

TOPIC: INTRO TO SEQUENCES

Intro to Sequences

◆ A **sequence** is a function represented as the *general term* _____, whose domain is all _____ integers.

► Inputs are called **Indexes**, represented by _____.

► Outputs are called **Terms**, represented by _____.

New

$$a_n = \{a_1, a_2, a_3, \dots\}$$

(Sequence Notation)

EXAMPLE

Find the first three terms and the tenth term of the sequence whose general term is given below.

$$a_n = 2^n$$

1st term, $n = 1$: $a = 2^{()} =$

2nd term

3rd term

.

.

.

10th term

◆ A sequence can be *infinite* (go on _____) or *finite* (_____ after a certain number).

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PRACTICE

List the first four terms of each sequence whose general term is given.

(A) $a_n = 5 - 2n$

(B) $a_n = n^2 - 4n + 2$

EXAMPLE

List the first 4 terms of the following alternating sequence.

(A) $a_n = (-1)^n 2^{n-1}$

(B) $a_n = (-1)^{n+1} n^2$

PRACTICE

What is the value of the term being asked for?

$$a_n = \frac{2n + 1}{n + 4}$$

$$a_4 = ?$$

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EXAMPLE

List all the terms of the finite sequence defined by:

(A) $a_n = 4 - n$ for $1 \leq n \leq 6$

(B) $a_n = \frac{n}{2n + 1}$
for $n = \{1, 2, 3, 4, 5\}$

EXAMPLE

For each sequence given below, find the term being asked.

(A) 2, 5, 8, 11, 14, ...

Find the 10th term.

(B) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \dots$

Find the 12th term.

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Writing a General Formula

◆ The **General** ("explicit") **Formula** of a sequence is an equation for a_n ("general term") containing n . ($n = 1, 2, 3, \dots$)

► To determine the general formula, find the _____ between the numbers.

Common Patterns in General Formulas of Sequences				
If sequences...	Increase by 1 or 2 or 3...	Alternating signs	Contain fractions	Increase exponentially
Formula contains...*	n or $2n$ or $3n...$	$(-, +, -, \dots) \rightarrow (-1)^n$ $(+, -, +, \dots) \rightarrow (-1)^{n+1}$	Fractions (top & bottom may be different)	$(\#)^n$
EXAMPLE	$\{5, 6, 7, 8, 9\}$	$\{-5, 5, -5, 5, -5\}$	$\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \dots\}$	$\{2, 4, 8, 16, 32\}$

*Note: You will often have to adjust your formula by $+$, $-$, $\times$, $\div$ constants to get the desired sequence!

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EXAMPLE

Given the first 4 terms of a sequence shown below, write the general formula for the n th term and use it to calculate the 15th term.

$$\left\{ \frac{1}{1 \cdot 2}, \frac{1}{2 \cdot 3}, \frac{1}{3 \cdot 4}, \frac{1}{4 \cdot 5}, \dots \right\}$$

EXAMPLE

Given the first 5 terms of a sequence shown below, write the general formula for the n th term and use it to calculate the 18th term.

$$\{-2, 4, -6, 8, -10, \dots\}$$

EXAMPLE

Carla saves money by increasing the amount she saves each week by \$10. She saved \$50 in the first week, \$60 in the following week, \$70 the next week, and so on...

How much will she have saved in Week 8?