Where's Ivan?

input file: `ivan.in`

There exist a number of computer simulation models that are available to predict the path of hurricanes. When using a specific model, one of the parameters that should be considered is its historical reliability.

In this problem, you are given a series of data regarding past storms and the predictions for those storms made by a number of different models. Your task is to determine the most accurate prediction model for each test scenario. By 'most accurate', we mean the model that has the smallest overall error in predicting storm position and movement.

The overall error of the model is the sum of the errors over all of a set of sample points. For each sample point, you will be given the actual position of the storm at that instant, and the position that the model had predicted. The error for that sample point is calculated as the following expression:

```
  |predicted latitude (in minutes) - actual latitude (in minutes)|
+ |predicted longitude (in minutes) - actual longitude (in minutes)|
+ |predicted direction (in degrees) - actual direction (in degrees)|
+ |predicted speed - actual speed|
```

Latitude is measured in degrees and minutes north or south of the equator (which is both 0N and 0S latitude). Longitude is measured in degrees and minutes east or west from the Greenwich Meridian (which is both 0E and 0W longitude). The 180^{th} Meridian is at the opposite side of the Greenwich Meridian and represents 180 degrees east and 180 degrees west. There are 60 minutes to a degree. The difference between two longitude measurements should always be calculated as the smallest angle between the two readings. For example, the absolute difference between 179 degrees, 0 minutes east and 179 degrees, 0 minutes west is 120 minutes rather than 21480 minutes.

Directions are measuredclockwise from 0 degrees (due north) to 359 degrees (one degree west of north). The difference between two directions should always be calculated as the smallest angle between the two directions. For example, the absolute difference between a direction of 1 degree and 359 degrees is 2 degrees rather than 358 degrees.

Input

The input file contains one or more test scenarios. Each test scenario begins with a line containing 2 positive integers less than 100, *h* and *m*, representing respectively the number of hurricanes and the number of models described in the test scenario.

After this line, there will be *h* hurricane records. Each hurricane record begins with a line formatted as follows:

`HURRICANE` *`HurricaneName N`*

where *HurricaneName* is a sequence of up to 25 alphanumeric characters (no spaces) and *N* is an integer, $1 \le N \le 100$. This line is followed by *N* lines, each giving the position of the hurricane at a different point in time, formatted as follows:

YYYY-MM-DD hh:*mm latitude longitude direction speed*

where:

- *YYYY-MM-DD hh*:*mm* gives the military time (24 hour clock) of this sample point and is guaranteed to be a valid date/time.
- latitude is an integer, *degrees*, $0 \le degrees \le 90$, followed by a 'd', then an integer *minutes*, $0 \le minutes < 60$, followed by either an 'N' or an 'S'. There will be no embedded spaces.
- longitude is a integer, *degrees*, $0 \le degrees \le 180$, followed by a 'd', then an integer *minutes*, $0 \le minutes < 60$, followed by either an 'E' or a 'W'. There will be no embedded spaces.
- *direction* is an integer, $0 \le direction \le 359$, which represents the direction of movement of the storm
- and *speed* is an integer, $0 \le speed \le 180$.

After the *h* hurricane records, each test scenario includes *m* model records. Each model record begins with a line formatted as follows:

MODEL *ModelName*

where *ModelName* is a sequence of up to 50 alphanumeric characters, which may also include embedded blanks (but leading and trailing blanks are not part of the *ModelName*), and is the name of the model. After this line there will be a series of lines describing the predictions of the model corresponding to each sample point given for each hurricane in the test scenario, formatted as before but preceded by the hurricane name:

HurricaneName YYYY-MM-DD hh:*mm latitude longitude direction speed*

For a given test scenario, all model and hurricane names are unique. The end of file will indicate no more test scenarios.

Output

For each test scenario, your output file should have a header line followed by one or more lines. The first line should be formatted as follows:

TEST *x*

where *x* is the test scenario number (starting at 1). After this line, you should list in alphabetical order the one or more 'most accurate' models, one to a line. This should be followed by a line containing only 20 dashes: `--------------------`

Sample Input

```
1 2
HURRICANE Hillary 2
2004-08-30 10:00 24d0N 85d30W 1 10
2004-08-30 18:00 25d0N 84d30W 1 10
MODEL ModelOne
Hillary 2004-08-30 18:00 23d0N 83d30W 2 20
Hillary 2004-08-30 10:00 22d0N 82d30W 2 20
MODEL ModelTwo
Hillary 2004-08-30 10:00 24d0N 93d30W 21 10
Hillary 2004-08-30 18:00 24d0N 90d0W 25 10
2 3
HURRICANE Gertrude 2
2005-07-01 09:00 30d15N 0d0W 180 90
2005-07-01 10:00 29d30N 0d0W 180 90
HURRICANE Fern 3
2005-06-28 10:00 0d30S 45d0E 180 90
2005-06-28 11:00 1d45S 45d0E 90 90
2005-06-28 12:00 1d45S 46d15E 180 90
MODEL Bullseye
Gertrude 2005-07-01 10:00 40d0N 5d0E 170 80
Gertrude 2005-07-01 09:00 40d45N 5d0E 170 80
Fern 2005-06-28 11:00 12d15S 40d0E 80 80
Fern 2005-06-28 12:00 8d45N 41d15E 170 80
Fern 2005-06-28 10:00 10d0N 40d0E 170 80
MODEL Good One
Gertrude 2005-07-01 09:00 30d15N 0d0W 180 90
Gertrude 2005-07-01 10:00 29d30N 0d0W 180 90
Fern 2005-06-28 10:00 0d30S 45d0E 180 90
Fern 2005-06-28 12:00 1d45S 46d15E 180 90
Fern 2005-06-28 11:00 1d45S 45d0E 90 90
MODEL Other Good One
Gertrude 2005-07-01 09:00 30d15N 0d0W 180 90
Gertrude 2005-07-01 10:00 29d30N 0d0W 180 90
Fern 2005-06-28 10:00 0d30S 45d0E 180 90
Fern 2005-06-28 11:00 1d45S 45d0E 90 90
Fern 2005-06-28 12:00 1d45S 46d15E 180 90
```

Sample Output (corresponding to sample input)

```
TEST 1
ModelOne
--------------------
TEST 2
Good One
Other Good One
--------------------
```