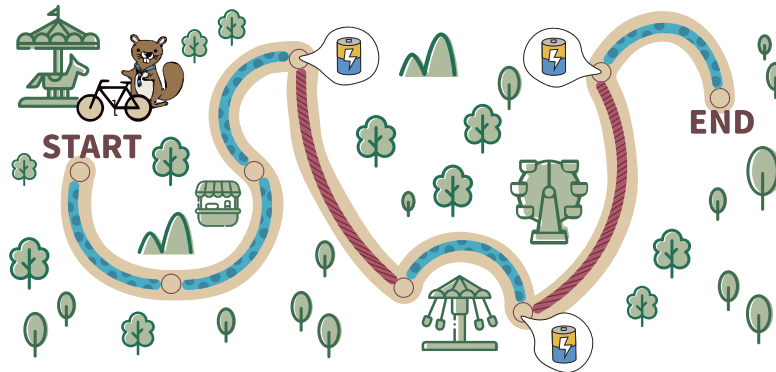


**Tasks T1 – T7 carry 3 points each**

**T1. Electric Bike**

Realizing that the amusement park is about to close, little Beaver Dean hops on his electric bike and hurries to the exit.

The map below shows the amusement park. There are two types of path sections: a blue section and a red section . He can change a battery cell at certain spots and instantly recharge the bike power by 20 percent.



Dean's bike has two speed modes: slow and fast . It cannot switch modes during a path section, but can switch modes at the end of a path section.

The following table shows the time and percentage of battery power needed to get through each path section in both modes:

slow	fast	slow	fast
⌚ 20s	⌚ 10s	⌚ 40s	⌚ 20s
⚡ 5%	⚡ 10%	⚡ 10%	⚡ 20%

Dean's bike is charged to 20% when he starts, and he has to reach the exit before the power runs out.

**Question / Challenge**

How many seconds does Dean at least need to reach the exit?

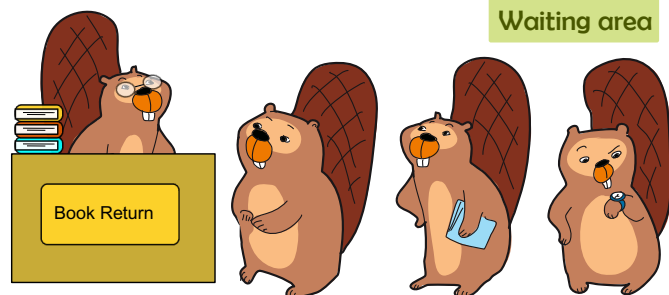
- A) 55                      B) 130                      C) 150                      D) 200

**T2. Returning the books**

In Hardwood Village, beavers love to read books. At the library, there is usually a long queue of beavers waiting to return their books. Since all the beavers are friendly, the library manager has decided to introduce a new rule about the order in which the beavers return their books. The rule is:

**“The beaver with the fewest books goes first.”**

Beavers come to return books at different times, and no matter what time the beaver comes to the library, the beaver in the queue with the fewest books will return them first.



The librarian processes one book return per minute. When she has processed all the books

that a beaver has returned, the beaver currently in the queue with the fewest books will come to her.

One morning, 5 beavers come to the library to return their books. The time of arrival and the number of books per beaver are shown in the table below:

Name	Time of arrival	Number of books
Ana	9.00	4
Beti	9.02	6
Cene	9.03	2
Darja	9.05	4
Emil	9.11	1

Ana arrives as the library opens, so her books are immediately processed upon her arrival.

### Question / Challenge

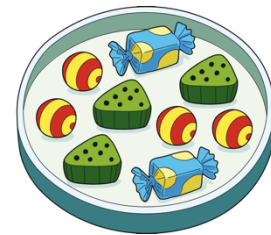
In which order will the beavers return their books to the librarian?

- |                                 |                                 |
|---------------------------------|---------------------------------|
| A) Ana, Beti, Cene, Darja, Emil | B) Ana, Cene, Beti, Darja, Emil |
| C) Ana, Cene, Darja, Beti, Emil | D) Emil, Cene, Ana, Darja, Beti |

### T3. Candies

Gabija has 9 candies and wants to treat her friends:

- Andrius will take half of all remaining round striped candies 🍬 (rounding down, for example 2.5 rounds to 2).
- Benas will take one candy of each different shape, if at least two candies of that shape are left.
- Marija will take 2 green dotted candies. 🍬



### Question / Challenge

What is the order in which Gabija should treat her friends so that she has the most candies left?

- |                           |                           |
|---------------------------|---------------------------|
| A) Andrius, Benas, Marija | B) Marija, Benas, Andrius |
| C) Benas, Andrius, Marija | D) Marija, Andrius, Benas |

### T4. Soccer Tournament

There are 5 teams in Beaver's Football tournament. All matches have these rules:

- A victory(🟠) gives 3 points to the team.
- A loss(❌) gives no points to the team.
- A tie(—) gives 1 point to both teams.

Each team can see its own matches and results in its row of the table. After the first round, the results are shown in the table. However, the Tournament Official notices an error in the results.

TEAM	The Little Beavers	Promises F.C.	The Tree Trunks	Jaguars	Pirates F.C.	Points
The Little Beavers		🟠	🟠	—	—	8
Promises F.C.	❌		—	❌	❌	1

The Tree Trunks	✗	—		✗	—	2
Jaguars	—	○	○		○	10
Pirates F.C.	—	○	—	○		8

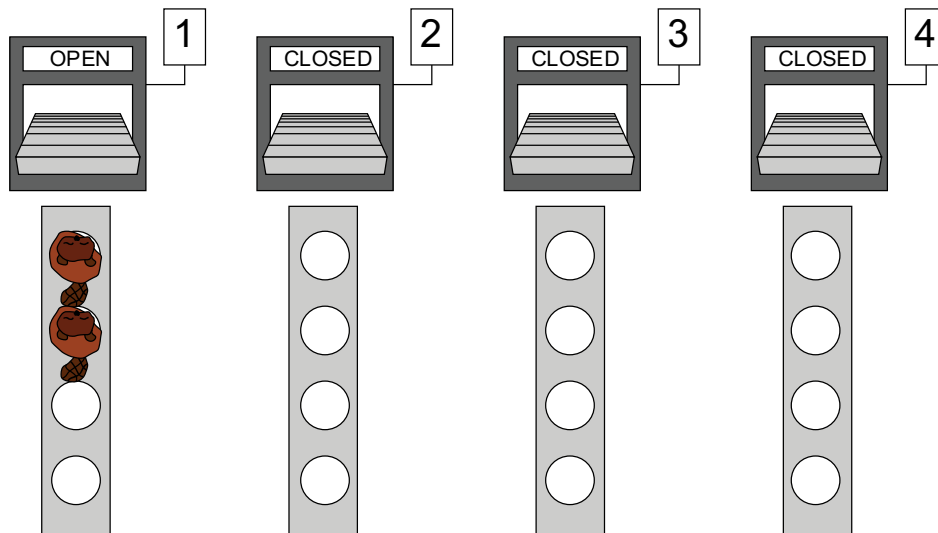
**Question / Challenge**

What match has an error in the table?

- A) Between Promises F.C. and Jaguars
- B) Between The Little Beavers and Promises F.C.
- C) Between Pirates F.C. and Jaguars
- D) Between The Tree Trunks and Pirates F.C.

**T5. Shop Counters**

A shop has four billing counters numbered 1, 2, 3, 4. Each counter can have a queue of at most 4 customers, including the customer being served. Each counter can serve one customer at a time. It takes 2 minutes to serve a customer. Initially, only counter 1 is open.



When a customer wants to pay the bill, he joins the end of the queue at the first counter where the queue is not full. He first tries counter 1, then counter 2, etc.

If there is no space available in any of the counters currently open, a new counter opens and the customer joins the queue there. However, it takes 1 minute to set up a counter, so it takes 3 minutes to serve the first customer at a newly opened counter. Each following customer will be served in 2 minutes as usual.

At a given time, if there are customers who leave their queue after being served and new customers who want to join a queue, you can assume that the served customers leave first and create an empty space in their queues where new customers can join.

**Question / Challenge**

12 customers arrive at the counters, two at a time each minute (two customers arrive initially, another two after 1 minute etc.). How long does it take to serve them all?

- A) 12 minutes
- B) 11 minutes
- C) 13 minutes
- D) 8 minutes

**T6. Art Mafia**

TransArt is a logistic company specialized in the transport of paintings. Paintings are brought to a store for inspection, and then couriers transport them to their final destination.

Every arriving painting is put on top of the stack of paintings. Every courier who takes a painting for transportation to its final destination, takes the painting from the top of the stack.

For security reasons, TransArt keeps good records of all paintings coming in and out.



Paintings brought in the store	
Time	Painting
11:40	Beavers on the grass
12:15	Happy beaver
12:55	Sun and moon
13:30	Enchanted forest
14:18	Oak and birch
15:10	Swampy romance

Paintings taken from the store	
Time	Courier
12:25	A
13:35	C
14:35	A
14:40	B
15:20	C
15:35	D

One evening TransArt was told that “Sun and Moon” never reached the museum that was supposed to receive it. The courier who took it from the store might have stolen it.

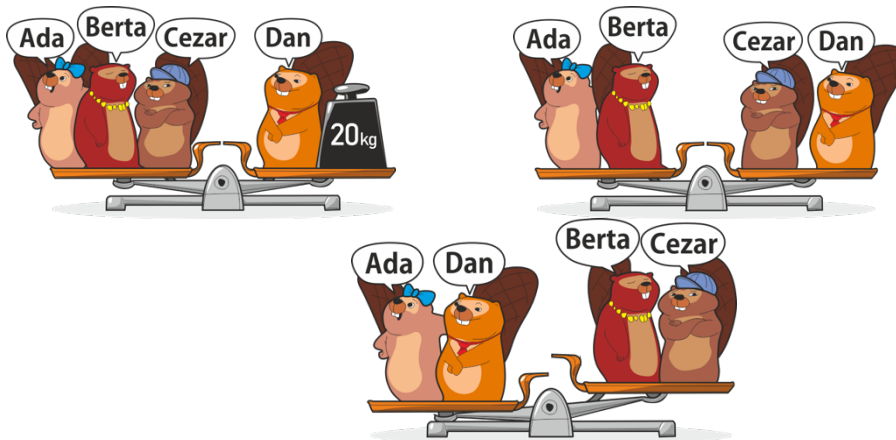
**Question / Challenge**

Who took “Sun and Moon”?

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

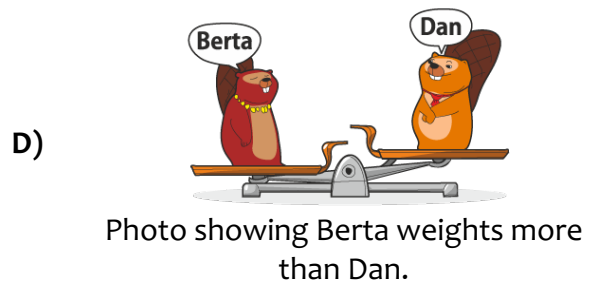
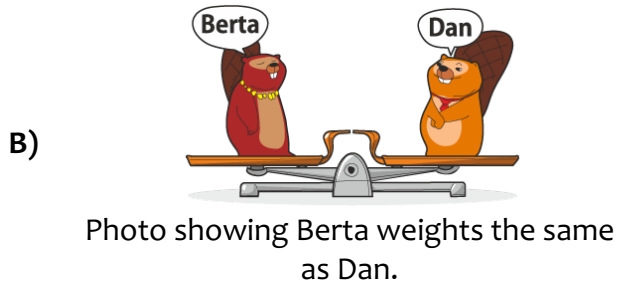
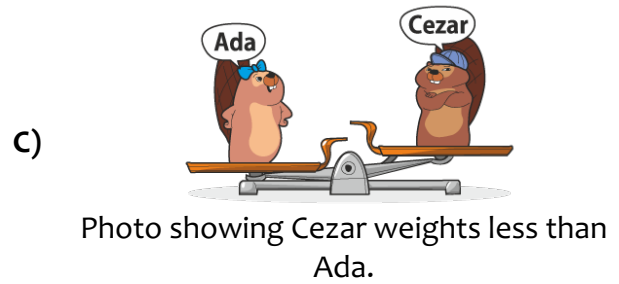
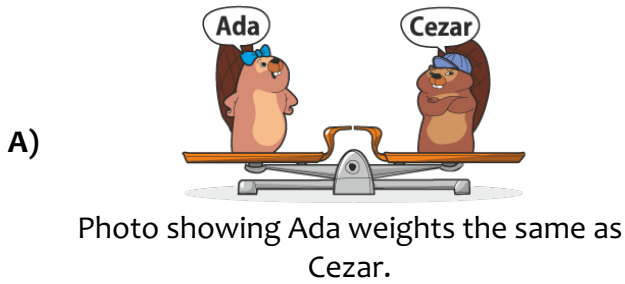
**T7. Compare**

Four beavers Ada, Berta, Cezar, and Dan are playing with a scale and took many photos. Three photos are shown below.



**Question / Challenge**

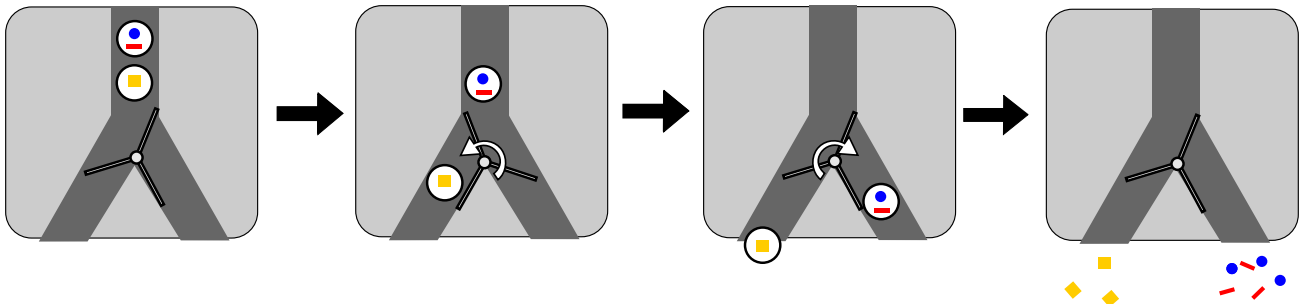
Which of the following photos could also have been taken?



**Tasks T8 – T14 carry 4 points each**

**T8. Pattern Creator**

A machine has been created to produce art patterns on a floor when viewed from above. Each ball contains a different pattern shape and follows the direction allowed by gates. Once the ball goes through a gate, the gate automatically switches and sends the next ball in the other direction.



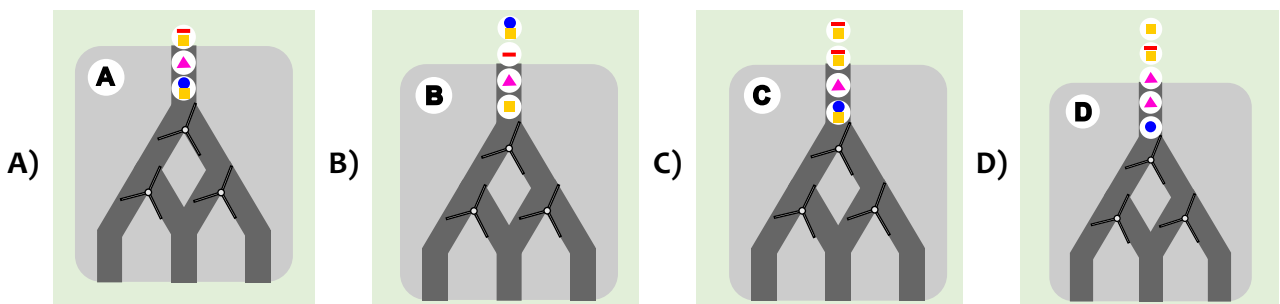
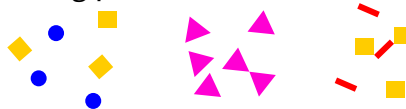
The example shows the gate open on the left, the first ball going left, and the gate switching to send the next ball to the right. This second ball switches the gate back again.

Each ball is labelled with a code representing the shape it will create.

If different balls exit the machine on the same space, the shapes will be distributed on the floor. If two identical balls land on the same space, the result will be the same as if there was only one.

**Question / Challenge**

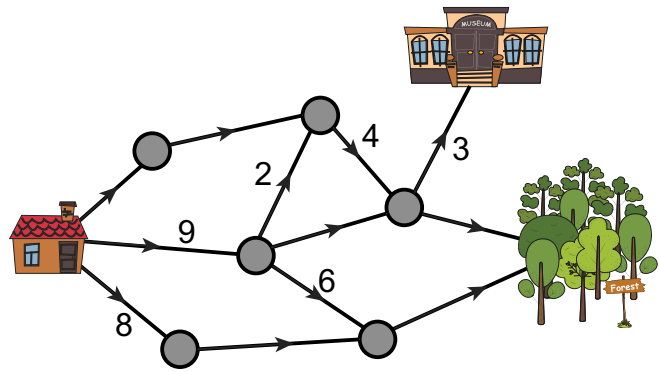
Which balls will create the following pattern on the floor?



**T9. Forest Nursery**

A group of beavers migrated from their house because their house was falling apart. Some beavers went for the museum , and the rest of them headed to the forest .

Beavers documented the migration in the map below: Each circle is a place where beavers could go, and the lines between them are the paths they could take. The number by the paths show how many beavers took that path. For example, the number 3 by the path connected to the museum means 3 beavers took that path and went to the museum. However, some beavers forgot to write down the number, so some paths are missing its number.



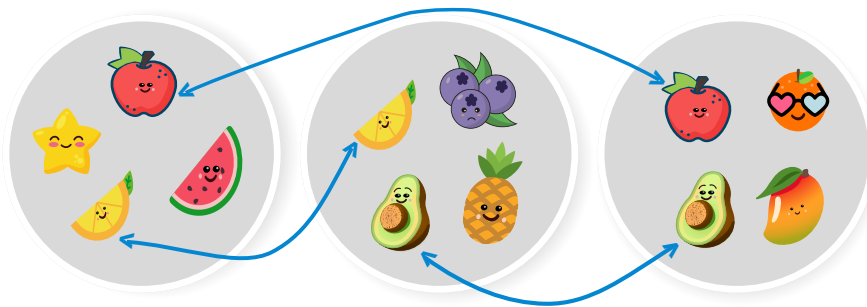
**Question / Challenge**

How many beavers went to the Forest?

- A) 8
- B) 16
- C) 32
- D) 100

**T10. Double**

Bemma and Boh love playing a game with cards. In this game, you have to look at two cards and find the picture that's the same on both. No matter which two cards you pick, there is always just ONE picture that's the same on both cards. For example, in this set of 3 cards, each card has 4 pictures. Notice how there is ONLY ONE PICTURE that's the same on each pair of cards.



Now, they want to make their own set of cards for a school project.

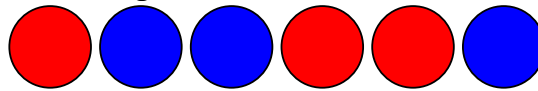
**Question / Challenge**

Below are the first 4 cards they made. But something is wrong, could you help them fix it? Choose ONE card to remove, so the other 3 cards are correct (there should be ONLY ONE PICTURE matching every other card).

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

**T11. Balls**

A sequence of red and blue balls is given:



We count the number of blue balls from left to right starting from the first ball, then starting from the second ball and so on, and obtain the following sequence:

3, 3, 2, 1, 1, 1.

Now we write 0, if the number is even and write 1, if the number is odd and get the following string:

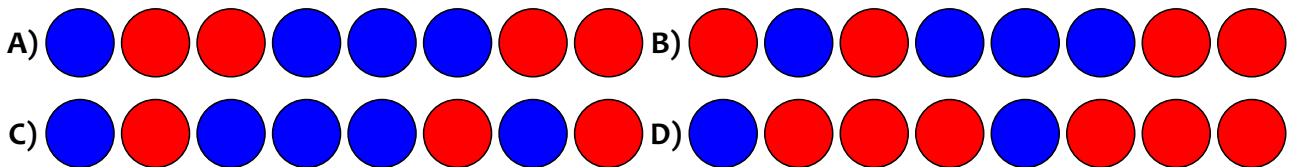
110111

**Question / Challenge**

Having the next string of 0's and 1's (meaning even and odd):

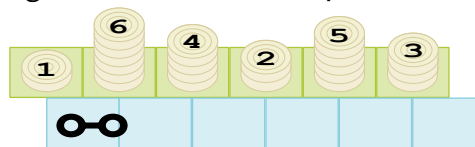
**01110100**

From which sequence of color balls the above string is obtained?



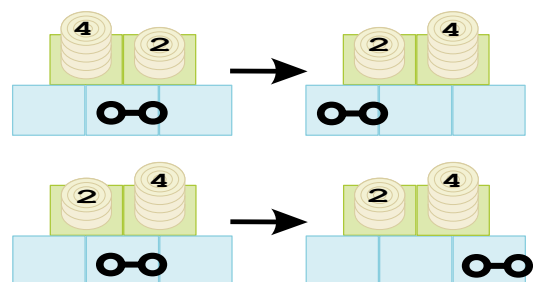
**T12. Keep Switching**

On a board there are two rows of 6 cells, arranged as in the picture below. In the cells on the top row there are stacks of discs, each of different height (1, 6, 4, 2, 5, 3). In the bottom row there is a marker pointing to two cells in the top row.



Starting from the configuration above you keep repeating the following 'moves'

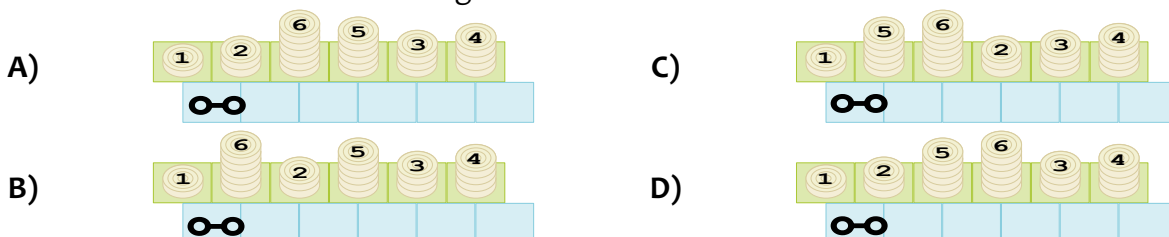
1. If the left cell of marker is taller than the right cell, you switch two cells and move the marker to the left, if possible.
2. If the left cell of marker is shorter than the right cell, you don't need to switch and move the marker to the right.



You stop repeating these moves when the marker is in the rightmost cell.

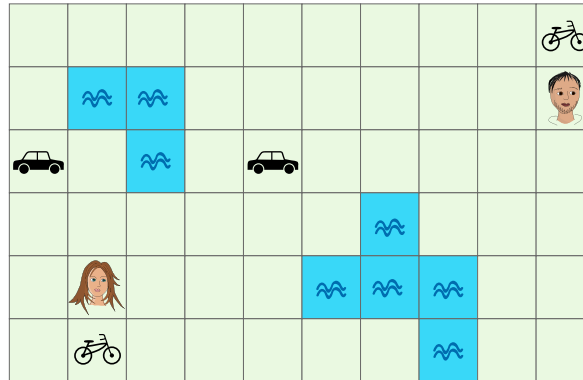
**Question / Challenge**

Below are four different start configurations. Which of these will take the fewest moves for the marker to reach the rightmost cell?



**T13. Meeting race**

Two friends need to meet urgently - see the map below. They can walk from a square to a horizontally or vertically adjacent square in exactly one minute. If they reach a bike or car they can use it to travel faster – 2 squares in one minute with a bike, 5 squares with a car. They cannot travel over water.



**Question / Challenge**

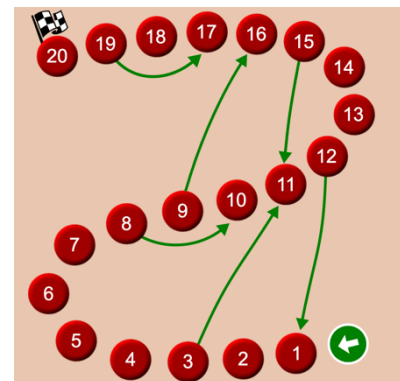
What is the minimum number of minutes they need to end up on the same square?

- A) 8                      B) 6                      C) 4                      D) 3

**T14. Disappearing arrows**

Fleas take part in a race on the track shown in the picture. The race has two rules:

1. On their turn, a flea will jump one position forward.
2. Arrows provide a one time short cut. If a flea jumps to a position that has an arrow leading from it, it immediately jumps to the position the arrow is pointing to. The arrow then disappears so no other fleas can use it.



**Question / Challenge**

If 4 fleas A, B, C, D start in that order, in what order will the fleas reach the finish?

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

**Tasks T15 – T21 carry 5 points each**

**T15. Word Chains**

Mr. Castor is teaching his students how to read. To help them learn he creates word chains, which are sequences of words in which exactly one letter in a word is changed in order to create the next word. For example, MUG → MUD → MAD → FAD is a word chain.



Mr. Castor has the following nine words: BOT, SAD, BAT, CAB, COT, BAD, COB, CAT, and SAT. He groups them into three word chains, each with three words, so that each of the nine words is used in one and only one of the word chains.

**Question / Challenge**

None of the following sequences breaks the word chain rules, but one of them makes it impossible to make three word chains without repeating any words. Which option could not be one of Mr. Castor's word chains?

- A) SAD → BAD → BAT
- B) COT → COB → CAB
- C) BAT → CAT → COT
- D) CAT → CAB → COB

**T16. Balloon Machine**

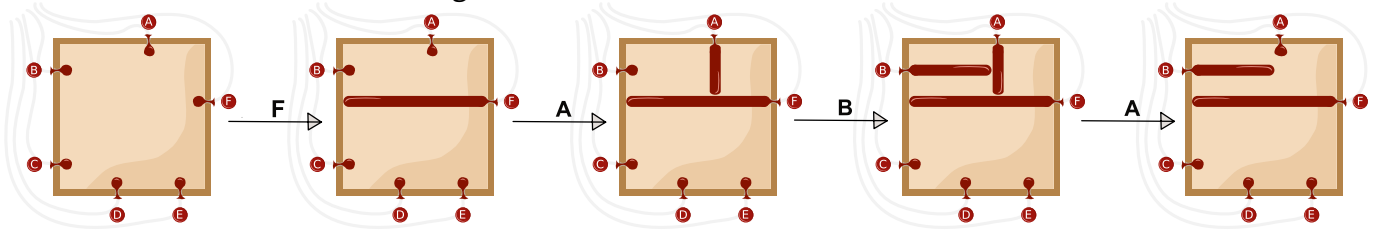
The beavers have a machine that can create images by inflating balloons in a square frame. The balloons are labelled with letters A, B, C, D, E, and F.

The machine reads letters one at a time. When it reads a letter:

If the balloon labelled with that letter is deflated, it is inflated until it touches another balloon or the opposite edge of the frame.

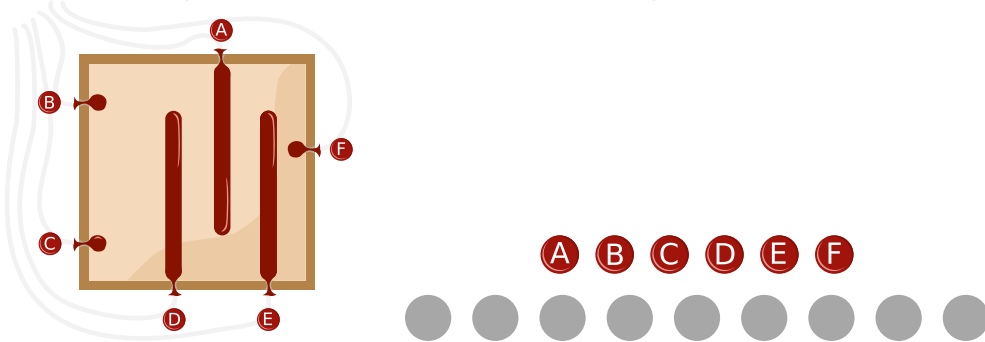
Otherwise it deflates the balloon labelled with that letter.

For example, if all the balloons are deflated at the start and the machine reads F, A, B, and then A, it will do the following:



**Question / Challenge**

To start, each balloon is deflated and then the machine reads a sequence of nine letters. Which of the following sequences does produce the image below?



- A) B E B C A C B D B
- B) B F B B A C B D B
- C) E E B B A F B D B
- D) C E B C B C F D B

**T17. Card Values**

We have 5 types of cards, with multiple copies of each type:



The cards have numbers 1, 2, 4, 8 and 16 on the other side. We don't know which card has which number on the other side, but beavers do. Each beaver has taken the **smallest number** of cards so that **the sum of its cards** equals **its age**.

Fred is 17 years old. He took two cards, one of them is a C.

Grace is 18 years old. She also took two cards. One of them is a B. The other is the same as one of Harry's cards and it's not E.

Harry is 15 years old and he is the only one with an A card. The A card is his highest card (with the highest number). He also took a C card.

**Question / Challenge**

Which is the correct values – individual cards pair?

<p>A) <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td style="background-color: red; color: white;">A</td><td style="background-color: blue; color: white;">B</td><td style="background-color: yellow; color: black;">C</td><td style="background-color: green; color: white;">D</td><td style="background-color: purple; color: white;">E</td></tr> <tr><td>8</td><td>16</td><td>1</td><td>2</td><td>4</td></tr> </table></p> <p>B) <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td style="background-color: red; color: white;">A</td><td style="background-color: blue; color: white;">B</td><td style="background-color: yellow; color: black;">C</td><td style="background-color: green; color: white;">D</td><td style="background-color: purple; color: white;">E</td></tr> <tr><td>16</td><td>8</td><td>1</td><td>2</td><td>4</td></tr> </table></p>	A	B	C	D	E	8	16	1	2	4	A	B	C	D	E	16	8	1	2	4	<p>c) <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td style="background-color: red; color: white;">A</td><td style="background-color: blue; color: white;">B</td><td style="background-color: yellow; color: black;">C</td><td style="background-color: green; color: white;">D</td><td style="background-color: purple; color: white;">E</td></tr> <tr><td>16</td><td>2</td><td>1</td><td>8</td><td>4</td></tr> </table></p> <p>D) <table border="1" style="display: inline-table; border-collapse: collapse; text-align: center;"> <tr><td style="background-color: red; color: white;">A</td><td style="background-color: blue; color: white;">B</td><td style="background-color: yellow; color: black;">C</td><td style="background-color: green; color: white;">D</td><td style="background-color: purple; color: white;">E</td></tr> <tr><td>4</td><td>16</td><td>1</td><td>8</td><td>2</td></tr> </table></p>	A	B	C	D	E	16	2	1	8	4	A	B	C	D	E	4	16	1	8	2
A	B	C	D	E																																					
8	16	1	2	4																																					
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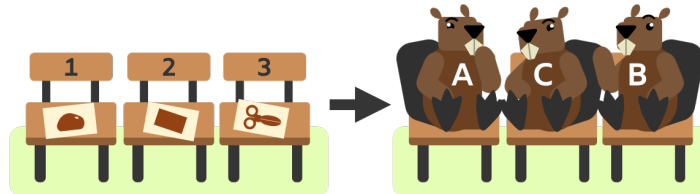
**T18. Rock Paper Scissors**

Anna (A), Bert (B) and Corry (C) are playing a variation of rock, paper, scissors. It starts with three numbered chairs each with a piece of paper that says 'rock', 'paper', or 'scissors' as shown below.

Remember:

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

Anna, Bert and Corry sit down on the chairs as indicated.



The following actions are taken:

1. First, each friend puts the piece of paper on their chair in an envelope so no one sees what is written on the paper;
2. Then, two friends will swap chairs and envelopes;
3. Then, two friends will swap envelopes, but not chairs.
4. Finally, two friends will swap chairs, but keep their envelope.

**Question / Challenge**

After all that, the friends open the envelopes they ended up with and compare the words on their pieces of paper.

Which one of the following statements is true?

- |                         |  |
|-------------------------|--|
| A) Corry will beat Bert | B) Bert will beat Anna                   |
| C) Corry will beat Anna | D) It is impossible to know who will win |

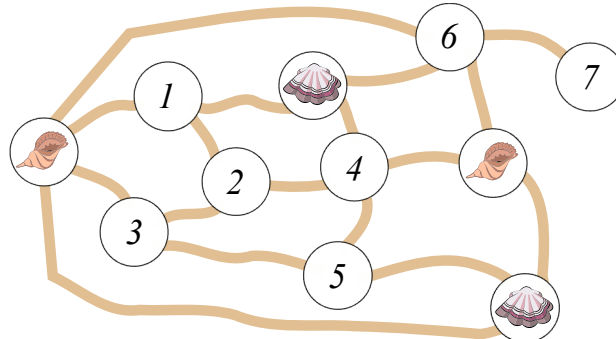
**T19. Seashell Game**

Alice and Bob are playing a game on the beach involving shells, holes and lines in the sand.

During the game, they take turns placing shells in empty holes. Shells can't be moved to another empty hole if they have already been placed in a hole. Alice plays with one type of shells:

shells: and Bob plays with another type of shells: .

The game has started and each player has completed two turns placing two of their shells as shown.



The loser of the game will be the first person with its shells placed in two holes connected by a line in the sand.

It is Alice's turn. The numbers represent the empty holes.

### Question / Challenge

In which empty hole should Alice place her next shell if she wants to guarantee a win in the game?

A) 2

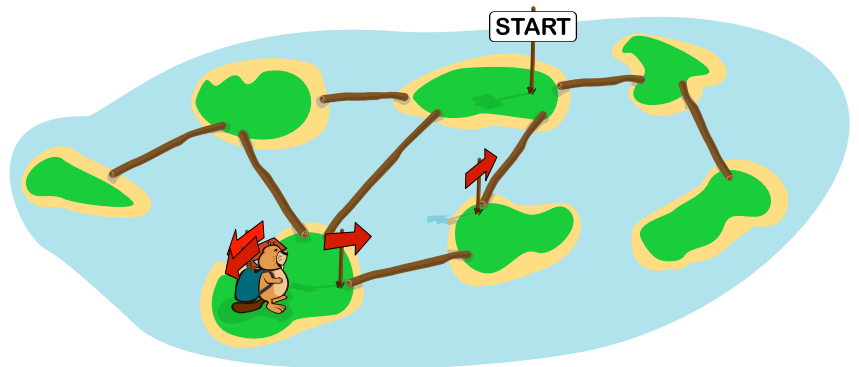
B) 3

C) 6

D) 7

### T20. Exploration

Beaver Harry is exploring a network of islands connected by logs, as shown in the right. Harry would like to visit every island on the network. From any island, he can see every neighboring island and identify whether it has a sign.



In the picture above, he started

on an arbitrary island and has reached two further islands using the following strategy:

Set up a start sign on an arbitrary island.

Every time you go to an island, do:

If this island already has a sign:

Leave the sign the way it is.

Else:

Set up an arrow sign pointing to the island that you just came from.

If there is a neighboring island that has \_\_\_\_\_ then:

Go to that island.

Else:

Look at the sign on the island you are on.

If it is an arrow sign then:

Go to the island \_\_\_\_\_.

Else:

You have gone to all islands of the network.

**Question / Challenge**

What is the correct pair of answers?

Answer options for the first gap:

- a) no sign
- b) an arrow sign
- c) a start sign

Answer options for the second gap:

- a) that you just came from
- b) pointed to by the arrow

- A) a-a                      B) b-a                      C) c-a                      D) a-b

**T21. Hidden pictures**

Leo has invented a new method for encrypting images using the operations **H** (horizontal) and **V** (vertical).

An image is essentially a rectangle divided into rows and columns of square cells called pixels, with each pixel storing a color.

In each application of the **H** operation:

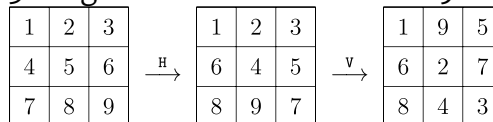
- Every pixel in the 1st row remains in place (i.e., they do not move).
- Every pixel in the 2nd row moves 1 place to the right.
- Every pixel in the 3rd row moves 2 places to the right.
- ...
- Every pixel in the nth row moves  $n - 1$  places to the right.

When pixels in any row are pushed beyond the right edge of the image, they are kept in order and moved as a group to the available space at the left end of the row.

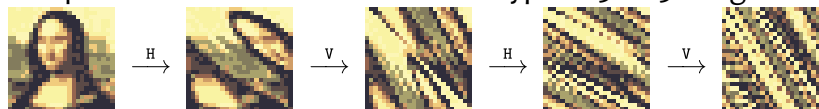
Similarly, in each application of the **V** operation:

- Every pixel in the nth column moves  $n - 1$  places down, and pixels pushed beyond the bottom edge are moved to the top.

Here is an example of a  $3 \times 3$  image with colors labeled 1 to 9:

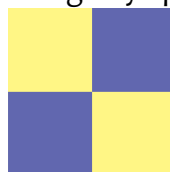


Here is how the sequence **HVHV** can be used to encrypt a  $25 \times 25$  image of the Mona Lisa:



**Question / Challenge**

Leo encrypts the following  $1000 \times 1000$  image by applying **V** then **H**:



Which of the following best matches the result?

- A)       B)       C)       D) 

END