Titans Invitational Coding Championship 2025

Questions

St Theresa Catholic Secondary School

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questions, data, solutions by

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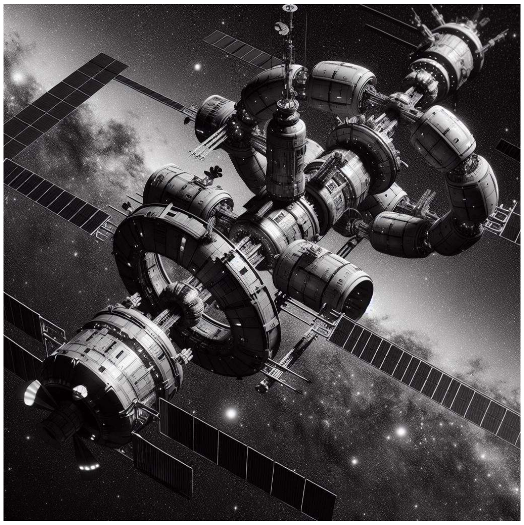


Life Support

1)

In order to live astronauts require food, water, oxygen and energy.

Each person has daily needs of:

380 L of oxygen per day

3 L of water

2.5 Kg of food

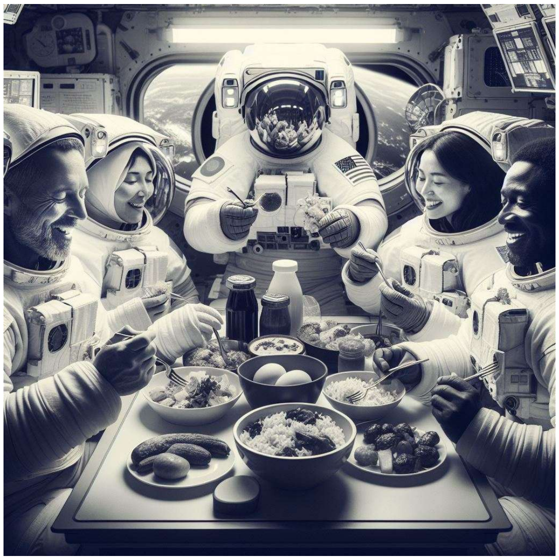
20 kWh of electricity

Write a program that will state how many days of life support that a space station can sustain given the number of people, how much oxygen, water, food and electrical energy it has.

The input will consist of 10 lines stating the number of people on board followed by the number of liters of oxygen, number of liters of water, Kg's of food and kWh of electricity.

The output must state the number of days that the space station can support the current number of people rounded down to the nearest day followed by the necessity that will run out first. If they run out of more than one necessity on the same day, only print the first one in order of the list above.

Sample input: 50 8666677 16484 27941 634272 67 2324149 49244 30121 459487 52 6704537 18023 484 45545
Sample output: 109 water 91 Oxygen 3 food



Universal Language

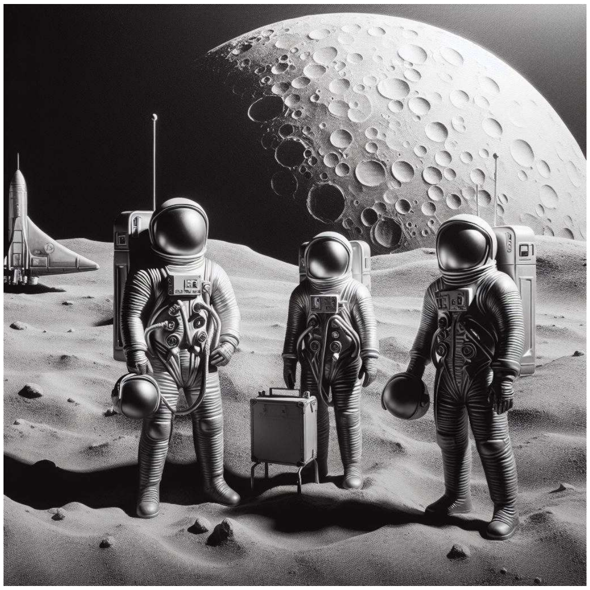
2)

In order to facilitate simple communication on the international space station, it has been decided to make a new language by using the shortest word among the languages spoken by all the occupants of the space station. If there are two words of the same length, the first one alphabetically will be chosen.

Each line of test data contains a list of words from an astronauts language. Words for the same thing correspond to locations in the list. For example, Pomme, Jablko and Maca all mean Apple. The output lines must contain the shortest words that may be used for each thing. Ties in word length will be broken by alphabetical order.

The test data will consist of 10 lines of 10 words.

Sample input: Apple Apricot Avocado Banana Blackberry Blueberry Cherry Pomme Abricot Avocat Banane Mure Myrtille Cerise Jablko Morela Awokado Banan Jezyna Borowka Wisnia Maca Damasco Abacate Banana Amora Mirtilo Cereja
Sample output: Maca Morela Avocat Banan Mure Borowka Cereja



Gravity on Different Planets and Moons

3)

Weight is a downward force due to gravity. Weight is different on different planets. You can calculate the weight of an object on a planet by multiplying the objects mass m by the planets gravitational acceleration g.

A space craft contains 5 pieces of equipment that may or may not be needed depending on the planet (or moon) that it lands on.

Each piece of equipment is considered manageable if it's weight does not exceed 1500N per astronaut. (If there are 2 astronauts, they can manage a piece of equipment weighing 3000 N)

Write a program that will determine if the spacecraft can land on a planet given the equipment that will be required and the planets gravitational acceleration.

The first line of test data contains the number of astronauts on board followed by the mass of each of 5 pieces of equipment (A,B,C,D,E)

The next 10 lines contain the name of a planet or moon followed by it's gravitational acceleration g, followed by the pieces of equipment required to land on it (A,B, etc).

Your output must contain the name of each planet followed by the word 'safe' or 'unsafe' indicating whether or not the planet is safe to land on.

Sample Input:	Sample Output:
3 200 3000 100 50 50	Mercury unsafe
Mercury 3.61 A B C	Venus unsafe
Venus 8.83 B C D	Earth safe
Earth 9.8 C D E	Mars unsafe
Mars 3.711 A B C D E	Io safe
Io 1.8 E	Europa safe
Europa 1.3 A C E	Ganymede safe
Ganymede 1.4 B D E	Callisto safe
Callisto 1.2 A E	Pluto safe
Pluto 0.62 A B C D E	Titan safe
Titan 1.35 C D F	

Space Probes

4)

Two probes are launched into space. They have the same radius of communication R. That is, if the distance between them is less than R, they can communicate. The first probe is launched with speed S1. The second is launched D days later with speed S2 at an angle A from the first probe.

Write a program that will determine if the probes can communicate with one another after a specified number of days.

Each input line contains the communication radius R in km, the speed of probe 1 S1 in km/h, the speed of probe 2 S2 in km/h, the number of days between launches D, the angle between launches A, a list of 3 to 8 days.

Your output is simple a list of the words yes or no indicating whether the probes can or cannot communicate after the specified number of days.

**NOTE: do not account for the movement of the earth between launches. Assume that the probes are launched from some fictional stationary point in space. The given angle A is the angle between their strait line trajectories. THERE ARE 24 HOURS IN A DAY.

R S1 S2 D A d1 d2 d3 ...

Sample Input 10000 100 50 3 30 10 100 1000 10000 25000 200 140 20 90 42 2 17 800 80000 300 400 1 180 1 2 3 10000000
Sample Output no no no no no no no no yes yes yes no

Planets Align

5)

Earth and Venus are the planets with the lowest eccentricity (meaning that their elliptical orbits are almost circular).

Write a program that will calculate the distance between two planets after time t (measured in earth days) given their orbital radii, orbital period in days and assuming that they are aligned when time is equal to zero.

The orbital radius is the distance between the planet and the star it orbits.

The orbital period is the time that it takes to orbit the star once. (go all the way around once)

The data will consist of 10 lines.

Each line will have:

Radius of planet 1, Period of planet 1, Radius of planet 2, Period of planet 2, time

You must find the distance between the planets at the specified time, assuming they are aligned when time is zero. This is when they are closest to one another.

You may assume that the planets have circular orbits and that they orbit in the same direction.

All distances are in millions of km, all times are in days.

Sample input	Sample output
183 278 150 308 345 130 208 197 386 289 130 235 151 302 66 153 339 114 269 984	distance is 127 million km distance is 297 million km distance is 58 million km distance is 188 million km