Leah Benitez

Professor Fakhouri

CMP 338

December 13, 2020

Homework 7 Analysis

Results:

***Equal 1000***

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| Equal 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2764.565 580.639 392.752 393.526 594.268 625.078 564.171 665.89 293.687 451.97 732.6546000000001  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  983.234375 983.234375 983.234375 983.234375 983.234375 983.234375 983.234375 983.234375 983.234375 983.234375 983.234375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Equal 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  15928.476 7136.277 10364.231 16663.632 22375.16 23308.331 17293.392 12940.173 5600.0 8909.478 14051.914999999997  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Equal 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  12961.874 11198.208 6659.679 19143.127 9660.946 6511.53 6284.173 2114.993 622.918 697.461 7585.4909  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Equal 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  12249.36 12150.873 9399.248 529.788 13501.335 9870.156 600.78 4849.565 893.93 611.886 6465.6921  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Equal 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  42769.031 6805.438 6787.41 6807.015 6756.614 6686.73 8848.706 6756.233 6707.875 6696.867 10562.1919  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375 1314.8359375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***Random 1000***

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| Random 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2431.471 1041.736 866.134 993.883 838.869 872.741 837.96 867.473 1035.072 1615.649 1140.0988  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1314.8359375 1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1613.27734375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Random 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  924.781 241.798 214.949 214.44 212.455 4500.625 431.644 1154.108 329.863 317.864 854.2527  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1646.4375 1978.0390625 1978.0390625 1978.0390625 1745.91796875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Random 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1019.34 855.63 867.95 1043.04 1039.039 924.895 933.148 987.439 1126.308 983.924 978.0713  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1978.0390625 1978.0390625 1978.0390625 1978.0390625 1978.0390625 1978.0390625 1978.0390625 1978.0390625 1978.0390625 1978.0390625 1978.0390625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Random 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  477.561 537.689 965.189 374.926 374.319 382.125 370.317 655.804 462.24 500.899 510.10689999999994  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1978.0390625 1978.0390625 1978.0390625 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2207.41484375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Random 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  11254.414 10220.232 10950.677 15598.367 7410.712 4340.381 4115.873 4195.482 3178.66 2399.986 7366.478400000002  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875 2305.71875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***Increasing 1000***

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| Increasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1205.396 702.347 248.652 243.757 239.727 240.214 241.433 240.706 240.632 240.155 384.30190000000005  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2633.3984375 2633.3984375 2633.3984375 2633.3984375 2633.3984375 2633.3984375 2633.3984375 2633.3984375 2633.3984375 2633.3984375 2633.3984375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Increasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  950.926 1388.34 1852.145 1906.736 1874.536 1886.04 1899.76 1698.503 1390.162 931.078 1577.8226  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2633.3984375 2633.3984375 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2895.5421875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Increasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  5460.634 7485.441 7853.569 6999.128 7723.428 6921.006 6043.775 7170.458 6251.883 3737.797 6564.7119  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125 2961.078125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Increasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  452.558 450.093 451.398 450.91 449.403 1226.396 1018.918 951.805 1168.684 701.149 732.1314  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2961.078125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3255.98984375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Increasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  3986.258 3269.92 2447.321 2400.314 4395.071 4268.839 3905.722 2806.017 2415.5 3891.077 3378.6038999999996  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125 3288.7578125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***Decreasing 1000***

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| Decreasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1383.598 1298.555 1280.263 1579.159 1707.398 1088.088 1346.459 1311.81 1313.366 1303.011 1361.1707000000001  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  3616.4375 3616.4375 3616.4375 3616.4375 3616.4375 3616.4375 3616.4375 3616.4375 3616.4375 3616.4375 3616.4375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Decreasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  3509.622 2643.028 2494.073 3278.106 3234.081 1803.223 1501.652 1896.925 1791.119 2314.879 2446.6708000000003  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  3616.4375 3616.4375 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3878.58125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Decreasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  641.3 472.96 468.618 654.778 560.284 442.37 727.416 601.298 1576.505 488.634 663.4163000000001  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875 3944.1171875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Decreasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1214.057 1024.915 1068.403 1059.459 1093.742 843.207 671.021 857.276 1028.582 1281.711 1014.2373  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Decreasing 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  4117.656 2355.785 2778.324 3983.853 3720.866 3748.322 4213.813 3349.003 3206.007 2553.027 3402.6656000000003  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4271.796875 4599.4765625 4304.56484375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***IncreasingAndRandom 1000***

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| IncreasingAndRandom 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  196.928 170.076 182.98 176.259 173.012 185.609 167.535 158.451 101.561 93.902 160.6313  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  4599.4765625 4599.4765625 4599.4765625 4599.4765625 4599.4765625 4599.4765625 4599.4765625 4599.4765625 4599.4765625 4599.4765625 4599.4765625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  IncreasingAndRandom 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  866.798 879.499 855.465 984.879 1452.298 1468.415 1486.401 946.724 1407.831 1823.491 1217.1801  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  4599.4765625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4894.38828125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  IncreasingAndRandom 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  839.0 675.857 680.132 575.341 515.379 514.399 2899.524 423.46 503.365 553.276 817.9732999999999  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625 4927.15625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  IncreasingAndRandom 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  252.92 377.593 324.637 327.166 324.28 317.524 332.905 341.321 342.86 342.382 328.3588  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  IncreasingAndRandom 1000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  3995.985 3944.787 3965.284 2634.831 2351.423 2654.766 2350.076 2365.347 3287.57 4538.618 3208.8687000000004  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5254.8359375 5582.515625 5582.515625 5320.371875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***Equal 10000***

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| Equal 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1940.912 1886.102 1528.127 2748.128 1776.565 2006.411 2143.015 2140.69 2147.422 2008.721 2032.6093  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  5582.515625 5582.515625 5621.59375 5699.75 5777.90625 5856.0625 5934.21875 6012.375 6090.53125 6168.6875 5832.615625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Equal 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  79460.728 72559.392 106045.695 74458.903 70520.155 75532.24 104130.11 91449.634 93163.277 78444.875 84576.5009  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  6207.765625 6246.84375 6285.921875 6325.0 6364.078125 6403.15625 6442.234375 6481.3125 6520.390625 6559.46875 6383.6171875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Equal 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  74358.73 91782.624 82617.842 70224.215 74069.416 112581.848 90982.42 151100.15 87409.464 80080.569 91520.72780000001  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  6598.546875 6637.625 6676.703125 6715.78125 6754.859375 6793.9375 6833.015625 6872.09375 6911.171875 6950.25 6774.3984375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Equal 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  85740.183 79783.656 87019.843 71874.977 78405.348 78516.249 77474.335 78974.073 80483.365 76020.709 79429.2738  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  6989.328125 7028.40625 7067.484375 7106.5625 7145.640625 7184.71875 7223.796875 7262.875 7301.953125 7341.03125 7165.1796875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Equal 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  737900.223 721846.113 705523.526 743234.324 718216.92 703338.403 740368.173 803136.63 759014.324 767751.132 740032.9768000001  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  7380.109375 7419.1875 7458.265625 7497.34375 7536.421875 7575.5 7614.578125 7653.65625 7692.734375 7731.8125 7555.9609375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***Random 10000***

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| Random 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1975.326 1697.184 1736.644 1690.739 1696.447 1871.612 3365.073 1735.185 1706.03 1704.718 1917.8958000000002  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  8059.4921875 8387.1875 8714.8828125 8753.9609375 9120.734375 9448.4296875 9448.4296875 9815.203125 10142.8984375 10142.8984375 9203.41171875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Random 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1204.424 1205.647 1177.284 1187.882 1222.932 1218.637 1211.442 1234.835 1189.124 1144.537 1199.6743999999999  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  10509.671875 10837.3671875 10837.3671875 11165.0625 11165.0625 11492.7578125 11492.7578125 11859.515625 12187.2109375 12187.2109375 11373.3984375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Random 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  6018.7 6801.231 3976.675 3703.072 3205.137 3507.827 5340.31 5646.954 3344.447 3573.852 4511.8205  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  12514.90625 12514.90625 12842.6015625 13170.296875 13170.296875 13497.9921875 13497.9921875 13825.6875 14153.3828125 14153.3828125 13334.14453125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Random 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1404.408 1513.081 1266.203 1245.641 1280.99 1377.15 1513.37 1248.712 1251.287 1389.577 1349.0418999999997  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  14481.078125 14481.078125 14808.7734375 15136.46875 15136.46875 15464.1640625 15464.1640625 15791.859375 15791.859375 16158.6171875 15271.453125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Random 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  259866.717 230763.803 234811.987 226264.633 216853.927 264356.791 233405.167 258423.212 225026.135 218847.705 236862.00770000002  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  16384.0 16384.0 1000.1640625 1322.15625 1322.15625 1644.1484375 1644.1484375 2005.21875 2327.2109375 2327.2109375 4636.04140625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***Increasing 10000***

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| Increasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  965.254 850.535 792.357 791.404 789.044 825.443 790.577 801.75 888.232 793.962 828.8558  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2649.203125 2971.1953125 3010.2734375 3371.34375 3693.3359375 3693.3359375 4054.40625 4376.3984375 4376.3984375 4737.46875 3693.3359375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Increasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  70472.19 73408.578 88286.457 70167.25 80172.659 91632.688 74196.564 73958.215 83292.961 83043.265 78863.0827  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  5059.4609375 5059.4609375 5381.453125 5381.453125 5742.5078125 6064.5 6064.5 6386.4921875 6386.4921875 6747.5625 5827.38828125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Increasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  22171.28 20211.424 21105.924 14060.875 17943.788 20320.304 18588.186 16746.524 18140.353 22211.431 19150.008900000004  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  6747.5625 7108.6328125 7430.625 7430.625 7752.6171875 7752.6171875 8074.609375 8396.6015625 8396.6015625 8718.59375 7780.90859375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Increasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  519.306 594.751 569.954 575.033 496.79 503.907 496.467 496.527 546.329 496.864 529.5927999999999  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  8718.59375 9040.5859375 9362.578125 9362.578125 9684.5703125 9684.5703125 10006.5625 10328.5546875 10328.5546875 10650.546875 9716.76953125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Increasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  210257.92 206855.563 194028.841 216312.786 235625.788 203214.032 225594.318 211953.218 209728.715 209869.965 212344.11460000003  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  10650.546875 10972.5390625 11294.53125 11294.53125 11616.5234375 11616.5234375 11938.515625 12260.5078125 12260.5078125 12582.5 11648.72265625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***Decreasing 10000***

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| Decreasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  961.861 888.753 921.714 860.999 897.805 858.45 1029.099 943.837 888.523 788.048 903.9089  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  12904.4921875 12904.4921875 13265.5625 13587.5546875 13587.5546875 13948.625 14270.6171875 14309.6953125 14670.765625 14992.7578125 13844.21171875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  Decreasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  161045.622 152282.942 154258.39 158725.455 172663.117 137187.78 150006.075 148657.193 144258.03 145727.774 152481.2378  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  14992.7578125 15314.75 15636.7421875 15636.7421875 15958.734375 15958.734375 16280.7265625 16602.71875 16602.71875 16924.7109375 15990.93359375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  Decreasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  16580.003 13853.359 19145.187 16186.186 20726.137 27078.01 10383.56 25177.345 23601.841 22188.655 19492.0283  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  16924.7109375 923.078125 923.078125 1247.0625 1247.0625 1610.125 1610.125 1973.171875 2297.15625 2297.15625 3105.27265625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  Decreasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  40530.31 35845.438 38934.477 39465.808 40388.445 34177.012 40326.065 45903.908 42593.47 46330.818 40449.575099999995  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  2621.140625 2621.140625 2945.125 3269.109375 3269.109375 3593.09375 3593.09375 3917.078125 4241.0625 4241.0625 3431.1015625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  Decreasing 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  200271.643 200015.444 240463.214 241894.996 205700.69 215669.384 183239.461 211836.577 191920.402 244490.854 213550.2665  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  4565.046875 4565.046875 4889.03125 5213.015625 5213.015625 5537.0 5537.0 5860.984375 6184.96875 6184.96875 5375.0078125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

***IncreasingAndRandom 10000***

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| IncreasingAndRandom 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  1644.009 1163.476 963.981 927.89 856.214 857.963 858.64 855.356 902.819 856.888 988.7236  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  MergeSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  6508.953125 6832.9375 6832.9375 7195.984375 7519.96875 7559.046875 7922.109375 8246.09375 8246.09375 8609.15625 7547.328125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  MergeSort  IncreasingAndRandom 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  70510.291 88114.404 87924.021 75763.869 84044.275 77283.355 77303.011 67421.795 77619.308 77389.245 78337.35740000001  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, FirstElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  8933.140625 8933.140625 9257.125 9257.125 9620.1875 9620.1875 9983.234375 10307.21875 10307.21875 10631.203125 9684.978125  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, FirstElement  IncreasingAndRandom 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  12292.002 21744.325 14046.816 15846.82 16996.765 23003.291 12186.763 12263.283 15234.789 19138.024 16275.2878  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, RandomElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  10631.203125 10955.1875 11279.171875 11279.171875 11603.15625 11603.15625 11927.140625 12251.125 12251.125 12575.109375 11635.5546875  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, RandomElement  IncreasingAndRandom 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  564.072 561.32 556.285 569.045 556.02 552.707 563.373 556.203 555.6 566.638 560.1263  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  QuickSort, MidOfFirstMidLastElement  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  12575.109375 12899.09375 13223.078125 13223.078125 13547.0625 13547.0625 13871.046875 14195.03125 14195.03125 14519.015625 13579.4609375  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  QuickSort, MidOfFirstMidLastElement  IncreasingAndRandom 10000  ------------------------  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  229582.131 219883.797 204184.642 210483.503 193223.278 207910.2 203402.579 197754.01 225691.989 217704.215 210982.0344  MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds MicroSeconds  HeapSort  Run 1 Run 2 Run 3 Run 4 Run 5 Run 6 Run 7 Run 8 Run 9 Run 10 Average  14519.015625 14843.0 14843.0 15206.046875 15530.03125 15530.03125 15854.015625 15854.015625 16178.0 16501.984375 15485.9140625  KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes KiloBytes  HeapSort |

Graphs:

Analysis:

Using the tables you created by running Driver.main(), copy your results and graphs into a Microsoft Word document and answer the following questions using 1-3 complete sentences for each question:

1. **Create graphs from the test times you measured.**

^^ See above

1. **Which sort worked best on data in constant or increasing order (i.e. already sorted data)? Why do you think this sort worked best?**

MergeSort worked best on data in constant or increasing order (though QuickSort, MidOfFirstMidLastElement performed similarly in Increasing 1000/10000). The algorithm still had to divide the data into smaller and smaller parts, but once that was done, I think it may have been faster to merge the partitioned data into the array because the data was already sorted.

1. **Did the same sort do well on the case of mostly sorted data? Why or why not?**

Yes, MergeSort also did well in the case of mostly sorted data. I think the reason is the same as in #2. Also, in comparison to the other algorithms, I think this is because MergeSort takes less comparisons than QuickSort and less swaps than HeapSort.

1. **In general, did the ordering of the incoming data affect the performance of the sorting algorithms? Please answer this question by referencing specific data from your table to support your answer.**

* *MergeSort*: When the arraySize was 1,000, the data in constant, increasing and mostly increasing order took less time to sort compared to data in random/decreasing order (think low-mid hundreds vs low thousands). When the arraySize was 10,000, data in constant and random order took longer to sort (in the 2,000s) than data in increasing, increasing/random and decreasing order (mid-high hundreds).
* *QuickSort*: When the arraySize was 1,000 the data in constant order took the longest to sort (mid-high thousands). The data in increasing order also took longer to sort compared to random, decreasing and increasing/random data. These trends carried on in arraySize = 10,000 (except data in random order took way less time to sort compared to everything else). Note: QuickSort, MidOfFirstMidLastElement generally took way less time to sort data compared to the other QuickSort pivots.
* *HeapSort*: When the arraySize was 1,000, the data in constant and random order took longer to sort compared to data in increasing, decreasing and increasing/random order (mid-high thousands vs low thousands). When the arraySize was 10,000, data in constant order took way longer compared to the rest of the data (high hundred-thousands vs low hundred-thousands).

1. **Which sort did best on the shorter (ie n=1,000) data sets? Did the same one do better on the longer (ie n=10,000) data sets? Why or why not? Please use specific data from your table to support your answer.**

MergeSort did best on shorter data sets (Average: ~755.77 vs low-mid thousands) and it also did better on longer data sets (Average: ~1334.39 vs low ten-thousands and low hundred-thousands). As I mentioned before, I think this is because MergeSort has less comparisons and swaps compared to QuickSort and HeapSort, respectively.

1. **In general, which sort did better? Give a hypothesis as to why the difference in performance exists.**

In general, MergeSort did best. I believe this is because MergeSort is a simple algorithm and it just recursively partitions and sorts the array. With QuickSort, you have to pick a pivot and I think each choice has an impact on how fast the algorithm runs. And in general, the algorithm just takes a lot of comparisons. With HeapSort, you have to repeatedly heapify the data, which takes a lot of comparisons/swaps which likely slows everything down by a lot.

1. **Are there results in your table that seem to be inconsistent? (ex. If I get run times for a sort that look like this {1.3, 1.5, 1.6, 7.0, 1.2, 1.6, 1.4, 1.8, 2.0, 1.5] the 7.0 entry is not consistent with the rest). Why do you think this happened?**

I do have some results that are inconsistent (Ex1: Test Times: Equal 1000-HeapSort-Run 1. Ex2: Test Times: IncreasingAndRandom 1000-QuickSort, RandomElement- Run 7. Etc). I think the sudden declines in memory have to do with the system clearing the memory after it reaches a certain point. I am not sure about the sudden changes in test times- maybe the system just stalled for a moment because of the sheer amount of instructions being executed at once?