Essential Questions: What is an arithmetic sequence? What is an explicit formula? How do we use explicit formulas to find the terms in a sequence?

Do Now:

Arrange the following numbers in order from least to greatest: 17, 29, 21, 13, 25

Do you notice a pattern?

What is a sequence?

A sequence is a set of numbers that follow a particular pattern. The individual elements in a sequence are called **terms**.

List the sequence from the Do Now:_____

What is the pattern? _____
Which number is the fourth term? _____

| Term Number (position) | 1 | 2 | 3 | 4 | 5 |
|---------------------------|---|---|---|---|---|
| Term | | | | | |

Sequences are functions

- > whose domain is the set of natural numbers (1, 2, 3, 4, ...).
- > whose range consists of the terms of the sequence.
- > that can be expressed in **subscript** or **function** notation.

| Term Number | Term | Subscript Notation | Function Notation |
|----------------|------|-----------------------|----------------------|
| 1 | 1 | <i>a</i> ₁ | f(1) |
| 2 | 5 | <i>a</i> ₂ | f(2) |
| 3 | 9 | <i>a</i> ₃ | <i>f</i> (3) |
| 4 | 13 | a_4 | f(4) |
| 5 | 17 | <i>a</i> 5 | <i>f</i> (5) |
| 6 | 21 | <i>a</i> ₆ | <i>f</i> (6) |
| п | ••• | a _n | f(n) |

What is an Arithmetic Sequence?

An **arithmetic sequence** is an ordered list of numbers in which the difference between each pair of consecutive **terms** is the same. This difference is called the **common difference (d)** and it is a **constant value**.



To find the common difference: Take any term and subtract the previous term.

> The common difference in this example is _____.

To find the next term: Add the common difference to the previous term.

> The next term in this example is _____.

Let's take a look at some sequences...is there a common difference?

(2) -2, -5, -8, -11,... (3) 16, 12, 9, 8, 4, 2,... (4) $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1, \frac{5}{4}, ...$

Writing Arithmetic Sequences as Functions

You can use the first term and the common difference to write a function rule that describes an arithmetic sequence.

Let's take another look at the sequence from the Do Now. How can we find the 75th term of the sequence?

13, 17, 21, 25, 29

a1 = _____ d = _____

| Term # | Term | Written in terms of | Term |
|--------|-----------------------|-----------------------|----------------|
| n | ۵n | a1 and a | |
| 1 | a 1 | a 1 | 13 |
| 2 | a ₂ | a1+ d | 13 + 4 = 17 |
| 3 | ۵3 | a1+ d + d> a1+ 2d | 13 + 2(4) = 21 |
| 4 | Q 4 | a1+ d + d + d> a1+ 3d | 13 + 3(4) = 25 |
| n | an | | |

The Explicit Formula to find the *n*th term of an arithmetic sequence:
Subscript Notation
$$\mathbf{a}_{n}$$
 =

Function Notation

a(n) =

Use the explicit formula (function rule) from the Do Now to determine the 75th term of the sequence.

- (5) Given the following arithmetic sequence: 2, 6, 10, 14, ...
 - a) Define the sequence explicitly. b) Find the 15th term. n =_____

a1 = _____ d = _____

(6) Given the following arithmetic sequence: 160, 140, 120, 100, ...

a) Write an equation for the nth term. b) Find the 10th term. n =_____

a1 = _____ d = _____



The increase or decrease in an arithmetic sequence is called the ______.
The explicit formula for an arithmetic sequence allows you to find the *n*th term of the sequence by substituting the values of ______ (first term) and ______ (common difference) in the equation and = ______.

For #'s 1 and 2, write the next three terms of the arithmetic sequence.

1) First term: 32) First term: 15Common difference: 11Common difference: -6

For #'s 3 - 5, find the common difference of the arithmetic sequence.

3) -15, -10, -5, 0, ... 4) 240, 210, 180, 150, ... 5) 2, $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, ...

For #'s 6 and 7:

- (a) Write an equation for the nth term of the arithmetic sequence.
- (b) Using your equation, find a_{10} .

6) -3, -1, 1, 3, ... 7) 2, -3, -8, -13, ...