

Lab 12
PF – BSDS

```
LENGTH = randint(5,9)
d = [[randint(1,9) for i in range(LENGTH)] for j in range(LENGTH)]
for i in range(LENGTH):
    d[i][i] = 0
```

Consider above code for next tasks. Consider d is distance between cities. There is one direct path from every city to every other city and there is one indirect path that is thorough any other city.

Task 1:

- a. Write a function with three parameters distance, city 1 and city 2. The distance is the 2D list (given), city 1 and city 2 is some number from 0 to LENGTH - 1. Print all distances from city 1 to city 2. One distance will be direct. Remaining distances will be one indirect. For example, there will be one direct distance between city 2 and city 4; whereas, there will be a distance between city 2 and city 4 via city 2 to city 6 and city 6 to city 2 and the total distance will be the sum of two distances. The output should be like:

Sample Run:

```
Direct Distance: 7
Indirect Distances
Via City 2: 8
Via City 3: 6
Via City 5: 9
```

- b. Modify function made in task 1 (a). Print shortest distance between city A and city B. Also print whether distance is direct or indirect. In case, of indirect shortest distance print the city number to be used between city A and city B.

Sample Runs:

```
Shortest distance between city 0 and city 7 is 6.
Shortest distance between city 2 and city 5 is 5 via city 4.
```

- c. Print the name of two cities having shortest direct distance

Sample Run:

```
City 2 and City 5 has shortest direct distance 2
```

For next task, place -1 at random showing there is no direct path between two cities. For example,

```
0  4 -1  6
5  0  7 -1
-1 3  0 -1
...
```

City 0 has direct path with city 1 and city 3 but no direct path with city 2.

Similarly, city 1 has direct path with city 0 and city 2 but no direct path with city 3

Similarly, city 2 has direct path with city 1 but no direct path between city 0 and city 3.

Task 2:

- a. Write code to print cities having direct link.

Sample Run:

```
City 0 has direct link with 2 3 5 6
City 1 has direct link with 0 1 2 3 5
City 2 has direct link with 0 5 6
...
```

- b. Write code to print cities having no direct link but one indirect link.

Sample Run:

```
City 0 has indirect link with 4 via 2
```