Austin Smothers

CISP 430

Assignment 8

It was right around this time that them old boys knew they was in a heap of trouble

HEAP SORT

Action: Insert 90

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 60

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 | 90 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 30

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 | 90 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 90 | 60 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 35

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 90 | 60 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 60 | 90 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 40

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 60 | 90 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 45

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 60 | 90 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 90 | 40 | 60 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 85

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 90 | 40 | 60 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 55

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 90 | 40 | 60 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 55 | 40 | 60 | 85 | 90 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 50

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 55 | 40 | 60 | 85 | 90 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 60 | 85 | 90 | 55 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 75

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 60 | 85 | 90 | 55 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 80

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 60 | 85 | 90 | 55 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 70

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 60 | 85 | 90 | 55 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Insert 25

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 60 | 85 | 90 | 55 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 25 | 85 | 90 | 55 | 75 | 80 | 70 | 60 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 25 | 50 | 40 | 45 | 85 | 90 | 55 | 75 | 80 | 70 | 60 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 | 35 | 30 | 50 | 40 | 45 | 85 | 90 | 55 | 75 | 80 | 70 | 60 | 20 | 65 | 10 |

Heap:

Action: Insert 20

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 | 35 | 30 | 50 | 40 | 45 | 85 | 90 | 55 | 75 | 80 | 70 | 60 | 20 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 | 35 | 30 | 50 | 40 | 45 | 20 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 | 35 | 20 | 50 | 40 | 45 | 30 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 35 | 25 | 50 | 40 | 45 | 30 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Insert 65

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 35 | 25 | 50 | 40 | 45 | 30 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Insert 10

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 35 | 25 | 50 | 40 | 45 | 30 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 35 | 25 | 50 | 40 | 45 | 30 | 10 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 90 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 35 | 25 | 10 | 40 | 45 | 30 | 50 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 90 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 10 | 25 | 35 | 40 | 45 | 30 | 50 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 90 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10 | 20 | 25 | 35 | 40 | 45 | 30 | 50 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 90 |

Heap:

INSERTIONS FINISHED! NOW FOR DELETIONS!

Action: Delete 10

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 20 | 25 | 35 | 40 | 45 | 30 | 50 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 90 | 25 | 35 | 40 | 45 | 30 | 50 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 35 | 25 | 90 | 40 | 45 | 30 | 50 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 | 35 | 25 | 50 | 40 | 45 | 30 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 65 | 10 |

Heap:

Action: Delete 20

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 65 | 35 | 25 | 50 | 40 | 45 | 30 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 | 35 | 65 | 50 | 40 | 45 | 30 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 | 35 | 30 | 50 | 40 | 45 | 65 | 90 | 55 | 75 | 80 | 70 | 60 | 85 | 20 | 10 |

Heap:

Action: Delete 25

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 85 | 35 | 30 | 50 | 40 | 45 | 65 | 90 | 55 | 75 | 80 | 70 | 60 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 85 | 50 | 40 | 45 | 65 | 90 | 55 | 75 | 80 | 70 | 60 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 85 | 65 | 90 | 55 | 75 | 80 | 70 | 60 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 | 35 | 45 | 50 | 40 | 60 | 65 | 90 | 55 | 75 | 80 | 70 | 85 | 25 | 20 | 10 |

Heap:

Action: Delete 30

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 85 | 35 | 45 | 50 | 40 | 60 | 65 | 90 | 55 | 75 | 80 | 70 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 | 85 | 45 | 50 | 40 | 60 | 65 | 90 | 55 | 75 | 80 | 70 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 | 40 | 45 | 50 | 85 | 60 | 65 | 90 | 55 | 75 | 80 | 70 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 | 40 | 45 | 50 | 75 | 60 | 65 | 90 | 55 | 85 | 80 | 70 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 35

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 70 | 40 | 45 | 50 | 75 | 60 | 65 | 90 | 55 | 85 | 80 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 | 70 | 45 | 50 | 75 | 60 | 65 | 90 | 55 | 85 | 80 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 | 50 | 45 | 70 | 75 | 60 | 65 | 90 | 55 | 85 | 80 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 | 50 | 45 | 55 | 75 | 60 | 65 | 90 | 70 | 85 | 80 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 40

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 | 50 | 45 | 55 | 75 | 60 | 65 | 90 | 70 | 85 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45 | 50 | 80 | 55 | 75 | 60 | 65 | 90 | 70 | 85 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45 | 50 | 60 | 55 | 75 | 80 | 65 | 90 | 70 | 85 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 45

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 85 | 50 | 60 | 55 | 75 | 80 | 65 | 90 | 70 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 50 | 85 | 60 | 55 | 75 | 80 | 65 | 90 | 70 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 50 | 55 | 60 | 85 | 75 | 80 | 65 | 90 | 70 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 50 | 55 | 60 | 70 | 75 | 80 | 65 | 90 | 85 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 50

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 85 | 55 | 60 | 70 | 75 | 80 | 65 | 90 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 55 | 85 | 60 | 70 | 75 | 80 | 65 | 90 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 55 | 70 | 60 | 85 | 75 | 80 | 65 | 90 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 55

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 70 | 60 | 85 | 75 | 80 | 65 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 | 70 | 90 | 85 | 75 | 80 | 65 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 | 70 | 65 | 85 | 75 | 80 | 90 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 60

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 70 | 65 | 85 | 75 | 80 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 65 | 70 | 90 | 85 | 75 | 80 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 65 | 70 | 80 | 85 | 75 | 90 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 65

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 70 | 80 | 85 | 75 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 70 | 90 | 80 | 85 | 75 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 70 | 75 | 80 | 85 | 90 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 70

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 75 | 80 | 85 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 75 | 90 | 80 | 85 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 75 | 85 | 80 | 90 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 75

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 | 85 | 90 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 80

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Swap

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 85 | 90 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 85

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap:

Action: Delete 90

Array:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 | 85 | 80 | 75 | 70 | 65 | 60 | 55 | 50 | 45 | 40 | 35 | 30 | 25 | 20 | 10 |

Heap: The Heap is dead… long live the tree!

DELETIONS FINISHED! FINALLY BLESSED SILENCE!!!

QUICK SORT

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 |  | 90 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |
| PV |  |  | P1 |  |  |  |  |  |  |  |  |  |  |  |  |  | P2 |

f = 0 l = 15

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 90 |  | 90 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 10 |  |
| PV |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | P2 | P1 |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10 |  | 10 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 90 |
| PV |  | SW |  |  |  |  |  |  |  |  |  |  |  |  |  |  | AP |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10 |  | 10 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 90 |
| PV |  |  | P1 |  |  |  |  |  |  |  |  |  |  |  |  | P2 |  |

f = 0 l = 14 🡪 0

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 10 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

f = 0 l = -1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 10 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

f = 1 l = 0

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 90 |
| PV |  |  |  | P1 |  |  |  |  |  |  |  |  |  |  |  | P2 |  |

f = 1 l = 14

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 90 |
| PV |  |  |  |  |  |  |  | P1 |  |  |  |  |  |  |  | P2 |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 85 | 55 | 50 | 75 | 80 | 70 | 25 | 20 | 65 | 90 |
| PV |  |  |  |  |  |  |  | P1 |  |  |  |  |  |  | P2 |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 75 | 80 | 70 | 25 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  | SW |  |  |  |  |  |  | AP |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 75 | 80 | 70 | 25 | 85 | 65 | 90 |
| PV |  |  |  | P1 |  |  |  |  |  |  |  |  |  | P2 |  |  |  |

f = 1 l = 12

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 75 | 80 | 70 | 25 | 85 | 65 | 90 |
| PV |  |  |  | P1 |  |  |  |  |  |  |  |  |  | P2 |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 75 | 80 | 70 | 25 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  | P1 |  |  | P2 |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 25 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  | SW |  |  | AP |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 25 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  | P1 |  |  |  |  |  |  |  |  | P2 |  |  |  |  |

f = 1 l = 11

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 25 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  | P1 | P2 |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 60 |  | 10 | 60 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 25 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  | P2 | P1 |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 |  | 10 | 25 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  | SW |  |  |  |  |  |  |  | AP |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 |  | 10 | 25 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  | P1 |  |  |  |  |  | P2 |  |  |  |  |  |  |  |

f = 1 l = 8

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 |  | 10 | 25 | 30 | 35 | 40 | 45 | 20 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  | P1 |  |  |  | P2 |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 |  | 10 | 25 | 20 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  | SW |  |  |  | AP |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 |  | 10 | 25 | 20 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  | P1 |  |  | P2 |  |  |  |  |  |  |  |  |  |  |

f = 1 l = 5

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 |  | 10 | 25 | 20 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  | P1 |  | P2 |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 25 |  | 10 | 25 | 20 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  | P2 | P1 |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 |  | 10 | 20 | 25 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  | SW | AP |  |  |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20 |  | 10 | 20 | 25 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  | P2 | P1 |  |  |  |  |  |  |  |  |  |  |  |  |  |

f = 1 l = 1

Jump to f = 3, l = 8 to save trees

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 |  | 10 | 20 | 25 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  | P1 |  |  |  | P2 |  |  |  |  |  |  |  |

f = 3 l = 8

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 |  | 10 | 20 | 25 | 35 | 40 | 45 | 30 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  | P1 |  | P2 |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 |  | 10 | 20 | 25 | 35 | 30 | 45 | 40 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  | SW |  | AP |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 |  | 10 | 20 | 25 | 35 | 30 | 45 | 40 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  | P1 | P2 |  |  |  |  |  |  |  |  |  |  |

f = 3 l = 5

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 35 |  | 10 | 20 | 25 | 35 | 30 | 45 | 40 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  | P2 | P1 |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 |  | 10 | 20 | 25 | 30 | 35 | 45 | 40 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  | SW | AP |  |  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 30 |  | 10 | 20 | 25 | 30 | 35 | 45 | 40 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  | P2 | P1 |  |  |  |  |  |  |  |  |  |  |  |

f = 3 l = 3

Jump to f = 4, l = 8 to save paper

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45 |  | 10 | 20 | 25 | 30 | 35 | 45 | 40 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  | P1 |  | P2 |  |  |  |  |  |  |  |

f = 5 l = 8

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 45 |  | 10 | 20 | 25 | 30 | 35 | 45 | 40 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  | P2 | P1 |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  | SW | AP |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 40 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  | P2 | P1 |  |  |  |  |  |  |  |  |  |

f = 5 l = 5

Jump to f = 7, l = 8 to save trees

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 55 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  | P1P2 |  |  |  |  |  |  |  |

f = 7 l = 8

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 55 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 55 | 50 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  | P2 | P1 |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 50 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  | SW | AP |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 50 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  | P2 | P1 |  |  |  |  |  |  |

f = 8, l = 8

Jump to f = 10, l = 14 to save paper

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  | P1 |  |  | P2 |  |

f = 10, l = 14

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 80 | 70 | 75 | 85 | 65 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  |  |  | P1 | P2 |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 80 | 70 | 75 | 65 | 85 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  |  |  | SW | AP |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 80 | 70 | 75 | 65 | 85 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  | P1 |  | P2 |  |  |

f = 10 l = 13

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 80 | 70 | 75 | 65 | 85 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  |  |  | P2 | P1 |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 65 |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  | SW |  |  | AP |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 10 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
| PV |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

FINISHED QUICK SORT!

Professor I promise that I understand the concept behind a merge sort, but I’ve spent 12 hours on this assignment already, it’s 3 AM, and I honestly can’t afford the ink it takes to print another 20 pages of “by hand” sorting. Heap and Quick are all I’ve got for now.