$$A_k = \frac{1}{2} h \left[f(a+(k-1)h + f(a+kh) \right]$$

$$I(a,b) = \int_a^b f(x)\,dx \simeq \sum_{k=1}^{N} A_k$$

$k = 1 \rightarrow A_1 = \frac{1}{2} h \left[f(a) + f(a+h) \right]$

$k = 2 \rightarrow A_2 = \frac{1}{2} h \left[f(a+h) + f(a+2h) \right]$

$\vdots$

$k = N$; $h = \frac{(b-a)}{N} \rightarrow b = a + Nh$

$$A_N = \frac{1}{2} h \left[f(a + (N-1)h + f(\underbrace{a+Nh}_{b}) \right]$$

$$\sum_{k=1}^{N} A_k = \frac{1}{2}h\left[f(a) + 2f(a+h) + 2f(a+2h) + \right.$$

$$\left. + \cdots f(b)\right]$$

$$= h\left[\frac{1}{2}f(a) + f(a+h) + \cdots + \frac{1}{2}f(b)\right]$$

$$\sum_{k=1}^{N} A_k = h\left[\frac{1}{2}f(a) + \frac{1}{2}f(b) + \sum_{k=1}^{N-1} f(a+kh)\right]$$