A very enlightening theorem by Carl Friedrich Gauss

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Background

- Born in Braunschweig, Germany
  - English – Brunswick
- Teacher in elementary school gave his class the assignment of summing the first 100 integers
  - $1+2+3+\ldots+98+99+100$
- Gauss almost immediately produced an answer of 5,050.

There are discrepancies about the exact story and his age at the time of the story.

Hayes, 2006
How did he solve this so quickly?

\[
1 + 2 + 3 + \ldots + 98 + 99 + 100 = N
\]
\[
+ 100 + 99 + 98 + \ldots + 3 + 2 + 1 = N
\]
\[
101 + 101 + 101 + \ldots + 101 + 101 + 101 = 2N
\]

\[
10100 \rightarrow 101 \times 100
\]

(add 2 zeros)

\[
10100 = 2N
\]
\[
\frac{2}{2} = 2
\]
\[
5050 = N
\]
1 + 2 + 3 + … + 8 = ?

Using Gauss’ Method: \(8(9) \div 2\)

Number of numbers in sequence

Sum of every individual sum

\[\frac{72}{2} = 36\]

Theorem: \(1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}\)

\(n = \) the number of consecutive numbers being summed
Useful in solving other problems
- Graph Theory
- Used for data algorithm analysis

Gross, 2009
Sources


