Sum of numbers from 1 to n is given by the mathematical formula:

$$\sum_{k=1}^{n} k = \underbrace{1 + 2 + 3 + \cdots + n}_{\text{n terms}} = \frac{n(n+1)}{2}$$

Note: $\sum_{k}^{n} m$ is Sum(from k to n) m

Sum of numbers that are multiples of m from m to n is:

$$m + 2m + 3m + \cdots + mr, n - m \leq mr \leq n, r \in Z$$

Take the common multiple m:

$$m\ (\underbrace{1 + 2 + 3 + \cdots + r}_{\text{r terms}}), \frac{(n-m)}{m} \leq r \leq \frac{n}{m}, r \in Z$$

$$m\left(\sum_{k=1}^{r} k\right) = m\frac{r * (r+1)}{2}$$

$r = \left\lfloor \frac{n}{m} \right\rfloor$ since $n - m \leq mr \leq n\ \ AND\ r \in Z$

Note: $\lfloor x \rfloor$ is floor(x)

$$m\left(\sum_{k=1}^{\left\lfloor \frac{n}{m} \right\rfloor} k\right) = m\frac{\left\lfloor \frac{n}{m} \right\rfloor * \left(\left\lfloor \frac{n}{m} \right\rfloor + 1\right)}{2}$$

Solution becomes:

$$3\left(\sum_{k=1}^{\left\lfloor \frac{999}{3} \right\rfloor} k\right) + 5\left(\sum_{k=1}^{\left\lfloor \frac{999}{5} \right\rfloor} k\right) \underbrace{- 3 * 5\left(\sum_{k=1}^{\left\lfloor \frac{999}{3*5} \right\rfloor} k\right)}_{}$$

notice that we add multiples of 3*5 twice
so, remove of the multiples of 3*5 once

$$3\frac{\left\lfloor \frac{999}{3} \right\rfloor * \left(\left\lfloor \frac{999}{3} \right\rfloor + 1\right)}{2} + 5\frac{\left\lfloor \frac{999}{5} \right\rfloor * \left(\left\lfloor \frac{999}{5} \right\rfloor + 1\right)}{2} - 15\frac{\left\lfloor \frac{999}{15} \right\rfloor * \left(\left\lfloor \frac{999}{15} \right\rfloor + 1\right)}{2}$$