

## Sequences and Series Test Review

**Arithmetic Sequence and Series**

$$a_n = a_1 + (n - 1)d$$

$$S_n = \frac{n}{2}(a_1 + a_n)$$

$$a_n = a_{n-1} + d$$

$$a_1 = \underline{\hspace{1cm}}$$

**Geometric Sequence and Series**

$$a_n = a_1 \cdot r^{(n-1)}$$

$$S_n = \frac{a_1(1 - r^n)}{1 - r}, \text{ where } r \neq 1$$

$$S = \frac{a_1}{1 - r}, \text{ where } |r| < 1$$

$$a_n = a_{n-1} \cdot r$$

$$a_1 = \underline{\hspace{1cm}}$$

**Part 1: Sigma Notation**

Calculate the following by expanding the sequence and calculating the sum.

1.

$$\sum_{n=1}^5 (n)^2 =$$

2.

$$\sum_{n=1}^4 2n =$$

3.

$$\sum_{n=1}^6 \frac{1}{n} =$$

Write the following sums using sigma notation.

4.  $1+8+27+64+125$

5.  $4+8+12+16+20+24+28+32$

6.  $\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \frac{1}{10}$

## Part 2: Geometric Sequences and Series

7. a. Find the 10<sup>th</sup> term of the sequence (to the nearest hundredth):  
 $a_1 = 2, r = 1.1$

b. Find the sum of the first 10 terms of that sequence

8. a. Find the 5<sup>th</sup> term of the sequence:  
 $a_1 = 4, r = 0.5$

b. Find the sum of the first 5 terms of that sequence

9. Write the recursive formula given the explicit formula for the following geometric sequences:

a.  $a_n = 3 \cdot \left(\frac{1}{3}\right)^{n-1}$

b.  $a_n = 2 \cdot (3)^{n-1}$

c.  $a_n = \left(\frac{2}{5}\right)^{n-1}$

10. Tell whether the following geometric series converge or diverge. Explain your reasoning. **If the series converges, find the sum.**

a. 
$$\sum_{n=1}^{\infty} 3(-0.25)^{n-1}$$

b. 
$$\sum_{n=1}^{\infty} 0.5(4)^{n-1}$$

c. 
$$\sum_{n=1}^{\infty} 0.6^{n-1}$$

### **Part 3: Arithmetic Sequences and Series**

11. a. Find the 120<sup>th</sup> term of the sequence:  
 $a_1 = 5, d = 0.5$

b. Find the sum of the first 120 terms of that sequence

12. a. Find the 100<sup>th</sup> term of the sequence:  
 $a_1 = 4, d = -10$

b. Find the sum of the first 100 terms of that sequence

13. Find the common difference  $d$  of the following sequences.

a.  $a_1 = 10, a_7 = 100$

b.  $a_1 = 4, a_{13} = 7$

14. Write the recursive formula given the explicit formula for the following arithmetic sequences:

a.  $a_n = 3 + (n - 1) \cdot 5$

b.  $a_n = .25 + (n - 1)(-.75)$

c.  $a_n = 2 + (n - 1) \cdot 8$

### **Part 4: Applications of Geometric and Arithmetic Sequences and Series**

15. Logs are stacked in a pile with 35 logs on the bottom row and 21 on the top row. Each row has two fewer logs than the one below it.

a. Is the pattern arithmetic or geometric?

b. How many rows of logs are there?

c. How many logs are in the stack?

16. A company is offering a job with a salary of \$40,000 for the first year and a 3% raise each year after that.
- Does the salary increase arithmetically or geometrically?
  - If the 3% raise continues every year, find the amount of money you would earn in a 35-year career.
17. The first row of a concert hall has 25 seats, and each row after the first one has two more seats than the row before it. There are 32 rows of seats.
- Is the pattern arithmetic or geometric?
  - A group of 90 students goes to a concert on a field trip. Can they all sit in one row? Explain why or why not.
18. Two prospective employers offer you a job. Calculate the total amount of money you would make in a month for each offer.
- |                                                                                          |                                                                                                   |
|------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| a. Company A offers a starting daily wage of 1 penny that doubles every day for 30 days. | b. Company B offers a starting daily wage of \$100 that increases by \$100 every day for 30 days. |
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Which offer should you take?