

A SERIES SURPRISE



Isaac Newton was one of the inventors of the calculus, in which series play an important role.

What is the sum of the series
 $\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} + \frac{1}{4 \cdot 5} + \frac{1}{5 \cdot 6} + \dots + \frac{1}{99 \cdot 100}$?

Adding a series of 99 fractions by finding a common denominator would be frustrating and difficult! Instead, find the sum of this series by observing a pattern.

The first term equals $\frac{1}{2}$. Find the sum of the series by adding the first two terms, the first three terms, etc., and enter your results in the table. Discover the pattern to solve this problem!

$$\frac{1}{1 \cdot 2} = \frac{1}{2}$$

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} = \frac{1}{2} + \frac{1}{6} = \frac{2}{3}$$

$$\frac{1}{1 \cdot 2} + \frac{1}{2 \cdot 3} + \frac{1}{3 \cdot 4} = \frac{1}{2} + \frac{1}{6} + \frac{1}{12} = ?$$

1	
2	$\frac{2}{3}$
3	
4	
5	
99	

QUESTIONS:

1. What does the sum of the series get closer to as the number of terms increases?
2. Finding the sum of the first n terms in a series is an important process. In calculus, this is called the "nth partial sum." What is the sum of the first n terms in this series?
3. Find the sum of the first 50 terms and the first n terms for the series

$$\frac{1}{1 \cdot 3} + \frac{1}{3 \cdot 5} + \frac{1}{5 \cdot 7} + \frac{1}{7 \cdot 9} + \frac{1}{9 \cdot 11} + \dots$$

[Source: Historical Connections in Mathematics, Volume I ©1992 AIMS Education Foundation, p. 61]