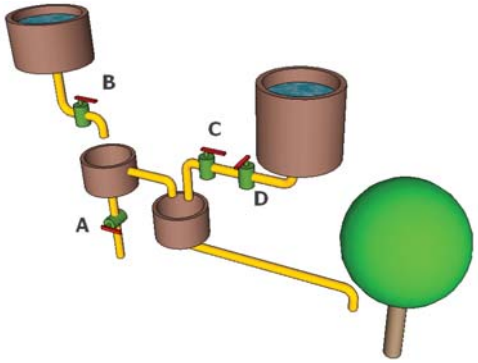
Water supply

Beaver has constructed a pipeline system to water his apple tree.

The expressions contain variables A, B, C, D, which may be true or false. A variable has the value true, if the corresponding gate is open, and false, if it is closed.

In which case the apple tree gets water?



Answer:

A: A = false, B = true, C = false, D = false
B: A = true, B = true, C = false, D = false
C: A = true, B = false, C = false, D = true
D: A = false, B = false, C = false, D = true

Source : challenge.bebras.uk

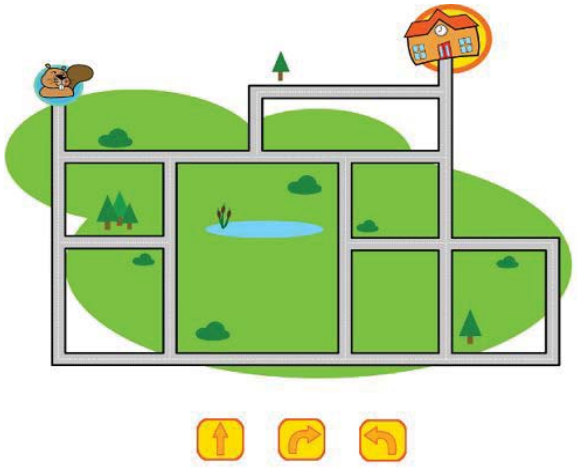
AlgoHack #Beaver 1

SELF DRIVING

A self-driving car needs to take a student to school.
The car is programmed so that it only use these 3 instructions:

Forward: go forward until you cannot go forward anymore
Left: turn 90° left
Right: turn 90° right
Question:

Write a set of instructions (a program) that will get the beaver to his school.



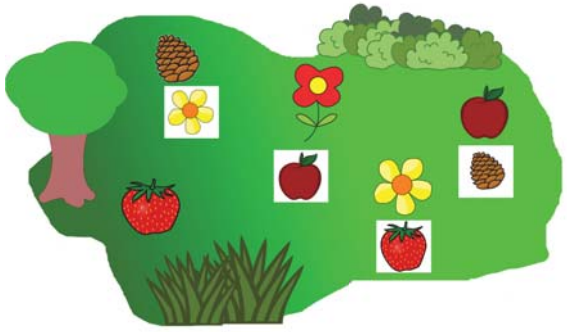
SPECIAL CAKE

Eszter has asked István to cook a special cake made of five ingredients.

She has put labels next to the ingredients in the garden. One ingredient has no label.

The labels tell István in what order the ingredients must be added.

The garden looks like this:



Question: Which ingredient should be added first?




Question:

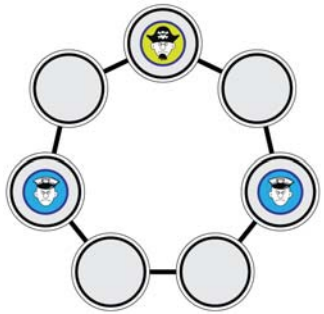
Which two of the license plates cannot be registered?

BB0001 BBB100 BBB011 BB0100
BR00A0 BSA001 BE0S01

Pirates

Jane and Jill play a board game Pirate Hunters. At each move, one of the policemen (but not both) moves to a neighboring place. In the next move, the pirate, who is faster and always jumps for two places. Policemen always move to an unoccupied place – they cannot move to a place occupied by the pirate or his colleague policeman.

The game is finished when the pirate is forced to jump onto one of the policemen … which would be now (see the picture), except that it is currently the policemen turn. To win, the policemen must force the pirate into this position when it is the pirate's turn.



Jane, who plays the pirate is quite skilled at evading being captured. You are smart as well, though. If you help Jill play a perfect game, how many moves will she make before the pirate is caught?

A. 2 **B.** 3 **C.** 5 **D.** Jill cannot win

Question:
Serge wants to ask as few questions as possible to find the present.

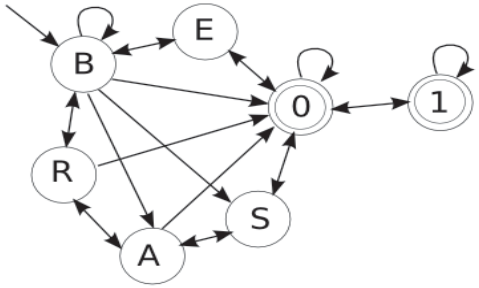
In the worst case, how many questions does he have to ask to be sure to have found the present?

Rafting

Beavers build rafts. For river traffic control, all rafts should be registered. This means that each raft should have a license plate with unique text.

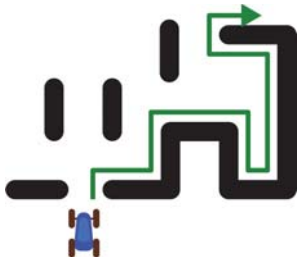
The text is is made up of letters and digits as shown in the diagram below.

The licence starts with the letter B and end with the digit 0 or 1.

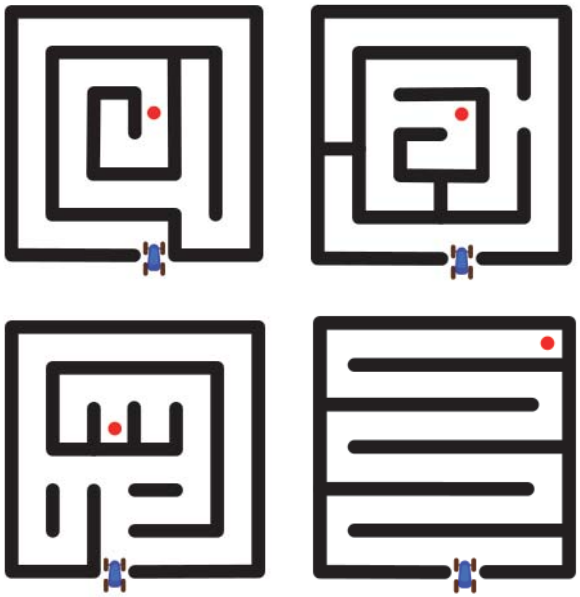


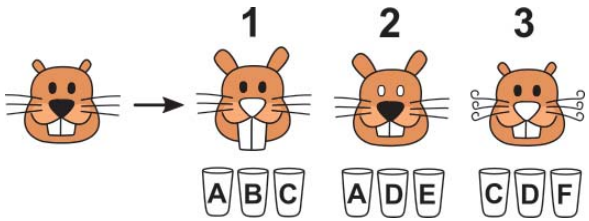
Mazes

A robotic car uses a simple rule to drive through a maze: Turn right whenever possible. The picture on the right gives an example of how the robot would drive through a maze.



Question:
In how many of the following mazes will the car reach the red dot if it uses this system?





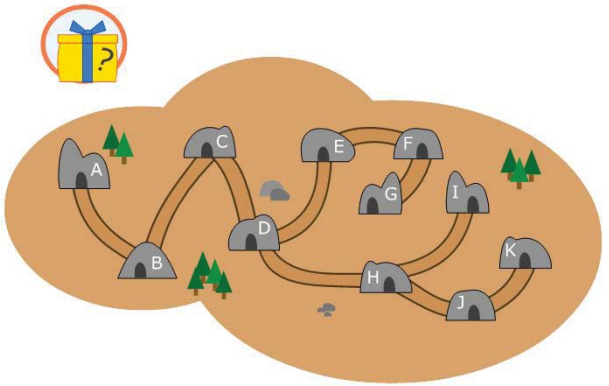
Question: Which beaker contains pure water?

Cave game

Hale and Serge are playing a game: Hale hides a present in one of several caves. Serge has to find which cave it is in.

To do so, Serge has the map shown below and is only allowed to ask questions like: “Is the toy in cave X?”If Serge guesses correctly, Hale will answer “yes”. Otherwise, she will tell Serge which of the neighboring caves leads to the hidden toy.

When Serge knows for sure where the toy is, the game is over and he will walk to the cave.



Magic potion

Betaro Beaver has discovered five new magic potions:

- one makes ears longer
- another makes teeth longer
- another makes whiskers curly
- another turns the nose white
- the last one turns eyes white.

Betaro put each magic potion into a separate beaker. He put pure water into another beaker, makes six beakers in total. They are marked A to F. The problem is, he forgot to record which beaker contains, which magic potion!

To find out which potion is in each beaker, Betaro set up the following experiments:

Experiment 1: A beaver drinks from beakers A, B and C together - the effects are shown in Figure 1.

Experiment 2: A beaver drinks from beakers A, D and E together - the effects are shown in Figure 2.

Experiment 3: A beaver drinks from beakers C, D and F together - the effects are shown in Figure 3.

COMPUTER GAME

Jane is playing a computer game.

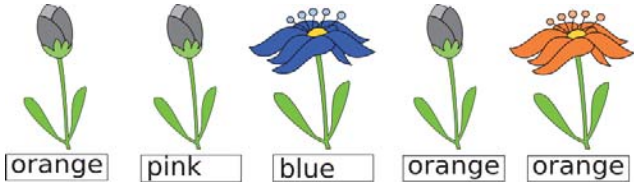
First the computer secretly chooses colours for five buds.

The available colours for each flower are **blue**, **orange**, and **pink**.

Jane has to guess which flower has which colour. She makes her first five guesses and presses the *Blossom* button.

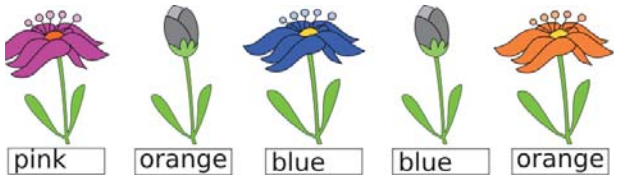
The buds, whose colours she guessed correctly, break into flowers. The others remain as buds.

Jane's first go:



Jane then has another go at guessing and presses the *Blossom* button again.

Jane's second go:



Question:

What colours did the computer choose for the flowers?

- blue pink blue orange orange
- pink blue blue pink orange
- pink blue blue blue orange
- pink pink blue pink orange

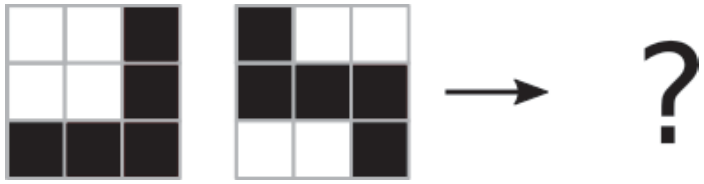
CARD LOCK

Combining Card A and Card B, you get Card C:

Card A Card B Card C

Question:

How many black cells will Card F have after combining Card D and Card E?

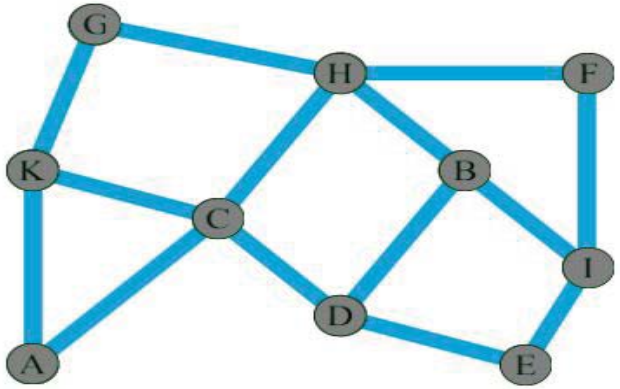


Primary Health Care

Doctor Hamid wants to build three hospitals for the beavers.

The hospitals can only be built on the places shown by a letter on the map below.

To get to a hospital, the beavers should not have to swim through more than one stream from any of these places.



Question:
What is the letter to choose three places to build the hospitals for Doctor Hamid.

Hurlers Shake Hands

Beavers enjoy playing hurling.

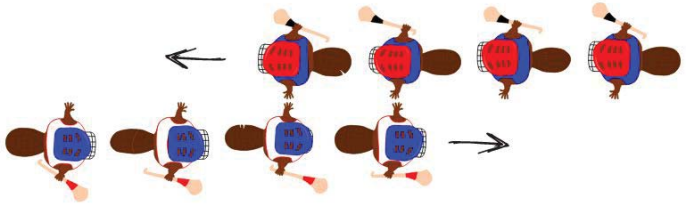
After the game ends, the beavers in each of the two teams line up in a row and walk past the other team.

As they pass each other, they shake hands.

At the beginning, only the first player on each team shakes hands.

Next, the first two players shake hands (see picture below).

This continues until each player has shaken hands with every player on the other team.



Question:
There are 15 players on each team.

If each player takes one second to shake hands and move to the next player, how many seconds of shaking hands will there be?

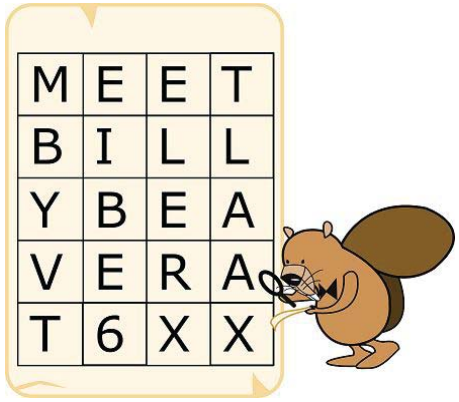
SECRET MESSAGES

Agents Boris and Bertha communicate using secret messages.Boris wants to send Bertha the secret message:

MEETBILLYBEAVERAT6

He writes each character in a 4 column grid from left to right and row by row starting from the top.

He puts an X in any unused spaces. The result is shown below.



Then he creates the secret message by reading the characters from top to bottom and column by column starting from the left:

MBYVTEIBE6ELERXTLAAX

Bertha then uses the same method to reply to Boris. The secret message she sends him is:

OIERKLTEILH!WBEX

Question

What message does Bertha send back?

OKWHERETOMEET!

WILLYOUBETHERETOO?

OKIWILLBETHERE!

OKIWILLMEETHIM!

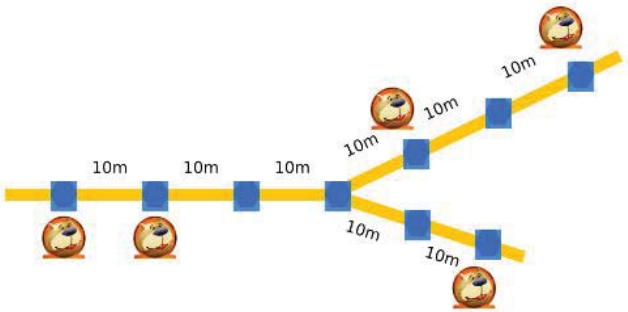
Bus stop

The lodges of five beavers are shown on the map below.

The Beavers want to put a bus stop in one of the places marked by blue hexagons.

All the hexagons are 10m apart.

The beavers decide that the sum of the distances from their lodges to the bus stop must be as small as possible.



Question: Find the best place for the bus stop.

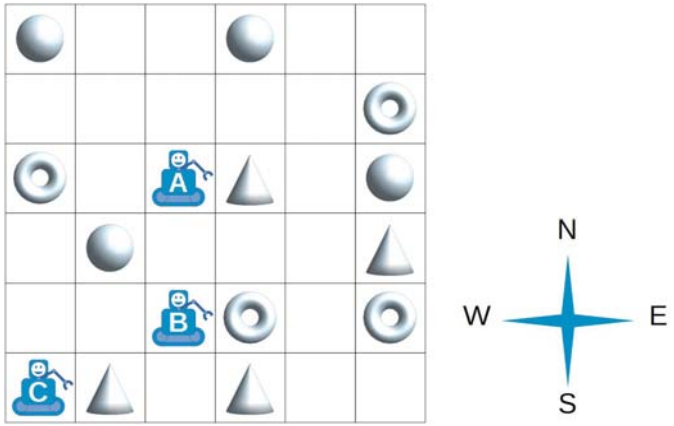
Concurrent directions

In a warehouse, three robots always work as a team.

When the team gets a direction instruction (N, S, E, W), all robots in the grid will move one square in that direction at the same time.

After following a list of instructions, the robots all pick up the object found in their final square.

For example, if we give the list N, N, S, S, E to the team, then robot A will pick up a cone, robot B will pick up a ring, and robot C will pick up a cone.



Question:

Which list of instructions can be sent to the robots so that the team picks up exactly a sphere, a cone, and a ring?

N, E, E, E

N, N, S, E, N

N, E, E, S, E

N, E, E, S, W