Section 7:

Garbage Collection

CS 164 @ UC Berkeley, Spring 2024

Reminders

WA 4 is due on Thursday, March 21 at 11:59 PST.

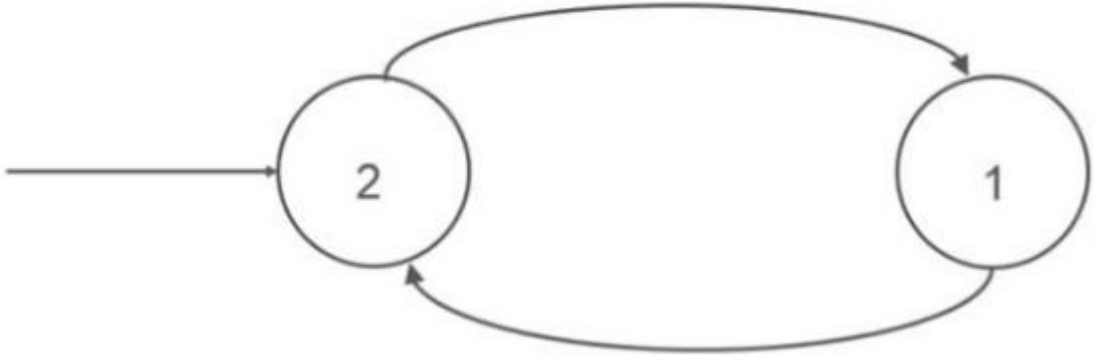
PA3 is released!

- Checkpoint is on April 8th
- Final due date is April 15th

Reminder to take care of yourselves, and to prioritize your health! WAs are worth 5% of your grade so don't stress too much about them!

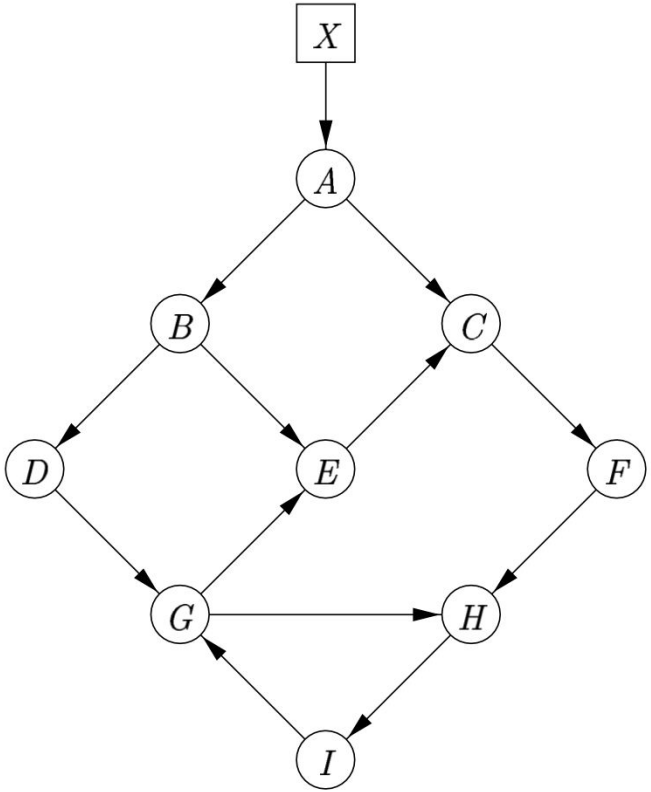
Reference Counting Garbage Collection

- Have each object keep track of number of references to it
- When an object's reference count hits 0, deallocate it
- Any pointer modifications (including deallocation) need to update pointee's reference count
- Naive reference counting fails with circular data structures



Example:

Which objects are deallocated if the link from A to B is deleted?



Reachability:

Which objects are reachable via pointers from our roots:

- Stack frames
- Registers

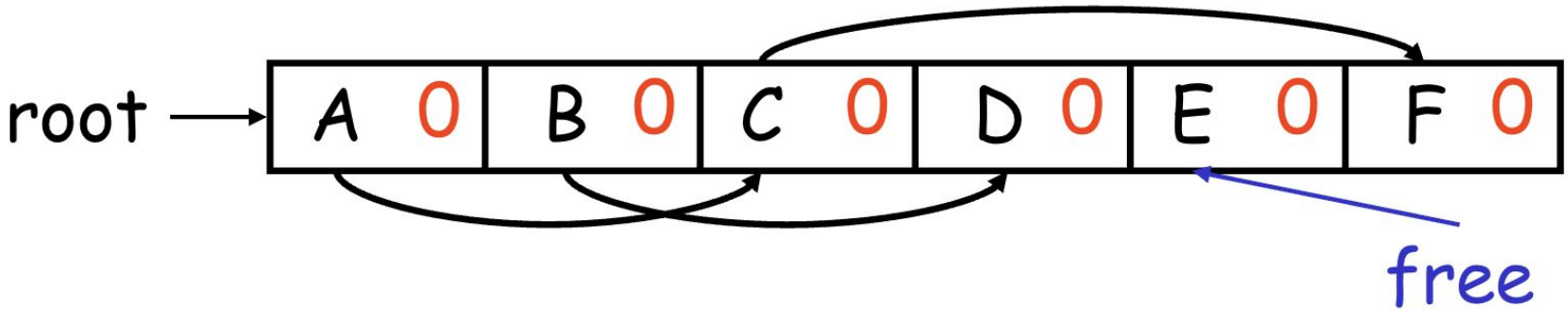
Mark & Sweep

Mark:

- Mark objects which are reachable

Sweep:

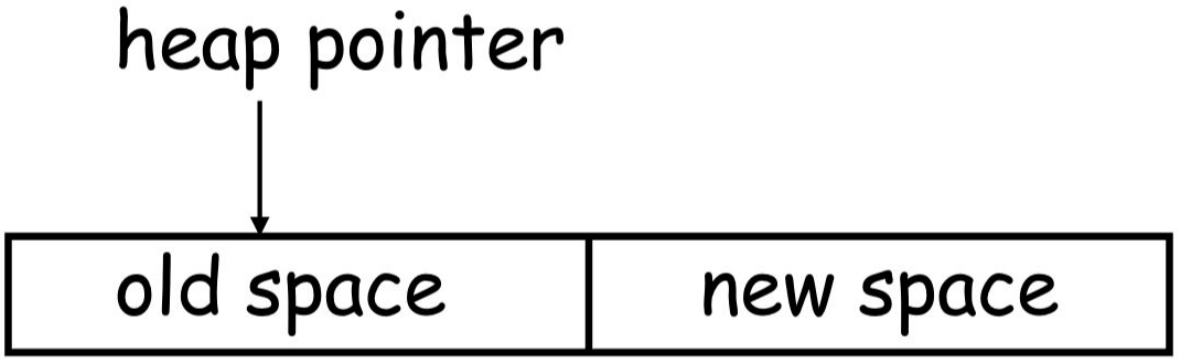
- Construct a list of freeable objects
- Commonly implemented as a linked list among the memory blocks being freed themselves



Stop & Copy

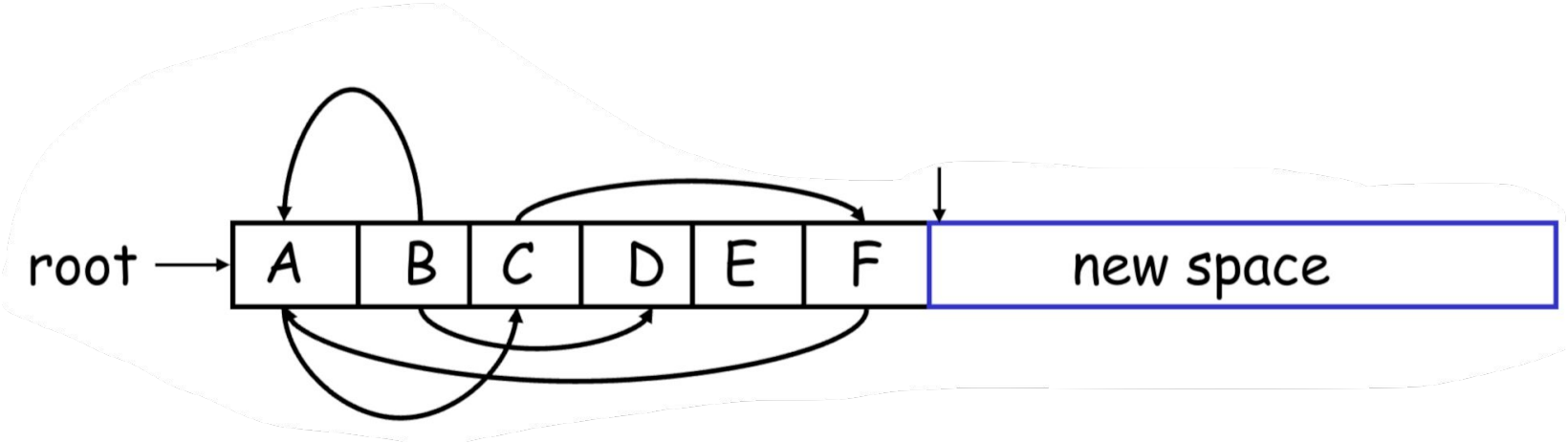
Partitions memory into two sections

When current block is filled up, copies all reachable objects to new section



Stop & Copy Example

Forwarding pointers keep track of moved objects



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