

Arithmetic Series Encyclopedia Article

Arithmetic Series

The following sections of this BookRags Literature Study Guide is offprint from Gale's For Students Series: Presenting Analysis, Context, and Criticism on Commonly Studied Works: Introduction, Author Biography, Plot Summary, Characters, Themes, Style, Historical Context, Critical Overview, Criticism and Critical Essays, Media Adaptations, Topics for Further Study, Compare & Contrast, What Do I Read Next?, For Further Study, and Sources.

(c)1998-2002; (c)2002 by Gale. Gale is an imprint of The Gale Group, Inc., a division of Thomson Learning, Inc. Gale and Design and Thomson Learning are trademarks used herein under license.

The following sections, if they exist, are offprint from Beacham's Encyclopedia of Popular Fiction: "Social Concerns", "Thematic Overview", "Techniques", "Literary Precedents", "Key Questions", "Related Titles", "Adaptations", "Related Web Sites". (c)1994-2005, by Walton Beacham.

The following sections, if they exist, are offprint from Beacham's Guide to Literature for Young Adults: "About the Author", "Overview", "Setting", "Literary Qualities", "Social Sensitivity", "Topics for Discussion", "Ideas for Reports and Papers". (c)1994-2005, by Walton Beacham.

All other sections in this Literature Study Guide are owned and copyrighted by BookRags, Inc.



Contents

Arithmetic Series Encyclopedia Article.....	1
Contents.....	2
Arithmetic Series.....	3



Arithmetic Series

A sequence of numbers is said to be **arithmetic** if the difference between any two successive terms is the same. For example the sequence 1,3,5,7,9,... is arithmetic because the difference between any two consecutive terms is 2. This difference is usually called the common difference. Thus the common difference in the arithmetic sequence 2,6,10,14,... is 4. If the terms of an arithmetic sequence are added together, this sum is called an arithmetic series. So $1+3+5+7+\dots$ and $2+6+10+14+\dots$ are arithmetic series. Arithmetic series may be infinite or finite. The finite arithmetic series $1+3+5+7+9$ has a sum of 25. There is a formula for computing the sum of a finite arithmetic series which is useful when the number of terms is large. The young Carl Freidrich Gauss (1777-1855), who would later become one of the greatest mathematicians of all time, is said to have discovered this formula when his elementary school teacher assigned the class the task of adding up all the **whole numbers** from 1 to 100. While the other students began the drudgery of adding the numbers one by one, Gauss suddenly realized that there was a simpler way. The sum $1+2+3+4+\dots+97+98+99+100$ is an arithmetic series with common difference 1. Gauss noticed that the sum of $1+100=101$, $2+99=101$, $3+98=101$, $4+97=101$, and so on through $50+51=101$. So, he reasoned, there are 50 pairs of numbers each of whose sum is 101; therefore, the sum of this series is $101 \times 50 = 5050$. Gauss, of course, finished before the other students and was the only one to get the correct answer. Notice that 101 is the sum of the first and last terms of the series and 50 is the number of pairs or $100/2$. So if 101×50 is written as $101 \times 100/2$ it can be seen as a special case of the formula (first term + last term) \times (the number of terms) divided by 2. In general, if the n th term of the series is designated by a_n , then $a_1 + a_2 + a_3 + \dots + a_n = (n(a_1 + a_n))/2$. If we try this out on $1+3+5+7+9$, we get $5(1+9)/2=25$, which agrees with our answer from summing the terms in the usual way.