

Questions over 8.1?

99

$$3 - 9 + 27 - 81 + 243 - 729$$

$$\frac{3}{3^1} \quad \frac{-9}{3^2} \quad \frac{27}{3^3} \quad \frac{-81}{3^4} \quad \frac{243}{3^5} \quad \frac{-729}{3^6}$$

$$\sum_{n=1}^6 (-1)^{n+1} 3^n = -546$$

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8.2: Arithmetic Sequences and Series

Review

Recall that a sequence that is defined **recursively** is a sequence where each term is dependent on the one(s) before it. Such as:

$$a_1 = 2; a_{n+1} = a_n + 3.$$

Example 1

List the first 5 terms of the above recursive sequence.

$$2, 5, 8, 11, 14$$

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Arithmetic Sequences

The previous example is called an **arithmetic sequence**, which is a sequence such that each term after the first is found by **adding** the same number to the preceding term. The number that is added each time is called the **common difference** and is typically denoted by d .

Q: What was the common difference, d , for Example 1?

A:

$$d = 3$$

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Example 2

For each of the following arithmetic sequences, identify the first term, a_1 , and the common difference, d .

[A] 5, 7, 9, 11, 13, ... $a_1 = 5$ $d = 2$

[B] 2, 1, 0, -1, -2, ... $a_1 = 2$ $d = -1$

[C] $1, \frac{17}{16}, \frac{9}{8}, \frac{19}{16}, \frac{5}{4}, \dots$ $a_1 = 1$ $d = \frac{1}{16}$

p. 598, #1-7 (odd) (HW)

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Thus, in general, arithmetic sequences with a common difference d take the form:

$$a_{n+1} = a_n + d$$

a_1
 $a_2 = a_1 + d$
 $a_3 = a_1 + 2d$
 $a_4 = a_1 + 3d$

The n th term of an arithmetic sequence is given by $a_n = a_1 + (n-1)d$ for any integer $n \geq 1$.

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Example
 Find a formula for a_n if $a_1=15$ and $d=4$.

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

$$a_n = 15 + (n-1)(4)$$

$$a_n = 15 + 4n - 4$$

$$a_n = 4n + 11$$

p. 598, #21 (HW)

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Example
 Find a formula for a_n if $a_1=-4$ and $a_5=16$. $d=5$

$$a_5 = a_1 + 4d$$

$$\frac{16}{+4} = \frac{-4 + 4d}{+4}$$

$$\frac{20}{4} = \frac{4d}{4}$$

$$5 = d$$

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

$$a_n = -4 + (n-1)(5)$$

$$a_n = -4 + 5n - 5$$

$$a_n = 5n - 9$$

p. 598, #23 (HW)

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Example
 Find a formula for a_n if $a_6=-38$ and $a_{11}=-73$. $a_1=3$ $d=-7$

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

$$-38 = a_1 + (6-1)(-7)$$

$$a_{11} = a_6 + 5d$$

$$\frac{-73}{+38} = \frac{-38 + 5d}{+38}$$

$$\frac{-35}{-35} = \frac{5d}{-35}$$

$$-7 = d$$

$$-38 = a_1 - 35$$

$$-3 = a_1$$

$$a_n = -3 + (n-1)(-7)$$

$$a_n = -3 - 7n + 7$$

$$a_n = -7n + 4$$

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HOMEWORK...arithmetic=add.

8.2a (p. 598): 1-33 (odd)

WARM UP

Recall the formula for finding the general term of an arithmetic sequence: $a_n = \underline{\hspace{2cm}}$.

Use this formula to work exercises 35-41 (odd); these are part of tonight's homework.

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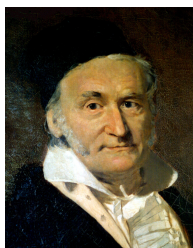
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Arithmetic Series

Q: What's a series?

A:

Two ways to notate a series:



$$1 + 2 + \dots + 49 + 50 + 51 + 52 + \dots + 99 + 100$$

p. 599, #57 (HW)

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Example

Find the sum of the first 65 terms of the arithmetic series

$$33 + 39 + 45 + 51 + \dots$$

p. 599, #63 (HW)

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Example

Find the sum of the arithmetic series $\sum_{i=1}^{10} (6i - 4)$

p. 599, #73 (HW)

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Example

How many poles will be in a stack of telephone poles if there are 50 in the first layer, 49 in the second, and so on, with 6 in the top layer?

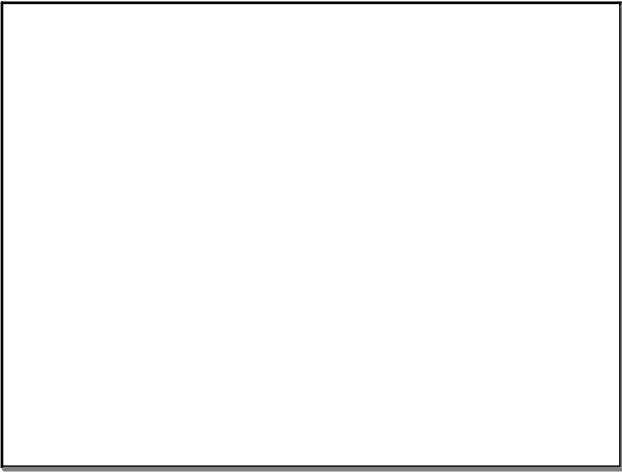
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HOMework

...arithmetic=add.

8.2b (p. 598): 35-41 (odd), 57-73 (odd), 81, 83

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