**11-4 Study Guide and Intervention****Geometric Series**CW → ○  
HW → even**Geometric Series** A geometric series is the indicated sum of consecutive terms of a geometric sequence.

<b>Sum of a Geometric Series</b>	The sum $S_n$ of the first $n$ terms of a geometric series is given by $S_n = \frac{a_1(1 - r^n)}{1 - r}$ or $S_n = \frac{a_1 - a_1 r^n}{1 - r}$ , where $r \neq 1$ .
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**Example 1** Find the sum of the first four terms of the geometric sequence for which  $a_1 = 120$  and  $r = \frac{1}{3}$ .

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{Sum formula}$$

$$S_4 = \frac{120\left(1 - \left(\frac{1}{3}\right)^4\right)}{1 - \frac{1}{3}} \quad n = 4, a_1 = 120, r = \frac{1}{3}$$

$$\approx 177.78 \quad \text{Use a calculator.}$$

The sum of the series is 177.78.

**Example 2** Find the sum of the geometric series  $\sum_{j=1}^7 4 \cdot 3^{j-2}$ .

Since the sum is a geometric series, you can use the sum formula.

$$S_n = \frac{a_1(1 - r^n)}{1 - r} \quad \text{Sum formula}$$

$$S_7 = \frac{\frac{4}{3}(1 - 3^7)}{1 - 3} \quad n = 7, a_1 = \frac{4}{3}, r = 3$$

$$\approx 1457.33 \quad \text{Use a calculator.}$$

The sum of the series is 1457.33.

**Exercises**Find  $S_n$  for each geometric series described.

1.  $a_1 = 2, a_n = 486, r = 3$       2.  $a_1 = 1200, a_n = 75, r = \frac{1}{2}$       3.  $a_1 = \frac{1}{25}, a_n = 125, r = 5$

4.  $a_1 = 3, r = \frac{1}{3}, n = 4$       5.  $a_1 = 2, r = 6, n = 4$       6.  $a_1 = 2, r = 4, n = 6$

7.  $a_1 = 100, r = -\frac{1}{2}, n = 5$       8.  $a_3 = 20, a_6 = 160, n = 8$       9.  $a_4 = 16, a_7 = 1024, n = 10$

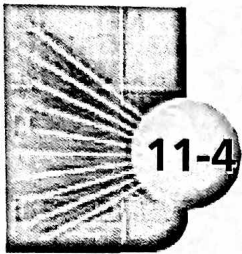
Find the sum of each geometric series.

10.  $6 + 18 + 54 + \dots$  to 6 terms

11.  $\frac{1}{4} + \frac{1}{2} + 1 + \dots$  to 10 terms

12.  $\sum_{j=4}^8 2^j$

13.  $\sum_{k=1}^7 3 \cdot 2^{k-1}$

**11-4 Practice****Geometric Series***HW: even #'s***Find  $S_n$  for each geometric series described.**

1.  $a_1 = 2, a_6 = 64, r = 2$

2.  $a_1 = 160, a_6 = 5, r = \frac{1}{2}$

3.  $a_1 = -3, a_n = -192, r = -2$

4.  $a_1 = -81, a_n = -16, r = -\frac{2}{3}$

5.  $a_1 = -3, a_n = 3072, r = -4$

6.  $a_1 = 54, a_6 = \frac{2}{9}, r = \frac{1}{3}$

7.  $a_1 = 5, r = 3, n = 9$

8.  $a_1 = -6, r = -1, n = 21$

9.  $a_1 = -6, r = -3, n = 7$

10.  $a_1 = -9, r = \frac{2}{3}, n = 4$

11.  $a_1 = \frac{1}{3}, r = 3, n = 10$

12.  $a_1 = 16, r = -1.5, n = 6$

**Find the sum of each geometric series.**

13.  $162 + 54 + 18 + \dots$  to 6 terms

14.  $2 + 4 + 8 + \dots$  to 8 terms

15.  $64 - 96 + 144 - \dots$  to 7 terms

16.  $\frac{1}{9} - \frac{1}{3} + 1 - \dots$  to 6 terms

17.  $\sum_{n=1}^8 (-3)^{n-1}$

18.  $\sum_{n=1}^9 5(-2)^{n-1}$

19.  $\sum_{n=1}^5 -1(4)^{n-1}$

20.  $\sum_{n=1}^6 \left(\frac{1}{2}\right)^{n-1}$

21.  $\sum_{n=1}^{10} 2560\left(\frac{1}{2}\right)^{n-1}$

22.  $\sum_{n=1}^4 9\left(\frac{2}{3}\right)^{n-1}$

**Find the indicated term for each geometric series described.**

23.  $S_n = 1023, a_n = 768, r = 4; a_1$

24.  $S_n = 10,160, a_n = 5120, r = 2; a_1$

25.  $S_n = -1365, n = 12, r = -2; a_1$

26.  $S_n = 665, n = 6, r = 1.5; a_1$

**27. CONSTRUCTION** A pile driver drives a post 27 inches into the ground on its first hit.Each additional hit drives the post  $\frac{2}{3}$  the distance of the prior hit. Find the total distance the post has been driven after 5 hits.**28. COMMUNICATIONS** Hugh Moore e-mails a joke to 5 friends on Sunday morning. Each of these friends e-mails the joke to 5 of her or his friends on Monday morning, and so on. Assuming no duplication, how many people will have heard the joke by the end of Saturday, not including Hugh?