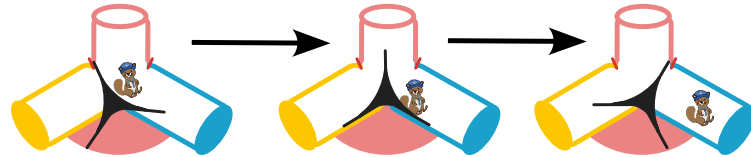


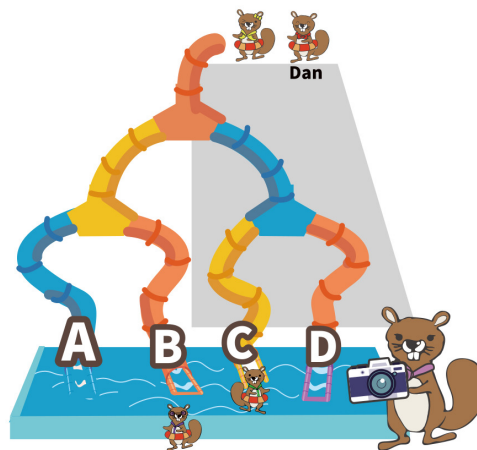
Tasks T1 – T7 carry 3 points each

T1. Exciting water slide

The Beaver Amusement Park has an exciting dynamic waterslide. The following diagrams show how it works: a mechanism controls the exit direction of each fork; whenever a beaver passes through a fork, the exit direction flips.



As the following picture shows, Little beaver Dan wants to try the waterslide. Mommy beaver wants to know where Dan will exit the slide so that she can take good pictures. She first sees a beaver exit from slide B, and then another from slide C. Little beaver Dan is the one after the next beaver.



Question / Challenge

From which slide will Little beaver Dan exit?

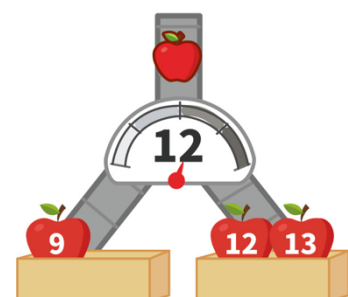
- A) Slide A
- B) Slide B
- C) Slide C
- D) Slide D

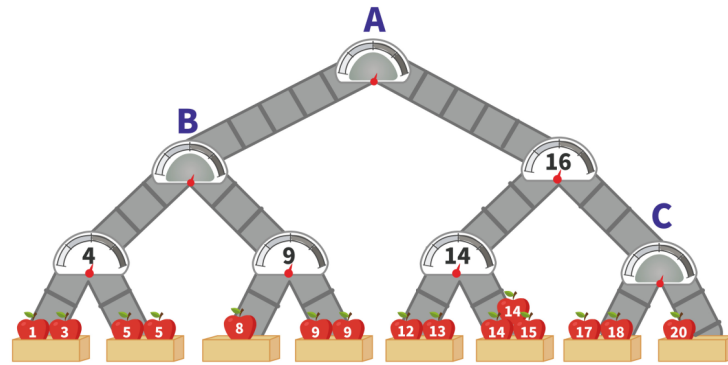
T2. Apple classification machine

At Beaver orchard, apples are sorted into 8 weight-based grades, with apples of the same grade sent to the same packaging area.

To handle the harvest efficiently, Mr. Beaver designs an automatic sorting machine. He puts apples on top of the machine. As each apple moves through the machine, it passes weight sensors that determine its path: if an apple is equal or heavier than the sensor's value, it drops through the right chute; otherwise, it drops through the left one. The number on each apple represents its weight.

The machine has already sorted some apples, and the results are shown in the picture below. The displays on the weight sensors A, B, and C are broken, so we need to figure out the values.





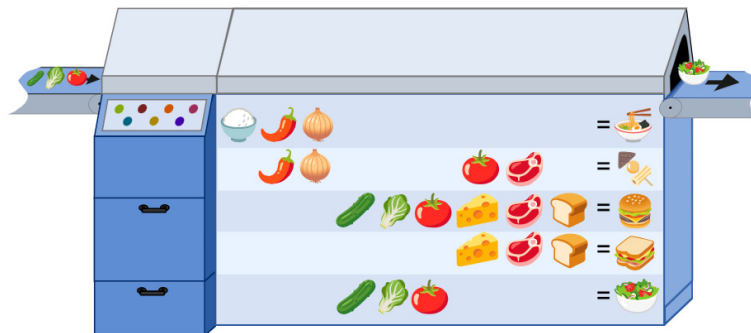
Question / Challenge

Which of the following values could be correct for weight sensors A, B, C?

A) B) C) D)

T3. The Bebravy Food Machine

The **Bebravy Food Factory** uses a special machine to prepare dishes. The machine checks the incoming ingredients and tries to match them with the **recipes** shown below:



Each recipe must be matched exactly, using consecutive ingredients in the correct order. The machine cannot skip any ingredient. Once used, an ingredient cannot be reused. Unused ingredients will pass through without change.

For example:

This input:	
... gets processed as:	
... to produce this output:	

Question / Challenge

These ingredients will be put on the conveyor belt:



What is the smallest number of outputs (dishes and unprocessed ingredients) that the machine can produce with this input?

- A) 7 B) 8 C) 9 D) 10

T4. Available parking space

Beaver Middle School's parking lot has four different zones for parking. Each zone is marked as follows, representing which individuals can park there.

Zone	Who Can Park in This Zone
	Disabled individuals only
	Staff only
	Parents only
	Everyone

Some individuals can park in more than one zone. For example, a disabled parent can park in zones , , or .

The table shows five cars waiting to park, in order. At the entrance, the number of available parking spaces is displayed.



Waiting order	1	2	3	4	5
Cars waiting for parking	Staff (disabled)	Staff	Staff	Parent	Parent

Question / Challenge

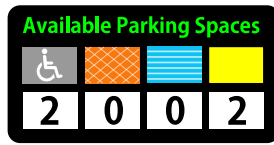
Which of the following could be the displayed number of available parking spaces after all the waiting cars have parked in order?



A)



B)



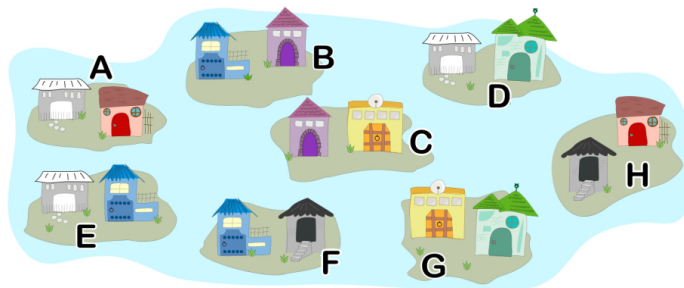
C)



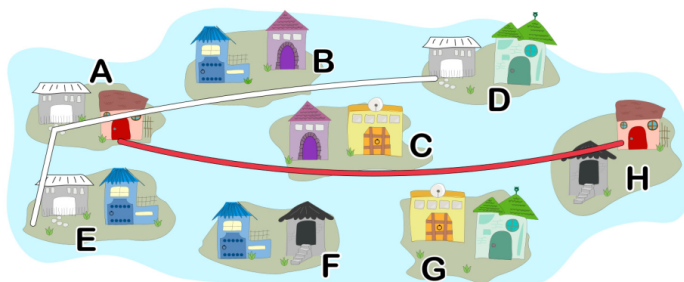
D)

T5. Enchanted islands

On these 8 magical islands, you can travel between these islands by going through buildings that look the same and have the same door color.



Example: on Island A, you can travel to Island D or E by using the white building. You can also go to Island H by using the red building.



Nora has a map showing the islands with letters. This map used to have lines connecting the islands that could magically travel to each other. Unfortunately those lines have disappeared.

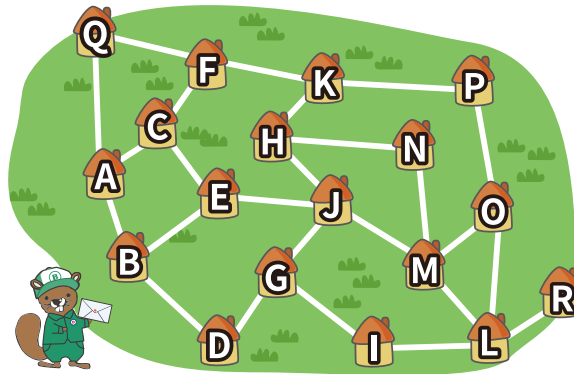
Question / Challenge

What is the least number of buildings Nora must step out of to go from island A to island C?

- A) 2
- B) 3
- C) 4
- D) 5

T6. Beaver Island Bulletin

There are 18 villages on Beaver Island, as shown in the picture below. Each village has many mail carriers; whenever a village needs to send a message or receives a new one, its mail carriers will deliver the message to all connected neighboring villages on the next day.



For example, if Village A sends a message, it takes 1 day for the message to reach Villages B, C, and Q. It takes 2 days to reach D, E, and F; and so on, until all villages have received the message.

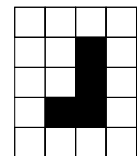
Question / Challenge

If a new message starts from Village J, how many days does it take to reach all villages?

- A) 2
- B) 3
- C) 4
- D) 5

T7. Stamps

Bert has a rubber stamp which creates a mirrored L-shape consisting of four colored squares. He applies the stamp several times on an initially empty sheet of squared paper.

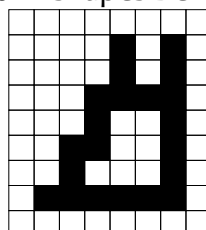


L-shapes can overlap, but only partially: Bert never stamps exactly the same position twice. Bert may rotate the stamp but he always uses it in such manner that the stamp's squares coincide with the paper's squares. The image below shows two overlapping L-shapes. The overlapping square is marked.



Question / Challenge


What is the largest possible number of L-shapes Bert has stamped on this grid?














- A) 10
- B) 11
- C) 9
- D) 12

Tasks T8 – T14 carry 4 points each

T8. Translation system

The beavers built a translation () system between several languages A, B, C, D, E. Each translation has an accuracy value between 0.0 to 1.0 (bigger numbers represent better accuracy), provided in the chart.

	 A	 B	 C	 D	 E
 A	1.0	0.9	0.2	0.7	0.6
 B	0.9	1.0	0.5	0.8	0.7
 C	0.2	0.5	1.0	0.9	0.7
 D	0.7	0.8	0.9	1.0	0.7
 E	0.6	0.7	0.7	0.7	1.0

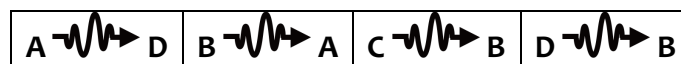
But sometimes, an indirect translation gives a better result than a direct translation, where the accuracy is the product of all accuracies through which translation was done.

For example, the direct translation $C \xrightarrow{\text{wavy arrow}} A$ has an accuracy of 0.2.

But going through $C \xrightarrow{\text{wavy arrow}} B \xrightarrow{\text{wavy arrow}} A$ gives $0.5 \times 0.9 = 0.45$, which is better than 0.2.

Question / Challenge

For how many of the cases below an indirect path improves the translation accuracy?



A) 1

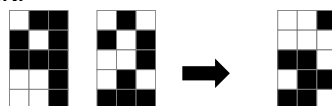
B) 2

C) 3

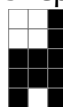
D) 4

T9. Masked Coordinates

Gemma is bored during class and starts filling squares on her sheet to draw numbers. She invents a special way to represent her favorite two-digit number, 42: from the two depictions of the digits “4” and “2” in a 3 × 5 grid, shown below, she creates a new grid where each square is black if and only if exactly one of the two corresponding squares in the images for “4” and “2” is black:



Gemma used the same method to carve this representation of another two-digit number:



Question / Challenge

Which of the following statements is correct?

A) One of the digits is 1

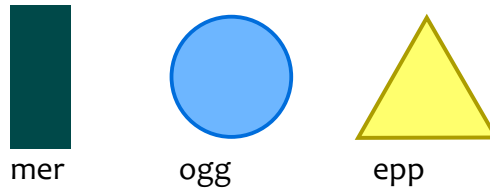
B) One of the digits is 3

C) Both digits are less than 7

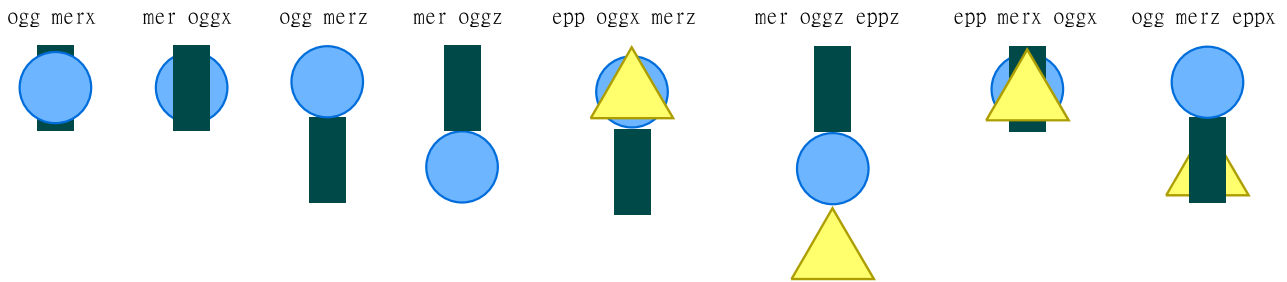
D) Both digits are equal

T10. Beaver language

In Beaver language the names of these three shapes are:

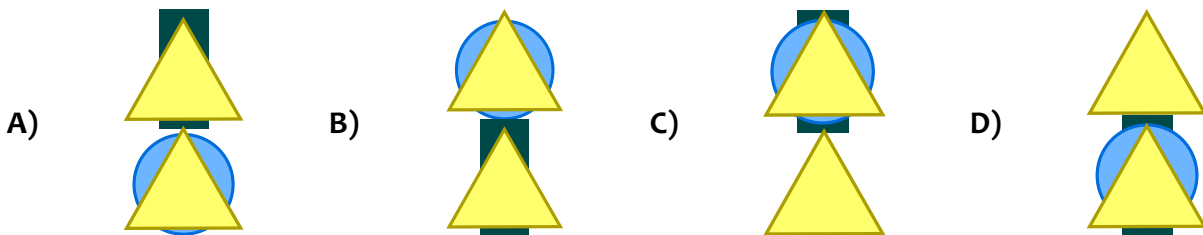


All ways a second shape can be behind or below a first shape are defined in the first four images below, using endings “x” and “z”. A third shape can be arranged relative to the second shape using the same definition, as shown in the fifth and subsequent images.



Question / Challenge

Which of the following shape arrangements can be described by epp eppz oggx merx?



T11. Brightness Map

Sandra is interested in the structural aspects of visual art. She creates brightness maps for images, which are surrounded by white pixels. In the brightness map, each pixel of the image is represented by a brightness number.

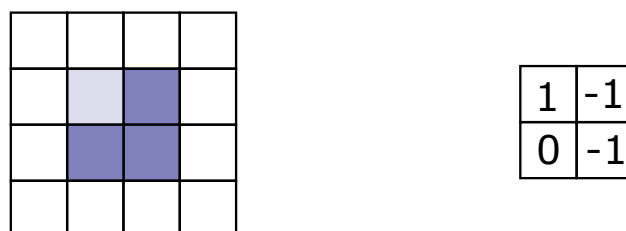
The brightness number of a pixel is determined as follows:

1 if the pixel is brighter than its right-hand neighbor.

0 if the pixel has the same brightness as its right-hand neighbor.

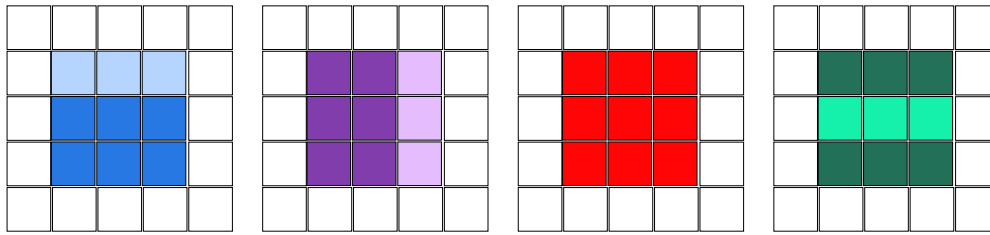
-1 if the pixel is darker than its right-hand neighbor.

Example



Question / Challenge

Images may have identical brightness maps even if they appear different. Which image shows a brightness map that **differs** from all the others?



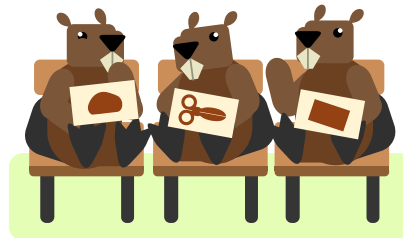
- A) 1 B) 2 C) 3 D) 4

T12. Rock, Paper, Scissors and Swaps

Anna (A), Bert (B) and Corry (C) are playing a variation of rock, paper, scissors. Remember:

- rock beats scissors
- scissors beats paper
- paper beats rock

Anna, Bert and Corry sit down on the chairs and hold the cards so everyone can see them.



Anna Bert Corry

Next, the players have to decide how many swaps they will perform. A swap is an exchange of cards between two of them. Then, they have to decide which players will be involved in each swap.

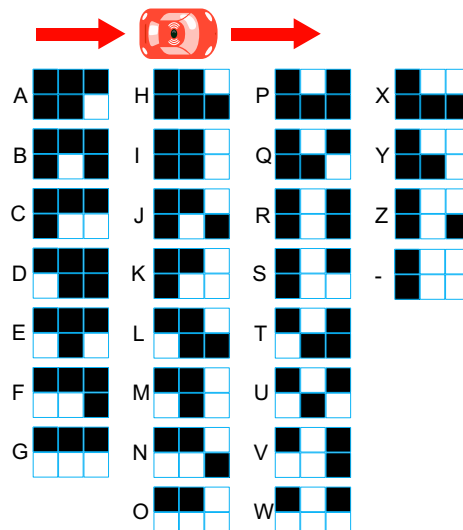
Question / Challenge

Bert's only goal is to beat Corry. What strategy would guarantee his success?

- A) Bert needs only to guarantee an odd number of swaps with Corry.
- B) No matter how many swaps they decide to do, Bert should never exchange cards with Corry.
- C) No matter how many swaps they decide to do, Bert should always exchange cards with Corry.
- D) Bert needs only to guarantee that there is an even number of swaps, no matter which swaps are performed.

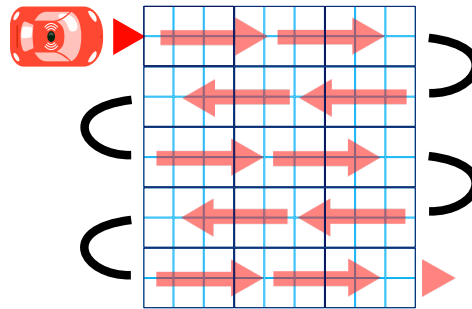
T13. BR Code

Beaver codes letters using 3x2 cards of squares. Each square in the card can be **black** or **white**:



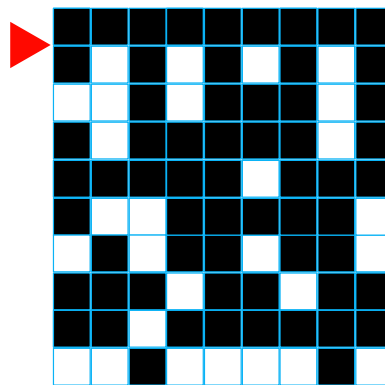
Beaver uses a robot to read these cards. Each card shows a letter using a pattern of black and white squares. The robot moves across the rows, reading each card in order. It's important that the robot reads the card from the correct direction. If a card is facing the wrong way, the robot might interpret the pattern as a different letter.

Beaver wants to write a **long message**, but he has **limited space**. So, he arranges the cards in a **rectangular grid** as shown below. The robot will move in a **zigzag pattern** across the grid to read each 3×2 card in the correct order. Beaver places a small **triangle** on the floor to show where and the direction the robot starts from. From there, the robot moves card by card (3×2 squares each) until it finishes reading the entire message as shown:



Question / Challenge

When Beaver finishes, his grid looks like this:



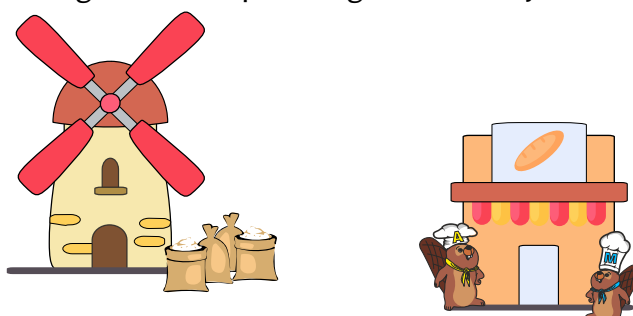
Using the dictionary of 3×2 letter patterns, what message does Beaver's robot read from the final grid?

- A) BEBRASCHALLENGE
- B) THANKYOUBEAVERS
- C) ROBOTSEESBEAVER
- D) READTHISMESSAGE

T14. Task Scheduling

Two beavers form a legendary flour transportation team. Albert carries 13 kg of flour per trip, taking one hour to go from the bakery to the mill and back. Mario carries only 5 kg but completes each round trip in 30 minutes. They cannot both take a trip because at least one must stay at the bakery for customers.

Like all hardworking creatures, they must rest. After 3 consecutive trips each beaver must take at least 30 minutes before taking another trip. During the rest they are able to take care of customers.



Question / Challenge

Albert and Mario want to transport as much flour as possible in eight hours. Which of the following statements is correct?

- A) Albert must deliver the first.
- B) Mario must deliver the first.
- C) Mario must deliver the last.
- D) Albert must not deliver the last.

Tasks T15 – T21 carry 5 points each

T15. Most worn segment



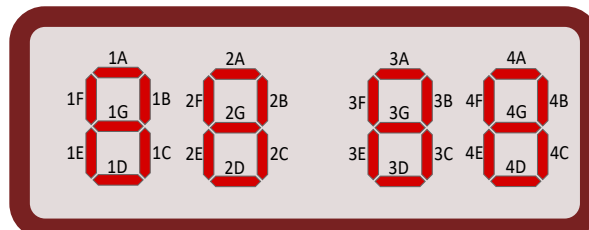
A standard digital clock which changes every minute, shows the time using four digits. Each digit contains 7 luminous segments. This is how an individual digit using the segments can represent the numbers from 0 to 9:



The segments wear out every time they are activated (switched from off to on). The segment that is activated the most times will need to be replaced first.

Question / Challenge

Which of the 28 segments needs to be replaced first? Provide the segment's code (a number followed by a letter, see image).



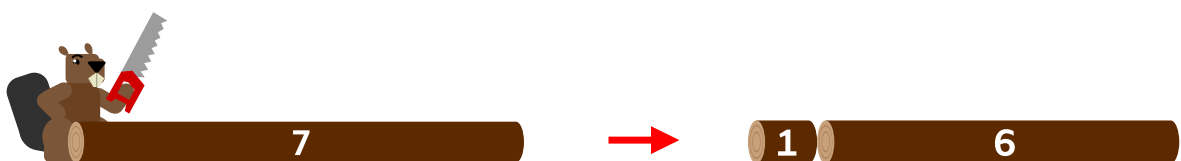
- A) 1B
- B) 1C
- C) 4C
- D) 4E

T16. Beaver and bear

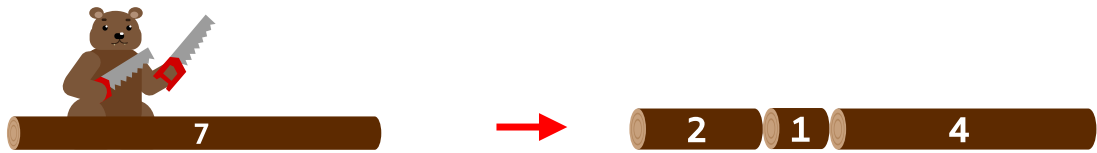
Every day, Beaver and Bear cut 7-meter logs into pieces and Beaver loads them for transport. Beaver can make one cut every minute. His friend Bear has two saws and can make two cuts at once, 1 meter apart. Beaver and Bear can cut different logs at the same time, but not the same log. Each cutting action takes 1 minute.

After cutting, Beaver spends 1 minute per 7m of pieces to load them into a truck. Bear doesn't help with loading.

For example, Beaver can cut a 7-meter log into 1 and 6 meters as shown below:



Similarly, Bear can cut a 7-meter log into a 2-meter log, a 1-meter log, and a 4-meter log as shown below:



Question / Challenge

Today, they received three 7-meter logs. They must produce 9 logs of 1 meter, 3 logs of 2 meters, and 2 logs of 3 meters. What is the minimum time needed to cut and load the logs?

- A) 5 minutes B) 6 minutes C) 7 minutes D) 8 minutes

T17. The Spanner

Saeed has a table that requires re-tightening one of its bolts. To do this, he needs a spanner. He finds a set of 10 spanners arranged from smallest to largest and must identify the correct spanner to fix the bolt.



Question / Challenge

What is the minimum number of spanners that Saeed must try that will guarantee him finding any spanner he wants?

- A) 2 B) 3 C) 4 D) 7

T18. Front Row

Sarah is playing a game. She has a sequence of squares that are either black or white and wants to represent them in a specific way according to the following rule:

- If all the squares of the current sequence are **White**, she just writes '**W**'
- If all the squares of the current sequence are **Black**, she just writes '**B**'
- Otherwise, she will write '**X**',
 - followed by the result of the same rule applied to the **left half** of the current sequence,
 - followed by the result of the same rule applied to the **right half** of the current sequence.

Here are some examples of how the rule works for a sequence of 8 squares:

<table border="1" style="border-collapse: collapse; width: 100px; height: 20px;"> <tr><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td></tr> </table>									W
<table border="1" style="border-collapse: collapse; width: 100px; height: 20px;"> <tr> <td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td> </tr> </table>									XWB
<table border="1" style="border-collapse: collapse; width: 100px; height: 20px;"> <tr> <td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td> </tr> </table>									XXBWB
<table border="1" style="border-collapse: collapse; width: 100px; height: 20px;"> <tr> <td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%;"></td><td style="width: 12.5%; background-color: black;"></td><td style="width: 12.5%;"></td> </tr> </table>									XBXWBW

Question / Challenge

How could Sarah represent the following sequence of squares?



- A) XXXWBWXBXBW B) XXXWBXWWXXBBXBW
 C) XXXBWBXWXWB D) XWBWXBWBW

T19. Flower planting

The robot plants fully-grown flowers in a line in a flower bed based on signs. An empty spot has no sign or flower. The robot uses these rules to plant flowers:

0: Go to the spot marked with an X.

Repeat steps 1-5 until there are not any spot with a sign

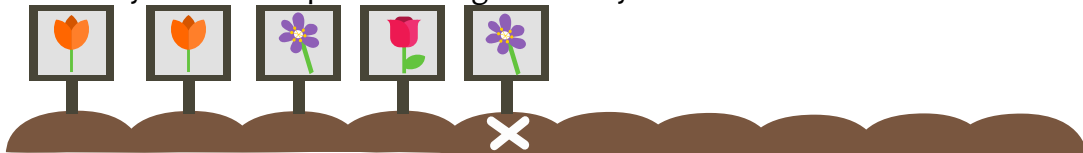
1: If there is a sign at your spot, plant the flower shown on the sign in this spot.

2: Remember the flower you have just planted.

3: Remove the sign.

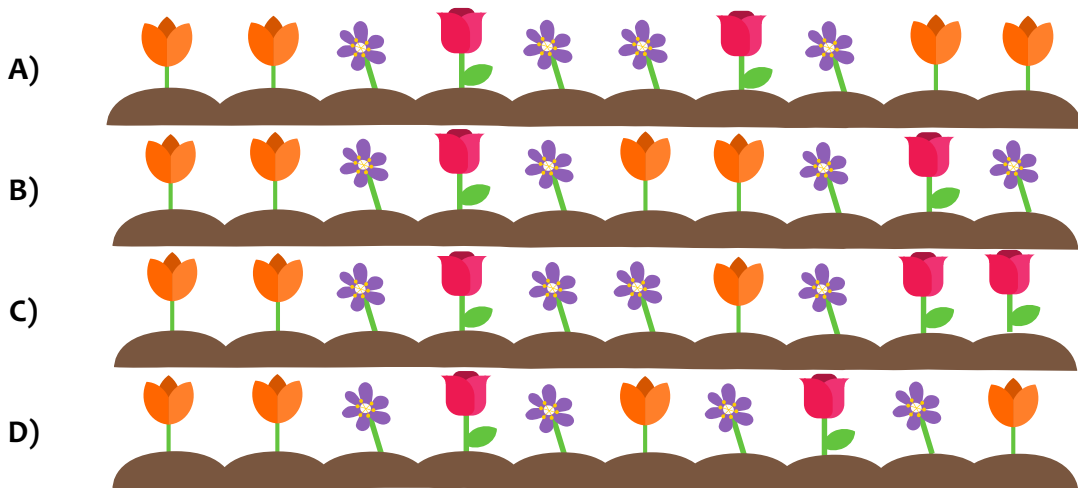
4: Go right until you reach an empty spot, then plant there the last flower you remembered.

5: Go left until you are at a spot with a sign or until you move out of the flower beds.



Question / Challenge

How will the flower beds look after planting?



T20. Biocolors

Using bacteria and enzymes, scientists have produced biological dyes with a special property: When one dye is added to a dye of a different color, the result is a dye of a completely different color after a fixed amount of reaction time.

Each dye color is described by a sequence of 3 nucleotides (a nucleotide can be A or C).

black	CCC
blue	CCA
green	CAC
cyan	CAA
red	ACC
purple	ACA
yellow	AAC
white	AAA

The resulting color can be determined by looking at how the corresponding nucleotides of the genetic codes of each colored dye react with each other:

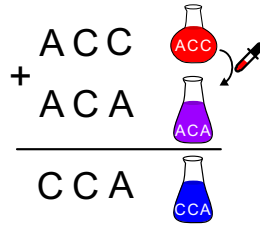
A+A = C

C+C = C

A+C = A

C+A = A

An example is given here:

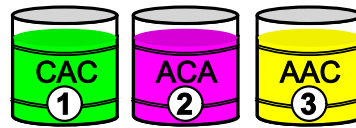


Question / Challenge

You have three immovable large tanks 1,2,3 with green, purple, and yellow dyes. You can get a drop of dye from any one of the tanks and put it in other tanks.

Your task is to swap the colors in tank 1 and tank 3, that is, to have the dye in tank 1 to become yellow (AAC), the dye in tank 2 to remain purple (ACA), and the dye in tank 3 to become green (CAC).

What is the smallest number of times we need to take a drop from one tank and put it on another one to achieve our task ?



A) 2

B) 3

C) 4

D) 5

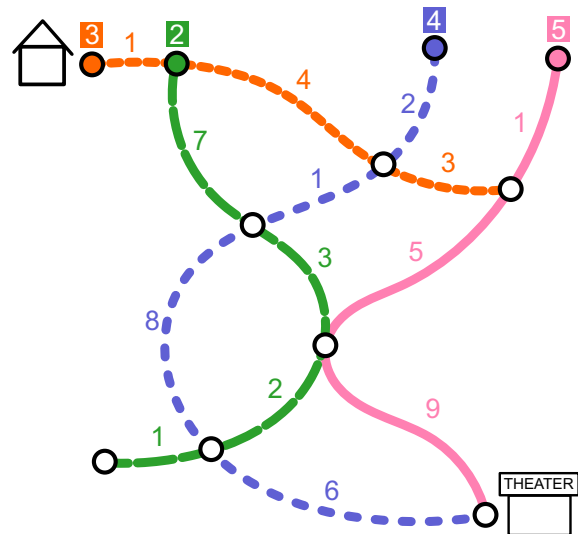
T21. Public Transport

Marcus wants to go to a theater from his home by bus. There are 4 one-way bus lines operating in the town. Bus stops are marked with black-bordered circles. The bus lines are marked with differently colored lines. Colored bus stops represent a line's starting point.

First buses depart on each of the lines from their starting stops at the same time. Then each line sends a bus out in different time intervals. Numbers in colored backgrounds represent the time interval between bus departures in minutes. For example, the orange line sends a bus out every 3 minutes – at minutes 0, 3, 6, 9 and so on.

The numbers near line segments represent how many minutes it takes for a bus to cover the distance between two stops. Stopping at a stop and loading passengers takes no time (0 minutes).

Stops with two or more bus lines intersecting can be used to perform a bus exchange. If Marcus arrives at an intersection point, he can switch to a bus that arrives there later or at the same time as him.



Question / Challenge

If Marcus departs with the first orange bus, what is the shortest time in minutes needed for him to reach the theater?

A) 18

B) 19

C) 20

D) 25

END