

Brendan Lauterborn

COSC 600

Programming Assignment 3

1.

```
<terminated> q1 (1) [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (May 4, 2025, 6:53:21 PM – 6:53:21 PM elapsed: 0:00:00.226) [pid: 16696]
First 50 values using nlogn build time
Number of swaps: 6451
Actual runtime is 0.574ms
8 9 12 16 115 54 86 40 62 340 279 207 60 106 211 260 53 107 150 362 383 535 398 242 627 265 209 207 397 243 227 288 271 302 267 302 223 172 539 423 1153 874 569 1036 541 729 1185 1533 697 1

First 50 values using linear build time
Number of swaps: 3711
Actual runtime is 0.4353ms
8 9 12 16 107 54 86 40 53 260 279 207 60 106 211 115 223 62 150 340 362 535 578 742 265 209 316 207 635 574 227 272 271 302 267 302 243 172 201 423 398 874 383 1007 541 729 1185 1533 1325 1
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2.

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<terminated> q2 (1) [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (May 4, 2025, 6:54:30 PM – 6:54:30 PM elapsed: 0:00:00.218) [pid: 14872]
Insert sort:  $O(n^2)$ .
Actual runtime is 8.5855ms
8 17 31 50 52 57 68 74 76 79 100 100 111 118 125 128 132 133 173 174 174 179 193 203 203 211 222 256 259 266 289 307 312 346 351 361 374 384 385 391 399 402 413 419 438 439 446 495 496 505

Selection sort:  $O(n^2)$ .
Actual runtime is 9.2218ms
7 22 31 36 46 51 64 64 84 99 103 115 122 129 129 158 161 173 179 182 186 191 192 206 211 211 216 220 240 243 251 263 264 269 278 281 304 308 313 315 335 344 357 357 361 365 371 371 404 405

Bubble sort:  $O(n^2)$ .
Actual runtime is 25.1397ms
1 6 10 11 45 54 78 88 105 114 118 122 136 148 158 164 172 182 185 189 203 205 242 248 255 272 281 290 302 303 312 327 330 351 375 375 377 391 391 404 408 437 440 451 460 467 469 470 472 473

Merge sort:  $O(n \log n)$ .
Actual runtime is 1.078ms
21 26 29 32 43 54 62 64 74 82 85 141 165 171 182 186 193 207 210 221 223 223 225 238 239 243 251 255 258 259 278 287 297 313 321 332 347 348 348 352 369 376 383 389 394 402 402 406 407 424
```

3.

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<terminated> q3 (1) [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (May 4, 2025, 7:04:38 PM – 7:04:38 PM elapsed: 0:00:00.161) [pid: 33680]
Counting sort:  $O(n+k)$ .
Actual runtime is 0.1962ms
8 18 28 40 50 60 70 82 91 102 112 123 133 144 152 162 172 182 192 202 213 223 233 244 254 264 272 283 294 305 316 326 336 347 358 366 374 385 396 406 416 426 435 445 454 464 474 483 492 500
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4.

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<terminated> q4 (1) [Java Application] C:\Program Files\Java\jdk-23\bin\javaw.exe (May 4, 2025, 6:55:14 PM – 6:55:14 PM elapsed: 0:00:00.153) [pid: 2704]
Radix sort.  $O(d(N+K))$ . Actual runtime: 4.7299ms

The first 100 numbers:
0 0 4 15 16 19 30 33 48 44 54 72 90 95 98 107 111 115 119 125 125 139 165 169 175 185 205 234 240 290 293 296 300 301 320 339 372 374 377 401 407 414 415 416 427 438 440 444 447 448 465 471

The last 100 numbers:
48969 48975 49010 49011 49012 49012 49034 49047 49065 49069 49075 49094 49094 49102 49106 49109 49135 49136 49138 49141 49145 49153 49161 49161 49177 49178 49231 49257 49259 49279 49281 492
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