Name: Key Date: _____

Pre-Calculus

Practice Test, L. 13.1 to 13.3

For each of the following, state whether the sequence is arithmetic, geometric, or neither. Find a formula for the nth term of the sequence.

1. $16, 24, 36, 54, \ldots$ geometric

$\times 1\frac{1}{2}$

$r = 1.5 = \frac{3}{2}$

$t_n = 16 \cdot \left(1\frac{1}{2}\right)^{n-1} = \frac{32}{3}\left(\frac{3}{2}\right)^n$

2. $8, -1, -10, -19, \ldots$ arithmetic

$-9 \quad -9 \quad -9$

$t_n = 8 - 9(n-1)$

$t_n = -9n + 17$

3. $\sqrt[3]{5}, \sqrt[3]{10}, \sqrt[3]{20}, \sqrt[3]{40}, \ldots$ geometric

$\times \sqrt[3]{2}$

$r = \sqrt[3]{2}$

$t_n = \sqrt[3]{5}\,\sqrt[3]{2}^{\,n-1}$

$t_n = \sqrt[3]{\frac{5}{2}} \cdot \sqrt[3]{2}^{\,n}$

4. $10, 9, 11, 8, 12, 7, \ldots$ neither

$-1 \quad +2 \quad -3 \quad +4 \quad -5$

$t_n = t_{n-1} + (-1)^{n-1}(n-1)$

List the first five terms of each sequence which is defined recursively.

5. $t_1 = 10, t_n = t_{n-1} + n$

$t_2 = 10 + 2 = 12$

$t_3 = 12 + 3 = 15$

$t_4 = 15 + 4 = 19$

$t_5 = 19 + 5 = 24$

6. $t_1 = 4, t_n = 2t_{n-1} - 1$

$t_2 = 2(4) - 1 = 7$

$t_3 = 2(7) - 1 = 13$

$t_4 = 2(13) - 1 = 25$

$t_5 = 2(25) - 1 = 49$

7. Find the missing terms of the arithmetic sequence $2, \_\_, \_\_, 13, \ldots$

$13 - 2 = 11$

$d = \frac{11}{3} = 11/3$

$5\frac{2}{3}, 9\frac{1}{3}$

$\frac{17}{3}, \frac{28}{3}$

8. Find the sum of the first eighteen terms of the series $4 + 7 + 10 + \ldots$

arith. $t_n = 4 + 3(n-1)$

$t_{18} = 4 + 3(17) = 55$

$+3$

$S_{18} = \frac{18(4+55)}{2}$

$S_{18} = 531$

9. The first term of an arithmetic sequence is 5 and the seventeenth term is 53. Find the third term.

$t_1 = 5 \qquad t_{17} = 53$

$t_{17} = 5 + d(16)$

$53 = 5 + 16d$

$48 = 16d$

$d = 3$

$t_n = 5 + d(n-1)$

$t_n = 5 + 3(n-1)$

$t_3 = 5 + 3(2) = 11$

$t_3 = 11$

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10. In a geometric sequence, the first term is 3, and the fourth term is 24. Find the common ratio.

$t_1 = 3$

$t_4 = 24$

$3, \_, \_, 24$

$t_n = 3 \cdot r^{n-1}$

$24 = 3 \cdot r^3$

$8 = r^3$

$r = 2$

11. Find the sum of the geometric series $4 + 12 + 36 + \ldots + 324$.

x3 x3

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

$324 = 4(3)^{n-1}$

$81 = 3^{n-1}$

$3^4 = 3^{n-1}$ $n = 5$

$S_5 = \frac{4(3^5 - 1)}{3 - 1} = 484$

12. Find the seventh term of the geometric sequence $\frac{3}{64}, \frac{-3}{16}, \frac{3}{4}, -3, \ldots$

x-4 x-4 x-4

$t_7 = \frac{3}{64}(-4)^6$

$t_7 = 192$

13. Find the sum of all positive 3-digit numbers divisible by 6. Also, write a formula for the sum of the first n of these numbers.

$t_1 = 102$ $t_n = 102 + 6(n-1)$

$996 = 102 + 6(n-1)$

$894 = 6(n-1)$

$149 = n - 1$

$n = 150$

$S_n = \frac{n(102 + 102 + 6n - 6)}{2}$

$S_n = \frac{n(198 + 6n)}{2} = 99n + 3n^2$

$S_{150} = \frac{150(1098)}{2}$

$S_{150} = 82{,}350$

14. Find the sum of all positive integers less than 200 that are multiples of 7.

$t_1 = 7$

$196 = 7 + 7(n-1)$

$189 = 7(n-1)$

$27 = n - 1$

$n = 28$

$S_{28} = \frac{28(7 + 196)}{2}$

$S_{28} = 2842$

15. Give a recursive definition for the sequence $5, 11, 24, 51, 106, 217, \ldots$

$$\begin{cases} t_1 = 5 \\ t_n = 2t_{n-1} + n - 1 \end{cases}$$

16. The sum of a series is defined by $S_n = n + \frac{n^2}{2}$. What is the 5th term in the series?

$S_4 = 4 + \frac{16}{2} = 12$

$S_5 = 5 + \frac{25}{2} = 17.5$

$t_5 = 5.5$