

# Third Assignment for MT471S

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Please submit these programs by 16:00 on 2022-11-25 by:

- uploading the .c files to the MT471S Moodle.

You **only** need to submit the .c file for each assignment. Your assignments are:

1. Write a program that reads a list of real numbers. For each number  $x$  in the list, it should check if there is a number  $y$  in the list so that  $x + y = 0$ . Your program should work with up to 100 numbers.

Please enter numbers and finish with a letter:

-2.0

0.0

3.2

2.0

v

-2 + 2 = 0.

0 + 0 = 0.

There is no number  $y$  in the list so that  $3.2 + y = 0$ .

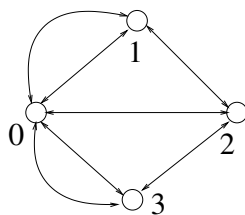
2 + -2 = 0.

Hint: You can ignore rounding error.

2. The adjacency matrix  $A$  of a multigraph has entries  $a_{ij}$ , where this is the number of edges between vertex  $i$  and vertex  $j$ . Each entry is a whole number. You can calculate the number of walks from vertex  $i$  to vertex  $j$  of length  $n$  by finding  $A^n$ .

Write a program that reads the adjacency matrix of a graph with 4 vertices. It should output  $A^5$  and the total number of walks of length 5.

Test it on this example, based on the *Bridges of Königsberg*:



$$A = \begin{bmatrix} 0 & 2 & 1 & 2 \\ 2 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 2 & 0 & 1 & 0 \end{bmatrix}$$

$$A^5 = \begin{bmatrix} 160 & 250 & 153 & 250 \\ 250 & 84 & 137 & 84 \\ 153 & 137 & 112 & 137 \\ 250 & 84 & 137 & 84 \end{bmatrix}$$

3. You are organising an event for a student society and need to order pizza. You can order half a pizza per student, rounded up to a whole number of pizzas. However, to reclaim the cost, you need to provide a list of distinct student ID numbers. You have a list of student IDs that may contain duplicates, as sometimes students registered twice.

Write a program that reads the list of student numbers and prints out (1) a list of distinct student numbers and (2) how many pizzas you should order. You can assume there are less than 300 student IDs on the list.

Please enter student numbers, with a letter to finish:

22200001

22200002

22200003

22200002

x

22200001

22200002

22200003

There were 3 distinct student numbers and you should order 2 pizzas.

Hint: There are several ways to do this. One involves sorting the numbers.