Section 12.2 Arithmetic and Geometric Sequences

# Objective 1: Identifying Arithmetic Sequences

An **arithmetic sequence** is a sequence in which each term is found by adding a constant $d$ to the previous term. The constant $d$ is called the **common difference** of the sequence.

**General Term of an Arithmetic Sequence:**

The general term $a\_{n}$ of an arithmetic sequence is given by

$$a\_{n}=a\_{1}+\left(n-1\right)d$$

where $a\_{1}$ is the first term and $d$ is the common difference.

a. Find the $25^{th}$ term of an arithmetic sequence if the first term is $-7.5$ and the common difference is $4$.

b. Find the first term of an arithmetic sequence if the $100^{th}$ term is $175$ and the common difference is $\frac{5}{3}$.

c. Consider a job offer with a starting annual salary of $\$32,000$ with a guaranteed raise of $\$960$ each year. Write a formula to represent the salary at the end of the nth year.

# Objective 2: Identifying Geometric Sequences

A **geometric sequence** is a sequence in which each term is found by multiplying the previous term by a constant $r$. The constant $r$ is called the **common ratio** of the sequence.

**General Term of a Geometric Sequence:**

The general term $a\_{n}$ of a geometric sequence is given by

$$a\_{n}=a\_{1}⋅r^{n-1}$$

where $a\_{1}$ is the first term and $r$ is the common ratio.

a. Find the $10^{th}$ term of a geometric sequence if the first term is $-7.5$ and the common ratio is $4$.

b. Find the first term of a geometric sequence if the $6^{th}$ term is $175$ and the common ratio is $\frac{5}{3}$.

c. Consider a job offer with a starting annual salary of $\$32,000$ with a guaranteed raise of $3\%$ each year. Write a formula to represent the salary at the end of the nth year.

Determine if the sequence is arithmetic, geometric, or neither. If it is arithmetic, state the common difference. If it is geometric state the common ratio.

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| d. $17, 14, 11, 8,…$ | e. $\frac{1}{2},\frac{2}{3},\frac{3}{4},\frac{4}{5},…$ |
| f. $-1,\frac{1}{2},-\frac{1}{4},\frac{1}{8},,…$ | g. $\sqrt{2}, 2, 2\sqrt{2}, 4, ….$ |
| h. $2, 5, 10, 17, …$ | i. $3t, 5t, 7t, 9t, …$ |