

# Sequences and Series: math practice, Grade 11 – download the PDF

21 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

## 1 Name that sequence

★ ★ ★

Decide whether each sequence is arithmetic, geometric, or neither. Give  $d$  or  $r$  when it exists.

- a. 4, 11, 18, 25, ...
- b. 5, 10, 20, 40, ...
- c. 2, 4, 7, 11, ...
- d. 81, 27, 9, 3, ...

## 2 First terms of an arithmetic sequence

★ ★ ★

An arithmetic sequence has  $a_1 = 9$  and  $d = 4$ . (a) List the first five terms. (b) Write an explicit formula. (c) Find  $a_{12}$ .

## 3 First terms of a geometric sequence

★ ★ ★

A geometric sequence has  $a_1 = 5$  and  $r = 3$ . List the first five terms and find  $a_7$ .

#### 4 Explicit to recursive



A sequence is defined by  $a_n = 7 - 2n$ . (a) Find  $a_1, a_2, a_3, a_4$ . (b) Write a recursive formula. (c) Find  $a_{15}$ .

#### 5 Your first sigma sum



Expand and evaluate  $\sum_{k=1}^4 (2k + 3)$ .

#### 6 Even numbers up to 50



Find  $2 + 4 + 6 + \dots + 50$ .

#### 7 Converge or diverge?



For each infinite geometric series, find the sum if it exists.

a.  $6 + 2 + \frac{2}{3} + \dots$

b.  $5 + 10 + 20 + \dots$

#### 8 Which term is it?



Consider the sequence  $4, 9, 14, 19, \dots$  (a) Which term equals 139? (b) Is 200 a term of the sequence? Explain.

#### 9 Finding the ratio from two terms



A geometric sequence has  $a_2 = 12$  and  $a_5 = 324$ . Find  $r$ ,  $a_1$ , and an explicit formula.

**10 Two terms of an arithmetic sequence**

In an arithmetic sequence  $a_4 = 17$  and  $a_9 = 42$ . Find  $d$ ,  $a_1$ , the formula for  $a_n$ , and the sum of the first 20 terms.

**11 A geometric sum**

Find the sum of the first 7 terms of  $4 + 12 + 36 + \dots$

**12 Theater seats**

A theater has 18 rows. The first row has 14 seats and each row has 2 more seats than the row in front of it. (a) How many seats are in the last row? (b) How many seats are in the theater?

**13 A sigma sum with powers**

Evaluate  $\sum_{k=1}^5 3 \cdot 2^k$ .

**14 A repeating decimal as a fraction**

Write  $0.363636\dots$  as an infinite geometric series and then as a fraction in lowest terms.

**15 Saving for a bike**

Maya saves 50 dollars the first month and increases her deposit by 15 dollars each month (65, 80, 95, and so on). After how many months will her total savings first reach at least 2,000 dollars?

**16 The bouncing ball**

A ball is dropped from a height of 20 feet (about 6.1 m). After each bounce it rises to  $\frac{3}{5}$  of the height it fell from. What total distance does it travel before coming to rest?

**17 Yearly deposits**

Leo deposits 500 dollars at the beginning of each year into an account paying 4% interest per year (compounded annually). Write the value of the deposits after 10 years as a sum and compute it. A calculator is allowed.

**18 Three numbers in an arithmetic sequence**

Three consecutive terms of an arithmetic sequence have sum 27 and product 693. Find them.

**19 Solving for  $x$** 

(a) For which values of  $x$  does  $8 + 8x + 8x^2 + \dots$  converge? (b) Find  $x$  so that the sum equals 20.

**20 Geometric means**

Insert three numbers between 5 and 80 so that the five numbers form a geometric sequence. Find all possibilities.

**21 An alternating series**

Consider  $\sum_{k=1}^{\infty} 9\left(-\frac{1}{2}\right)^{k-1}$ . (a) Compute the partial sum  $S_4$ . (b) Find the sum of the infinite series. (c) How far is  $S_4$  from the sum?



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