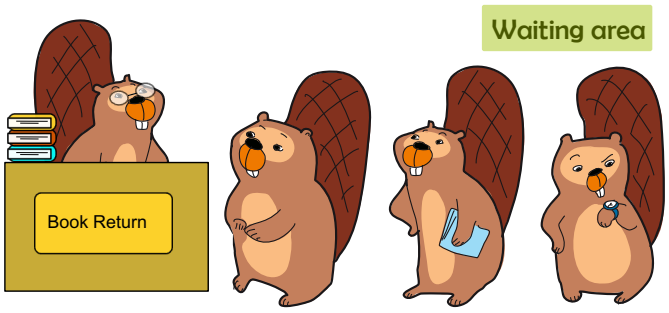
Tasks T1 – T7 carry 3 points each

T1. 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

T2. String Machine

We have a **machine** that combines strings. It has **two inputs** (left and right) and **one output**. The output string is produced using iterations so that as long as there are any letters **in both inputs**, it repeats these two operations:

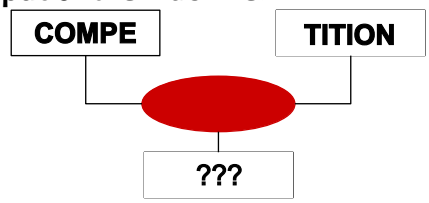
- remove the last letter from the right input and place it at the end of the output
- remove the last letter from the left input and place it at the end of the output

After that if there are **any letters left on any input**, they are added to the end of the output string.

For example:

Question / Challenge

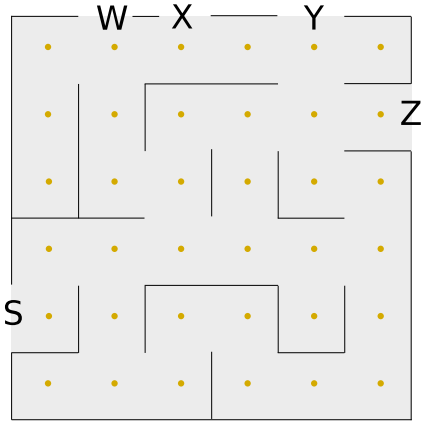
What string is produced when the string *COMPE* is given to the **left input** and the string *TITION* is given to the **right input** of the machine?



A) NEOPIMTOICT **B)** NTOEIPTMIOC **C)** ENPOMIOTCIT **D)** TNEOPIMTOIC

T3. Maze

We consider the following maze:



Starting from S, we must move by visiting the points shown. Being at a given point, we can go to one of the neighboring points, which can only be directly above, below, left or right. We cannot pass through the obstacles indicated by black lines. Our goal is to get out of the maze to one of the positions W, X, Y, or Z.

Question / Challenge

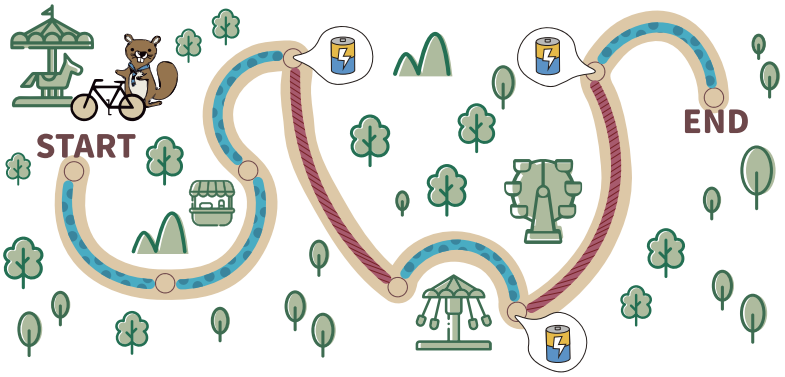
What is the minimum number of points to visit before exiting the maze?

A) 5 **B)** 6 **C)** 7 **D)** 8

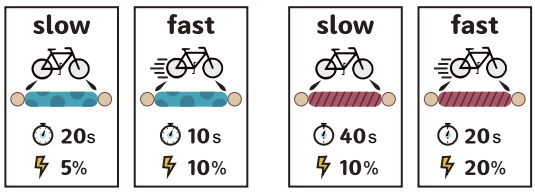
T4. Electric Bike

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:



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?

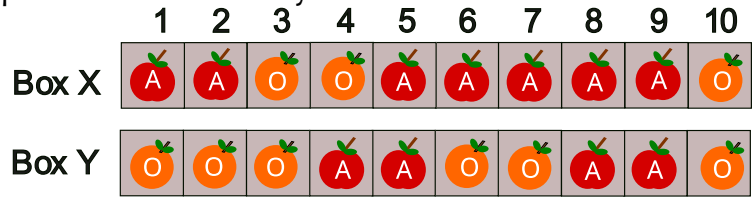
A) 55 **B)** 130 **C)** 150 **D)** 200

T5. Mix the Boxes

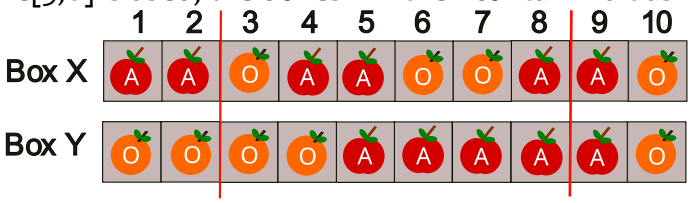
Dodo has two boxes of fruit, each divided into sections numbered 1 to 10. Some sections have apples, and some have oranges. Dodo uses two commands to change the fruit:

1. **move[m,n]:** All the fruit in Box X from sections numbered m to n is moved (in order) to the same numbered sections in Box Y and all the fruit originally in Box Y from sections numbered m to n is moved (in order) to the same numbered sections in Box X.
2. **magic[m,n]:** In each box, all apples in sections numbered m to n become oranges and all oranges originally in sections numbered m to n become apples.

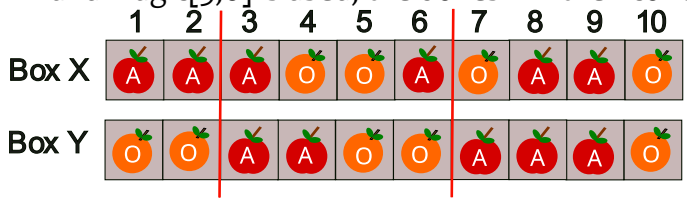
For example, suppose the boxes initially contain fruit as follows:



If the command move[3,8] is used, the boxes will then contain fruit as follows:

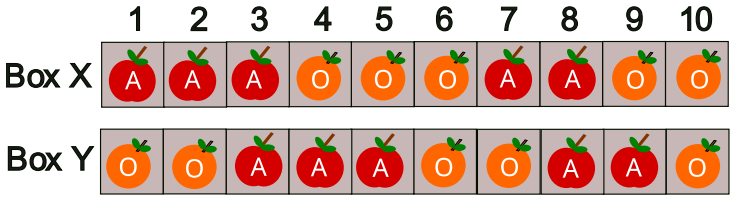


After this, if the command magic[3,6] is used, the boxes will then contain fruit as follows:



Question / Challenge

Now suppose the boxes initially contain fruit as follows:



After using the commands magic[5,7], move[2,5], and then magic[7,10], how many more apples are in Box X compared to Box Y?

A) 1 **B)** 2 **C)** 3 **D)** 5

T6. Swimming Competition

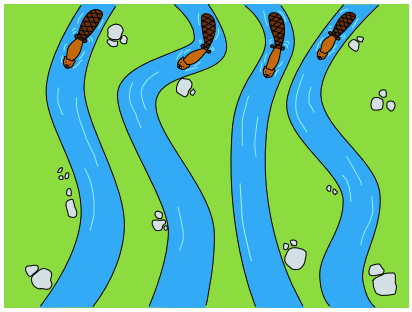
Beavers Alex, Benny, Cathy and Diana enjoy swimming competitions and want to see which one of them is the fastest swimmer.

When they swim in a river, the speed of the river is either added to their swimming speed when they swim down the river, or subtracted from their swimming speed when they swim up the river.

However, each beaver is swimming in their own river. The rivers flow with different speeds, which means some beavers may have an unfair advantage if their river is faster when swimming down the river or slower when swimming up the river.

In order to find which one of them is the fastest, they recorded their speeds down the river and up the river and got these result:

Name	Speed down the river	Speed up the river
Alex	5 m/s	3 m/s
Benny	8 m/s	1 m/s
Cathy	7 m/s	3 m/s
Diana	6 m/s	5 m/s



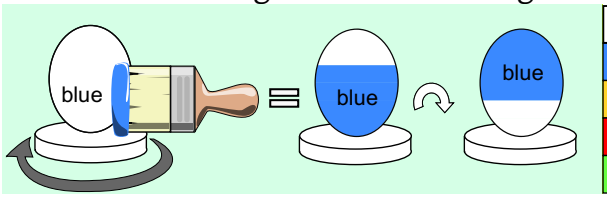
Question / Challenge

Which beaver is the fastest swimmer?

A) Alex **B)** Benny **C)** Cathy **D)** Diana

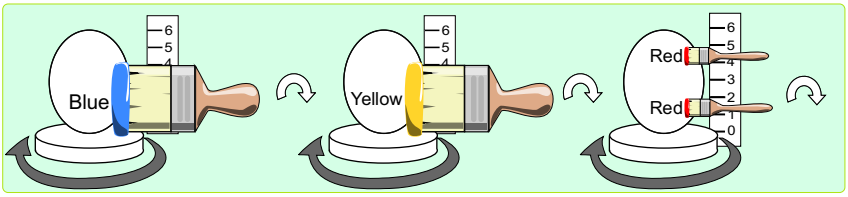
T7. Egg painting

Aoife paints white eggs for Easter. When she puts the egg on a turntable and holds the paintbrush next to it, the egg is painted very quickly. She doesn't move the paintbrush whilst the turntable is moving, but she always flips the egg upside down after each colour is applied, as shown in the image below. The colours mix together when they overlap. The table below shows the resulting colour after mixing two colours together.



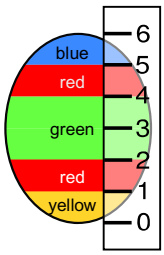
colour mixing guide				
blue	+	yellow	=	green
yellow	+	red	=	orange
red	+	blue	=	purple
green	+	red	=	brown

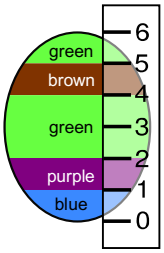
Aoife paints her white egg using the sequence of colours and paintbrush widths as shown below.

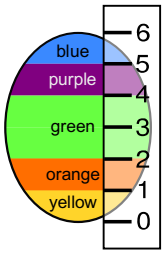


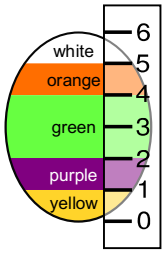
Question / Challenge

Which egg shows the correct result of Aoife's painting?

A) 

B) 

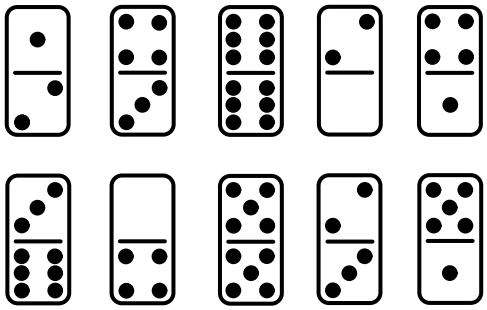
C) 

D) 

Tasks T8 – T14 carry 4 points each

T8. Guess The Domino

Alice and Bob are playing a game. They have 10 dominoes on a table:



Bob selects a secret domino piece, known only to him. Alice can then ask Bob yes-or-no questions to figure out which domino he chose. Each question must have as an answer ***yes*** or ***no***.

Alice should frame her questions in such a way that, regardless of Bob's answer, she will have the fewest possible choices for the secret domino.

Question / Challenge

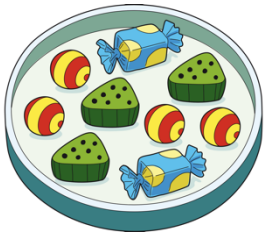
Which question should Alice ask first?

A) Is the sum of the dots on the piece greater than or equal to 7?
B) Is the number of dots on the larger end of the piece greater than or equal to 4?
C) Is the number of dots on the smaller end of the piece greater than or equal to 2?
D) Do both ends of the piece have the same number of dots?

T9. Candies

Gabija has 9 candies and wants to treat her friends:

- Andrius will take half of all remaining round stripped 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. 



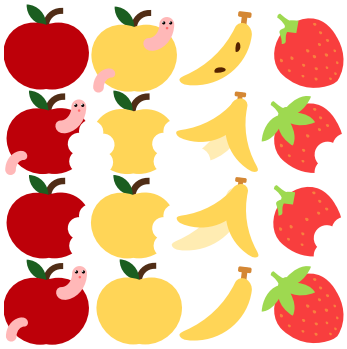
Question / Challenge

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

T10. Still life

A painter has chosen one piece of fruit to paint from the fruits below.
You are trying to figure out which piece of fruit the painter chose by asking him yes or no questions and you want to find it out in as few questions as possible, no matter which piece of fruit the painter chose.



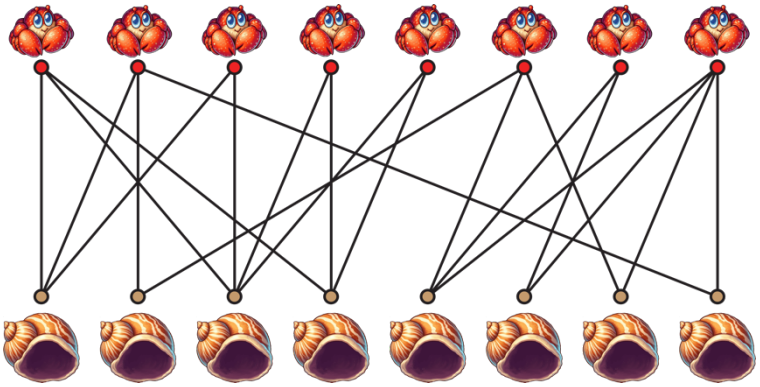
Question / Challenge

With which of the following questions should you start to discover the selected fruit?

A) is the fruit yellow?
B) is the fruit a banana?
C) does the fruit have a bite taken out?
D) is there a worm in the fruit?

T11. Hermit Crabs

Hermit crabs wear shells. As the crabs grow, their shells become too small and they need to look for larger shells.
An assortment of new shells has just been washed ashore. Several crabs have gathered to try on these new shells. In the following diagram, there are 8 crabs and 8 shells. The crab can wear only shells connected with him by a line.



Question / Challenge

What is the maximum number of hermit crabs that can wear one of these new shells?

A) 8 **B)** 7 **C)** 6 **D)** 5

T12. Soccer Tournament

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

- A victory(O) gives 3 points to the team.
- A loss(X) 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		O	O	—	—	8
Promises F.C.	X		—	X	X	1
The Tree Trunks	X	—		X	—	2
Jaguars	—	O	O		O	10
Pirates F.C.	—	O	—	O		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.

T13. 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?

A) 

B) 

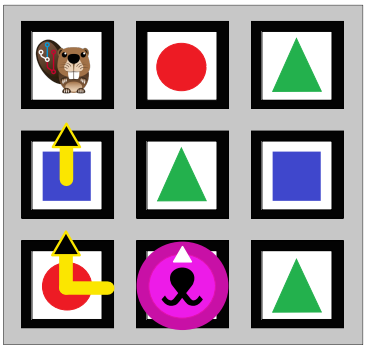
C) 

D) 

T14. Color reading robot

The robot  Is at the starting position and aims to reach the goal  .
It can recognize the colored symbols on which it is standing.

When the robot is at the starting position, we cannot see which symbol is beneath it .
The robot moves according to colored symbols.

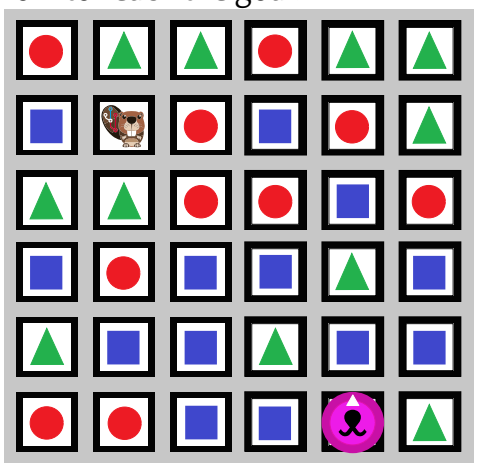


- Blue square = step forward
- Red circle = turn right and step forward
- Green triangle = turn left and step forward

In the example, the robot moves according to this path .In the first step it turns to the left and moves forward, then it turns to the right and moves forward and finally it moves forward. The arrows show the path the robot takes.

Question / Challenge

Which path did the robot follow to reach the goal?



A) 

B) 

C) 

D) 

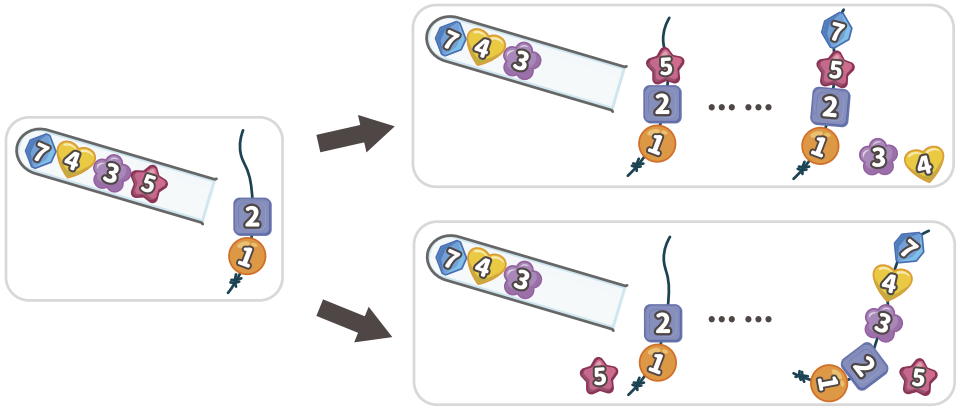
Tasks T15 – T21 carry 5 points each

T15. Bebracelet

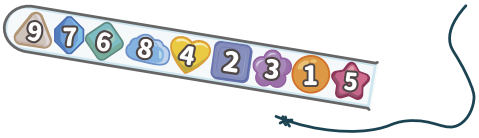
Beaver is making a Bebracelet. He takes numbered beads from a tube, one at a time. For each bead, he chooses whether to put it on the string or put it aside and not use it. But he may put a bead on the string, only if:

- the string is empty, or
- the number on the bead is larger than the number on the last bead on the string.

In this example, the last bead on the string has number 2. So, Beaver may put bead #5 on the string or put it aside.



Beaver is making a new bracelet from the beads in this tube:



Question / Challenge

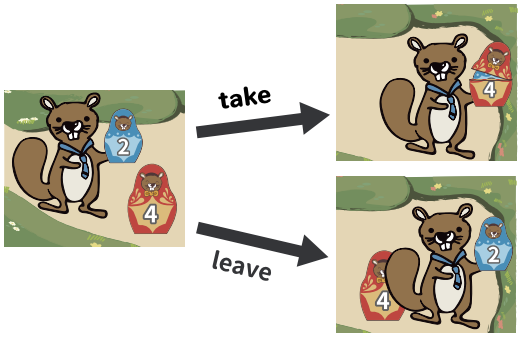
What is the largest number of beads that he can put on the string?

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

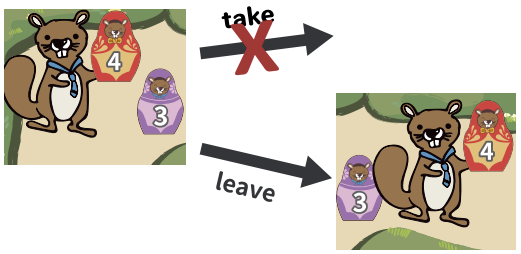
T16. Beaver Maze

Beaver Deana enters the maze below, carrying a doll of size 1. She wants to go through the maze and collect the dolls that are scattered around.

Deana must move in the direction of the arrows and obey the following rule each time she sees a doll.



If the doll is bigger than the biggest doll she already carries, she can either take it with her or leave it behind.



Otherwise, she must leave the doll behind.

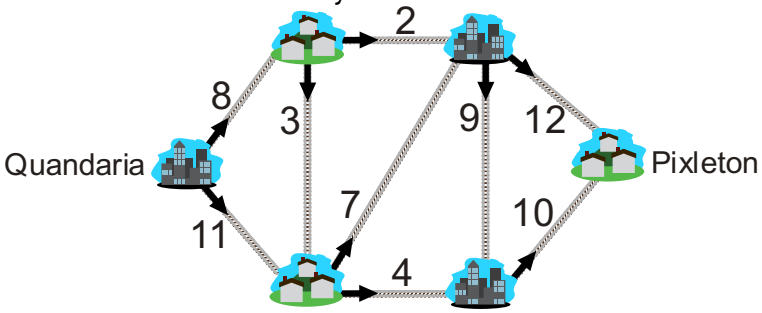
Question / Challenge

What is the maximum number of dolls that Deana can carry with her, including the size 1 doll, when she gets out the maze?

A) 1 **B)** 3 **C)** 5 **D)** 6

T17. Railway Network

In the land of Bebravia, neighboring settlements are linked by a network of railway tracks. For each track, there is a limited number of trains that can travel along it each day, indicated on the diagram below. Different trains may share a track.



Quandaria offered to send materials to Pixleton. In this direction, trains must always follow the arrows.

Question / Challenge

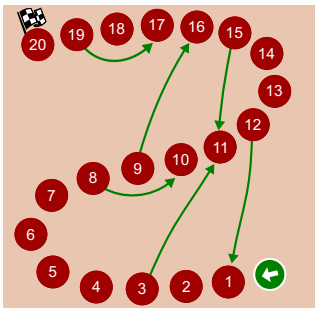
What is the maximum number of trains that can depart from Quandaria and arrive at Pixleton every day?

A) 13 **B)** 15 **C)** 19 **D)** 22

T18. 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, which flea will finish first?

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

T19. Friends

There are seven beavers in a class: Alex, Bess, Cora, Dave, Eric, Fred, and Gigi. Some of the beavers know each other and some don't.

The diagram below shows a checkmark between two beavers if they know each other.

	Alex	Bess	Cora	Dave	Eric	Fred	Gigi
Alex		✓	✓				
Bess	✓						✓
Cora	✓				✓		
Dave						✓	
Eric			✓				
Fred				✓			
Gigi		✓					

Each beaver received a different message from someone outside the class, and shared it with all the beavers they know in their class. Whenever a beaver receives a new message from someone in the class, they immediately share it with all the beavers they know in the class.

Question / Challenge

Which beavers in this class received the least number of messages in total?

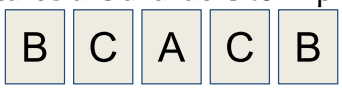
A) Alex and Bess **B)** Dave and Fred **C)** Gigi and Bess **D)** Eric and Cora

T20. Highest Score of Sequence

A game involves editing sequences made from cards with the letters A, B and C. Players try to get the highest possible score by replacing some of the letters.

For every group of 2 identical letters in a row, the player scores 2 points. For every group of 3 identical letters in a row, the player scores 3 points. And so on.

For example, the sequence of five grey cards scores 0 points because no identical letters are next to each other. But two red cards are available to improve the score.

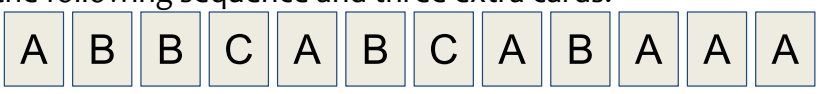


We could cover the first C with a red A card and the second C with a red B card as shown.

Then the score is 2 + 2 = 4 points for the group of two A's and the group of two B's. The first B is by itself, so it doesn't contribute to the score.

Question / Challenge

You are given the following sequence and three extra cards:



Using the red cards B, B and C to cover any three letters, which is the sequence with the highest score?

A)

A	B	B	C	A	C	C	A	B	B	A	A

B)

A	B	C	C	A	B	B	A	B	A	A	A

C)

A	B	B	B	A	B	C	C	B	B	A	A

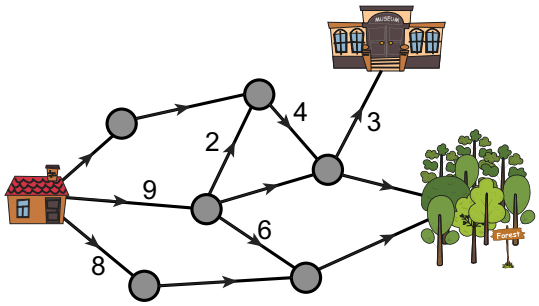
D)

A	B	B	C	C	B	B	B	B	A	A	A

T21. Forest Nursery

The picture shows a schematic map. The circles represent **villages**, the lines between them are **paths**. Harry will go from his home through villages either to the **museum** or to the **Forest Nursery**. On his journey, he follows the direction of the path. The **number** on each path represents **how many times** he walked that path. If there is no number on the path, he forgot to write it down.

From the map we can see that Harry came to the museum three times.



Question / Challenge

How many times did Harry come to the **Forest Nursery**?

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

END