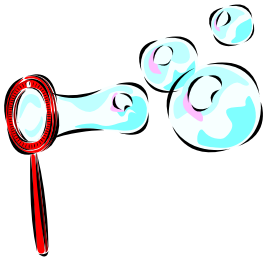
PROGRAM 481a

(Bubble Sort)

Program Description: Read a series of two-digit integers into an array from an unordered external file. Write a procedure that accepts that array, sorts the integers by using a BUBBLE SORT and returns the ordered array to the main program for output.

Explanation of the Problem: A Bubble Sort involves checking numbers in consecutive positions of an array and "floating: the small ones to the top and letting the large ones "sink" to the bottom. Look at the following example and assume that you want the numbers sorted from smallest to largest:

Original List	First Time Through	Second Time Through	Third Time Through	Final Time Through
18	18	18	13	13
27	27	13	18	18
99	13	27	26	26
13	78	26	27	27
78	26	55	55	55
26	55	78	78	78
55	99	99	99	99



As consecutive positions of the original list are compared, they are exchanged when they are not in the correct order. This means that 99 and 13 are exchanged, then 99 and 78, then 99 and 26 and finally 99 and 55. After the first time through the list (since an interchange was made) the numbers are compared again: 27 and 13 are exchanged, 78 and 26, and finally 78 and 55. Since there was and interchange, the numbers are again compared. This time, 18 and 13 are exchanged, then 27 and 26. Since there was an interchange, the numbers are again compared with no need for an interchange. Hence, the list is in order.

NOTE: Various observations can be noted to reduce the number of comparisons after each time through the loop.

Statements Required: input, output, loop control, decision making, array structure

Data Location: Numsort.dat

Exact Copy: (next page)

Bubble Sort

Original List:

```
388 206 868 857 239 659 687 504 426 132 854 734  37 299 957 920 734 179  13
208 953 568 374 144 159 545 228 417 513 148 477 821 333 210 846 207 654 580
615 754 740 296 580 647 631 133 666 167 931 943 242 413 220 955 669 515  75
401  63 817 476 303 625 171 482 531 968 616  85 186 707  92 692 813 278 440
230 181 596  16 253 484 268  37 144 676 869  92 436 310 575   5 833   2 449
  5 868 276 820 338 783 438 717 463 606 258 278  57 881 151 216 111 399 345
107 210 857 695 462 495 368 538 813 456 386 200 584 513 544 353 664 340 763
 27 684 167 938 998 186 416 962  19 780  94 560 826 133 207  64 581 487 628
550 432 999 414  49   3 879  58 578 659 554 231 790   6  34 568 880 590 975
379 460 793 349 354 485 205 620  13 379 340 366 559 513 909 321 234 235 376
582 490 740 970 738 635 238 540 274 872 689 995 945 699 796 223 717 408  66
830 772 514 971 357 511  87 826  54 326 458 835 149 730 401  51 442 536 631
156 359 511 355 399 569 353  43 654 559 919 719 841 635 109 704 927 501 950
527  79 401 518 792 121 415  17 827 751 768 263 820 910 698 564 585 113   2
203 190 339 866 707 539 362 836 436 118  79 719  57 356 209 659 755 616 252
448 617 162 217 109 999 914 165 882 858   2  33 366 778 736 684 583 183 159
529 239 311 829 398 799 330 591 511 308 251 305 306 830 687  11 752 685 920
639 858 888 729 583  45 580 329 618 319  52 921 761 572 209 418 382 116 480
831 374 571 822 203 134 225 692 461 800 666 587 672   3 446 178 394 853 446
 13 717 480   1 156 350 115  55 233 392 156 523 614 502 355 129 754 204 304
222 308  13 786 451 121 585 538 642 457 763 430 581 561 717 749 245  13 588
470 736 321 526 113 785 717 393  25 585 974 574 678 229 420 537 220 519  17
799   6 837 989 861 754 164 191 316 301  95 898 678  97 165  95 405  99 802
 97 424 289 145 944 456 173 604 759 416 567 877 960  60  81 399 215 934 335
269 418 534 511 155 396 271 155 203 919 323 358 407 558 795 934 125  27 707
534 827 168 583 655 396 207 930 966 490 442 669 322 555 753 798 634 690 399
 90 832 981  51 235 599
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Sorted List:

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  1   2   2   2   3   3   5   5   6   6  11  13  13  13  13  16  17  17  19
 25  27  27  33  34  37  37  43  45  49  51  51  52  54  55  57  57  58  60
 63  64  66  75  79  79  81  85  87  90  92  92  94  95  95  97  97  99 107
109 109 111 113 113 115 116 118 121 121 125 129 132 133 133 133 134 144 144
145 148 149 151 155 155 156 156 156 159 159 162 164 165 165 167 167 168 171
173 178 179 181 183 186 186 190 191 200 203 203 203 204 205 206 207 207 207
208 209 209 210 210 215 216 217 220 220 222 223 225 228 229 230 231 233 234
235 235 238 239 239 242 245 251 252 253 258 263 268 269 271 274 276 278 278
289 296 299 301 303 304 305 306 308 308 310 311 316 319 321 321 322 323 326
329 330 333 335 338 339 340 340 345 349 350 353 353 354 355 355 356 357 358
359 362 366 366 368 374 374 376 379 379 382 386 388 392 393 394 396 396 398
399 399 399 399 401 401 401 405 407 408 413 414 415 416 416 417 418 418 420
424 426 430 432 436 436 438 440 442 442 446 446 448 449 451 456 456 457 458
460 461 462 463 470 476 477 480 480 482 484 485 487 490 490 495 501 502 504
511 511 511 511 513 513 513 514 515 518 519 523 526 527 529 531 534 534 536
537 538 538 539 540 544 545 550 554 555 558 559 559 560 561 564 567 568 568
569 571 572 574 575 578 580 580 580 581 581 582 583 583 583 584 585 585 585
587 588 590 591 596 599 604 606 614 615 616 616 617 618 620 625 628 631 631
634 635 635 639 642 647 654 654 655 659 659 659 664 666 666 669 669 672 676
678 678 684 684 685 687 687 689 690 692 692 695 698 699 704 707 707 707 717
717 717 717 717 719 719 729 730 734 734 736 736 738 740 740 749 751 752 753
754 754 754 755 759 761 763 763 768 772 778 780 783 785 786 790 792 793 795
796 798 799 799 800 802 813 813 817 820 820 821 822 826 826 827 827 829 830
830 831 832 833 835 836 837 841 846 853 854 857 857 858 858 861 866 868 868
869 872 877 879 880 881 882 888 898 909 910 914 919 919 920 920 921 927 930
931 934 934 938 943 944 945 950 953 955 957 960 962 966 968 970 971 974 975
981 989 995 998 999 999
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