



Problem 11

Diffusion Limited Aggregation

9 points

JAVA: program name must be prob11.class

C/C++ program name must be: prob11.exe

Task Description

Diffusion-limited aggregation (DLA) is a process whereby particles undergoing a random (or simulated random) motion cluster together to form aggregates of such particles. The fractal patterns created by DLAs resemble patterns formed in nature, including river networks and lightning.

Write a program to generate a DLA diagram.

Program Input

The first section of input (read from file prob11.in) is an 11x11 array of previously generated random integers. These numbers could represent, for example, the elevation data for a square section of land. The second section contains x and y coordinates (in that order), which are the starting locations for the particles (such as rain drops) whose paths of motion will form the DLA diagram. The x axis increases left-to-right, and the y axis top-to-bottom. The point (0,0) is in the top-left corner. The input ends with the values -1, -1.

```
600 809 840 815 555 508 493 546 608 737 930
774 831 699 536 586 818 485 790 861 617 838
799 919 538 521 510 431 924 742 589 602 814
645 933 801 521 728 870 701 621 705 746 730
665 665 655 515 496 720 729 969 517 858 532
606 606 572 797 480 469 455 666 483 488 514
545 864 928 866 906 639 454 480 699 607 582
884 602 617 608 812 957 583 499 500 672 672
966 597 587 580 958 667 684 537 500 912 805
843 783 653 577 528 523 521 515 506 830 875
643 904 632 859 627 690 561 657 741 729 587
10 4
2 7
3 2
7 9
8 4
5 0
6 1
-1 -1
```

Program Output

The program must track the path of each particle in an 11x11 array. The array should be initialized with periods. Cells that are visited by a particle should be marked with an asterisk. After marking the cell, the program should examine the eight neighboring cells and move the particle to the cell with the smallest integer value in the corresponding input array. If there are no adjacent cells with lower values, or if the particle visits a cell that has already been visited, the program should begin tracking the next particle. The program should print the array after all the particles have been tracked.

```
.....*.....
.....*.....
...***.....
.....
.....*.*
.....**
.....**
.*.....*
..*.....*
...****
.....
```