

## 11.2 Arithmetic Sequences

Arithmetic Sequence - The difference between consecutive terms is constant. Add same number each time.

Common Difference - The difference. (positive or negative) Number you are adding.

Is the given sequence arithmetic? If so, identify the common difference.

2, 5, 7, 12, .....

no

48, 45, 42, 39, .....

yes

$d = -3$

## Arithmetic Sequence Formulas

In these formulas,  $a_n$  is the  $n$ th term,  $a_1$  is the first term,  $n$  is the number of the term, and  $d$  is the common differences.

### Recursive Formula

$$a_1 = \text{a given value}, a_n = a_{n-1} + d$$

$$a_2 = a_{2-1} + d$$

$$a_2 = a_1 + d$$

### Explicit Formula

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

Suppose you participate in a bike-a-thon for charity. The charity starts with \$1100 in donations. Each participant must raise at least \$35 in pledges. What is the minimum amount of money raised if there are 75 participants.

$$1100 + 35(75) = \$3725$$

Suppose you have already saved \$75 toward the purchase of a new CD player and speakers. You plan to save at least \$12 a week from money you earn at a part-time job. In all, what is the minimum amount you will have after 26 weeks?  $75 + 12(26) = \$387$

The Arithmetic Mean of any two numbers is the average of the two numbers.

Graphs of arithmetic sequences are linear. Two terms of an arithmetic sequence and their arithmetic mean lie on the same line.

You can use the arithmetic mean to find a missing term of an arithmetic sequence.

Find the missing term of the arithmetic sequences

50, 71, 92

24, 40.5, 57

$$\frac{50 + 92}{2} = \frac{142}{2} = 71$$

Write a recursive and an explicit formula for each sequence.

48, 45, 42, 39, ...

$$d = -3$$

$$R: a_1 = 48$$

$$a_n = a_{n-1} - 3$$

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

$$a_n = 48 + (n-1)(-3)$$

$$= 48 - 3n + 3$$

$$a_n = 51 - 3n$$

7, 10, 13, 16, ...  $d = 3$

$$R: a_1 = 7$$

$$a_n = a_{n-1} + 3$$

$$E: a_n = 7 + (n-1)3$$

$$= 7 + 3n - 3$$

$$= 4 + 3n$$