Problem 2: How to Get Some Heads by Advertising

In order publicize the next mixer, the Computer Science Society is going to start an ad campaign. Naturally, they want to advertise to as many people as possible while minimizing the cost. Each public display monitor upon which an electronic ad can be placed has been assigned an *impact factor* which reflects factors such as how visible the monitor is and how many people view it during the course of a day. The impact factor ranges from 1 (low impact) to 10 (high impact). As with all advertising, costs are involved. This may include, for example, the fee required to put an electronic ad on a monitor. Multiple ads, up to a predefined maximum, can be placed at the same location. (Multiple ads on an electronic monitor would imply a heavier rotation, for example.) The effectiveness of a location is determined by the impact divided by the cost of an ad. You can assume that no two locations have the same effectiveness.

Write a program which, given the total number of ads and possible locations, computes and outputs the appropriate distribution of ads over all available locations so that the most effective locations receive the maximum number of ads before the lesser effective locations. For each location, you must output, at a minimum, the name of the location and the number of ads to run at that location. Other information may also be displayed, if desired (for example, the output below shows the effectiveness of each location in parentheses). The order in which the locations are displayed is not important. The first line of input is the total number of ads that are to be run. The remaining lines represent the places the ads can be run. Each of these lines contain four values separated by whitespace: the name or location of the monitor, its impact factor, the cost to put each ad on the monitor (in cents) and the maximum number of ads that can be run at that location. You may assume that all input files are formatted correctly.

Sample input #1 (available as file "test2a.dat"):

```
16
stu-center 5 16 3
cs-dept 5 44 10
library 2 58 7
```

Sample output #1:

```
stu-center   (0.313) run 3/3 ads
cs-dept      (0.114) run 10/10 ads
library      (0.034) run 3/7 ads
```

Sample input #2 (available as file "test2b.dat"):

```
21
er-hallway 10 100 8
cs-dept 8 96 6
en-hallway 4 21 6
library 4 64 5
math 6 38 4
```

Sample output #2:

```
en-hallway   (0.190) run 6/6 ads
math         (0.158) run 4/4 ads
er-hallway   (0.100) run 8/8 ads
cs-dept      (0.083) run 3/6 ads
library      (0.063) run 0/5 ads
```

Sample input #3 (available as file "test2c.dat"):

```
11
math 5 60 6
library 9 65 6
cs-lab 2 49 8
```

Sample output #3:

```
library      (0.138) run 6/6 ads
math         (0.083) run 5/6 ads
cs-lab       (0.041) run 0/8 ads
```