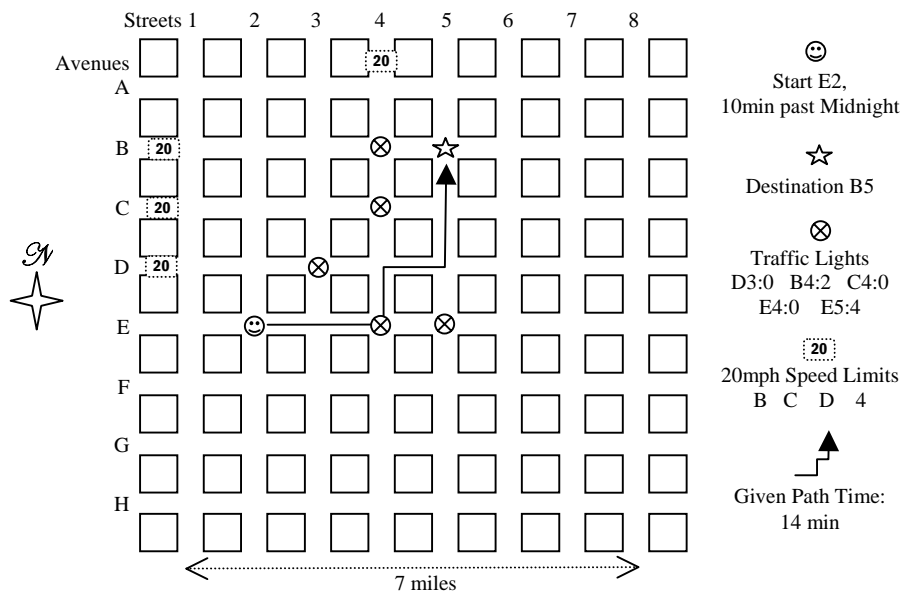


Problem 3: The Octavia Traffic Lights

The City of Octavia is one of the most orderly and well-organized cities in the world. The traffic in Octavia flows on 8 major avenues, named A through H and 8 major streets, numbered 1 through 8, all of which are two-way. The avenues stretch in the East/West direction and are perpendicular to the streets, which go North/South. Each street and each avenue has a speed limit - either 20 or 30 miles per hour (Octavia is not known to be fast-paced). The city infrastructure is so well designed that the distance between any two consecutive streets or avenues is exactly 1 mile. Thus, Octavians live in large city blocks that are each one square mile each (as illustrated in the diagram below), but drive only on the 8 streets and 8 avenues. Each intersection in Octavia is labeled with the name of the avenue and street that meet at that point; for example H8 is in the southeast corner of the city, while D5 is near the center.

The Octavia City Council is conducting a traffic study and wants to install traffic lights on some (or all) intersections in Octavia. The city has already contracted Imperial Light Machines (ILM) to deliver the traffic lights. The ILM traffic lights are very simple: they only have red and green signals and are designed to cycle from green to red and back to green every 4 minutes, showing green for 2 minutes, then showing red for another 2 minutes. While this is adjustable, the Octavian Traffic Committee (OTC) has determined that 4 minutes is precisely the cycle time that they would need to control all the traffic in the city. Each traffic light is reset at a particular time every 24 hours and starts alternating from that point on, giving a green light to the North/South direction first. The city council is concerned with optimizing the traffic flow and wants to calculate the time it would take an average citizen to travel from their home to their work place, given a particular configuration of the ILM traffic lights.



You have been contracted by the OTC to provide key simulation data that will help the Octavia City Council determine the number and placement of the ILM Traffic Lights. To do that, you will be given a series of test cases that include speed limit data, the proposed location of traffic lights, the initial reset time of each traffic light, a starting point and time, and a destination point for a driving test (both points are intersections). You are to determine the minimum time it would take an

Octavian driver to traverse the major streets and avenues from the starting point to the destination point with the given configuration. Remember that Octavians are very strict and law-abiding citizens - they always drive at exactly the speed limit and always obey traffic lights. Keep in mind that no left or right turns are permitted on a red light in the City of Octavia.

Input

There will be multiple test cases, sequentially numbered starting with 1. The input begins with a single line containing an integer giving the number of tests. Following, there will be three separate lines of input for each test case, with all data items separated by whitespace (spaces or tabs):

- Speed limits: a list of street or avenue names on which the speed limit is set to 20mph. All other streets and avenues (not listed in this input line) have a speed limit of 30mph.
- Intersections with traffic lights and their reset times: a list of intersection labels, each followed by a reset time in minutes. All the reset times are given as integral numbers of minutes after midnight.
- Start location, start time, end location: The intersection label of the start location, the time (as an integral number of minutes past midnight) when the Octavian driver leaves the start location, followed by the destination intersection label. Assume that if the start and destination locations have traffic lights, then the driver does not have to wait on those lights in order to depart or to arrive at the destination.

Output

For each test case, display the test case number and the number of minutes it takes the Octavian driver to reach the destination. Use a format similar to that shown in the samples. Display a blank line after the output for each case.

Sample Input

```
2
B C D 4
D3 0    B4 2    C4 0    E4 0    E5 4
E2 10   B5

A1 0    A2 0
A1 4    A2
```

Output for the Sample Input

```
Case 1: 14 minutes
Case 2: 2 minutes
```