CSSE230 – MCSS O(N^3) Version

Example:
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a = [-2,11,-4,13]
|a| = 4, so N = 4
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[ ] i j k	# of iterations of innermost loop	Summation for # of times inner loop executed
0 0 0	1	$$\sum_{l}^{N} l = \frac{N(N+1)}{2}$$ $$N = 4, so\ \frac{4(5)}{2} = 10$$
0 1 0 0 1 1	2	
0 2 0 0 2 1 0 2 2	3	
0 3 0 0 3 1 0 3 2 0 3 3	4	
1 1 1	1	$$\sum_{l}^{N-1} l = \frac{(N-1)(N)}{2}$$ $$N = 4, so\ \frac{3(4)}{2} = 6$$
1 2 1 1 2 2	2	
1 3 1 1 3 2 1 3 3	3	
2 2 2	1	$$\sum_{l}^{N-2} l = \frac{(N-2)(N-1)}{2}$$ $$N = 4, so\ \frac{2(3)}{2} = 3$$
2 3 2 2 3 3	2	
3 3 3	1	$$\sum_{l}^{N-3} l = \frac{(N-3)(N-2)}{2}$$ $$N = 4, so\ \frac{1(2)}{2} = 1$$
Closed Forms Required $$\sum_{k=0}^{n} k = \frac{n(n+1)}{2}$$ $$\sum_{k=0}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$$		$$\sum_{m=1}^{N} \frac{m(m+1)}{2}$$ $$For\ N = 4, inner\ loop\ executed:\ \sum_{m=1}^{4} \frac{m(m+1)}{2} = 1 + 3 + 6 + 10 = 20$$ $$In\ General:\ \sum_{m=1}^{N} \frac{m(m+1)}{2} = \sum_{m=1}^{N} \frac{m^2+m}{2} = \frac{1}{2}\sum_{m=1}^{N} m^2 + \frac{1}{2}\sum_{m=1}^{N} m = \frac{N(N+1)(N+2)}{6}$$