CSE 250 Recitation

January 30 - 31: Welcome, Summations, Linked Lists

Welcome

Introductions

- SAs: Who are we?
- Class: Who are you?

Participation

- Written exercises during recitation
- Not about getting it right…it's about gaining hands on experience*
- Good opportunity to ask questions
- **Turned in with your name and UBIT for attendance** (see syllabus)

* we reserve the right to not count participation with no effort

Summations – General Form

$$\sum_{i=j}^{k} f(i) = f(j) + f(j+1) + \ldots + f(k)$$

Summations - Examples

k is 7

f(i) is 5i

$$\sum_{i=4}^{7} 5i = 20 + 25 + 30 + 35$$

f(4) f(5) f(6) f(7)

j is 4

Summations - Examples

k is n^2

f(i) is 15n i

$$\sum_{i=n}^{n^2} 15n \cdot i = 15n^2 + 15n \cdot (n+1) + ... + 15n^3$$

j is n

f(n) f(n+1) $f(n^2)$

The bounds of our summation can be unknowns!

Simplifying the Summation

$$\sum_{i=n}^{n^2} 15n \cdot i$$

Identify the parts of this summation are **constant with respect to the summation variable**

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(notice how on the previous slide each term had a 15n that did not change...only the value of i did)

Simplifying the Summation

$$\sum_{i=n}^{n^2} 15n \cdot i$$

Which of S1, S8, or S9 does this most resemble?

$$\text{S1. } \sum_{i=j}^{k} c = \ldots$$

$$\text{S8. } \sum_{i=1}^{k} i = \ldots$$

$$\text{S9. } \sum_{i=0}^{k} 2^i = \ldots$$

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Simplifying the Summation

$$\sum_{i=n}^{n^2} 15n \cdot i$$

What parts of the summation don't match the rule?

$$\text{S8.} \sum_{i=1}^{k} i = \ldots$$

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$$\sum_{i=n}^{n^2} 15n \cdot i$$

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$$\text{S8. } \sum_{i=1}^{k} i = \ldots$$

Notice how the lower bound in S8 is NOT an unknown...it must be exactly 1 to match

Recitation Exercise

Simplify the summation to its closed form solution using rules on the next slide

$$\sum_{i=n}^{n^2} 15n \cdot i$$

Summation Rules

S1. $\sum_{i=j}^{k} c = (k - j + 1)c$

S2. $\sum_{i=j}^{k}(cf(i)) = c\sum_{i=j}^{k} f(i)$

S3. $\sum_{i=j}^{k}(f(i) + g(i)) = \left(\sum_{i=j}^{k} f(i)\right) + \left(\sum_{i=j}^{k} g(i)\right)$

S4. $\sum_{i=j}^{k}(f(i)) = \left(\sum_{i=\ell}^{k}(f(i))\right) - \left(\sum_{i=\ell}^{j-1}(f(i))\right)$ **(for any $\ell < j$)**

S5. $\sum_{i=j}^{k} f(i) = f(j) + f(j+1) + \ldots + f(k-1) + f(k)$

S6. $\sum_{i=j}^{k} f(i) = f(j) + \ldots + f(\ell - 1) + \left(\sum_{i=\ell}^{k} f(i)\right)$ **(for any $j < \ell \leq k$)**

S7. $\sum_{i=j}^{k} f(i) = \left(\sum_{i=j}^{\ell} f(i)\right) + f(\ell + 1) + \ldots + f(k)$ **(for any $j \leq \ell < k$)**

S8. $\sum_{i=1}^{k} i = \frac{k(k+1)}{2}$

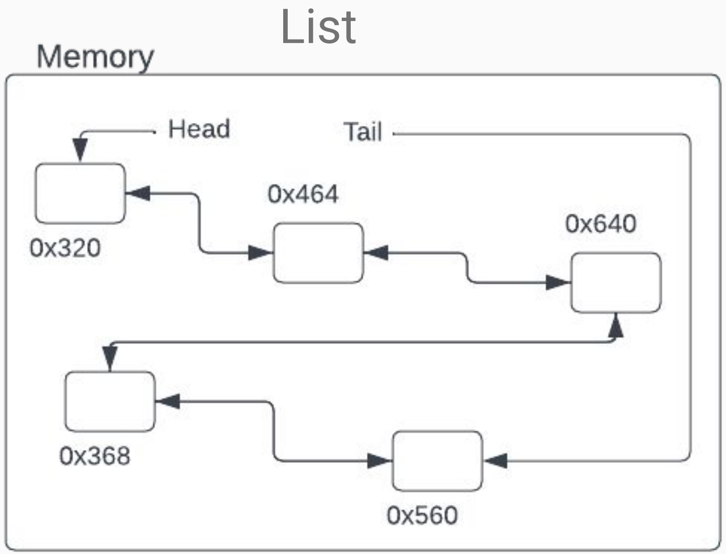
S9. $\sum_{i=0}^{k} 2^i = 2^{k+1} - 1$

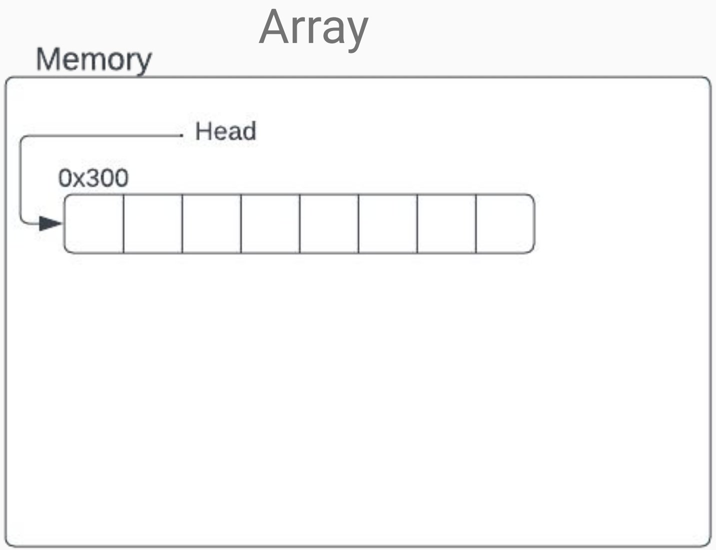
$$\sum_{i=n}^{n^2} 15n \cdot i$$

"Bonus" Question

$$\sum_{x=0}^{n} \sum_{y=1}^{k} (x + 1)$$

Linked Lists vs. Arrays





Recitation Exercise

Write out **pseudocode** for the following two algorithms:

1. Find the value of a linked list node at a given index
2. Find the index of a linked list node with a given value (return -1 if the value does not exist)

Be Precise!

If you write good pseudocode, translating it into Java (or C, or Python, or Scala, etc) should be straightforward!