Question

$1 + 2 + 3 + \ldots + n =$

Answer

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

Solution

If n is even:

1+2+3+…+n =

(1+n) + (2+(n-1)) + (3+(n-2)) + …

All these terms sum to n+1 and there are n/2 such terms. Thus, the sum is

(n/2)*(n+1) = $\frac{n(n+1)}{2}$

If n is odd:

Let's omit the last term for now, leaving us with an even number. We can use the logic above, taking (n-1)/2 pairs of sums of n+1 to get a total of: (n-1)*n/2. =

$(n^2 - n)/2$. Now let's add that last term of n:

$(n^2 - n)/2 + n =$

$(n^2 - n)/2 + 2n/2 =$

$(n^2 + n)/2 =$

$$\frac{n(n+1)}{2}$$

So, the answer is n(n+1)/2 whether n is odd or even.