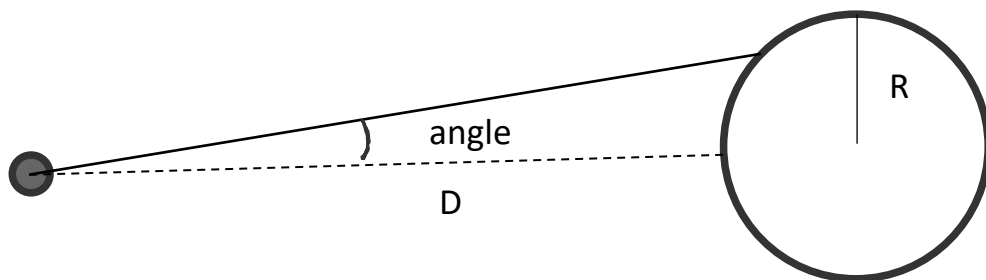


Radar

As part of an ultra-secret advance detection project of unidentified spatial objects, a radar system detects distance, mass, angle of incidence and velocity with which different objects from space are approaching Earth. Your objective is to classify the types of objects to identify potential dangers to our planet.

The Earth is considered a perfect sphere, with a radius of 6371 km and the velocity of the objects is constant. Distances are measured from the object (considered punctiform) to the surface of the planet. The latter is the reference in the inertial system, all velocities are relative to it (in other words, the angle of incidence is constant with time).



Requirement

With the above information, determine how many objects will hit the Earth and how many of them are a danger. An object strikes the earth if, moving along the direction of the speed, with the angle of incidence, it intersects with the planet. It represents a danger if its kinetic energy is greater than or equal to 20,000,000 TJ. In addition, it is necessary to classify them in three categories: asteroids, comets and unidentified objects, as follows:

1. Asteroids have a mass greater than or equal to 2000 tons and a maximum speed of 100 km/h.
2. Comets have mass below 2000 tons and speed equal to or greater than 150 km/h.
3. Whatever is not an asteroid or comet is an unidentified body.

Input data

You will read from the keyboard (*stdin* stream) from the first line a positive integer **n** representing the number of objects identified by the radar. On the following **n** lines there are four numerical values representing the distance from the object to the surface of the Earth, the mass of the object, its angle of incidence with the Earth and the velocity. They are all fractional values. Values on each line are separated by one or more spaces.

Output data

The program will show on the screen (standard output stream):

1. On the first line two positive integer values, representing the total number of objects that will hit the Earth and how many of them pose a danger.
2. On the second line, three numbers representing the number of asteroids, the number of comets and the number of unidentified objects.
3. On the third line, the number of asteroids, comets and unidentified objects that will hit the Earth.

- On the fourth line, the number of asteroids, comets and unidentified objects that will strike the Earth and pose a danger.

MAKE SURE to carefully meet the requirement of the problem: the display of the results must be done EXACTLY in the way indicated! In other words, nothing in addition to the problem requirement will be displayed on the standard output stream; as a result of the automatic evaluation, any additional character displayed, or a different display than the one indicated, will lead to an erroneous result and therefore to be "Rejected".

Restrictions and clarifications

- $0 < n \leq 1000$
- Distances are in km and are strictly positive.
- The masses are expressed in tons and are strictly positive.
- The incidence angles are expressed in radians.
- Velocities are expressed in km/h and are positive.
- The formula for kinetic energy is $E_c = \frac{mv^2}{2}$
- All values above, except for n , are fractional values. **Use double-precision floating point data types.**
- Caution:** Depending on the programming language you have chosen, the file containing the code must have one of the .c, .cpp, .java, or .m extensions. The web editor will not automatically add these extensions and their lack leads to the impossibility of compiling the program!
- Caution:** for those working in MATLAB, it is recommended that the source file be named by the candidate in the form of: <name>.m where *name* is the candidate's surname.
- Caution:** There may be spaces or other white characters at the beginning or end of any input lines. The reading of the data must be carried out with this in mind!

Examples

Input	Output	Explanation:
3 13629.0 20000 0.3 100.0 13629.0 1000 0.6 1000.0 13629.0 20000 0.2 3000.0	2 1 1 1 1 1 0 1 0 0 1	<p>Using Earth radius and distance to objects (they are all 13629 km away), it is noted that the maximum incidence angle for which objects are hitting the Earth is ~ 0.4 rad. Of the three objects, the first and the last have a lower angle, so they hit the planet, the second does not. Of the two, the last one has the kinetic energy greater than 20,000,000 TJ, namely 90 million TJ and so is a danger.</p> <p>For classification, it is noted that the first object is an asteroid, its mass and its speed matches the first case.</p> <p>The second object is a comet, corresponding to the second case.</p> <p>The third is an unidentified object.</p>

Working time: 150 minutes