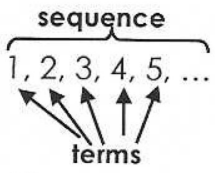
Notes:

Arithmetic Sequence

Created for you by Ms. Nhotsoubanh

A **sequence** is an ordered list of numbers, geometric figures, letters, or other objects. A sequence may be named or referred to as "a_n" or "a". The numbers in the ordered list are called terms.

Example



The two specific sequences we will study are arithmetic and geometric sequences.

Example

- *Sequence 1:* 2, 6, 10, 14,..... (+4 +4 +4) arithmetic
- *Sequence 2:* 2, 6, 18, 54,..... (×3 ×3 ×3) geometric

We can think of the term number as the input (domain) and the actual term in the sequence as the output (range). Instead of using x for the input we are going to use n and instead of using y for the output, we are going to use a_n.

Arithmetic Sequence - is a sequence of terms that have a common difference between them. The common difference is often written as "d."

Explicit formula is a formula that allows you direct computation of any term in an arithmetic sequence.

Explicit formula ⇒ $a_n = a_1 + (n - 1)d$

To find the common difference, (d) Subtract any term from the term that follows it.

Common differences can be negative.

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Glue on page 44

Fold along solid line.

Directions: For the following arithmetic sequence, find the 1st term (a) and the common difference(d) and state the explicit formula. Then find the 7th term and the 20th term.

1.) −10, −4, 2, 8, 14,... (+6 +6 +6, d = 6)

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

$a_n = -10 + 6(n-1)$

$a_n = -10 + 6n - 6$

$a_n = -16 + 6n$ explicit formula

↑ type of sequence ... Linear

$a_7 = -16 + 6(7)$

$a_7 = 26$

$a_{20} = -16 + 6(20)$

$a_{20} = 104$

2.) 10, 8, 6, 4,... (−2 −2, d = −2)

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

$a_n = 10 - 2(n-1)$

$a_n = 10 - 2n + 2$

$a_n = 12 - 2n$ explicit formula

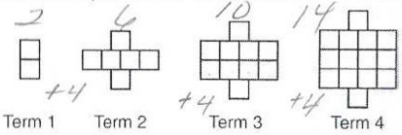
$a_7 = 12 - 2(7)$

$a_7 = -2$

$a_{20} = 12 - 2(20)$

$a_{20} = -28$

3.) Caitlin creates the pattern of blocks below in her art class.



d = 4

Assuming the pattern continues, how many blocks will there be when Caitlin gets to the pattern with 7 rows?

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

$a_n = 2 + 4(n-1)$

$a_n = 2 + 4n - 4$

$a_n = -2 + 4n$ explicit

$a_7 = -2 + 4(7)$

$a_7 = 26$ blocks

4.) The third term in an arithmetic sequence is 10 and the fifth term is 26. If the first term is a_1, what is the equation for the nth term of this sequence?

n	a_n
3	10
5	26

(+2, +16)

plug into a_1 & L_2 to get formula → use table

$m = \frac{\Delta y}{\Delta x} = \frac{16}{2} = 8$

common difference

6, 2, 10, +8, 18, +8, 26

$a_n = 8n - 14$ explicit formula

$a_1 = -6$

Given the first term and the common difference of an arithmetic sequence **find** the **first five terms** and **the explicit formula**.

5) $a_1 = 28$, $d = 10$

28, 38, 48, 58, 68

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

$a_n = 28 + 10(n-1)$

$a_n = 28 + 10n - 10$

$a_n = 18 + 10n$

6) $a_1 = -34$, $d = -10$

−34, −44, −54, −64, −74

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

$a_n = -34 - 10(n-1)$

$a_n = -34 - 10n + 10$

$a_n = -24 - 10n$ explicit formula