1(a):

In code.

1(b):

Elapsed time in nanoseconds for quick sort: 6231300

[10, 32, 32, 56, 56, 68, 68, 68, 93, 93]

1(c):

array\_size = 4

Elapsed time in nanoseconds for heap sort: 398500

Elapsed time in nanoseconds for merge sort: 9700

Elapsed time in nanoseconds for quick sort: 27200

array\_size = 16

Elapsed time in nanoseconds for heap sort: 11100

Elapsed time in nanoseconds for merge sort: 16400

Elapsed time in nanoseconds for quick sort: 52500

array\_size = 64

Elapsed time in nanoseconds for heap sort: 52400

Elapsed time in nanoseconds for merge sort: 48800

Elapsed time in nanoseconds for quick sort: 183300

array\_size = 256

Elapsed time in nanoseconds for heap sort: 60600

Elapsed time in nanoseconds for merge sort: 363800

Elapsed time in nanoseconds for quick sort: 717300

array\_size = 1024

Elapsed time in nanoseconds for heap sort: 306700

Elapsed time in nanoseconds for merge sort: 557600

Elapsed time in nanoseconds for quick sort: 3540500

array\_size = 4096

Elapsed time in nanoseconds for heap sort: 595000

Elapsed time in nanoseconds for merge sort: 1335100

Elapsed time in nanoseconds for quick sort: 5903500

array\_size = 16384

Elapsed time in nanoseconds for heap sort: 3396900

Elapsed time in nanoseconds for merge sort: 5710500

Elapsed time in nanoseconds for quick sort: 23043400

array\_size = 65536

Elapsed time in nanoseconds for heap sort: 12999700

Elapsed time in nanoseconds for merge sort: 11034400

Elapsed time in nanoseconds for quick sort: 155552500

array\_size = 262144

Elapsed time in nanoseconds for heap sort: 29623100

Elapsed time in nanoseconds for merge sort: 32620900

Elapsed time in nanoseconds for quick sort: 3479597400

array\_size = 1048576

Elapsed time in nanoseconds for heap sort: 111827100

Elapsed time in nanoseconds for merge sort: 133460100

Elapsed time in nanoseconds for quick sort: 171334105200

array\_size = 4194304

Elapsed time in nanoseconds for heap sort: 511092100

Elapsed time in nanoseconds for merge sort: 544498800

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It takes too much time.

1(d):

array\_size = 1048576

Quick sort ram usage: 202.534 kb

Heap sort ram usage: 194.133 kb

Merge sort ram usage: 543.432 kb