TASKS T1 – T7 CARRY 3 POINTS EACH

T1. TURNING IMAGES INTO NUMBERS

Consider a red and white picture drawn in a 6×5 grid, as shown in the image below.

This image can be represented using numbers by listing, for each line, how many consecutive squares should be painted white, then how many should be painted red, then how many should be painted white until all the squares in the line are considered, as shown on the right in the image. The first number in a line always corresponds to the initial white squares.
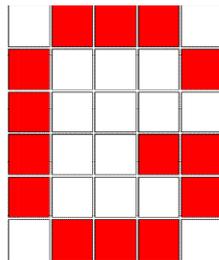

```
1, 3, 1
0, 1, 3, 1
0, 1, 4
0, 1, 2, 2
0, 1, 3, 1
1, 3, 1
```

Finally, we can join all the numbers in each line into a single sequence. The previous example would result in the following sequence: **1, 3, 1, 0, 1, 3, 1, 0, 1, 4, 0, 1, 2, 2, 0, 1, 3, 1, 1, 3, 1**.

Question / Challenge

What is the sequence of numbers that describes the image below?
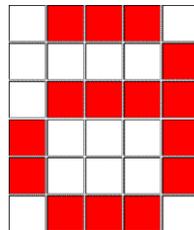
A) 0, 1, 3, 4, 1, 1, 3, 1, 0, 2, 2, 1, 0, 1, 3, 1, 2, 2, 1
B) 1, 3, 1, 4, 1, 1, 4, 0, 1, 3, 1, 0, 1, 3, 1, 1, 3, 1
C) 1, 3, 1, 0, 1, 4, 1, 4, 0, 1, 3, 1, 0, 1, 3, 1, 1, 3, 1
D) 1, 3, 1, 4, 1, 1, 4, 1, 3, 1, 1, 3, 1, 1, 3, 1

T2. NUTS AND BOLTS

At the Beaver Construction factory, Benoit works at the nuts and bolts assembly line.

His job description is as follows:
- Benoit stands at one end of a long conveyor belt, which contains a line of nuts and bolts.
- Benoit's job is to take each element, either a nut or a bolt, off of the conveyor belt.

- If Benoit takes a nut from the conveyor belt, he puts it in the bucket beside him.
- If Benoit takes a bolt from the conveyor belt, he grabs a nut from the bucket beside him, attaches the nut and bolt together, and places the assembled part onto a large box.

However, things can go wrong for Benoit in two different ways:
- If Benoit takes a bolt from the conveyor belt, and there is no nut in the bucket to attach.
- If there are no more nuts or bolts on the conveyor belt, and there are still nuts in the bucket.

Question / Challenge

Which sequence of nuts and bolts , when processed from left-to-right, will **not** cause things to go wrong for Benoit?

A)

B)
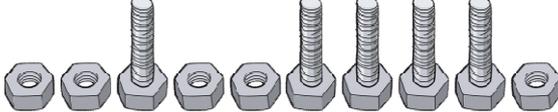
C)
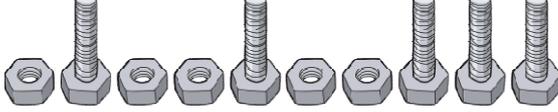
D)

T3. AFTER PARTY CLEANING

Anna cleans up after her summer party. Luckily Butch[95] the robot helps her. Butch[95] can only move up, down, left or right as shown.
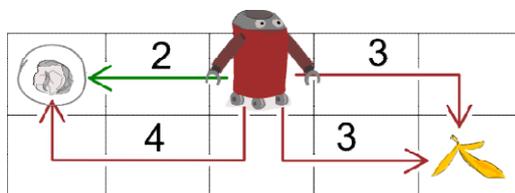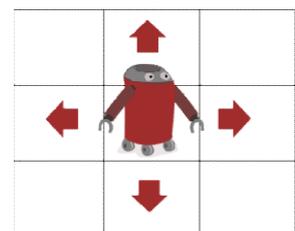
Moving from one square to another counts as 1 move. Butch[95] automatically detects the nearest garbage, as shown by the image above. Butch[95] works like this:

- He goes to the nearest garbage (the paper in the image above).
- He picks the garbage up.
- From there he detects again the nearest garbage.

He repeats this until all garbage is picked up.

Question / Challenge

Now Anna starts Butch[95] to pick up all garbage on the floor below. Which garbage Butch[95] will pick up last?

A)   B)   C)   D)
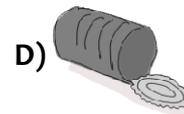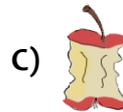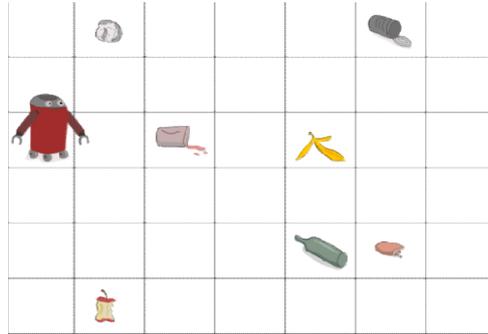
T4. RUG WEAVING

Hale is a Turkish weaving artist. She is making a square rug with 6 rows and 6 columns.
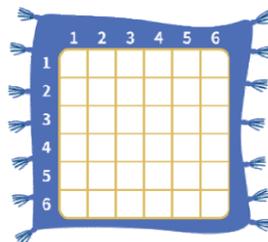
Hale puts a symbol in each square on the grid of the rug using the following questions:
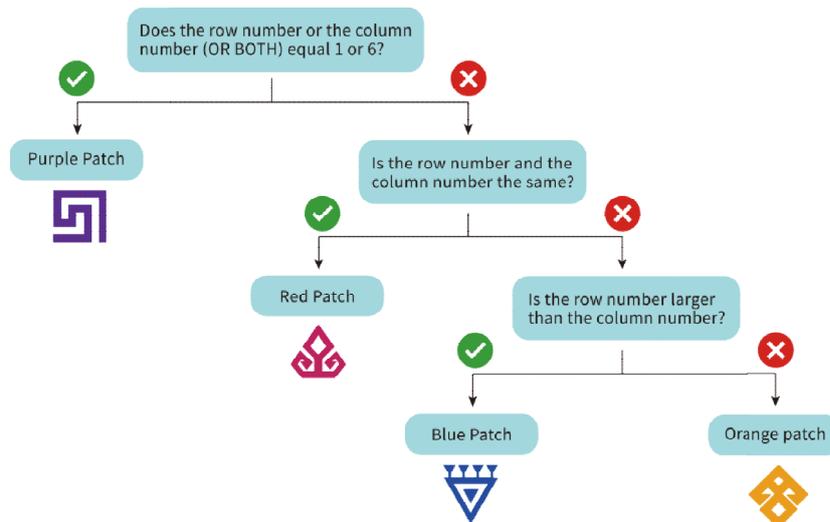
Question / Challenge

Using this method, what would the resulting rug look like?

A)   B)   C)   D)

T5. SECRET MESSAGE
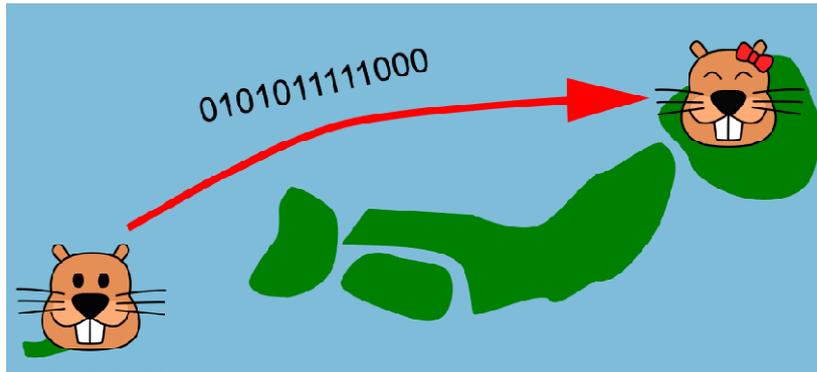
One beaver decided to send a message to a distant friend. They had arranged to only use the symbols 0 and 1 to send messages and had agreed to substitute a, b, e, and s with sequences of 0's and 1's as follows:

a=110, b=111, e=10, s=0

and to write the symbols from left to right, as we normally do when writing words.
He sent the following message:

0101011111000

Question / Challenge

Which is the correct translation of the sent message into letters?

A) seebee   **B)** seebass   **C)** seebabs   **D)** seebees

T6. COLORFUL TOWER

Sam has hexagonalpuzzle pieces in three colors. When he places three pieces as shown, the three pieces must all be the same color or all different colors.

Question / Challenge

Sam places pieces in a tower shape as shown below. What must the top piece be?
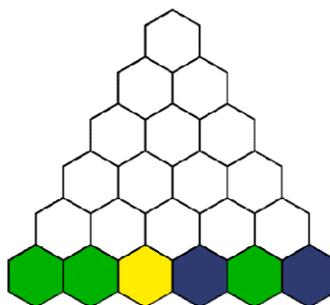
A)

B)

C)

D) there is more than one possibility

T7. RECOMMENDATION SYSTEM

An online fashion shop is using a new software recommendation system based on personal information about customers. For example, when a customer who wants to buy shoes puts in their information, the software follows the rule shown in the following chart and recommends a pair of boots.
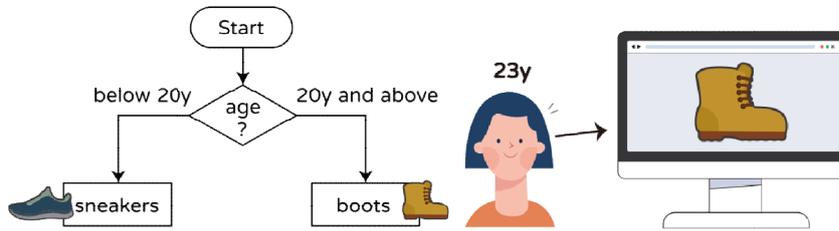
One day, a part of the clothing recommendation rules are accidentally erased. The chart below shows the remaining part of the rules.
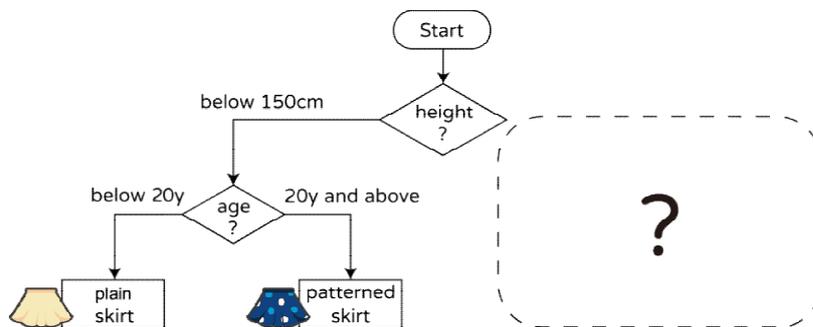
Fortunately, records of past recommendations are stored on the server, as shown in the following table:

Customer	18y 140cm	32y 145cm	28y 155cm	15y 160cm	10y 152cm
Recommendation	plain skirt	patterned skirt	Patterned trousers	plain trousers	plain trousers

Question / Challenge

Can you reconstruct the missing part of the chart from the information in the table above?
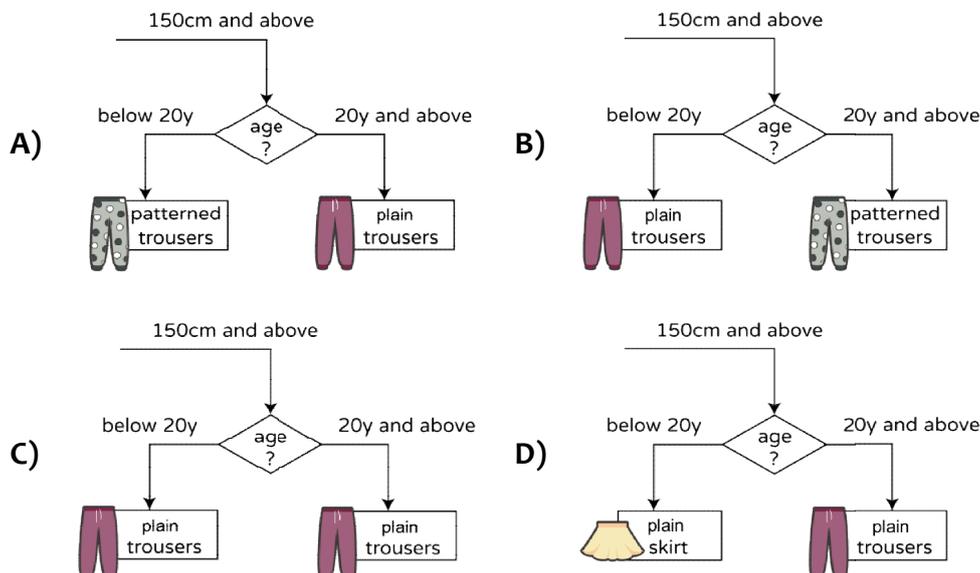
TASKS T8 – T14 CARRY 4 POINTS EACH

T8. LIGHTS ON

Beaver Sofia and her group of 3 friends are playing games in an arcade. They decide to play a game called 'Lights On'. The game has 8 buttons for Sofia and her friends to stand on. Standing on a button will send a signal down a wire. These wires pass through some triangle or square boxes and eventually lead to a light bulb.

- *A triangle will send on a signal if BOTH incoming wires send it a signal.*
- *A square will send on a signal if only ONE of the incoming wires send it a signal.*
- *The beavers win the game if they can turn the light on.*
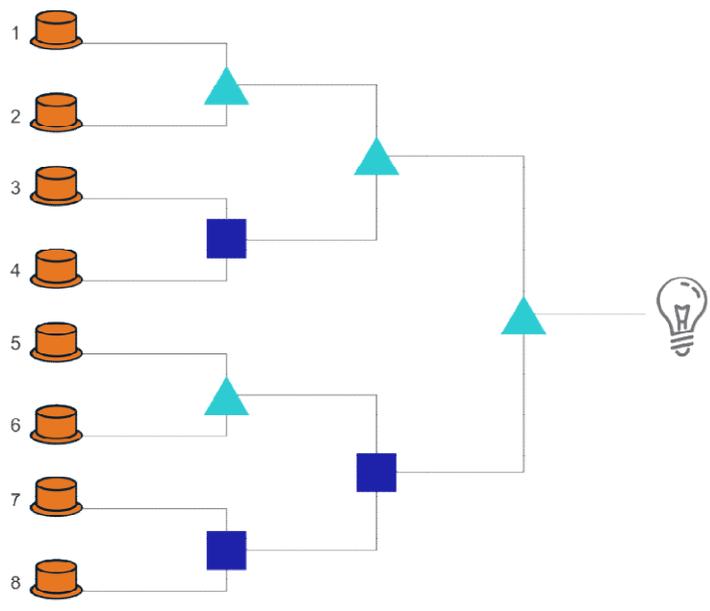
Question / Challenge

Which buttons should Sofia and her friends stand on to turn on the light at the end and win the game?

A) 2,3,4,5   **B)** 1, 2, 3, 7   **C)** 1, 4, 5, 8   **D)** 2, 5, 7, 8

T9. BEAVER WORLD CUP BALL

Bebras wants to make a classical soccer ball. He has four different options of material, which can be used.

Question / Challenge

With which material is it possible to make a soccer ball?

A)

B)

C)

D)

T10. PANTRY MAP

Castorus found two good hiding places for his food. To remember them, he wants to mark the spots on this map with an "X". But if his rival Biberina finds the map, she would know where to look!
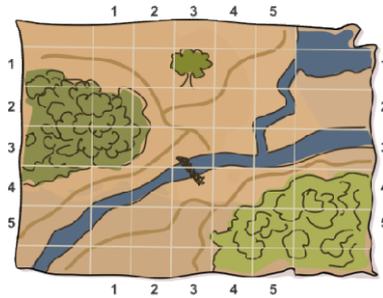
To confuse Biberina, Castorus randomly adds some "X"s in other squares of the map, making sure that the total number of "X"s in each row and each column is even (Note: 0 is also an even number). Then he erases the two "X"s showing his hiding places. This is the resulting map:
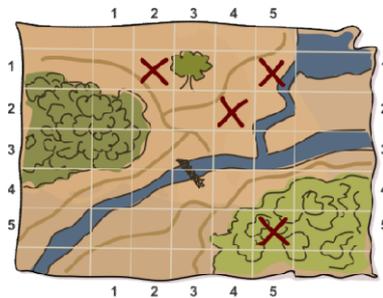
Question / Challenge

Where are Castorus's two hiding places?

A) $(2,2), (5,4)$ **B)** $(5,3), (3,1)$ **C)** $(4,2), (4,5)$ **D)** $(2,3), (4,4)$

T11. ANTIVIRUS

Ati developed a new security application that can detect dangerous programs. It scans the incoming program using the following list of dangerous statements:
- save in the system folder
- read from the system folder
- add to autostart
- send via e-mail

If the security application finds at least 2 statements that contain all the words from one item in the list above, the program is considered dangerous and is quarantined.

Question / Challenge

Which of the following programs will be quarantined?

A)
```
read the file from the document folder;
open the file;
save the file in the document folder;
send the file via e-mail;
```

B)
```
read the file from the document folder;
open the file;
add the file to the autostart;
```

C)
```
read the file from the system folder;
open the file;
save the file in the document folder;
send the file via e-mail;
```

D)
```
read the file from the autostartfolder;
open the file;
save the file in the document folder;
send the file via e-mail;
```

T12. FLOWER GARDEN

The Flower Garden is a simple logic game.

If you click on a square, you can see either a flower or a number. The number shows how many neighboring squares have flowers in them.

In the situation shown in the picture below, we can see some numbers and we have a flower in one of the squares.
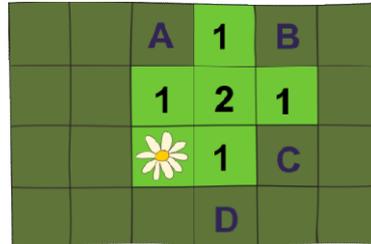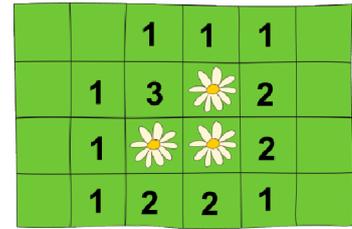
Question / Challenge

In which square, marked with A, B, C or D, do we have another flower?

A) A   **B)** B   **C)** C   **D)** D

T13. POOL PARTY LOCKERS

The Beavers are going to a pool party!

After putting their valuables in lockers, each beaver wrote down his locker number on a sheet of paper. Then they entrusted both the key and this sheet to the Old Beaver for safekeeping.

Old Beaver split the given locker numbers into digits and made the picture. For example, for the locker number 243 the Old Beaver draws the digits 2, 4, and 3 one by one and then connects the digits to the purple key (see at the bottom of the picture).
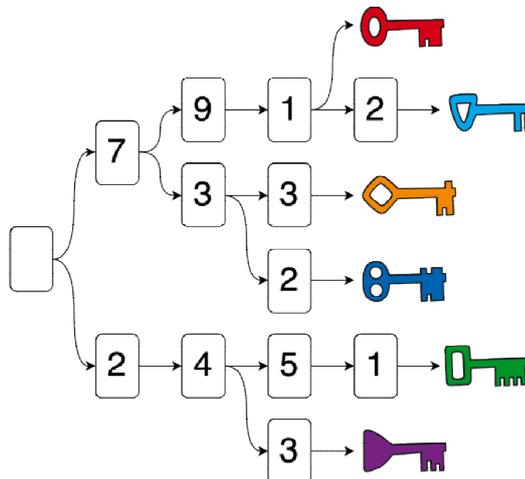
Later in the evening, the beavers found out that water had gotten on the sheet of paper and smudged some of the written digits.

Question / Challenge

Knowing that the keys for locker numbers 73X, 24XX, 7X1X are arranged in order, which one of the following sets of keys is the correct set for these lockers?

A)

B)

C)

D)

T14. STRING FUNCTION

There are two kinds of machines in the stone factory. When we put an arrangement of the stones into these machines from the left hand side, they will remove some stones and put out specific arrangements of the stones on the right:

The blue machine is called an "odd machine", which puts out stones in the odd places and remove every second stones, just like the picture below:

The brown machine with a number "n" on it is called a "trim machine". It removes the first and last "n" stones, and puts out whichever stones that are left. The picture below shows how a trim machine with the number "3" on it works:

These two machines can be combined, and the output of the first machine will be the input of the second machine.

Question / Challenge

If the stones are arranged and put into the machine like the picture below, what will be the output?

A)

B)

C)

D)

TASKS T15 – T21 CARRY 5 POINTS EACH

T15. TREASURE BOX

Maria found a box containing a hidden treasure, but the box was locked. To unlock the box, she needs to use the correct combination of three shapes. Help Maria unlock the box by following the given hints on the right of the combinations shown below.

 1. One shape is correct and well-placed.

 2. Nothing is correct.

 3. Two shapes are correct but in the wrong place.

 4 . One shape is correct but in the wrong place.

 5. One shape is correct but in the wrong place.

Question / Challenge

Which of the following combinations will unlock the treasure box?

A)

B)

C)

D)

T16. SUPER SECURITY SYSTEM

Beaver Business Banking (BBB) needs a new security system to secure the room in front of their safe from intruders. They bought five detectors. Each detector sends out laser beams in eight directions until they hit an object or a wall.
If an intruder crosses the laser beam of any detector, the alarm is activated. Also, if one of the detectors stands in the way of a laser beam of another one, the alarm goes off as well.
BBB wants to position the five detectors on the squared floor tiles such that they cover the whole remaining tiles in the room, but do not activate each other. They suggest four different ways to do this. However, one does not satisfy these conditions.
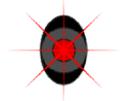
Question / Challenge

Which one?
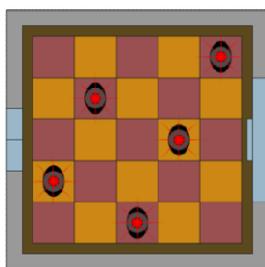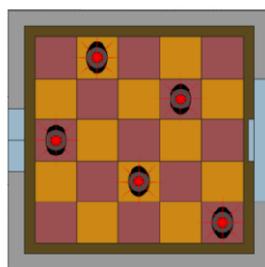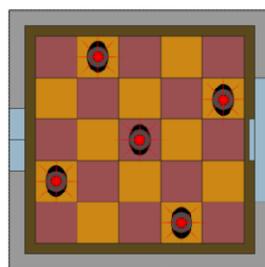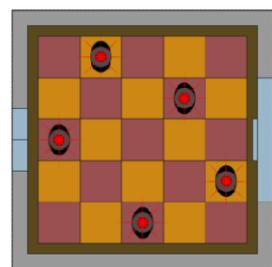
A)   **B)**   **C)**   **D)**

T17. RANK

The Bebras store has ordered tiger dolls to celebrate the Chinese tiger new year. Jack put the dolls randomly on the shelf (as shown in the picture below). Mark thinks this looks too messy. He asked Jack to rearrange the tiger dolls from shortest to tallest (from left to right). Jack can only pick up and switch two dolls at a time.
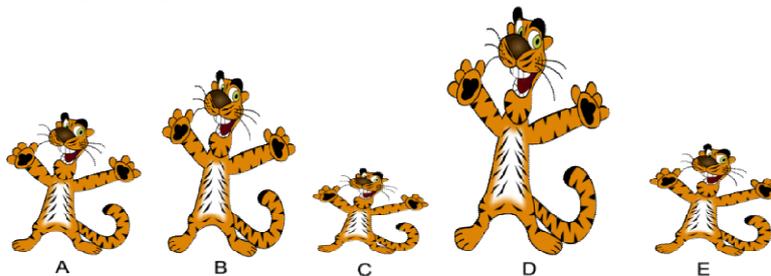
Question / Challenge

What is the smallest number of times Jack has to switch two dolls to put them in the correct order?

A) 3   **B)** 4   **C)** 5   **D)** 6

T18. MARY'S NEIGHBOURS

Bebras wants to visit his friend Mary. But he doesn't know where she lives. Fortunately, he has a map and some information:

- Two beavers are neighbours if a path connects their house.
- Each of the following three beavers: Mary, Zac, and Pan, has four neighbours.
- Zac and Pan are neighbours with Niki.
- Niki has no other neighbour, except for Zac and Pan.
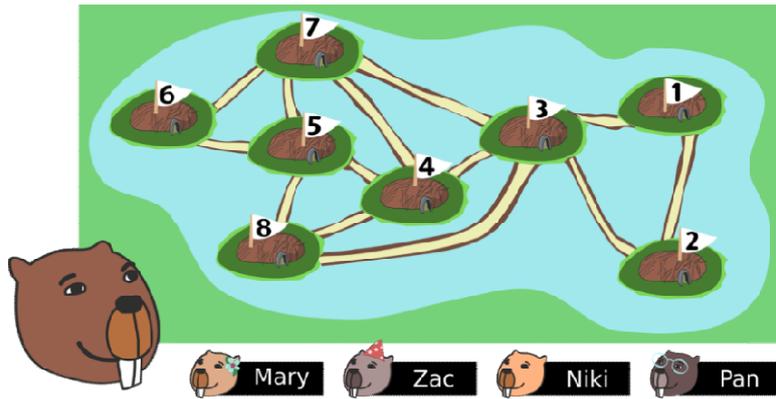
Question / Challenge

What is Mary's house number?

A) 3   **B)** 4   **C)** 5   **D)** 6

T19. BOMBOM'S MESSAGE

At their restaurant, Bombom forwards food orders to Lala using two signal lamps, a leaf-shaped and a flower-shaped one. Each dish on their menu is identified by a unique code made of these two shapes. Bombom turns the lamps on and off in a specific sequence corresponding to the code of the order and Lala prepares the dish accordingly.
Bombom and Lala agree on these codes for two of their dishes.

MENU	CODE
Burger	🍃 🍃
Fried rice	🍃 🍃 ✿

A problem occurs because Lala starts to prepare the dish as soon as she identifies a complete code. Whenever Bombom turns on the leaf lamp twice as part of the code for Fried rice, Lala starts preparing a Burger instead, so Fried rice would never be prepared.
To solve the problem, they decide to change the codes. The new codes for all the dishes on the menu are given below.

MENU	CODE
Burger	🍃 🍃
Fried rice	🍃 ✿ 🍃 ✿
Sandwich	✿ 🍃
Pizza	🍃 ✿ ✿
Tart	✿ ✿ ✿

Question / Challenge

One day, the restaurant decides to add french fries to the menu. Which code can be used for french fries?

A) ✿ ✿ 🍃   **B)** 🍃 🍃 ✿

C) 🍃 ✿ 🍃   **D)** ✿ ✿ ✿ 🍃

T20. MISS INFINITY

Students in a classroom talk to their classmates as shown in the figure. For example, student H only talks to D, E and F during the day.
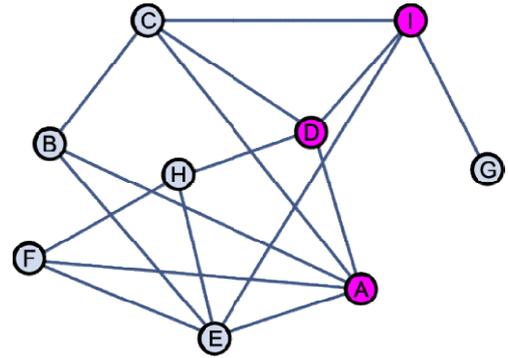
On Monday they got a new Mathematics teacher. Because of her hairstyle, the three students A, D and I immediately started calling her "Miss Infinity". The nickname spreads among the students in this way: for each student, if more than half of the classmates they talk to use the nickname, this student will use it the next day.

Question / Challenge

What is the first day of the week when every classmate uses the nickname "Miss Infinity"?

A) Tuesday **B)** Wednesday **C)** Thursday **D)** Friday

T21. FLOUR STORAGE

The picture shows several mills and the roads connecting them to the storage. Every evening, the mills produce sacks of flour and place them in front of the mills. Willie the beaver is supposed to pick up all the sacks and bring them to the storage before sunset. Willie can carry several sacks at the same time, but the total weight cannot be heavier than 15kg.

The time it takes Willie to travel from one mill to another and to the storage is shown in the picture.
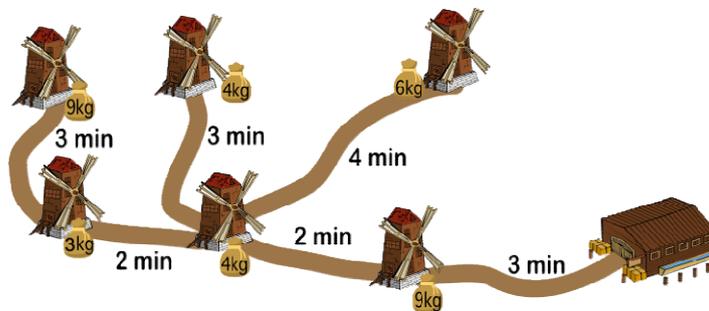
Question / Challenge

Starting from the storage, Willie the beaver wants to bring in all the sacks to the storage as fast as possible. How many minutes does it take him to carry out this task?

A) 50 minutes **B)** 31 minutes **C)** 44 minutes **D)** 54 minutes