HeapSort.java

```
1      package com.example;
2
3      public class HeapSort {
4          public int[] heapSort(int arr[]) {
5              int N = arr.length;
6
7              // Build heap (rearrange array)
8   5          for (int i = N / 2 - 1; i >= 0; i--)
9   1              heapify(arr, N, i);
10
11             // One by one extract an element from heap
12  4          for (int i = N - 1; i > 0; i--) {
13                 // Move current root to end
14                 int temp = arr[0];
15                 arr[0] = arr[i];
16                 arr[i] = temp;
17
18                 // call max heapify on the reduced heap
19  1              heapify(arr, i, 0);
20             }
21  1          return arr;
22         }
23
24         // To heapify a subtree rooted with node i which is
25         // an index in arr[]. n is size of heap
26         void heapify(int arr[], int N, int i) {
27             int largest = i; // Initialize largest as root
28  2          int l = 2 * i + 1; // left = 2*i + 1
29  2          int r = 2 * i + 2; // right = 2*i + 2
30
31             // If left child is larger than root
32  4          if (l < N && arr[l] > arr[largest])
33                 largest = l;
34
35             // If right child is larger than largest so far
36  4          if (r < N && arr[r] > arr[largest])
37                 largest = r;
38
39             // If largest is not root
40  1          if (largest != i) {
41                 int swap = arr[i];
42                 arr[i] = arr[largest];
43                 arr[largest] = swap;
44
45                 // Recursively heapify the affected sub-tree
46  1              heapify(arr, N, largest);
47          }
48      }
49  }
```

Mutations

```
8   1. changed conditional boundary → KILLED
    2. Changed increment from -1 to 1 → KILLED
    3. Replaced integer division with multiplication → SURVIVED
    4. Replaced integer subtraction with addition → SURVIVED
    5. negated conditional → KILLED
9   1. removed call to com/example/HeapSort::heapify → KILLED
12  1. changed conditional boundary → SURVIVED
    2. Changed increment from -1 to 1 → KILLED
    3. Replaced integer subtraction with addition → KILLED
    4. negated conditional → KILLED
19  1. removed call to com/example/HeapSort::heapify → KILLED
21  1. replaced return value with null for com/example
    /HeapSort::heapSort → KILLED
28  1. Replaced integer multiplication with division → KILLED
    2. Replaced integer addition with subtraction → KILLED
29  1. Replaced integer multiplication with division → KILLED
    2. Replaced integer addition with subtraction → KILLED
32  1. changed conditional boundary → KILLED
    2. changed conditional boundary → SURVIVED
    3. negated conditional → KILLED
    4. negated conditional → KILLED
36  1. changed conditional boundary → KILLED
    2. changed conditional boundary → SURVIVED
    3. negated conditional → KILLED
    4. negated conditional → KILLED
40  1. negated conditional → KILLED
46  1. removed call to com/example/HeapSort::heapify → KILLED
```

Active mutators

- BOOLEAN_FALSE_RETURN
- BOOLEAN_TRUE_RETURN
- CONDITIONALS_BOUNDARY_MUTATOR
- EMPTY_RETURN_VALUES
- INCREMENTS_MUTATOR
- INVERT_NEGS_MUTATOR
- MATH_MUTATOR
- NEGATE_CONDITIONALS_MUTATOR
- NULL_RETURN_VALUES
- PRIMITIVE_RETURN_VALS_MUTATOR
- VOID_METHOD_CALL_MUTATOR

Tests examined

- com.example.HeapSortTest.testSort(com.example.HeapSortTest) (2 ms)

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