

<https://github.com/amcm26/Bonus-Programming-assignment>

[illegible]

```
Insertion Sort:
    runtime      : 0.1
    extra memory allocated : 0
    Data:
1 44 123 359 456 586 636 676 690 883 1114 1125 1196 1247 1334 1338 1459 1525 1531 1549 1597 1599 1671 1680 1974 1980 2112 2223 2524 2808 2889 2817 2960 2969 3046 3192 3394 3479 3640 3722 3870 4071 4542 4632 4737 4774 4903 5005
5144 5322 5406 5493 5510 5521 5987 6009 6355 6557 6571 6819 6870 6885 6915 6919 6968 6988 7053 7054 7077 7086 7093 7173 7284 7367 7408 7416 7675 7691 7945 8030 8166 8170 8754 9009 9180 9310 9513 9635 9636 9732 9753 9769 9816 9829 981
6 10051 10171 10244 10448 10464
909654 909698 909701 909812 909856 909860 909883 909892 9098148 9098392 909465 909824 909870 909805 909913 901178 901217 901170 901470 901811 901821 901918 902088 902331 902400 902554 902630 902670 902795 902816 902816 902836 96
2002 903838 903173 903112 903513 903551 903561 903592 903607 903602 903866 903875 903888 903897 903921 904000 904013 904176 904180 904210 904486 904573 904606 904680 904694 904089 905172 905207 905265 905385 905457 905460 905513 90556
2 905963 906173 906186 906324 906379 906508 906531 906537 906544 906600 906753 906842 906866 906904 907070 907290 907601 907785 907825 907873 908165 908170 908240 908370 908835 909107 909415 909420 909606 909791 909810 909963 5
90990

Extra memory deallocated, size: 400000
Extra memory deallocated, size: 400000
Extra memory allocated, size: 400000
Extra memory allocated, size: 400000
-----
Dataset Size : 100000
-----
Insertion Sort:
    runtime      : 6.1
    extra memory allocated : 0
    Data:
5 6 64 122 171 369 401 499 667 794 1005 1281 1414 1822 2076 2342 2460 2545 2616 2620 2674 2752 2877 2932 3070 3341 3353 3481 3561 3580 3649 3655 3703 3920 4255 4258 4265 4640 4666 4795 4817 4838 4867 5004 5173 5233 5236 5680 5
806 5832 5913 5939 6086 6074 6182 6200 6208 6323 6512 6622 6935 7039 7094 7153 7156 7190 7438 7567 7602 7681 7742 7774 7814 7895 7957 8168 8275 8518 8521 8534 8624 8696 8786 8807 8809 8882 8947 9003 9174 9175 9199 9261 9379 9438 9530
9547 9801 9948 9994 10176

909809 909812 9098161 9098205 9098206 9098213 9098219 9098234 9098270 9098291 9098445 9098504 9098642 9098678 9098747 9098787 9098950 9098987 9091066 9091204 9091216 9091269 9091370 9091405 9091419 9091425 9091464 9091510 96
91637 9091705 9091707 9091704 9091824 9092003 9092118 9093401 9093401 9092542 9092574 9092663 9092895 9093315 9093301 9092305 9093457 9093248 9093589 9093981 9094005 9094233 9094402 9094408 9094406 9094560 9094645 9094707 9094760 9094
824 9094934 9094990 9095012 9095007 9095100 9095196 9095323 9095700 9095973 9096100 9096271 9096316 9096420 9096666 9096697 9097086 9097274 9097536 9097540 9097737 9097708 9097853 9097920 9097970 9097981 9098000 9098088 9098144 909815
7 9098240 9098334 9098412 9098777 9098804 9098952 9098960 9098962 9099022 9099253 9099346 9099482 9099996

Extra memory deallocated, size: 400000
Extra memory deallocated, size: 400000
Extra memory allocated, size: 400000
Extra memory allocated, size: 400000
-----
Dataset Size : 100000
-----
Insertion Sort:
    runtime      : 508.6
    extra memory allocated : 0
    Data:
173 240 262 272 301 422 510 617 688 757 757 1111 1252 1263 1306 1433 1471 1502 1518 1552 1858 1895 2045 2135 2143 2179 2426 2459 2810 2833 2859 2893 2931 3105 3110 3220 3237 3377 3396 3638 3683 3771 3932 3995 4103 4142 4458 44
69 4496 4542 4699 4781 4872 4887 5131 5356 5426 5451 5458 5719 5926 6000 6334 6370 6405 6414 6488 6600 6716 6827 6892 7386 7515 7547 7620 7662 7676 7744 7848 7864 7930 7942 7991 8271 8286 8293 8343 8401 8405 8542 8589 8945 8997 9133 5
200 9299 9384 9676 9871 9995

90988244 90988293 90988390 90988427 90988441 90988408 90988507 90988568 90988580 90988608 90988825 90989098 90989125 90989138 90989363 90989383 90989619 90989671 90989793 90989879 90989928 90990021 90990250 90990281 90990301 5
90990327 90990328 90990378 90990805 90991007 90991110 90991221 90991359 90991385 90991518 90991585 90992061 90992096 90992264 90992271 90992487 90992546 90992607 90992673 90992814 90992911 90992937 90993002 90993070 90993126 90993125 5
90993436 90993439 90993512 90993582 90993635 90993681 90994128 90994407 90994416 90994693 90994803 90994909 90995099 90995113 90995307 90995471 90995671 90995697 90995711 90995716 90995743 90995704 90995803 90996104 90996403 90996621 90996763 5
9099708 90997354 90997468 90997670 90997722 90997741 90997744 90997841 90998004 90998052 90998307 90998523 90998774 90998854 90998900 90999103 90999181 90999231 90999371 90999543 90999682 90999762 90999946

Merge Sort:
    runtime      : 0.0
    extra memory allocated : 0
    Data:
1 44 123 359 456 586 636 676 690 883 1114 1125 1196 1247 1334 1338 1459 1525 1531 1549 1597 1599 1671 1680 1974 1980 2112 2223 2524 2808 2889 2817 2960 2969 3046 3192 3394 3479 3640 3722 3870 4071 4542 4632 4737 4774 4903 5005
5144 5322 5406 5493 5510 5521 5987 6009 6355 6557 6571 6819 6870 6885 6915 6919 6968 6988 7053 7054 7077 7086 7093 7173 7284 7367 7408 7416 7675 7691 7945 8030 8166 8170 8754 9009 9180 9310 9513 9635 9636 9732 9753 9769 9816 9829 981
6 10051 10171 10244 10448 10464
909654 909698 909701 909812 909856 909860 909883 909892 9098148 9098392 909465 909824 909870 909805 909913 901178 901217 901170 901470 901811 901821 901918 902088 902331 902400 902554 902630 902670 902795 902816 902816 902836 96
2002 903838 903173 903112 903513 903551 903561 903592 903607 903602 903866 903875 903888 903897 903921 904000 904013 904176 904180 904210 904486 904573 904606 904680 904694 904089 905172 905207 905265 905385 905457 905460 905513 90556
2 905963 906173 906186 906324 906379 906508 906531 906537 906544 906600 906753 906842 906866 906904 907070 907290 907601 907785 907825 907873 908165 908170 908240 908370 908835 909107 909415 909420 909606 909791 909810 909963 5
90990

Extra memory deallocated, size: 400000
Extra memory deallocated, size: 400000
Extra memory allocated, size: 400000
Extra memory allocated, size: 400000
-----
Dataset Size : 100000
-----
Merge Sort:
    runtime      : 0.1
    extra memory allocated : 0
    Data:
5 6 64 122 171 369 401 499 667 794 1005 1281 1414 1822 2076 2342 2460 2545 2616 2620 2674 2752 2877 2932 3070 3341 3353 3481 3561 3580 3649 3655 3703 3920 4255 4258 4265 4640 4666 4795 4817 4838 4867 5004 5173 5233 5236 5680 5
806 5832 5913 5939 6086 6074 6182 6200 6208 6323 6512 6622 6935 7039 7094 7153 7156 7190 7438 7567 7602 7681 7742 7774 7814 7895 7957 8168 8275 8518 8521 8534 8624 8696 8786 8807 8809 8882 8947 9003 9174 9175 9199 9261 9379 9438 9530
9547 9801 9948 9994 10176

909809 909812 9098161 9098205 9098206 9098213 9098219 9098234 9098270 9098291 9098445 9098504 9098642 9098678 9098747 9098787 9098950 9098987 9091066 9091204 9091216 9091269 9091370 9091405 9091419 9091425 9091464 9091510 96
91637 9091705 9091707 9091704 9091824 9092003 9092118 9093401 9093401 9092542 9092574 9092663 9092895 9093315 9093301 9092305 9093457 9093248 9093589 9093981 9094005 9094233 9094402 9094408 9094406 9094560 9094645 9094707 9094760 9094
824 9094934 9094990 9095012 9095007 9095100 9095196 9095323 9095700 9095973 9096100 9096271 9096316 9096420 9096666 9096697 9097086 9097274 9097536 9097540 9097737 9097708 9097853 9097920 9097970 9097981 9098000 9098088 9098144 909815
7 9098240 9098334 9098412 9098777 9098804 9098952 9098960 9098962 9099022 9099253 9099346 9099482 9099996

Extra memory deallocated, size: 400000
Extra memory deallocated, size: 400000
Extra memory allocated, size: 400000
Extra memory allocated, size: 400000
-----
Dataset Size : 100000
-----
Merge Sort:
    runtime      : 2.6
    extra memory allocated : 0
    Data:
173 240 262 272 301 422 510 617 688 757 757 1111 1252 1263 1306 1433 1471 1502 1518 1552 1858 1895 2045 2135 2143 2179 2426 2459 2810 2833 2859 2893 2931 3105 3110 3220 3237 3377 3396 3638 3683 3771 3932 3995 4103 4142 4458 44
69 4496 4542 4699 4781 4872 4887 5131 5356 5426 5451 5458 5719 5926 6000 6334 6370 6405 6414 6488 6600 6716 6827 6892 7386 7515 7547 7620 7662 7676 7744 7848 7864 7930 7942 7991 8271 8286 8293 8343 8401 8405 8542 8589 8945 8997 9133 5
200 9299 9384 9676 9871 9995

90988244 90988293 90988390 90988427 90988441 90988408 90988507 90988568 90988580 90988608 90988825 90989098 90989125 90989138 90989363 90989383 90989619 90989671 90989793 90989879 90989928 90990021 90990250 90990281 90990301 5
90990327 90990328 90990378 90990805 90991007 90991110 90991221 90991359 90991385 90991518 90991585 90992061 90992096 90992264 90992271 90992487 90992546 90992607 90992673 90992814 90992911 90992937 90993002 90993070 90993126 90993125 5
90993436 90993439 90993512 90993582 90993635 90993681 90994128 90994407 90994416 90994693 90994803 90994909 90995099 90995113 90995307 90995471 90995671 90995697 90995711 90995716 90995743 90995704 90995803 90996104 90996403 90996621 90996763 5
9099708 90997354 90997468 90997670 90997722 90997741 90997744 90997841 90998004 90998052 90998307 90998523 90998774 90998854 90998900 90999103 90999181 90999231 90999371 90999543 90999682 90999762 90999946
```



```
-Out-ivij9fs.qba' '--stderr=Microsoft-MiEngine-Error-pjrn2uan.aq' '--pid=Microsoft-MiEngine-Pid-5foruwn.vdu' '--dbgExecC:\sys64\ucr64\bin\gdb.exe' '--interpreted'
Extra memory allocated, size: 480000
Extra memory allocated, size: 480000
-----
Dataset Size : 180000
-----
Selection Sort:
    runtime      : 0.1
    extra memory allocated : 0
    Data:
        1 44 123 359 456 586 636 676 690 883 1114 1125 1196 1247 1334 1338 1459 1525 1531 1549 1597 1599 1671 1680 1974 1980 2112 2223 2524 2888 2809 2817 2960 2969 3046 3192 3394 3479 3640 3722 3870 4071 4542 4622 4737 4774 4983 5085
5144 5122 5486 5491 5510 5521 5987 6009 6355 6557 6571 6819 6870 6885 6915 6919 6968 6988 7053 7054 7077 7086 7093 7173 7284 7367 7408 7416 7675 7691 7945 8030 8166 8170 8754 9009 9180 9310 9513 9635 9636 9732 9753 9769 9816 9829 983
6 10051 10171 10244 10448 10454
989664 989698 989761 989812 989856 989869 989883 989882 990148 990392 990465 990824 990870 990895 990913 991178 991217 991279 991478 991811 991821 991918 992088 992331 992460 992554 992630 992670 992795 992816 992816 992836 99
2902 993038 993173 993312 993513 993551 993561 993592 993607 993692 993866 993875 993888 993807 993921 994009 994013 994176 994189 994210 994486 994573 994606 994689 994694 994980 995172 995207 995265 995385 995457 995469 995513 99555
2 995963 996173 996186 996324 996378 996379 996508 996531 996537 996544 996690 996753 996842 996866 996994 997070 997290 997601 997785 997825 997873 998165 998170 998240 998370 998835 999107 999415 999428 999606 999791 999810 999963 9
99990
Extra memory deallocated, size: 480000
Extra memory deallocated, size: 480000
Extra memory allocated, size: 480000
Extra memory allocated, size: 480000
-----
Dataset Size : 180000
-----
Selection Sort:
    runtime      : 10.5
    extra memory allocated : 0
    Data:
        5 6 64 122 171 369 401 499 667 794 1005 1281 1414 1822 2076 2342 2460 2545 2616 2620 2674 2752 2877 2932 3070 3341 3353 3481 3561 3589 3649 3655 3703 3920 4255 4258 4265 4640 4666 4795 4817 4838 4867 5004 5173 5233 5236 5689 5
806 5832 5913 5939 6006 6074 6182 6200 6208 6323 6512 6622 6935 7039 7094 7153 7156 7190 7438 7567 7602 7681 7742 7774 7814 7905 7957 8160 8275 8518 8521 8534 8624 8696 8786 8807 8809 8882 8947 9003 9174 9175 9199 9261 9379 9438 9530
9547 9801 9948 9994 10176
9990009 9990122 9990161 9990205 9990206 9990213 9990219 9990234 9990270 9990291 9990445 9990504 9990642 9990678 9990747 9990787 9990950 9990987 9991066 9991204 9991216 9991269 9991370 9991405 9991419 9991425 9991464 9991510 99
91637 9991785 9991787 9991794 9991834 9992003 9992118 9992401 9992401 9992542 9992574 9992663 9992895 9993315 9993391 9993395 9993457 9993548 9993589 9993981 9994005 9994253 9994403 9994400 9994406 9994560 9994645 9994707 9994760 9994
824 9994934 9994999 9995012 9995097 9995100 9995196 9995323 9995709 9995973 9996100 9996271 9996316 9996420 9996666 9996697 9997086 9997274 9997536 9997540 9997737 9997798 9997853 9997920 9997970 9997981 9998000 9998088 9998144 999815
7 9998240 9998334 9998412 9998777 9998804 9998952 9998960 9998962 9999212 9999251 9999346 9999482 9999996
Extra memory deallocated, size: 480000
Extra memory deallocated, size: 480000
Extra memory allocated, size: 480000
Extra memory allocated, size: 480000
-----
Dataset Size : 1800000
-----
Selection Sort:
    runtime      : 1065.2
    extra memory allocated : 0
    Data:
        173 240 262 272 301 422 510 617 688 757 757 1111 1252 1263 1306 1433 1471 1502 1518 1552 1858 1895 2045 2135 2143 2170 2426 2450 2810 2833 2850 2893 2931 3105 3110 3220 3237 3377 3396 3638 3683 3771 3932 3995 4103 4142 4458 44
69 4496 4542 4699 4781 4872 4887 5131 5356 5426 5451 5458 5719 5926 6090 6334 6370 6405 6414 6488 6600 6716 6827 6892 7386 7515 7547 7620 7662 7676 7744 7848 7864 7930 7942 7991 8271 8286 8293 8343 8401 8405 8542 8589 8945 8997 9133 9
200 9299 9384 9676 9871 9995
99900244 99900293 99900390 99900427 99900441 99900450 99900507 99900508 99900580 99900600 99900825 99900808 99900125 99900130 99900363 99900383 99900619 99900671 99900793 99900879 99900920 99900241 99900250 99900281 99900301 9
9900327 99900528 99900870 99900805 99901007 99901110 99901221 99901350 99901385 99901518 99901585 99902061 99902096 99902264 99902271 99902407 99902546 99902667 99902673 99902814 99902913 99902937 99903002 99903070 99903250 99903425 9
9903436 99903439 99903512 99903582 99903635 99903983 99904128 99904407 99904416 99904693 99904835 99905009 99905213 99905307 99905471 99905671 99905697 99905713 99905716 99905743 99905794 99905861 99906194 99906403 99906621 99906763 9
9906798 99907354 99907468 99907670 99907722 99907741 99907744 99907841 99908004 99908052 99908397 99908523 99908774 99908854 99908900 99909103 99909181 99909231 99909371 99909543 99909682 99909762 99909946
Extra memory deallocated, size: 4800000
Extra memory deallocated, size: 4800000
```