Algebra 2

Name Key

Finite Geometric Series WS#1

Per. __________

Find the sum of each geometric series.

1. $\sum_{k=1}^{6} 3(4)^{k-1}$

$a_1 = 3(4)^{1-1} = 3$ $\quad r = 4 \quad n = 6$

$S_6 = 3\left(\frac{1-4^6}{1-4}\right) = 3\left(\frac{-4095}{-3}\right) = 4095$

$\boxed{S_6 = 4095}$

2. $\sum_{k=1}^{8} 4\left(\frac{1}{2}\right)^{k-1}$

$a_1 = 4 \quad n = 8 \quad r = \frac{1}{2}$

$S_8 = 4\left(\frac{1-\left(\frac{1}{2}\right)^8}{1-\frac{1}{2}}\right) = 4 \cdot \left(\frac{\frac{255}{256}}{\frac{1}{2}}\right) = \frac{255}{32}$

$\boxed{S_8 = \frac{255}{32}}$

3. S_6 for $2 + 0.2 + 0.002 + \ldots$ $\quad r = \frac{.2}{2} = 0.1$

$a_1 = 2 \quad n = 6 \quad r = 0.1$

$S_6 = 2\left(\frac{1-(0.1)^6}{1-0.1}\right) = 2\left(\frac{0.9999}{0.9}\right) = 2(1.1111) = 2.22$

$\boxed{S_6 = 2.2\overline{2}}$

4. S_5 for $12 - 24 + 48 - 96 + \ldots$

$a_1 = 12 \quad n = 5 \quad r = -2$

$S_5 = 12\left(\frac{1-(-2)^5}{1-(-2)}\right) = 12\left(\frac{33}{3}\right) = 12(11) = 132$

$\boxed{S_5 = 132}$

5. S_8 for $10 + 1 + \frac{1}{10} + \frac{1}{100} + \ldots$

$a_1 = 10 \quad n = 8 \quad r = \frac{1}{10}$

$S_8 = 10\left(\frac{1-\left(\frac{1}{10}\right)^8}{1-\frac{1}{10}}\right) = 10(\quad) = 11.1111$

$\boxed{S_8 = 11.1\overline{1}}$

Given each geometric sequence, (a) write an explicit rule for the sequence, (b) find the 10th term, and (c) find the sum of the first 10 terms.

6. $\frac{1}{16}, \frac{1}{8}, \frac{1}{4}, \frac{1}{2}, \ldots$

(a) $a_n = \frac{1}{16} \cdot \left(\frac{1}{4}\right)^{n-1}$

(b) $a_{10} = \frac{1}{16} \cdot \left(\frac{1}{4}\right)^{10-1}$

$a_{10} = \frac{1}{16}\left(\frac{1}{262144}\right)$

$\boxed{a_{10} = \frac{1}{4194304}}$

(c) $a_1 = \frac{1}{16} \quad r = \frac{1}{4} \quad n = 10$

$S_{10} = \frac{1}{16}\left(\frac{1-\left(\frac{1}{4}\right)^{10}}{1-\frac{1}{4}}\right)$

$\boxed{S_{10} = \frac{349525}{4194304}}$

7. $4, 0.4, 0.04, 0.004, \ldots$

(a) $a_n = 4 \cdot (0.1)^{n-1}$

(b) $a_{10} = 4 \cdot (0.1)^{10-1}$

$\boxed{a_{10} = 0.000000004}$

(c) $a_1 = 4 \quad r = .1 \quad n = 10$

$S_{10} = 4\left(\frac{1-.1^{10}}{1-.1}\right)$

$\boxed{S_{10} = 4.4\overline{4}}$

8. $8, 16, 32, 64, \ldots$

(a) $a_n = 8 \cdot (2)^{n-1}$

(b) $a_{10} = 8 \cdot 2^{10-1}$

$\boxed{a_{10} = 4096}$

(c) $a_1 = 8 \quad r = 2 \quad n = 10$

$S_{10} = 8\left(\frac{1-2^{10}}{1-2}\right)$

$\boxed{S_{10} = 8184}$

9. $162, -54, 18, -6, \ldots$

(a) $a_n = 162 \cdot \left(-\frac{1}{3}\right)^{n-1}$

(b) $a_{10} = 162 \cdot \left(-\frac{1}{3}\right)^{10-1}$

$\boxed{a_{10} = \frac{-2}{243}}$

(c) $a_1 = 162 \quad r = -\frac{1}{3} \quad n = 10$

$S_{10} = 162\left(\frac{1-\left(-\frac{1}{3}\right)^{10}}{1-\left(-\frac{1}{3}\right)}\right)$

$\boxed{S_{10} = \frac{29524}{243}}$

10. $-22, -11, -\frac{11}{2}, -\frac{11}{4}, \ldots$

(a) $a_n = -22 \cdot \left(\frac{1}{2}\right)^{n-1}$

(b) $a_{10} = -22 \cdot \left(\frac{1}{2}\right)^{10-1}$

$\boxed{a_{10} = \frac{-11}{256}}$

(c) $a_1 = -22 \quad r = \frac{1}{2} \quad n = 10$

$S_{10} = -22\left(\frac{1-\left(\frac{1}{2}\right)^{10}}{1-\frac{1}{2}}\right)$

$\boxed{S_{10} = \frac{-11253}{256}}$