

Project Description – Zovid-301 Infection Simulator

Currently, a city called Enrangel is suffering from Zovid-301. Our task is to investigate the data collected in Enrangel and make an exposure prediction, in order to implement an email warning system to alert the residents in Enrangel.

The data definition of each table is as follows:

Table Name (PK/FK)	Attributes and Data Types		Notes
audience	Name	VARCHAR	All the audience information who watched the movie on one day.
	id_Number	NUMERIC	
	row_Number	NUMERIC	
	seat_Number	NUMERIC	
	auditorium_Number	NUMERIC	
census	id_Number	NUMERIC	Residents' information in Erangel.
	city	VARCHAR	
	latitude	NUMERIC	
	longitude	NUMERIC	
zovid301test	id_Number	NUMERIC	Records of the Zovid-301 test.
	result	VARCHAR	
	date	DATE	
hospital_info	hospital_ID	NUMERIC	Eight hospital information in major cities in Erangel.
	city	VARCHAR	
	latitude	NUMERIC	
	longitude	NUMERIC	
assigned_hospital	city	VARCHAR	Residents in different cities are assigned to nearest hospitals in Erangel.
	hospital_ID	NUMERIC	
patient_info	name	VARCHAR	Records of the patients
	id_Number	NUMERIC	

	gender	VARCHAR	information in Erangel.
	height_cm	NUMERIC	
	weight_kg	NUMERIC	
positive_cases	id_Number	NUMERIC	Positive cases happened in Erangel.
	case_Number	NUMERIC	
	discharge_Date	DATE	
positive_physical_exam	case_Number	NUMERIC	Physical exam information for all positive cases in Erangel.
	vital_cap	NUMERIC	
	metabolism	NUMERIC	
	exam_date	DATE	
positive_billing_info	case_Number	NUMERIC	Billing information for all positive cases in Erangel.
	bill_Amount	NUMERIC	
	bill_Status	VARCHAR	
patients_physical_exam	id_Number	NUMERIC	Physical exam information for all patients in Erangel.
	vital_cap	NUMERIC	
	metabolism	NUMERIC	
	exam_date	DATE	

Task 1: SQL queries

Step 1:

Calculate the age of each resident and add a column “age” into the census table with their ages.

Step 2:

Calculate the BMI of each resident and add a column “bmi” into the census table with their BMI.

$$\text{BMI} = \frac{m}{h^2}$$

BMI = body mass index

m = mass (in kilograms)

h = height (in meters)

Step 3:

Use the result from the closest physical exam date and calculate the body fitness score. Then, add the score into column “score” into the census table.

$$\text{body fitness score} = \left[\frac{\text{vital-cap}}{5250} + \frac{\text{metabolism}}{2800} + \left(1 - \frac{|\text{age}-25|}{75}\right) + \left(1 - \frac{|\text{bmi}-23|}{30}\right) \right] \times 25$$

* Use the average body fitness score from all the residents for someone who missed some of the information required to calculate the body fitness score. Do not include the residents who don't have the body fitness score when you calculate the average.

Step 4:

Add the zovid-301 test result and body fitness score into column “test_result” and “score” into the audiences table. Then, export the audiences table as .csv.

Task 2: C++

You are required to use C++ to implement an alert system in order to make an exposure prediction.

$$\text{exposure time (sec)} = \lfloor \text{body fitness score} \times 0.06 \rfloor$$

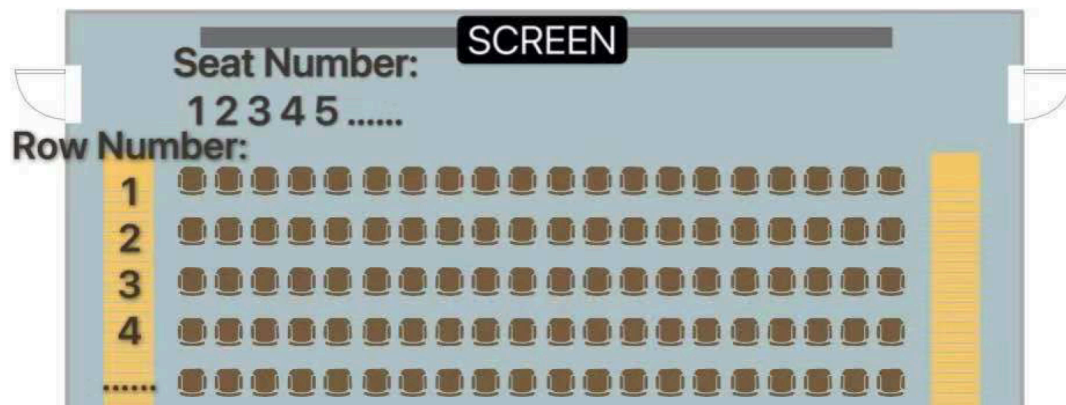
Step 1:

There are a total of 6 auditoriums in the database. In an auditorium, each seat can have one of three situations:

- An empty seat;
- An audience who is received negative in zovid-301 test;
- An audience who is received positive in zovid-301 test;

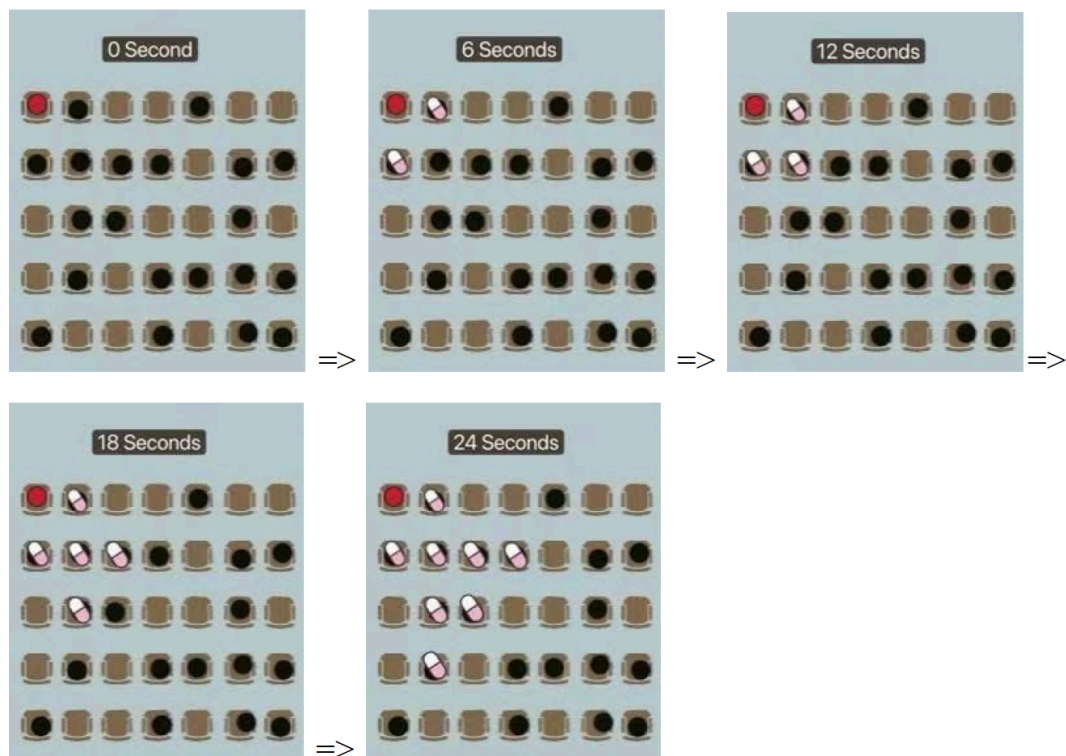
Every second, any audience who receives a positive result will start to infect another negative result audience that is adjacent (4-directionally). Return the minimum number of seconds that must elapse until all the audiences have been infected. If this is impossible, return -1 instead.

Auditorium Seating Map:



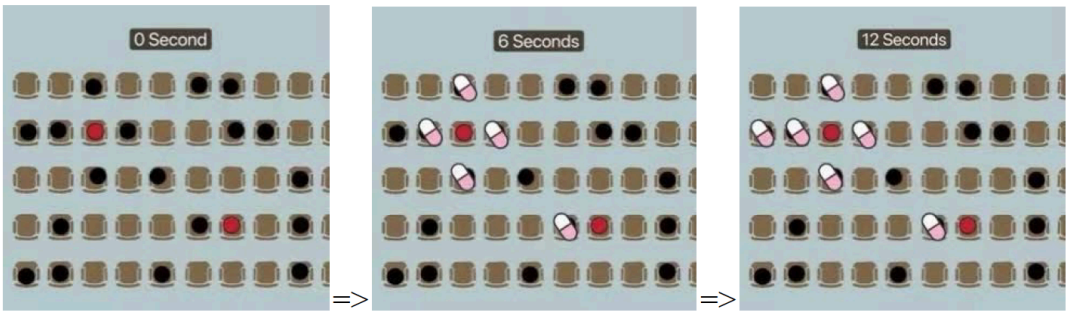
Assume all audiences' body fitness score is 100 in both of the examples.

Example 1:



Output: 24

Example 2:



Output: 12

Step 2:

Generate a .csv file called alert_info that includes three columns which has all the audience's information that are potentially in danger. Sort the ExposureTime in a decreasing order.

Output for Example 1:

	A	B	C
1	Name	id_Number	ExposureTime
2	Aaron Eytcn1	xxxxxxxxxxxxxxxxxx	24
3	Aaron Eytcn2	xxxxxxxxxxxxxxxxxx	24
4	Aaron Eytcn3	xxxxxxxxxxxxxxxxxx	24
5	Aaron Eytcn4	xxxxxxxxxxxxxxxxxx	18
6	Aaron Eytcn5	xxxxxxxxxxxxxxxxxx	18
7	Aaron Eytcn6	xxxxxxxxxxxxxxxxxx	12
8	Aaron Eytcn7	xxxxxxxxxxxxxxxxxx	6
9	Aaron Eytcn8	xxxxxxxxxxxxxxxxxx	6
10			

Output for Example 2:

	A	B	C
1	Name	id_Number	ExposureTime
2	Aaron Eytcn1	xxxxxxxxxxxxxxxxxx	12
3	Aaron Eytcn2	xxxxxxxxxxxxxxxxxx	6
4	Aaron Eytcn3	xxxxxxxxxxxxxxxxxx	6
5	Aaron Eytcn4	xxxxxxxxxxxxxxxxxx	6
6	Aaron Eytcn5	xxxxxxxxxxxxxxxxxx	6
7	Aaron Eytcn6	xxxxxxxxxxxxxxxxxx	6
8			