Workload 1: Sequential Allocation (Low Fragmentation)

Purpose: Baseline behavior, minimal fragmentation.

init memory 1024
set allocator first_fit
malloc 100
malloc 100
malloc 100
malloc 100
malloc 100

Expected observation:

- Single free block at the end
- Near-zero external fragmentation

Workload 2: Alternating Free Pattern (External Fragmentation)

Purpose: Create many small holes.

init memory 1024
set allocator first_fit
malloc 100
malloc 100
malloc 100
malloc 100
malloc 100
free 2
free 4
malloc 50
malloc 50

Expected observation:

- Multiple non-contiguous free blocks
- Fragmentation visible despite sufficient total free memory

Workload 3: Best-Fit Fragmentation Stress

Purpose: Show how best-fit increases fragmentation.

init memory 1024
set allocator best_fit
malloc 200
malloc 180
malloc 160
malloc 140
free 2
free 4
malloc 170
malloc 130

Expected observation:

- Many small unusable gaps
- Large external fragmentation ratio

Workload 4: Worst-Fit Behavior

Purpose: Compare worst-fit against best-fit.

init memory 1024
set allocator worst_fit
malloc 300
malloc 100
malloc 100
free 1
malloc 90
malloc 80

Expected observation:

- Large free blocks persist longer
- Different fragmentation pattern than best-fit

Workload 5: Compaction Demonstration

Purpose: Show effectiveness of compaction.

init memory 1024
set allocator first_fit
malloc 200
malloc 150
malloc 100
free 2

malloc 50
compact

Expected observation:

- Allocated blocks shifted
- One large free block at end

Workload 6: Allocation Failure Due to Fragmentation

Purpose: Show failure despite enough total free memory.

init memory 512
set allocator first_fit
malloc 200
malloc 200
free 1
malloc 180

Expected observation:

- Allocation failure before compaction
- Success after compaction