 + 50 + 25 + \dots$

22. Calculate  $S_{20}$  for the series  $100 + 200 + 400 + \dots$

Calculate the sum, if it exists, for the following series.

$$23. -6 + 4 - \frac{8}{3} + \dots$$

$$24. 100 + 50 + 25 + \dots$$

$$25. 100 + 200 + 400 + \dots$$

$$26. 12 + 3 + \frac{3}{4} + \dots$$

Calculate the following sums, if they exist.

$$27. \sum_{k=0}^{10} 2^{k+2}$$

$$28. \sum_{j=1}^{\infty} 15 \left( \frac{3}{5} \right)^j$$

$$29. \sum_{i=2}^{\infty} 25(0.1)^i$$

30.  $\sum_{i=0}^{\infty} 4(-3)^i$

31. If the number of vampires in Transylvania doubles every month, then how many vampires will be in Transylvania in 3 years, starting from one individual? Comment on your result if the total population of Transylvania is 2 million people.
32. As I was going to St. Ives, I met a man with seven wives. Each wife had seven sacks. Each sack had seven cats. Each sack had seven kits. Kits, cats, sacks, wives: does this form a geometric sequence?
33. The paper used in the photocopier by Pat's office is said to be 0.097 mm thick. If it is folded over repeatedly, doubling its thickness each time, how thick will the paper be if it's folded 7 times? Bonus: why, then, were the Mythbusters having so many problems trying to fold the paper this many times?