- CSE547

- Chapter 2, Problem 6

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- What is the value of $\sum_k [1 \leq j \leq k \leq n]$, as a function of j and n?

Information

k lies between j and n $\{j \leq k \leq n\}$

j lies between 1 and n $\{1 \leq j \leq n\}$

It's a summation of '1' over one index k such that it satisfies the condition, $1 \leq j \leq k \leq n$

j here is just another constant like n.

Groundwork- A recap of different summation notations

- $\Sigma_{P(k)} a_k$ **implies that a is a function of k which is subject to iterative summation with P(k) defining the limits of summation.**
- $\Sigma_{P(k)} a_k = \Sigma_{k \in K} a_k = \Sigma_K [P(k)] a_k$

where :

$K = \{k \in N : P(k)\}$

and K is FINITE

A Recap of notations for summation!

The summation now becomes something like this:
$\sum_k [P(k)]$,

$\Rightarrow \sum_k [P(k)] = \sum_{P(k)} 1$

i.e. For our problem $\sum_k [1 \leq j \leq k \leq n]$, **P(k) is** **$[1 \leq j \leq k \leq n]$ and a_k is 1 for all k. (Notice that a_k is a constant)**

The Problem now is…

Since

$[1 \leq j \leq k \leq n] = [1 \leq j \leq n]$ and $[j \leq k \leq n]$

Our problem is now:

$\sum_{j \leq k \leq n} 1$

The Problem and the solution:

We need to add 1 (n-j+1) times. Which gives us,

$\sum_{j \leq k \leq n} 1$

$= (n-j+1)$

Solution Continued…

One small thing to finish it up, if value of j doesn't satisfy the condition $j \leq k \leq n$ we need to evaluate the sum to zero.

Hence our final answer would be,

$[j \leq k \leq n](n-j+1)$