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CSSAP 443
MP1 Design Document
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A. TmemoryManager constructor pseudo-code:

```
TmemoryManager()
    fFreelinks ← new TmyList()
    for j = 0 to n –2  , j += 2
            fFreelinks.insertElement(-1, j)
```

Constructor worst-cast run time: 2 * n/2 = n, O(n)
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Data structure resulting from constructor:

Memory	-1	2	-1	4	-1	6	-1	8	…	-1	-1
Array subscript	0	1	2	3	4	5	6	7		n-2	n-1

B. TmyList.removeLinkFromList() pseudo-code:

```
removeLinkFromList(key)
    previousElement ← listHead
    currentElement ← listHead
    while(currentElement != -1  And  foundElement = false)
            if(systemMemory[currentElement] = key)
                    foundElement ← true
                    foundElementPointer ← currentElement
                    foundPrevPointer ← prevElement

            previousElement ← currentElement
            currentElement ← systemMemory[currentElement + 1]

    if(foundElment = true)
            removeItem(foundElementPointer, foundPreviousPointer)
            return foundElementPointer
    else
            return kInvalidAddress
```

TmyList.insertElement() pseudo-code:

```
insertElement(key, freeLinkAddress)
    if (list = empty)
            listHead ← freeLinkAddress
            listEnd ← freeLinkAddress
    else
            systemMemory[listEnd + 1] ← freeLinkAddress
            listEnd ← freeLinkAddress
            systemMemory[listEnd] ← key
            systemMemory[listEnd + 1] ← -1
```

C. TmemoryManager.nextFreeLink() pseudo-code:

```
TmemoryManager.nextFreeLink()
    return fFreeLinks.removeFirstLinkFromList()
```

Worst-case run time analysis: O(1) because TmyList.removeFirstLinkFromList() is O(1)

TmemoryManager.returnFreeLink() pseudo-code:

```
TmemoryManager.returnFreeLink()
    return fFreeLinks.insertElement(-1, linkAddress)
```

Worst-case run time analysis: O(1) because TmyList.insertElement() is O(1)

D. Worst-case run time analysis:
TmyQueue constructor: O(1), the TmyQueue constructor instantiates a new list, which is O(1)
TmyQueue.enQueue O(1), calls TmyList.insertElement() which is O(1)
TmyQueue.deQueue O(1), calls TmyList.removeFirstLinkFromList() which is O(1)