

4.6 Arithmetic Sequences

Algebra 1: 4.6 Arithmetic Sequences

An Arithmetic Sequence is a sequence where you add the same number (could be a negative number) every time to get the next term.

3, 5, 7, 9, 11

Pattern: add 2.

"Common Difference": the # you add to get the next term.

Abbreviated as d

Ex: Is the following sequence arithmetic? If so, what is the common difference? yes

11, 7, 3, -1, -5

-4 -4 -4 -4

$$d = -4$$

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Finding the common difference on difficult sequences.

Ex: Is the sequence arithmetic? if so, state the common difference.

$$\frac{2}{3}, \frac{17}{12}, \frac{13}{6}, \frac{35}{12}, \dots$$

"Generalizing" to the "Arbitrary" Sequence to see a pattern.

$$a_1, a_2, a_3, a_4, \dots$$

if this is arithmetic, then

$$\begin{array}{r} a_1 + d = a_2 \\ -a_1 \qquad -a_1 \end{array}$$

$$d = a_2 - a_1$$

term notation

$$a_n$$

"a sub n"

Ex: a_1 is 1st term.

Shortcut: If the sequence is arithmetic, you can take any term MINUS the PREVIOUS term to find the common difference.

So take the 2nd term (a_2) minus the 1st term (a_1)

$$\frac{17}{12} - \frac{2}{3} = \frac{3}{4} \quad d = \frac{3}{4}$$

calculator
so does $\frac{3}{4}$
continue to be
the common difference?

check to see
if it holds.

$$\frac{17}{12} + \frac{3}{4} = \frac{13}{6} \quad \checkmark \quad \frac{13}{6} \text{ is the 3rd term.}$$

"d"

$$\frac{13}{6} + \frac{3}{4} = \frac{35}{12} \quad \checkmark \quad \text{so } d = \frac{3}{4}$$

"d"

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Ex: Write the first 5 terms of the arithmetic sequence that has a first term of -6 and a common difference of 7.

$$\begin{array}{cccc} -6, & 1, & 8, & 15, & 22 \\ \swarrow & \swarrow & \swarrow & \swarrow & \\ +d & +d & +d & +d & \\ +7 & +7 & +7 & +7 & \end{array}$$

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Explicit/General Rule for Arithmetic Sequences (sometimes called an equation):

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

The only part you have to change is a_1 and d . The rest stays the same for every general rule.

Write a general rule for the following arithmetic sequences. Then state the 20th term in each sequence

Ex: 7, -1, -9, -17, ...

$$a_1 = 7$$

$$d = \text{Any term} - \text{Previous term}$$
$$-9 - -1 = -8$$

General Rule: Formula $a_n = \square + (n-1)(\square)$

$$a_n = 7 + (n-1)(-8)$$

Plug in 20 for n to find 20th term

$$a_{20} = 7 + (20-1)(-8) = -145$$

Ex: $\frac{1}{2}, 2, \frac{7}{2}, 5, \frac{13}{2}, \dots$

$$a_1 = \frac{1}{2} \quad d = 2 - \frac{1}{2} = \frac{3}{2}$$

• Rule: $a_n = \frac{1}{2} + (n-1)(\frac{3}{2})$

• 20th term: $a_{20} = \frac{1}{2} + (20-1)(\frac{3}{2})$
 $= 29$

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Homework:

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3-5, 8, 9, 11, 34-36