# 12.2 Analyze Arithmetic Sequences and Series

| Before | You worked with general sequences and series. |
| Now | You will study arithmetic sequences and series. |
| Why? | So you can arrange a marching band, as in Ex. 64. |

**Key Vocabulary**
- arithmetic sequence
- common difference
- arithmetic series

In an **arithmetic sequence**, the difference of consecutive terms is constant. This constant difference is called the **common difference** and is denoted by $d$.

### EXAMPLE 1    Identify arithmetic sequences

**Tell whether the sequence is arithmetic.**

a.  $-4, 1, 6, 11, 16, \ldots$

b.  $3, 5, 9, 15, 23, \ldots$

**Solution**

Find the differences of consecutive terms.

a.  $a_2 - a_1 = 1 - (-4) = 5$

$a_3 - a_2 = 6 - 1 = 5$

$a_4 - a_3 = 11 - 6 = 5$

$a_5 - a_4 = 16 - 11 = 5$

▶ Each difference is 5, so the sequence is arithmetic.

b.  $a_2 - a_1 = 5 - 3 = 2$

$a_3 - a_2 = 9 - 5 = 4$

$a_4 - a_3 = 15 - 9 = 6$

$a_5 - a_4 = 23 - 15 = 8$

▶ The differences are not constant, so the sequence is not arithmetic.

✓ **GUIDED PRACTICE**    for Example 1

1. Tell whether the sequence 17, 14, 11, 8, 5, . . . is arithmetic. *Explain* why or why not.

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**KEY CONCEPT**                                    *For Your Notebook*

**Rule for an Arithmetic Sequence**

**Algebra**    The $n$th term of an arithmetic sequence with first term $a_1$ and common difference $d$ is given by:

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

**Example**    The $n$th term of an arithmetic sequence with a first term of 2 and common difference 3 is given by:

$$a_n = 2 + (n - 1)3, \text{ or } a_n = -1 + 3n$$

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