CS2010 2016/2017 Sem 2: PS6 A

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Task Content

A Trip to the Supermarket, v2017 (Subtask A)

Released: Friday, 31 March 2017, 12.00noon
Due: Thursday, 13 April 2017, 11:59pm

You are encouraged to work with other students or teaching staffs (inside or outside this module) on solving this problem set. However, you **must** write Java code **by yourself**. In addition, when you write your Java code, you **must** list the names of every collaborator, that is, every other person that you talked to about the problem (even if you only discussed it briefly). This list may include certain posts in CS2010 Facebook group. If you have access to CS2010 files from senior batch (that is, CS2010 problem sets from year 2011-2016), please refrain from looking at their code verbatim or worse... submit your senior's code. Automatic special checks are done especially on the last/hardest subtask to compare older code with this year's version. Any deviation from this policy will be considered as cheating. If the offender is caught beyond reasonable doubt, he/she will be punished severely, including referral to the NUS Board of Discipline.

2017 Story

Sometimes Ketfah will need to go buy some grocery from the supermarket near his house. However since the supermarket is big and sometimes the things that need to be bought are quite numerous, he will have to wheel himself around a lot. This can cause bleeding if he overexerts himself, and thus he needs to plan how to buy all the items required while having to wheel himself over the least distance.

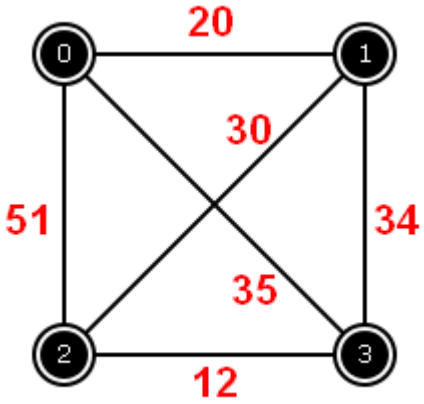
The Actual Problem Description

Today, Ketfah has to visit a supermarket at West Coast area to buy groceries (name omitted to avoid indirect advertising). ket fah has visited this place numerous times and therefore he knows the location of various **N** items in that supermarket. He has estimated the *direct* wheeling time from one point to every other points in that supermarket (in seconds) and store that information in a 2D table **T** of size (**N**+1) * (**N**+1). Given a list of **K** items to be bought today, he wants to know what is the minimum amount of time to complete the shopping duty of that day. We have to make some simplifying assumptions in order for this problem to be solvable... :

- Ketfah always starts at vertex 0, the entrance (+ cashier section) of that supermarket.
- There are **V** = **N**+1 vertices due to the presence of this special vertex 0.
  The other **N** vertices corresponds to the **N** items.
  The vertices are numbered from [0..**N**].
- The direct wheeling time graph that is stored in a 2D table **T** is a **complete graph**.
  T is a symmetric square adjacency matrix with **T[i][i] = 0** for all **i** in [0..**N**].
  The values inside **T** is guaranteed to be between [1..1000].
- Ketfah has to grab all **K** items (numbered from [1..**K**]) that he has to buy that day, or he will have to come again another day which takes even more effort. Here 1 ≤ **K** ≤ **N**.
- Ketfah is very efficient, once he arrives at the point that stores item **i**, he can grab item **i** into his shopping bag in 0 seconds (e.g. for item 'banana', he does not have to compare the price of 'banana A' versus 'banana B' and he does not have to select which banana looks nicer, etc...). So, Ketfah's shopping time is only determined by the total time taken to wheel himself inside that supermarket to grab all the **K** items.

- In this problem, Ketfah ends his shopping when he arrives at the cashier (also at vertex 0) after grabbing all the required **K** items.
- Ketfah can grab the **K** items in **any order**, but the total wheeling time (i.e. time to wheel himself from vertex 0 → to various points in the supermarket in order to grab all the **K** items → back to vertex 0) **must be minimized**. Ketfah can choose to bypass a certain point that is *not in his shopping list* or even *revisit* a point that contains item that he already grab (he does not need to re-grab it again) if this leads to faster overall shopping time.

See below for an example supermarket:



	0	1	2	3
0	0	20	51	35
1	20	0	30	34
2	51	30	0	12
3	35	34	12	0

2D Table T

A sample supermarket layout, **N = 3**, **V = 3+1 = 4**

Example Queries:

1. If today, Ketfah has to buy all item 1, item 2, and item 3, then one of the best possible shopping route is like this: `0 → 1 → 2 → 3 → 0` with a total wheeling time of: `20+30+12+35 = 97` seconds.
2. If tomorrow, Ketfah has to buy only item 1 and item 2, then one of the best possible shopping route is still: `0 → 1 → 2 (→ 3) → 0` with a total wheeling time of: `20+30+(12+35) = 97` seconds. Notice that although Ketfah does not have to buy item 3, taking sub path `2 → 3 → 0` (where Ketfah will just bypass item 3) is faster than taking sub path `2 → 0`.
3. If two days later, Ketfah has to buy only item 2, then one of the best possible shopping route is like this: `0 (→ 3) → 2 (→ 3) → 0` with a total wheeling time of: `(35+12)+(12+35) = 94` seconds. That is, Ketfah bypass through item 3 twice.
4. If three days later, Ketfah has to buy only item 2 and item 3, then one of the best possible shopping route is like this: `0 → 3 → 2 (→ 3) → 0` with a total wheeling time of: `35+12+(12+35) = 94` seconds. See that Ketfah can revisit point 3 although he does not have to grab item 3 twice.

Hopefully these four examples should be clear enough to describe this problem.

The skeleton program Supermarket.java (click to view) that can handle all input/output details is already written for you.

You just need to implement one (or more[1]) method(s)/function(s):

- `int Query()`
  You are given a 2D matrix **T** of size (**N**+1) * (**N**+1) and an array **shoppingList** of size **K**. Query these two data structures and answer the query as defined above.

Subtask A Constraints (70 points)

Time Limit: 1s.

The supermarket is a very small convenience store and everything there have to be grabbed/bought. 1 ≤ **K** = **N** ≤ 10.

Special for this Subtask A: **T[i][j] ≤ T[i][k]+T[k][j]** for all combinations of **i**, **j**, and **k**.
Note that the example above is for Subtask B :).

There are a few (not more than 30) test cases in the test data for Subtask A-B.

Sample Input

```
2

3 3
1 2 3
0 20 47 35
```

```
20 0 30 34
47 30 0 12
35 34 12 0

1 1
1
0 10
10 0
```

Sample Output

```
97
20
```

Generating Test Data

The given sample input/output are for illustration purpose and are not enough to verify the correctness of your solution.

You are encouraged to generate and post additional test data in CS2010 Facebook group.

Please use SupermarketVerifier.java (click to view) to verify whether your custom-made test data conform with the required specifications.

Problem Author

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For CS2010/R.

Footnotes

[1]If needed, you can write additional helper methods/functions to simplify your code.

Submission (Course)

Select course: CS2010 (2016/2017 Sem 2) - Data Structures and Algorithms II ▼

Your Files:

SUBMIT (only .java, .c, .cpp and .h extensions allowed)

To submit multiple files, click on the Browse button, then select one or more files. The selected file(s) will be added to the upload queue. You can repeat this step to add more files. Check that you have all the files needed for your submission. Then click on the Submit button to upload your submission.

CS2010 2016/2017 Sem 2: PS6 B

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Task Content

A Trip to the Supermarket, v2017 (Subtask B)

The Actual Problem Description

Please refer to Subtask A for the full problem description.

Subtask B Constraints (additional 30 points)

Time Limit: 1s.

The supermarket is a minimart that sells *~hundreds* of grocery items. However, Ketfah only needs to buy some items. 1 ≤ **N** ≤ 200, 1 ≤ **K** ≤ 10, **K** ≤ **N**.

For Subtask B, it is no longer guaranteed that: **T[i][j] ≤ T[i][k] + T[k][j]** for all combination of **i**, **j**, and **k**.

Sample Input

```
5

3 3
1 2 3
0 20 51 35
20 0 30 34
51 30 0 12
35 34 12 0

3 2
1 2
0 20 51 35
20 0 30 34
51 30 0 12
35 34 12 0

3 1
2
0 20 51 35
20 0 30 34
51 30 0 12
35 34 12 0

3 2
2 3
0 20 51 35
```

```
20 0 30 34
51 30 0 12
35 34 12 0

200 5
11 22 33 44 55
0 543 721 835 40 215 207 6 237 487 419 823 909 600 564 248 88 188 374 376 856 971 77 316 223 716
543 0 932 872 548 328 555 886 199 77 989 465 796 751 547 866 74 77 94 821 641 38 145 261 655 981
721 932 0 221 882 914 196 164 309 791 651 112 109 295 395 185 189 791 426 170 724 854 699 186 925
835 872 221 0 769 417 718 541 572 442 416 768 630 192 948 886 443 281 494 879 200 377 569 151 885
40 548 882 769 0 886 34 433 822 790 823 120 298 390 256 729 912 4 604 912 853 284 51 540 508 107
215 328 914 417 886 0 661 791 303 403 568 684 525 736 22 199 556 323 595 748 942 797 443 305 252
207 555 196 718 34 661 0 76 944 963 745 805 778 530 988 859 94 743 944 101 812 184 239 248 336 36
6 886 164 541 433 791 76 0 515 954 448 418 38 105 428 748 734 379 84 372 10 797 350 483 197 590 3
237 199 309 572 822 303 944 515 0 540 893 872 130 43 835 258 754 668 211 973 46 577 832 35 493 53
487 77 791 442 790 403 963 954 540 0 570 762 369 826 481 769 982 675 149 725 607 492 853 356 212
419 989 651 416 823 568 745 448 893 570 0 62 21 951 651 576 64 731 752 409 339 438 220 373 199 96
823 465 112 768 120 684 805 418 872 762 62 0 975 486 999 20 917 384 513 771 276 592 335 906 666 1
909 796 109 630 298 525 778 38 130 369 21 975 0 995 750 150 864 92 775 123 234 605 68 25 331 890
600 751 295 192 390 736 530 105 43 826 951 486 995 0 736 843 326 416 621 730 308 729 520 692 636
564 547 395 948 256 22 988 428 835 481 651 999 750 736 0 941 893 162 7 53 27 209 529 561 385 50 3
248 866 185 886 729 199 859 748 258 769 576 20 150 843 941 0 439 121 765 793 906 650 906 971 443
88 74 189 443 912 556 94 734 754 982 64 917 864 326 893 439 0 104 277 225 403 352 343 819 2 44 38
188 77 791 281 4 323 743 379 668 675 731 384 92 416 162 121 104 0 896 721 474 169 641 739 611 127
374 94 426 494 604 595 944 84 211 149 752 513 775 621 7 765 277 896 0 418 882 426 615 17 835 514
376 821 170 879 912 748 101 372 973 725 409 771 123 730 53 793 225 721 418 0 889 434 248 438 434
856 641 724 200 853 942 812 10 46 607 339 276 234 308 27 906 403 474 882 889 0 841 484 86 755 693
971 38 854 377 284 797 184 797 577 492 438 592 605 729 209 650 352 169 426 434 841 0 771 345 324
77 145 699 569 51 443 239 350 832 853 220 335 68 520 529 906 343 641 615 248 484 771 0 642 368 52
316 261 186 151 540 305 248 483 35 356 373 906 25 692 561 971 819 739 17 438 86 345 642 0 31 813
223 655 925 885 508 252 336 197 493 212 199 666 331 636 385 443 2 611 835 434 755 324 368 31 0 74
716 981 555 473 107 131 360 590 535 577 96 108 890 48 50 863 44 127 514 228 693 368 52 813 749 0
898 882 601 3 903 142 588 305 458 306 331 628 861 49 354 270 380 465 94 719 738 501 666 780 448 4
504 404 294 452 121 680 701 884 474 534 593 687 422 299 398 348 172 832 932 649 503 517 368 343 7
806 84 887 941 191 258 33 580 406 992 73 780 900 662 490 36 900 433 322 63 66 353 988 932 866 245
239 13 288 8 810 682 141 278 70 415 492 140 226 927 12 991 213 545 74 506 594 895 860 223 66 309
339 303 31 617 959 721 629 649 101 603 13 533 58 178 249 250 341 963 646 531 174 558 997 498 115
983 114 462 882 852 62 131 156 398 640 278 214 204 491 149 704 743 485 573 120 400 855 564 865 26
432 276 387 876 865 353 123 168 587 635 118 72 578 998 840 596 995 14 714 867 440 225 594 676 857
994 577 115 362 720 882 426 592 670 217 921 158 780 707 152 319 961 602 492 636 186 683 691 812 3
970 649 191 794 275 455 28 613 149 685 650 578 793 373 119 303 122 967 869 408 843 68 870 810 54
563 719 413 486 320 709 181 686 150 156 714 473 473 483 719 668 995 638 781 932 48 906 996 210 78
394 849 710 188 420 370 667 707 244 896 756 183 482 419 802 506 996 279 888 591 221 921 95 468 53
359 552 299 890 5 315 420 612 475 371 386 820 970 782 898 278 144 329 908 386 190 483 88 374 165
264 89 4 619 581 894 447 28 381 851 916 7 121 76 938 666 342 216 676 448 714 253 958 835 779 480
391 290 863 711 707 299 962 612 745 985 22 171 453 406 314 578 843 758 349 620 846 453 747 7 418
885 440 439 501 456 291 95 460 589 351 452 310 613 236 268 708 571 76 813 697 574 210 805 391 950
10 693 717 349 779 71 295 120 316 610 738 456 819 360 49 924 525 386 95 316 440 726 889 593 155 6
585 651 85 941 626 643 862 781 258 379 514 822 333 666 490 511 137 88 749 628 609 737 585 842 824
516 537 829 24 715 563 727 939 445 215 677 396 195 175 491 788 76 274 772 651 140 422 672 578 466
632 832 354 393 601 547 709 277 231 544 958 992 34 258 545 205 891 765 54 959 596 345 555 164 729
415 974 490 760 922 344 66 841 230 8 413 564 607 946 554 37 104 533 432 810 384 689 155 950 595 7
674 849 744 41 614 870 142 77 35 955 937 330 96 419 57 430 618 790 247 827 288 326 475 225 527 95
244 759 874 140 661 785 664 998 540 996 818 905 54 749 823 969 514 835 253 471 617 433 165 101 51
129 753 125 322 371 650 897 424 52 237 848 206 879 776 231 752 644 696 530 694 977 441 149 734 27
531 992 81 282 260 705 26 448 621 100 73 95 195 709 611 231 83 315 456 659 97 612 375 705 48 56 7
561 744 66 606 922 327 554 154 336 133 981 487 999 742 726 493 852 764 147 695 583 372 732 979 44
674 434 36 381 791 823 628 248 470 420 92 668 558 599 193 890 439 288 465 268 862 381 75 882 529
302 516 606 9 988 943 269 631 13 444 618 625 573 916 854 128 813 781 679 414 515 397 163 454 254
509 380 240 690 418 543 500 192 48 863 790 813 964 914 527 407 872 548 640 303 701 6 692 197 425
462 357 268 487 573 110 110 600 512 595 242 296 950 845 119 941 791 611 894 955 413 683 980 123 8
513 929 947 679 46 813 218 674 865 22 343 814 629 489 683 941 590 657 491 875 834 951 446 762 215
305 612 574 942 89 916 521 183 459 462 609 230 472 733 53 882 103 182 742 618 616 206 642 387 738
869 310 21 454 251 697 858 260 535 350 895 322 85 658 581 474 583 318 530 17 94 259 996 256 406 4
974 289 722 755 994 458 371 710 77 109 856 965 265 442 649 561 32 929 298 728 204 686 846 847 92
809 518 799 312 541 333 922 292 792 770 56 889 438 75 358 803 123 57 594 169 914 849 642 68 682 9
608 616 335 524 304 66 974 697 872 960 428 115 702 670 178 866 194 827 634 912 469 512 464 829 53
764 149 631 802 424 558 450 102 849 219 365 198 113 535 407 748 318 794 285 560 377 298 531 556 5
395 236 779 244 848 687 289 502 88 999 117 476 613 509 806 85 275 884 107 776 97 883 166 177 850
571 907 535 830 880 473 200 341 476 571 423 164 133 198 438 504 950 868 63 558 277 118 146 155 89
876 993 501 459 598 349 988 63 695 96 765 795 399 660 439 469 823 924 703 389 356 745 371 358 985
67 77 63 598 301 740 370 612 451 306 946 776 639 941 386 877 195 845 725 660 283 230 793 993 444
744 555 678 405 90 173 886 563 608 154 842 710 875 576 149 625 704 871 753 635 125 12 786 253 177
683 66 255 219 412 450 688 917 111 877 959 644 564 30 560 688 303 889 671 22 763 433 750 624 644
```

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27 266 249 851 936 296 704 389 362 562 555 436 944 461 96 39 932 372 715 882 299 729 850 44 357 4
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119 475 911 539 733 71 254 117 557 976 775 537 371 742 186 901 204 586 766 96 238 318 644 392 449
949 462 850 535 428 307 827 121 660 150 143 178 280 285 589 556 108 419 492 363 646 817 519 760 9
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923 431 571 876 626 436 726 723 16 508 607 556 760 389 319 61 195 995 645 398 251 756 877 193 832
368 620 345 577 952 627 82 715 560 983 942 891 377 695 805 839 284 431 238 435 255 202 366 715 43
119 328 732 44 933 736 559 733 844 344 919 340 305 306 806 433 644 158 427 107 519 850 662 272 39
472 756 167 729 597 804 631 258 802 364 115 680 749 356 174 850 257 49 651 446 581 450 376 909 86
568 443 37 843 894 177 158 760 179 491 931 158 29 331 648 499 783 519 950 897 552 489 637 54 537
426 251 641 41 366 508 62 859 169 253 414 686 670 597 202 24 799 978 817 555 797 15 402 806 324 4
470 356 223 510 340 11 695 123 753 303 324 870 694 420 342 499 942 597 598 414 662 871 314 662 61
392 331 195 385 937 62 506 645 998 894 998 611 638 71 264 671 999 700 362 126 723 659 900 68 250
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688 598 312 584 80 724 949 538 538 994 861 135 734 965 689 827 293 884 390 230 470 836 127 536 19
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511 135 539 205 172 395 804 360 881 711 898 260 208 794 41 262 837 181 363 883 860 273 863 147 72
552 402 261 717 550 799 627 448 5 896 391 51 502 481 823 497 504 390 399 182 700 404 847 464 146
597 324 194 115 328 354 414 1 488 98 284 401 176 819 252 887 599 771 569 967 338 468 977 742 166
988 528 632 617 191 383 846 433 598 118 592 417 161 821 878 311 915 971 266 845 819 628 195 5 240
413 650 944 489 365 648 708 982 60 478 689 887 106 465 731 234 39 501 761 502 711 50 348 260 579
923 293 869 33 698 753 40 880 26 942 209 443 440 205 122 130 181 429 409 705 930 825 774 296 806
316 336 166 763 381 901 983 947 866 911 882 344 584 311 114 134 584 851 537 992 213 471 238 426 2
330 881 337 489 999 900 224 533 334 334 23 291 107 688 182 396 526 834 801 112 387 490 606 873 82
715 591 467 882 77 92 273 267 37 537 941 106 138 348 515 822 901 316 992 481 722 402 481 916 156
502 63 70 41 286 266 279 697 524 872 558 910 12 373 957 274 648 393 63 1 349 629 346 386 976 494
5 184 592 712 919 634 384 549 898 229 839 579 3 740 717 86 638 512 330 680 35 626 998 259 873 437
792 71 537 440 238 110 343 985 396 289 210 732 762 562 658 559 380 836 295 879 556 632 742 665 78
952 463 115 940 491 31 90 30 12 339 898 317 356 569 104 242 882 63 633 662 729 30 580 499 276 221
743 126 904 351 193 271 561 552 460 641 575 737 933 475 675 84 874 608 783 845 508 462 814 842 31
317 299 724 92 483 895 680 680 636 526 788 755 956 276 396 304 889 192 192 310 454 715 407 990 88
393 459 92 706 15 589 285 837 565 896 544 547 604 113 409 48 420 409 895 573 42 479 579 81 28 660
231 884 336 433 39 365 363 866 586 767 330 234 972 434 364 725 919 731 571 153 671 157 889 584 56
854 344 404 613 87 880 923 305 848 856 219 301 62 335 977 531 278 299 506 796 449 899 869 627 337
668 542 764 215 207 793 755 326 264 96 73 455 110 27 188 21 87 637 391 435 354 342 462 652 12 748
218 143 470 561 746 224 899 909 496 997 397 12 674 213 66 3 923 266 945 847 900 978 961 29 364 91
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310 346 485 145 59 420 390 132 616 400 982 683 894 924 568 778 408 812 971 485 552 892 886 426 81
538 547 194 217 488 458 533 293 350 489 551 938 624 965 418 384 709 650 428 109 923 485 220 347 3
363 309 239 347 205 181 864 942 127 453 560 350 142 804 746 880 504 364 229 540 771 914 701 753 2
541 372 608 232 697 63 280 288 893 115 528 471 652 522 166 751 728 639 857 480 178 328 298 632 93
762 355 240 423 788 342 244 256 734 734 272 681 466 971 340 947 475 392 711 44 389 261 596 229 69
439 486 768 787 947 141 496 901 350 807 722 449 692 684 283 400 581 678 986 854 641 211 118 321 4
999 80 61 421 913 46 194 762 138 597 257 472 393 993 536 929 138 617 163 215 662 230 636 934 882
620 833 942 599 796 582 298 665 543 148 778 583 235 651 344 423 344 266 556 4 151 853 339 471 325
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858 939 895 654 269 660 86 639 834 489 372 238 581 580 868 372 505 68 793 198 895 781 337 257 782
661 287 972 816 231 340 835 643 910 186 407 464 22 556 305 195 458 322 921 656 811 385 722 203 51
540 351 144 502 103 703 735 935 305 109 11 124 777 625 165 963 603 815 790 958 787 709 292 512 99
417 465 820 890 829 27 125 600 781 660 987 389 158 909 897 244 834 186 521 567 986 509 37 934 650
967 533 339 631 788 265 809 753 627 576 474 636 28 577 733 273 365 698 352 31 849 591 708 377 590
668 69 266 979 279 713 300 365 242 507 850 646 960 149 880 765 59 640 26 866 708 296 68 241 284 9
179 917 193 200 64 309 843 860 794 433 966 510 429 927 755 764 991 51 669 568 751 663 156 705 886
225 209 900 221 393 339 97 415 659 48 747 709 299 387 689 709 127 55 866 871 458 694 404 235 776
164 504 468 351 566 999 964 542 526 943 299 495 474 127 86 897 780 552 283 959 215 11 699 361 249
845 744 548 410 37 864 315 110 536 591 503 892 145 82 362 671 848 534 295 237 211 75 534 451 948
208 728 484 556 352 909 828 89 933 799 730 336 802 196 22 5 590 601 564 407 925 473 261 938 889 5
571 590 508 959 730 790 833 963 123 437 653 971 797 344 795 617 180 659 515 876 376 156 590 914 2
218 56 595 753 228 957 398 678 621 191 487 379 342 832 358 411 917 90 756 800 545 600 709 558 518
34 319 456 541 394 864 145 366 719 732 743 328 614 454 414 555 515 324 36 932 386 92 925 160 860
702 708 990 786 987 766 380 774 293 263 193 746 232 650 78 648 814 706 356 677 136 559 442 589 20
619 691 548 997 921 471 414 135 901 4 921 241 558 98 172 692 703 754 242 411 150 285 642 806 585
205 984 428 778 931 809 548 779 917 272 149 431 94 410 615 258 255 860 390 155 675 535 292 437 18
789 893 787 691 755 91 436 817 40 566 467 965 343 538 718 534 888 419 540 998 813 95 477 607 780
45 644 810 341 535 477 800 765 297 219 167 117 709 866 71 420 714 610 442 507 533 221 378 61 715
424 112 730 725 615 153 202 206 612 648 540 297 613 314 615 950 846 345 96 536 983 753 798 547 50
456 78 205 759 273 373 646 67 621 65 286 552 303 845 549 824 584 185 441 71 578 937 594 648 79 53
72 359 780 276 471 663 167 805 894 860 335 57 287 514 374 214 882 334 381 217 683 662 510 194 614
819 279 254 52 404 5 22 273 594 245 826 6 842 977 113 721 614 355 244 136 827 768 217 593 470 780
776 910 867 292 211 10 61 458 775 192 155 655 937 64 348 260 926 669 897 758 310 411 40 513 529 5
623 81 668 350 120 145 924 295 671 690 671 325 882 872 737 226 946 901 897 901 902 352 823 65 565
4 236 535 42 860 754 280 865 186 141 51 945 908 262 485 953 163 22 896 199 829 491 584 182 989 17
179 481 504 121 182 819 831 597 90 527 887 726 552 749 6 678 829 534 5 761 54 390 645 468 971 123
987 637 437 906 659 907 440 156 670 807 13 160 935 291 609 422 2 625 255 882 949 230 357 33 421 1
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440 842 951 703 21 30 398 457 911 865 690 945 97 813 223 696 810 313 10 562 711 439 614 331 497 1
822 100 759 58 63 481 461 518 67 530 985 809 981 322 216 779 168 303 788 309 984 648 4 588 961 81
713 477 119 862 619 921 310 296 218 6 313 595 815 368 586 870 533 683 246 759 254 830 908 512 275
380 402 481 804 916 483 893 452 265 784 996 563 84 32 526 254 553 96 207 585 822 441 538 307 865
539 579 636 306 884 247 55 3 988 161 768 128 75 500 979 671 353 908 213 342 847 220 826 406 94 58
236 454 94 155 692 217 367 270 479 552 683 169 478 814 791 28 178 335 833 198 966 197 276 772 206
204 483 701 612 115 299 251 296 658 424 776 593 594 784 802 834 688 661 154 98 321 66 132 728 160
68 955 961 85 375 693 170 467 934 971 732 954 807 530 541 850 229 976 549 320 558 329 567 578 613
208 732 319 100 599 248 806 834 558 114 810 974 888 907 792 368 987 941 958 249 219 176 614 939 5
958 63 171 957 171 316 160 936 156 655 984 244 862 531 747 36 386 859 704 542 695 325 247 616 492
681 628 73 320 586 524 83 839 116 16 286 903 114 792 210 481 143 505 318 242 750 943 676 153 698
897 585 95 844 709 731 66 21 214 889 85 867 94 939 695 740 796 749 807 663 522 113 886 26 681 385
866 200 311 947 530 908 630 940 567 436 833 675 276 240 716 847 434 660 574 147 792 581 426 516 6
961 640 141 541 718 812 231 803 901 334 377 896 595 514 416 309 866 491 251 20 611 670 674 116 43
149 907 285 829 880 386 821 138 452 643 447 219 550 912 521 368 865 275 33 73 725 624 647 712 193
706 610 838 862 749 115 197 217 449 614 197 585 376 974 845 450 149 638 416 340 936 661 703 263 2
503 25 780 164 279 283 701 856 539 730 953 641 895 387 514 555 566 929 607 186 207 760 94 191 588
573 680 176 439 402 230 586 351 212 71 209 232 374 495 537 819 898 452 115 142 547 143 94 314 925
367 377 236 842 180 853 233 251 478 82 693 382 603 213 21 678 571 375 354 574 936 616 838 860 728
921 407 348 895 767 386 257 788 148 461 553 82 718 548 706 300 773 499 38 575 772 924 791 532 453
235 346 607 556 316 170 59 602 456 44 964 700 166 102 710 708 215 746 283 866 682 868 53 150 834
447 762 207 111 77 35 827 558 766 833 923 141 507 485 639 152 681 245 979 617 251 441 113 799 184
262 225 933 853 921 190 711 45 528 12 371 634 668 956 760 994 123 725 361 743 313 271 598 335 924
724 976 327 960 27 932 885 405 518 905 907 109 505 337 933 999 410 853 223 786 496 798 10 517 216
517 676 514 208 960 358 24 903 733 869 422 722 578 686 54 963 845 421 375 506 740 989 16 151 890
72 905 567 727 866 339 887 525 55 411 528 683 22 117 582 892 523 670 965 427 874 717 372 340 935
163 876 392 88 318 640 2 86 572 318 879 440 569 466 591 935 201 890 951 372 804 253 445 338 448 6
641 288 904 17 219 485 314 623 172 791 505 725 812 446 152 463 459 447 48 661 715 920 171 974 748
982 35 377 714 357 672 854 495 116 484 15 767 594 805 37 808 835 86 484 857 519 133 137 779 383 8
363 933 101 545 661 812 449 560 425 444 119 183 211 46 229 30 688 599 276 933 399 378 136 793 888
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Sample Output

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97
97
94
94
139
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Problem Author

Dr Steven Halim
For CS2010/R.

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