

CMSC 401 – Fall 2018

Assignment 2 (due Friday 10/12 – 11:59pm)

Dr. Eyuphan Bulut

CMSC 401- Algorithm Analysis with
Advanced Data Structures

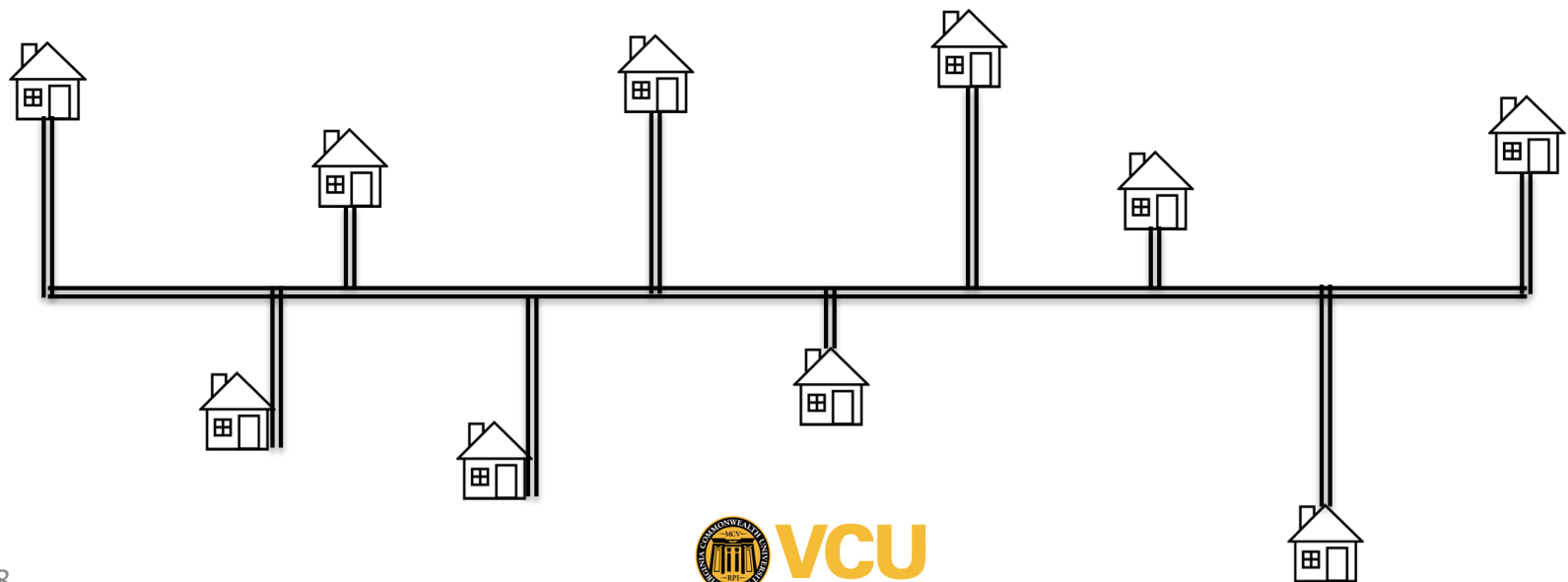


VCU

School of Engineering | Computer Science

Optimal Power Line Location

- Power distribution company is planning to build a main power line from east to west (x-axis) across its distribution area
- The area has n houses
- The company wants to connect each house directly to the main power line with smaller power lines in north-south direction (y-axis)
- Your task is to estimate the optimal position (on the y-axis) of the main power line, so that the total length of smaller power lines is the shortest.

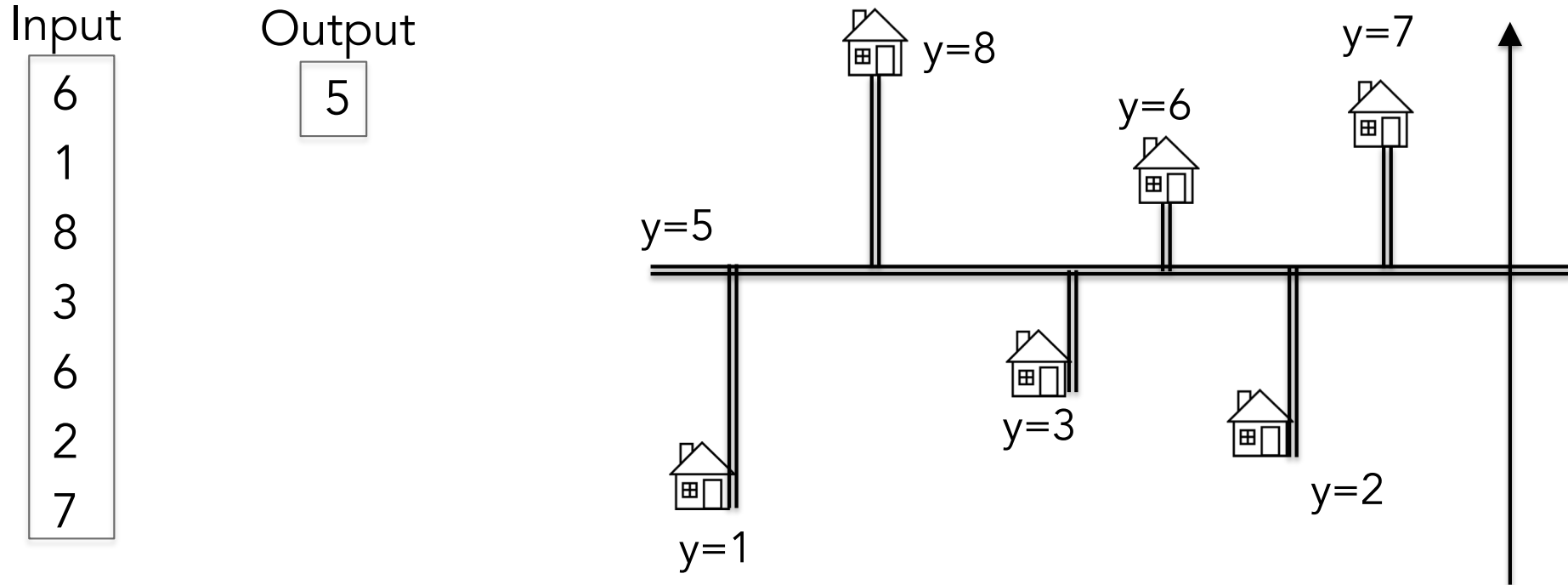


Assignment 2

Write a program cmisc401.java that

- takes as input
 - in the first line, the number of houses n , $n \geq 2$, $n < 1,000,000$
 - in each consecutive line (from 2nd to $(n+1)$ -th line), the y-coordinate of one house (integers in the range 0 to 1,000,000,000)
- returns as output
 - a single number: the y-coordinate where the main power line should be built
 - only one number, no comments, prompts etc.
- Use standard I/O to read input (System.in, System.out) and write the result
- Make sure the program compiles

Example



Total length of smaller power lines: 15

This is the minimum possible length.

There might be other results with the same minimum

Hints

- Think about the solution over examples
- Consider the y-coordinates of houses as an array of size n
- Design a divide & conquer algorithm like quicksort
 - Use recursive approach with an appropriate *Partition-like* method
- Try to use the asymptotically fastest method
 - Aim at expected **linear time $O(n)$**
 - **Slower methods will get lower score** even it is correct
- There may be several correct solutions, return one of them.

Submission

- Date due: Friday, Oct 12th, 11:59 pm
- Upload through Blackboard
 - Submit as a zip file with name **2_FamilyName_FirstName.zip** and include
 - Java source code in a single file **cmssc401.java** (all lower case letters!)
 - The file should have *your name* in a comment in the first line
 - Remember: in Java, class name should match the file name, and is case sensitive
- Please do NOT create your own packages
- Do NOT place the file into a folder – just zip the file
- Use standard I/O to read input (System.in, System.out) and output
- Make sure the program compiles and WORKS!
- Late submissions are accepted up to 2 days!