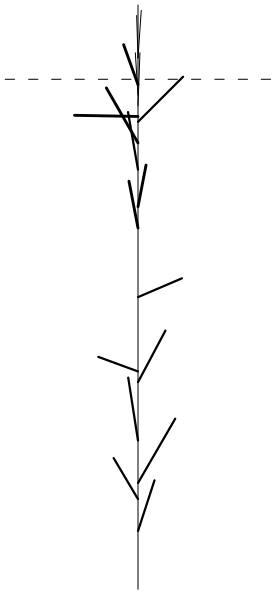
Detassel

Computer Science Society
Programming Contest
Winter 2011

A corn *stalk* grows straight up, perpendicular to the ground from whence it came. Attached to the stalk are *leaves*, *ears*, and *tassels*. An attached leaf, ear, or tassel is seen as a line segment of a given length, one end of which is connected to the stalk at a given height, protruding upward and outward at a given angle. The tassels tend to be attached near the top of the stalk and, at the right time of the growing season, a farmer might want to remove the tassels and leave the leaves and ears untouched. This can be done using (slave labor or) a detasseling machine, which cuts a swath that's effectively a horizontal plane, parallel to and at a constant height above the ground. Since ears and leaves can protrude out alongside tassels, the detassling machine might not be able to remove all of the tassels and none of the leaves or ears. Any length of tassel remaining below the cut plane contributes to total *tassel error*, and any length of leaf or ear protruding above the cut plane contributes to total *ear/leaf error*. In this problem, a corn stalk and its attachments are given, and you are to compute the total tassel and total ear/leaf error caused by various cut plane heights.



Input Format

The input consists of lines describing corn stalk attachments, followed by an empty line, followed by lines containing cut plane heights. Each attachment consists of a letter (`t`–tassel, `l`–leaf, or `e`–ear), a real height $y > 0$ at which the attachment connects to the stalk, a real angle $0 < \theta < 180$ (in degrees) at which the attachment protrudes, and the real length (a.k.a. radius) $r > 0$ of the attachment, separated by blanks.

Output Format

For each cut plane height $y_{cut} > 0$ in the input, compute and output the total tassel error and total ear/leaf error for the corn stalk accurate to two decimal places, as shown in the output sample.

Input Sample

```
l 11 72 10
l 17 121 9
l 20 60 14
l 28 99 12
l 39 62 11
l 41 160 8
l 55 23 9
e 68 101 9
e 72 79 8
l 79 100 11
e 84 120 12
l 88 45 12
e 89 179 12
t 91 88 10
t 93 94 8
e 95 110 8
t 100 86 9
t 100 90 10
t 100 92 8

88 90 92 94 95 96 97 98 99 100 101
```

Output Sample

```
cut 88.00 produces tassel error 0.00 and ear/leaf error 41.24
cut 90.00 produces tassel error 0.00 and ear/leaf error 22.24
cut 92.00 produces tassel error 1.00 and ear/leaf error 17.11
cut 94.00 produces tassel error 4.00 and ear/leaf error 11.97
cut 95.00 produces tassel error 6.01 and ear/leaf error 10.10
cut 96.00 produces tassel error 8.01 and ear/leaf error 7.62
cut 97.00 produces tassel error 10.01 and ear/leaf error 5.87
cut 98.00 produces tassel error 12.02 and ear/leaf error 4.81
cut 99.00 produces tassel error 14.02 and ear/leaf error 3.74
cut 100.00 produces tassel error 16.02 and ear/leaf error 2.68
cut 101.00 produces tassel error 21.00 and ear/leaf error 1.61
```