# 12 CHAPTER SUMMARY

## BIG IDEAS

*For Your Notebook*

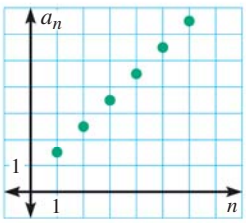
### Big Idea 1

TEKS a.2

### Analyze Sequences

The information below highlights the similarities and differences between arithmetic and geometric sequences.

**Arithmetic Sequence**



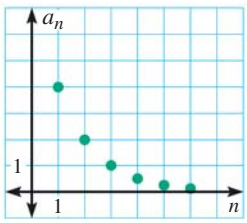

$a_n = a_1 + (n - 1)d$

**First term:** $a_1$

**Common difference:** $d$

**Graph is linear.**

**Geometric Sequence**




$a_n = a_1 r^{n-1}$

**First term:** $a_1$

**Common ratio:** $r$

**Graph is exponential.**

### Big Idea 2

TEKS a.2

### Find Sums of Series

The most common formulas for sums of series are shown below.

| Arithmetic Series | Geometric Series | Infinite Geometric Series |
|---|---|---|
| Sum of the first $n$ terms: $S_n = n\left(\frac{a_1 + a_n}{2}\right)$ | Sum of the first $n$ terms: $S_n = a_1\left(\frac{1 - r^n}{1 - r}\right), r \neq 1$ | Sum of the series: $S = \frac{a_1}{1 - r}, \lvert r \rvert < 1$ |
| Example: $4 + 9 + 14 + 19 + 24$ | Example: $3 + 6 + 12 + 24$ | Example: $5 + 1 + 0.2 + 0.04 + \cdots$ |
| $S_5 = 5\left(\frac{4 + 24}{2}\right) = 70$ | $S_4 = 3\left(\frac{1 - 2^4}{1 - 2}\right) = 45$ | $S = \frac{5}{1 - 0.2} = 6.25$ |

Other common sum formulas:

$$\sum_{i=1}^{n} 1 = n \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2} \qquad \sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$$

### Big Idea 3

TEKS a.1

### Use Recursive Rules

The table shows explicit and recursive rules for arithmetic and geometric sequences.

| | Explicit Rule | Recursive Rule |
|---|---|---|
| **Arithmetic Sequence** Example: 3, 5, 7, 9, 11, . . . | $a_n = a_1 + (n - 1)d$<br>$a_n = 1 + 2n$ | $a_n = a_{n-1} + d$<br>$a_1 = 3, a_n = a_{n-1} + 2$ |
| **Geometric Sequence** Example: 8, 4, 2, 1, 0.5, . . . | $a_n = a_1 r^{n-1}$<br>$a_n = 8(0.5)^{n-1}$ | $a_n = r \cdot a_{n-1}$<br>$a_1 = 8, a_n = 0.5a_{n-1}$ |