**Investigation 41 Arithmetic Sequences Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

A **sequence** is an ordered list that follows a set pattern.

An **arithmetic sequence** is a sequence with a constant **common difference**, or, in plain language, where you add a certain number to get from term to term.

Example: 2, 4, 6, 8, 10, 12, . . . common difference = *d* = 2

Example: 10, 4, -2, -8, -14, . . . common difference = *d* = -6

For #1 & 2: a) Determine whether the sequence is arithmetic or not,

b) find the common difference, and

c) list the next three terms

1. 11, 8, 5, 2, . . .

a) Arithmetic? \_\_\_\_\_\_\_\_\_\_\_ b) *d* = \_\_\_\_\_\_ c) \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_

1. 5, 10, 15, 20, . . .

a) Arithmetic? \_\_\_\_\_\_\_\_\_\_\_ b) *d* = \_\_\_\_\_\_ c) \_\_\_\_\_\_, \_\_\_\_\_\_, \_\_\_\_\_\_

Missing terms in an arithmetic sequence are called **arithmetic means**.

Example: Find the arithmetic mean of 13 and 19:

13, \_\_\_\_\_, 19 Since we know this is an arithmetic sequence, the pattern is to *add* a constant each time.

1. Find three arithmetic means of 2 and -22.
2. Find four arithmetic means of -18 and 62.

**Recursive and Explicit Formulae and Notation** –

The *n*th term of a sequence is written *an*. *n* is the number of the term and *an* is the actual term.

In the sequence 2, 4, 6, 8, 10, 12

*a*1 = \_\_\_\_\_\_\_\_ *a*2 = \_\_\_\_\_\_\_\_

Fill in the missing term names in the sequence *a*1, *a*2, *a*3, …, \_\_\_\_\_\_\_, *an* , \_\_\_\_\_\_\_,…

A **recursive formula** for a sequence is a rule that defines a new term, based on previous terms.

Example: To get the *n*th term of the sequence 2, 5, 8, 11, . . . we can use the rule *an* = *an* – 1 + 3, because to get a term, you add 3 to the previous term.

So, to find the 4th term, we take the 3rd term and add 3. *a*4 = *\_\_\_\_* + 3 = \_\_\_\_ + 3 = \_\_\_\_\_

The **recursive formula** for an arithmetic sequence is:

*an* = *an* – 1 + *d* where *an*-1 is the previous term

*d* is the common difference

Example:

What are the first 5 terms? \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_

An **explicit formula** for a sequence is like a function where you plug in any number *n* to get the *n*th term.

Example: To get the *n*th term of the sequence 2, 5, 8, 11, . . . we can use the rule

*an* = 2 + (*n* – 1)(3), because the sequence starts at 2 and the difference between the terms is 3 (like a slope).

The **explicit formula** for an arithmetic sequence is:

*an* = *a*1 + (*n* – 1) *d* where *a*1 is the first term,

*n* is the number of the term that you want

*d* is the common difference.

Example: *an* = 15 + (*n* – 1)(-5)

What are the first 5 terms? \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_

What is the 21st term? \_\_\_\_\_\_\_\_

Write a recursive and an explicit formula for each:

5) 3, 7, 11, 15, . . .

Recursive: Explicit:

6) 13, 7, 1, -5, . . .

Recursive: Explicit:

7) *an* = 25 + (*n* – 1)(10)

a) What are the first 5 terms? \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_

b) What is the 11th term? \_\_\_\_\_\_\_\_

8)  What are the first 5 terms? \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_, \_\_\_\_

9) If the fifth term of an arithmetic sequence is 6, and the eleventh term is 36,

1. What is the common difference?
2. What is the first term?
3. What is the recursive formula for the sequence?
4. What is the explicit formula for the sequence?