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Hypothesis: If six of the sorts are Stooage, BOGO, Random Quicksort, Quicksort, Heap, and Selection sort, then six of the sorts will be unstable.

Input file: A file with 20 random values to be sorted.

Result: Sort numbers 2, 3, 7, 8, 10, and 11 are all unstable. (See table below for full Stability listing)

Conclusion: The sorts that are unstable will be one of the sorts listed above.

Hypothesis: If given 10,000 random elements that need to be sorted, then BOGO sort will take an extremely long time to run, because BOGO sort runs in $O(n!)$ time. Also, Stooage sort will complete but it will take an extremely long time.

Input file: A file with 10,000 random values to be sorted.

Result: Sort 2 took a long time to run and sort 10 took too long to run and had to be terminated. (See Table at bottom of the document)

Conclusion: Sort 2 is Stooage Sort and Sort 10 is BOGO sort.

Hypothesis: If given 100,000 random elements that have been reverse sorted, then quick sort will break, because a worst case for quicksort is reverse sort.

Input file: A file with 10,000 reverse sorted random values.

Result: Sort 3 broke (see table below)

Conclusion: Sort 3 is quick sort.

Hypothesis: If given 100,000 elements that are the same, then random quick sort will break, because random quick sort chooses a pivot at random.

Input file: A file with 10,000 elements that are the same.

Result: Sort 3 and 11 broke. See table below.

Conclusion: Sort 11 is random quick sort since sort 3 is quick sort.

Hypothesis: If given a value of 1 and a value of 10,000, then Counting sort will take longer than the rest, because counting sort runs in $O(n+k)$ time.

Input file: A file with elements 1 and 10,000.

Result: Sort 6 took longer than the rest. (see table below)

Conclusion: Sort 6 is the counting sort.

Hypothesis: If a sort is selection sort, then it will take a longer than most of the sorts for all input.

Input file: See table below.

Result: Sort 7 took longer than the rest. (see table below)

Conclusion: Sort 7 is selection sort.

Algorithm #	10,000 Element	10,000 Sorted	10,000 same element	100,000 Elements	Reverse Sort 100,000	Sorted 100,000	100,000 Same	2 elements	Stable	Type of Sort
1	340	1	1	85295	32069	5	3	0	yes	bubble
2	145944	118294	118874	n/a	n/a	n/a	n/a	0	no	Stooge
3	7	170	148	41	breaks	breaks	breaks	0	no	quicksort
4	11	14	3	80	50	46	18	1	yes	radix sort
5	81	1	0	25737	25947	5	4	0	yes	insertion
6	22	11	5	26	34	40	17	15	yes	counting sort
7	161	126	133	59413	23418	30002	24747	0	no	selection
8	10	8	2	67	29	32	14	0	no	heap
9	29	25	16	99	69	71	66	1	yes	merge
10	n/a	1	1	n/a	n/a	2	4	0	no	BOGO
11	7	7	142	41	27	28	breaks	0	no	Random quicksort