To start with, I will rewrite the inequality to this form:

$$\left|\sum_{k=1}^{n} O(k) - \sum_{k=1}^{n} E(k)\right| \leq n$$

The reason why I rewrote the inequality like this is because we can easily get the number of numbers from 1 to n divisible by k with formula $\lfloor n/k \rfloor$. As a result, the inequality is equivalent to:

$$\left|\sum_{k=1}^{\lceil n/2 \rceil} \left\lfloor \frac{n}{2k-1} \right\rfloor - \sum_{k=1}^{\lceil n/2 \rceil} \left\lfloor \frac{n}{2k} \right\rfloor\right| \leq n$$

Now we will solve this inequality for two cases – when the value in the vertical bars are positive and when it is negative.

When the value is positive, then:

$$\sum_{k=1}^{\lceil n/2 \rceil} \left\lfloor \frac{n}{2k-1} \right\rfloor \leq n + \sum_{k=1}^{\lceil n/2 \rceil} \left\lfloor \frac{n}{2k} \right\rfloor$$

$$\left\lfloor \frac{n}{1} \right\rfloor + \left\lfloor \frac{n}{3} \right\rfloor + ... \leq n + \left\lfloor \frac{n}{2} \right\rfloor + \left\lfloor \frac{n}{4} \right\rfloor + \left\lfloor \frac{n}{6} \right\rfloor + ...$$

Because $n \leq n$, $n/3 \leq n/2$, $n/5 \leq n/4$ etc., this inequality has to hold in this case.

When the value is negative, then similarly:

$$\sum_{k=1}^{\lceil n/2 \rceil} \left\lfloor \frac{n}{2k} \right\rfloor \leq n + \sum_{k=1}^{\lceil n/2 \rceil} \left\lfloor \frac{n}{2k-1} \right\rfloor$$

$$\left\lfloor \frac{n}{2} \right\rfloor + \left\lfloor \frac{n}{4} \right\rfloor + \left\lfloor \frac{n}{6} \right\rfloor + ... \leq n + \left\lfloor \frac{n}{1} \right\rfloor + \left\lfloor \frac{n}{3} \right\rfloor + \left\lfloor \frac{n}{5} \right\rfloor + ...$$

Because $n/2 \leq n$, $n/4 \leq n$, $n/6 \leq n/3$ etc., the inequality holds in both cases, so the proof is complete.