## Extra Example 12.1

Find the sum of the series $\sum_{i=1}^{5}(5i - 4)$. 55

# 12 CHAPTER REVIEW

**@HomeTutor**
**classzone.com**
- Multi-Language Glossary
- Vocabulary practice

## REVIEW KEY VOCABULARY

- sequence, *p. 794*
- terms of a sequence, *p. 794*
- series, *p. 796*
- summation notation, *p. 796*
- sigma notation, *p. 796*
- arithmetic sequence, *p. 802*
- common difference, *p. 802*
- arithmetic series, *p. 804*
- geometric sequence, *p. 810*
- common ratio, *p. 810*
- geometric series, *p. 812*
- partial sum, *p. 820*
- explicit rule, *p. 827*
- recursive rule, *p. 827*
- iteration, *p. 830*

### VOCABULARY EXERCISES

**1.** Copy and complete: The values in the range of a sequence are called the _?_ of the sequence. **terms**

**2.** **WRITING** How can you determine whether a sequence is arithmetic?
**A sequence is arithmetic if the difference between consecutive terms is constant.**

**3.** Copy and complete: A(n) _?_ rule gives $a_n$ as a function of the term's position number $n$ in the sequence. **explicit**

**4.** Copy and complete: In a(n) _?_ sequence, the ratio of any term to the previous term is constant. **geometric**

## REVIEW EXAMPLES AND EXERCISES

Use the review examples and exercises below to check your understanding of the concepts you have learned in each lesson of Chapter 12.

### 12.1 Define and Use Sequences and Series *pp. 794–800*

**EXAMPLE**

**Find the sum of the series $\sum_{i=1}^{4}(i^2 - 4)$.**

$a_1 = 1^2 - 4 = -3$ **First term**

$a_2 = 2^2 - 4 = 0$ **Second term**

$a_3 = 3^2 - 4 = 5$ **Third term**

$a_4 = 4^2 - 4 = 12$ **Fourth term**

The sum of the series is $\sum_{i=1}^{4}(i^2 - 4) = -3 + 0 + 5 + 12 = 14$.

### EXERCISES

**EXAMPLES 5 and 6** on p. 797 for Exs. 5–8

**Find the sum of the series.**

**5.** $\sum_{n=1}^{6}(n^2 + 7)$ **133**

**6.** $\sum_{i=2}^{6}(10 - 4i)$ **−30**

**7.** $\sum_{i=1}^{17} i$ **153**

**8.** $\sum_{k=1}^{25} k^2$ **5525**

**@HomeTutor**
**classzone.com**
Chapter Review Practice

## 12.2 Analyze Arithmetic Sequences and Series

*pp. 802–809*

**EXAMPLE**

**Write a rule for the $n$th term of the sequence 9, 13, 17, 21, 25, . . . .**

The sequence is arithmetic with first term $a_1 = 9$ and common difference $d = 4$. So, a rule for the $n$th term is:

$a_n = a_1 + (n - 1)d$ **Write general rule.**

$= 9 + (n - 1)(4)$ **Substitute 9 for $a_1$ and 4 for $d$.**

$= 5 + 4n$ **Simplify.**

### EXERCISES

**EXAMPLES 2, 3, 4, and 5** on pp. 803–805 for Exs. 9–16

**Write a rule for the $n$th term of the arithmetic sequence.**

9. 8, 5, 2, −1, −4, . . . **$a_n = 11 - 3n$**
10. $d = 7, a_8 = 54$ **$a_n = -2 + 7n$**
11. $a_4 = 27, a_{11} = 69$ **$a_n = 3 + 6n$**

**Find the sum of the series.**

12. $\sum_{i=1}^{15} (3 + 2i)$ **285**
13. $\sum_{i=1}^{26} (25 - 3i)$ **−403**
14. $\sum_{i=1}^{22} (6i - 5)$ **1408**
15. $\sum_{i=1}^{30} (-84 + 8i)$ **1200**
16. **COMPUTER** Joe buys a $600 computer on layaway by making a $200 down payment and then paying $25 per month. Write a rule for the total amount of money paid on the computer after $n$ months. **$a_n = 200 + 25n$**

## 12.3 Analyze Geometric Sequences and Series

*pp. 810–817*

**EXAMPLE**

**Find the sum of the series $\sum_{i=1}^{7} 5(3)^{i-1}$.**

The series is geometric with first term $a_1 = 5$ and common ratio $r = 3$.

$S_7 = a_1\left(\frac{1 - r^7}{1 - r}\right)$ **Write rule for $S_7$.**

$= 5\left(\frac{1 - 3^7}{1 - 3}\right)$ **Substitute 5 for $a_1$ and 3 for $r$.**

$= 5465$ **Simplify.**

### EXERCISES

**EXAMPLES 2, 3, 4, and 5** on pp. 811–813 for Exs. 17–23

**Write a rule for the $n$th term of the geometric sequence.**

17. 256, 64, 16, 4, 1, . . . **$a_n = 256\left(\frac{1}{4}\right)^{n-1}$**
18. $r = 5, a_2 = 200$ **$a_n = 40(5)^{n-1}$**
19. $a_1 = 144, a_3 = 16$ **$a_n = 144\left(\frac{1}{3}\right)^{n-1}$**

**Find the sum of the series.**

20. $\sum_{i=1}^{6} 3(5)^{i-1}$ **11,718**
21. $\sum_{i=1}^{9} 8(2)^{i-1}$ **4088**
22. $\sum_{i=1}^{5} 15\left(\frac{2}{3}\right)^{i-1}$ **$\frac{1055}{27}$**
23. $\sum_{i=1}^{7} 40\left(\frac{1}{2}\right)^{i-1}$ **$\frac{635}{8}$**

**Extra Example 12.2**

Write a rule for the $n$th term of the sequence −4, −7, −10, −13, −16, . . . . **$a_n = -1 - 3n$**

**Extra Example 12.3**

Find the sum of the series $\sum_{i=1}^{10} 6(2)^i$. **12,276**

## Extra Example 12.4

Find the sum of the series $\sum_{i=1}^{\infty}(1.6)^i$.

**does not exist**

## Extra Example 12.5

Write a recursive rule for the sequence 125, 25, 5, 1, $\frac{1}{5}$, . . . .

**$a_1 = 125$, $a_n = \frac{1}{5}a_{n-1}$**

# 12 CHAPTER REVIEW

## 12.4 Find Sums of Infinite Geometric Series

pp. 820–825

**EXAMPLE**

**Find the sum of the series $\sum_{i=1}^{\infty}\left(\frac{4}{5}\right)^{i-1}$, if it exists.**

For this series, $a_1 = 1$ and $r = \frac{4}{5}$. Because $|r| < 1$, the sum of this series exists.

The sum is $S = \frac{a_1}{1-r} = \frac{1}{1-\frac{4}{5}} = 5$.

### EXERCISES

**EXAMPLES 2 and 5** on pp. 821–822 for Exs. 24–31

**Find the sum of the infinite geometric series, if it exists.**

**24.** $\sum_{i=1}^{\infty}3\left(\frac{5}{8}\right)^{i-1}$ **8**

**25.** $\sum_{i=1}^{\infty}7\left(-\frac{3}{4}\right)^{i-1}$ **4**

**26.** $\sum_{i=1}^{\infty}4(1.3)^{i-1}$ **no sum**

**27.** $\sum_{i=1}^{\infty}-0.2(0.5)^{i-1}$ **−0.4**

**Write the repeating decimal as a fraction in lowest terms.**

**28.** 0.888. . . $\frac{8}{9}$

**29.** 0.546546546. . . $\frac{182}{333}$

**30.** 0.3787878. . . $\frac{25}{66}$

**31.** 0.7838383. . . $\frac{388}{495}$

## 12.5 Use Recursive Rules with Sequences and Functions

pp. 827–833

**EXAMPLE**

**Write a recursive rule for the sequence 6, 10, 14, 18, 22, . . . .**

The sequence is arithmetic with first term $a_1 = 6$ and common difference $d = 10 - 6 = 4$.

$a_n = a_{n-1} + d$ **General recursive rule for $a_n$**

$= a_{n-1} + 4$ **Substitute 4 for $d$.**

So, a recursive rule for the sequence is $a_1 = 6$, $a_n = a_{n-1} + 4$.

### EXERCISES

**EXAMPLES 1, 2, and 3** on pp. 827–828 for Exs. 32–38

**Write the first five terms of the sequence.**

**32.** $a_1 = 4$, $a_n = a_{n-1} + 9$ **4, 13, 22, 31, 40**

**33.** $a_1 = 8$, $a_n = 5a_{n-1}$ **8, 40, 200, 1000, 5000**

**34.** $a_1 = 2$, $a_n = n \cdot a_{n-1}$ **2, 4, 12, 48, 240**

**Write a recursive rule for the sequence.**

**35.** 6, 18, 54, 162, 486, . . . **$a_1 = 6$, $a_n = 3a_{n-1}$**

**36.** 4, 6, 9, 13, 18, . . . **$a_1 = 4$, $a_n = a_{n-1} + n$**

**37.** 7, 13, 19, 25, 31, . . . **$a_1 = 7$, $a_n = a_{n-1} + 6$**

**38. POPULATION** A town's population increases at a rate of about 1% per year. In 2000, the town had a population of 26,000. Write a recursive rule for the town's population $P_n$ in year $n$. Let $n = 1$ represent 2000. **$a_1 = 26{,}000$, $a_n = 1.01a_{n-1}$**