A. Product Sum

- Given \( n \) numbers \( A[1..n] \)
- Characteristic of array
  \[ c = \sum_{i=1}^{n} a_i \cdot i \]
- Allowed one change
  - Move one item from its current location to a different location
- Find the move that maximizes resulting \( c \)
Properties

- If an item $x$ is moved from location to its right by $k$ positions and if there are no items larger than it on the way, then the increase is proportional to the difference between $kx$ and the sum of the items it passes.
B. Iorha Loves Strings
C. ACM Rank

• Data contains a stream of requests
  ▪ S minute teamID problemID result
  ▪ R teamID
  ▪ T rank

• Goal is to answer each query as efficiently as possible
Augmented RB Tree

- As with Rank and Select,
  - Augment RB tree with size (of subtree) info
- S translates to
  - insert or update operation
- R translates to
  - inorder tree traversal
- T translates to
  - Doing select operation on augmented tree
E. Tree Augmentation

• Examples
  ▪ Tree -> AugTree

• Examples
  ▪ AugTree -> Tree
  ▪ Challenges
Observation

• Every vertex forms a star with its neighbors
• Every star in Tree becomes a clique in the AugTree
• Thus identify the cliques
• Is that enough
• What about adjacent neighbors in Tree?
  ▪ Cliques with common vertices
Algorithm for Augmented Tree?

• Use observations above to design an algorithm