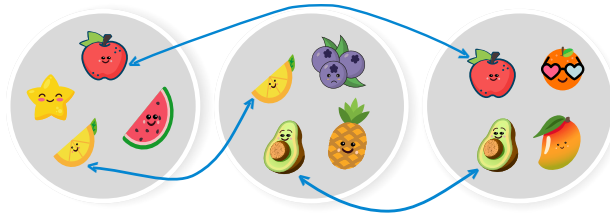


**Tasks T1 – T7 carry 3 points each**

### T1. 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's always just ONE picture that's the same on both cards.

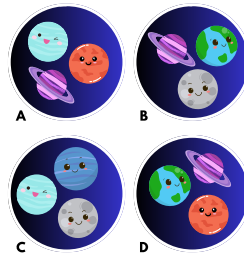
For example, in the following set of 3 cards, each card has 4 pictures. Notice how there's ONLY ONE PICTURE that's the same on each pair of cards.



Now, Bemma and Boh 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? Which card should be deleted, so the other 3 cards are correct (there should be ONLY ONE PICTURE matching every other card).



A) A

B) B

C) C

D) D

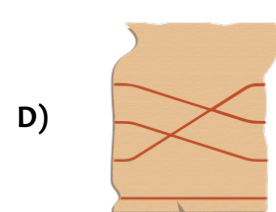
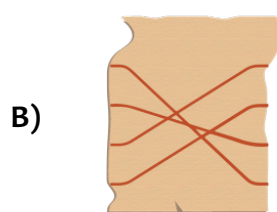
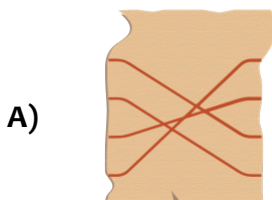
### T2. Map it Out

Four animals set out on a journey. A map showing their journey was created, showing for each animal, a line going from its initial location to its final location. However, the middle section of the map went missing.



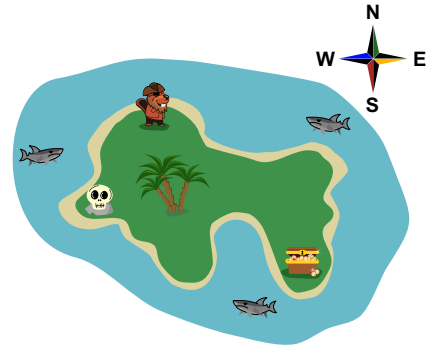
### Question / Challenge

Which of these could be the missing portion of the map?



**T3. The pirate and the treasure**

A treasure chest is buried somewhere on the Treasure island. A pirate received an instruction sequence to reach the treasure chest. The instruction sequence contains 4 steps, where each step is to move exactly one mile either in the South (S) or the East (E) direction. The instruction sequence also ensures the pirate will not fall into the sea that is full of sharks.



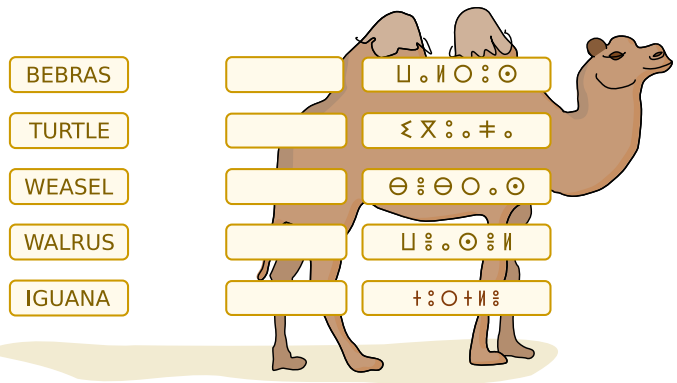
**Question / Challenge**

Which one of the following instruction sequence has the pirate received?

- A) S, S, E, E      B) E, E, S, S      C) E, S, S, E      D) S, E, E, S

**T4. Tifinagh**

Tim knows the Tifinagh alphabet, which is used by some Tuareg Berber, who are living in northern Africa. Tim uses the Tifinagh alphabet as code. Tim maps the same Tifinagh symbol to the same letter. Tim codes five words: BEBRAS, TURTLE, WEASEL, WALRUS, and IGUANA.



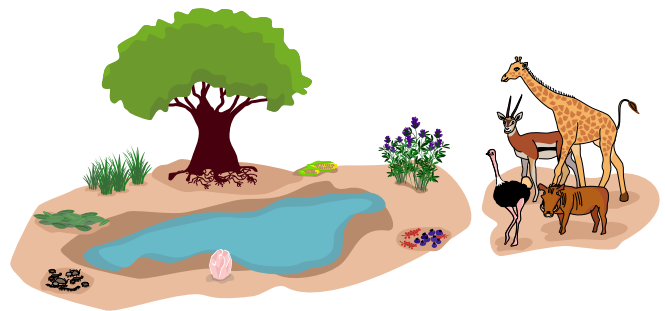
**Question / Challenge**

Which is the Tifinagh-code for BEBRAS?

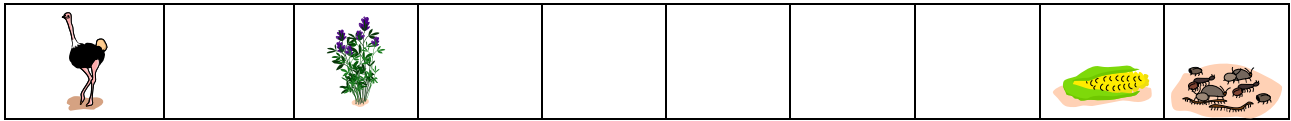
- A)      C)
- B)      D)

**T5. Exciting Waterhole**

Officer Martin is at the waterhole to see what animals are coming to feed. The table shows which animals visit the waterhole and what food they can eat:



	bush leaves	lucerne	grass	salt	roots	berries	tree leaves	corn	insects

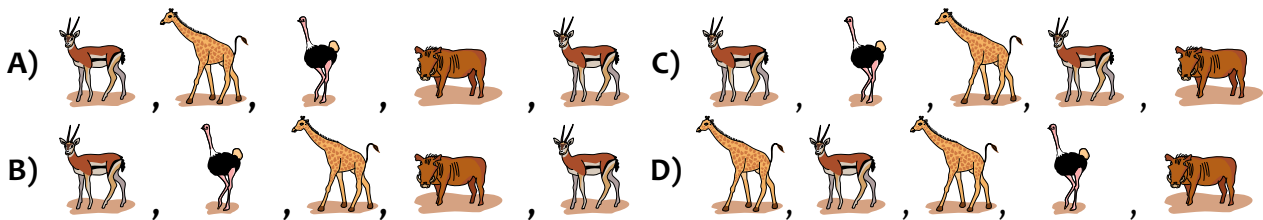


Martin observes five groups of animals that come to eat. The animals in each group are all of the same type. The groups arrive after each other. This is what the different groups ate:

1 <sup>st</sup> Group	The animals ate the lucerne and the salt block.
2 <sup>nd</sup> Group	The animals ate the lucerne and the corn.
3 <sup>rd</sup> Group	The animals did not eat the lucerne.
4 <sup>th</sup> Group	The animals ate the lucerne and the bush leaves.
5 <sup>th</sup> Group	The animals ate the grass and the roots.

### Question / Challenge

In what order did animals arrive at the waterhole?



### T6. Mix the Boxes

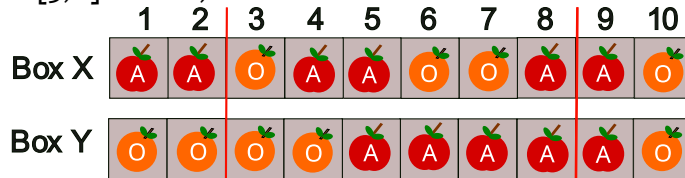
Dodo has two boxes of fruit, each divided into sections numbered 1 to 10. Some sections have apples, and some have oranges. Dodo uses two commands to change the fruit:

- 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.
- 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.

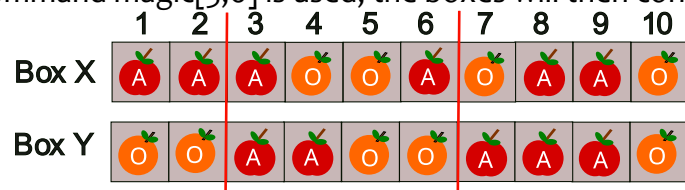
For example, suppose the boxes initially contain fruit as follows:



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

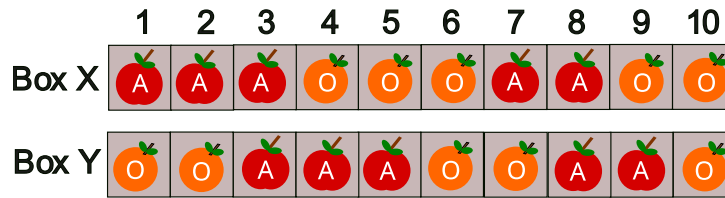


After this, if the command `magic[3,6]` is used, the boxes will then contain fruit as follows:



### Question / Challenge

Now suppose the boxes initially contain fruit as follows:

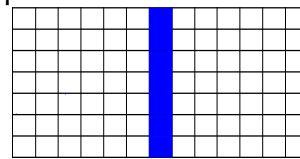
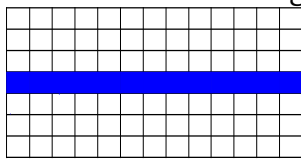


After using the commands `magic[5,7]`, `move[2,5]`, and then `magic[7,10]`, how many more apples are in Box X compared to Box Y?

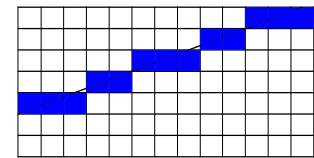
- A) 1                      B) 2                      C) 3                      D) 5

**T7. Line Drawing**

Pixels are the tiny squares on a grid that the computer uses to represent images. Drawing horizontal or vertical lines is straightforward as adjacent pixels are filled in.

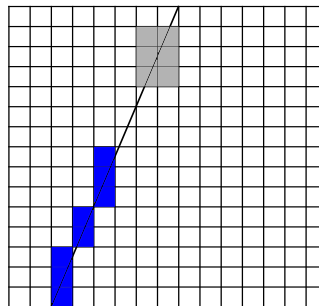


Diagonal lines have to be drawn using a combination of horizontal and vertical pixels so they will not be exact. You can see the pattern of pixels that represent parts of a diagonal line. This pattern is a group of horizontal (or vertical) pixels that are repeated along the diagonal line.



**Question / Challenge**

To complete the pattern to represent the diagonal line shown, which of the grey pixels will become blue?

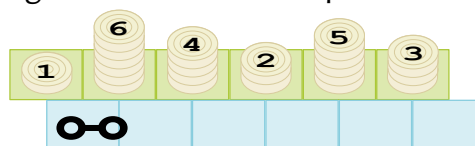


- A)      B)      C)      D)

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

**T8. Keep Switching**

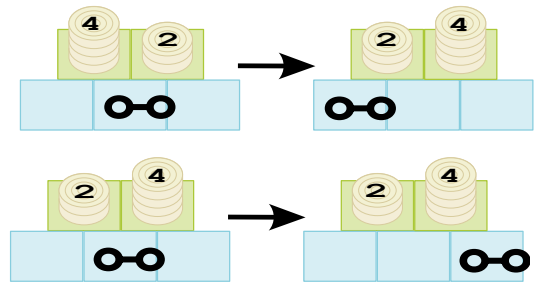
On a board there are two rows of 6 cells, arranged as in the picture below. In the cells on the top row there are stacks of discs, each of different height (1, 6, 4, 2, 5, 3). In the bottom row there is a marker pointing to two cells in the top row.



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.



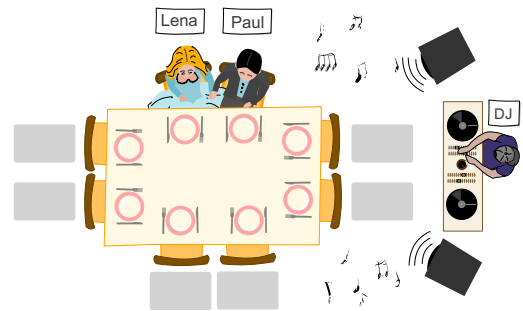
### Question / Challenge

What will the top row look like when the marker ends up in the rightmost cell?

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

### T9. Wedding places

Lena and Paul are getting married. They want to invite some of their friends but each one has preferences about where they want to sit. Lena and Paul will sit next to each other, as shown, and their six friends will sit in the remaining seats around the table.

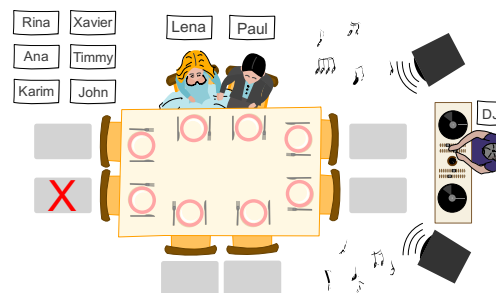


Their friends have the following preferences. In this case, being “next to” means both “directly next to” or “only separated by a corner”.

- Xavier wants to be able to see the married couple in front of him.
- Rina really likes music and wants to be closest to the DJ.
- Ana doesn't want to sit next to Rina.
- Timmy wants to be in front of Karim.
- Timmy wants to be next to Paul.
- John wants to be able to see the DJ in front of him.

### Question / Challenge

Who will seat in the bottom-left corner of the table?

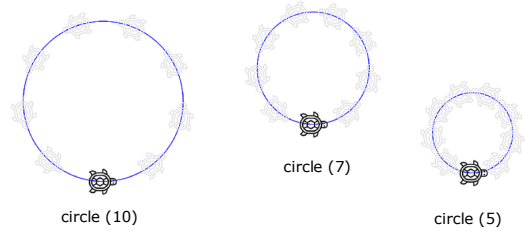


- A) John                      B) Timmy                      C) Ana                      D) Rina

### T10. Turtle Graphics

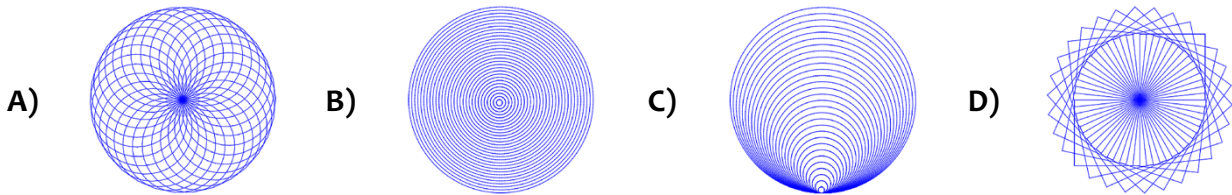
The turtle robot will draw the corresponding pattern on the drawing board upon receiving instructions. When it receives the command to draw a circle, "circle(d)", it will draw a circle

of different size according to the parameter d. By changing the parameter d, circles of different sizes can be drawn (look at the picture).



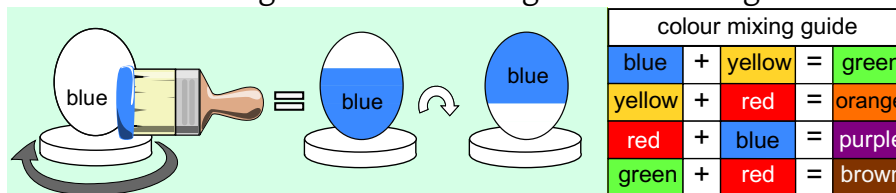
### Question / Challenge

If the parameter increases by 1 after each complete circle is drawn, what pattern will the robot produce after executing the command to draw circles starting from parameter d = 1, 30 times?

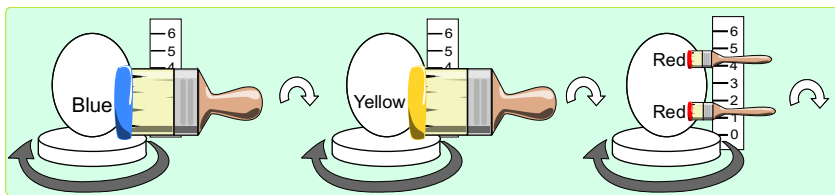


### T11. Egg painting

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.

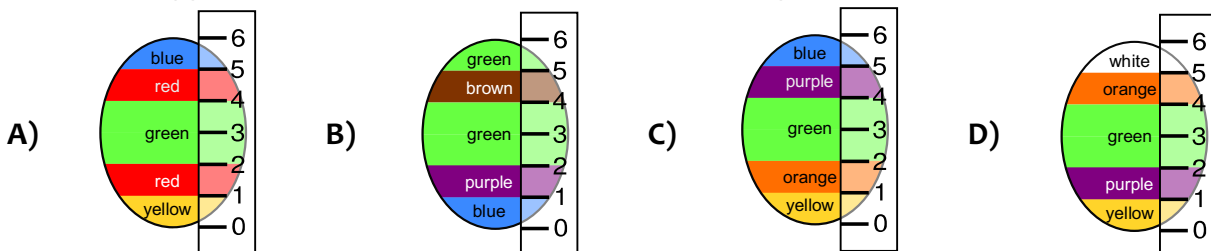


Aoife paints her white egg using the sequence of colours and paintbrush widths as shown below.



### Question / Challenge

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



### T12. Magician Ben

Beaver Ben is a famous magician who can transform one type of fruit into another. Fans all over the world ask him to perform his magic. Below is a description of what fruit is produced when applying a single magical transformation on different fruits.

$M(\text{apple}) = \text{pear}$	$M(\text{pineapple}) = \text{grapes}$
$M(\text{pear}) = \text{banana}$	$M(\text{grapes}) = \text{apple}$
$M(\text{lemon}) = \text{pineapple}$	$M(\text{banana}) = \text{lemon}$

Beaver Ben can perform multiple magic transformations on a fruit, for example starting with an apple 🍏, a first magic transformation gives a pear 🍐, and a second magic transformation turns the pear into a banana 🍌. This double transformation can be presented by this formula:

$$M(M(\text{apple})) = M(\text{pear}) = \text{banana}$$

**Question / Challenge**

Ben's loyal fan Elena sent him this formula. Which fruit will beaver Ben get?

$$M(M(M(M(M(\text{lemon}))))))$$

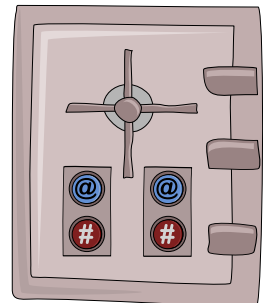
- A) 🍌      B) 🍐      C) 🍏      D) 🍍

**T13. The Safety Box**

Omar and Nour have designed a safety box that requires entering two passwords of the same length: one for Omar and one for Nour. The safety box then generates the main password to open it using their combined passwords.

Omar and Nour's passwords are written with only two symbols: @ and #. The main password is a sequence of the digits 0 and 1, which are generated from the passwords of Omar and Nour through the following rules. For each position:

- 0 is generated if they both entered the same symbol,
- 1 is generated if they entered different symbols.



**Question / Challenge**

If the main password is 0110, which option is a possible password combination for Omar and Nour?

Omar's password	Nour's password	Omar's password	Nour's password	Omar's password	Nour's password	Omar's password	Nour's password
@ # @ #	# @ @ #	@ # @ #	@ @ # #	# @ @ #	# @ # @	@ @ @ #	@ @ @ #

- A)                      B)                      C)                      D)

**T14. Swimming Competition**

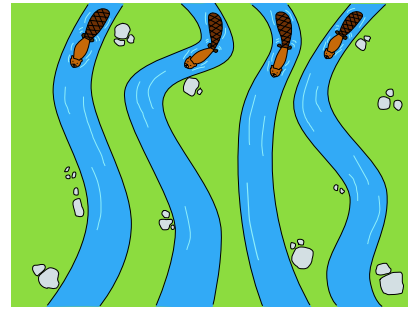
Beavers Alex, Benny, Cathy and Diana enjoy swimming competitions and want to see which one of them is the fastest swimmer.

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

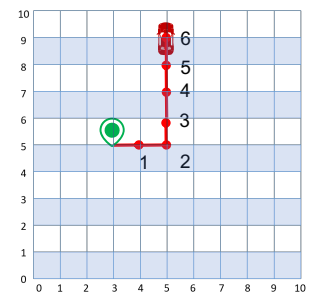
C) Cathy

D) Diana

### Tasks T15 – T21 carry 5 points each

#### T15. Car Retrieval

The streets of a city form a grid. A beaver cannot remember where he parked his car but he knows it is at the intersection of two streets. To find the car, he walks one block at a time moving north, south, east or west. Each time the beaver visits an intersection, an app indicates how many blocks away the car is. An example is shown where the beaver is 6 blocks away from his car.



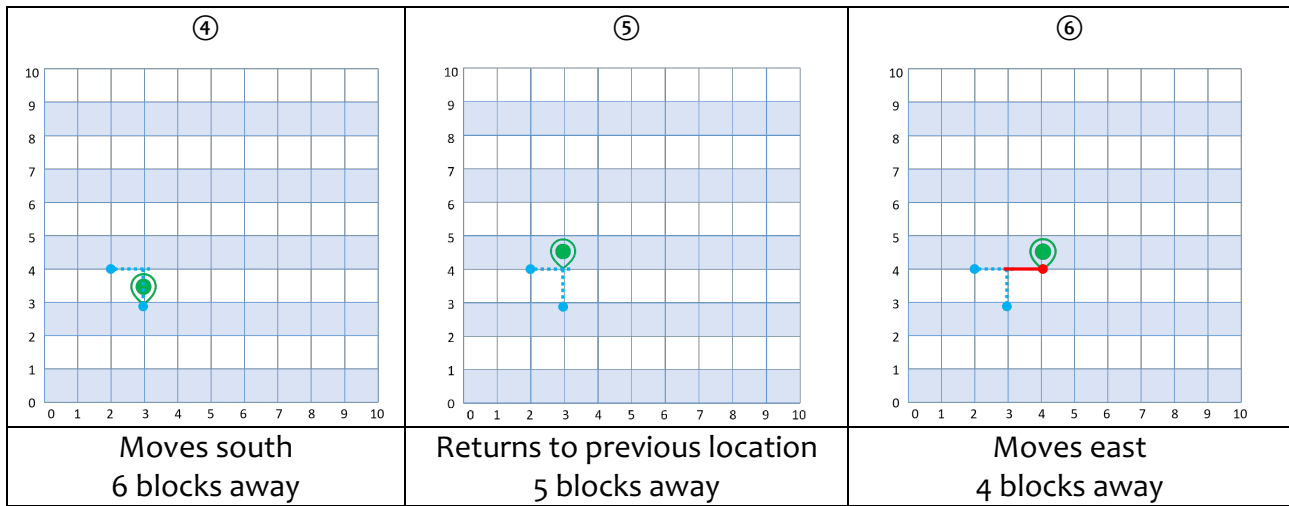
At each intersection, the beaver has to decide what direction to move next. Initially, the beaver chooses a direction randomly.

When the beaver visits an intersection for the first time he uses this rule: If he has moved further from the car, he returns to the previous intersection, and otherwise he continues in his current direction.

When the beaver returns to an intersection he has already visited he uses this rule: His new direction is the next one in counterclockwise order.

Here is an example:

①	②	③
<p>Initial location 5 blocks away</p>	<p>Randomly moves west 6 blocks away</p>	<p>Returns to previous location 5 blocks away</p>

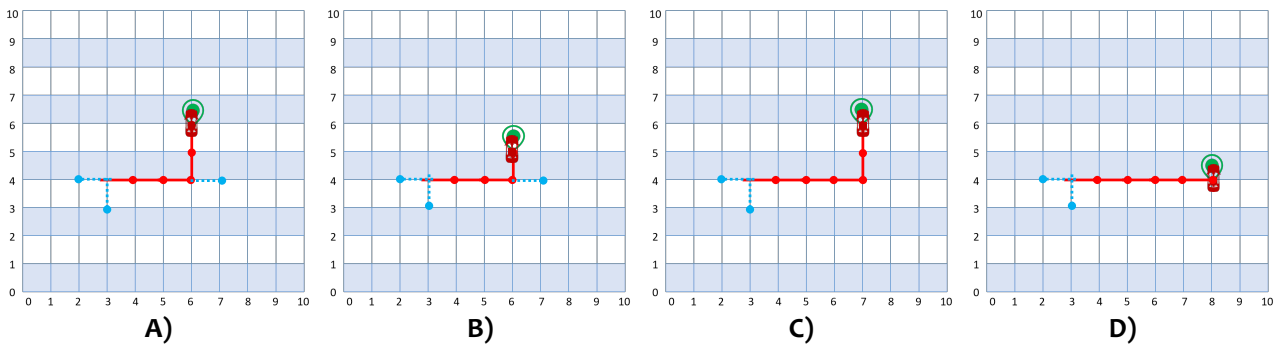


### Question / Challenge

Including the initial and final intersections the beaver visits, the app provides the following data:

	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫
blocks away	5	6	5	6	5	4	3	2	3	2	1	0

Which image below accurately reflects the beaver's movements?

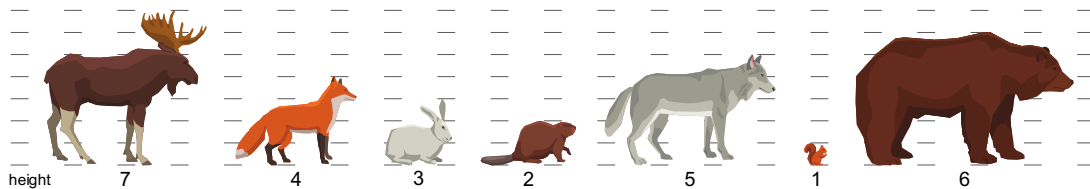


### T16. Ordering animals

There is a line of seven different animals. All of them can jump exactly as high as their own height. If you call an animal's name, it will jump over the animal forward as many times as possible. If it finds a taller animal, it stops there, it has found its place.

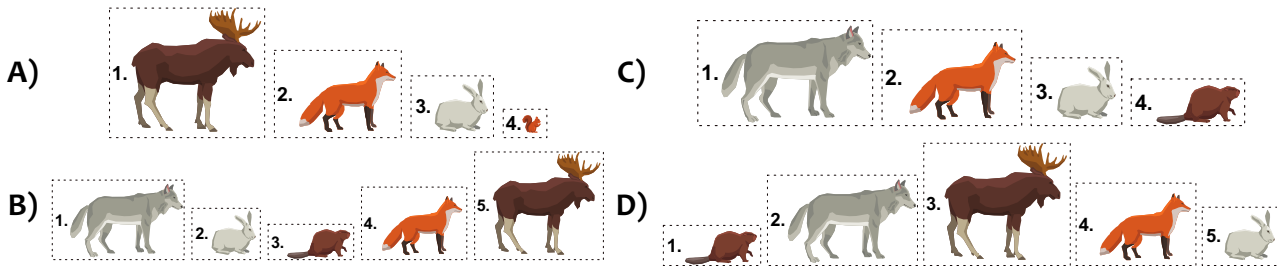
So, for example, if you call the fox, it will first jump over the rabbit, then over the beaver. The fox is shorter than a wolf, so the fox stay between the beaver and the wolf.

The initial **height** order is: 7 – 4 – 3 – 2 – 5 – 1 – 6 (as it is shown on the picture: deer, fox, rabbit, beaver, wolf, squirrel, bear).



### Question / Challenge

You have to order the animals from the shortest on the left to the tallest on the right by calling some of them in a specific order. The options below show the called animals **in the order of the call from left to right**. Which call orders them from the shortest to the tallest?



### T17. Formula E-Prix

Five Beavers Anala, Devi, Hem, Jay and Raj competed in the Formula E World Championship E-Prix. The table below provides information on the racetracks in different cities where races would be held in one season. The race season begins in January and ends in July.



City	Mexico City	Diriyah	Rome	Portland	London
Race month	January	February	April	June	July
Corners	16	21	19	12	22
Length	4.3km	2.49km	3.36km	3.2km	2.25km
Direction	Clockwise	Clockwise	Counter-clockwise	Clockwise	Counter-clockwise
Incline	0	0	1	0	1
Decline	0	0	1	0	1

The following outcomes have been observed in the past seasons:

1. Raj and Jay do better on racetracks with 20 or more corners
2. Hem does not do well when he needs to drive counter clockwise
3. Raj loves to race on tracks that have inclines
4. Anala does best on tracks that are longer than 3 km
5. Devi does best on tracks with an odd number of corners and are longer than 3 km
6. Anala wins early in the season

### Question / Challenge

Each beaver wins one race. Which of the following options that lists winners by cities is likely to be true if all constraints are met?

- A) Mexico City – Devi, Diriyah – Anala, Rome – Raj, Portland – Hem, London – Jay
- B) Mexico City – Devi, Diriyah – Jay, Rome – Anala, Portland – Hem, London – Raj
- C) Mexico City – Anala, Diriyah – Jay, Rome – Devi, Portland – Hem, London – Raj
- D) Mexico City – Anala, Diriyah – Jay, Rome – Devi, Portland – Raj, London – Hem

### T18. Time Will Tell

The diamond is hidden in a box that opens only if you type in a secret code. There's a special machine in the box that checks each letter you type to match the secret code. It takes 1 second to check each letter.

If a letter you type doesn't match the secret code, an alarm starts right away. For example, if the first two letters match but the third one doesn't, the alarm starts after 3 seconds.



Every night, the Burglar Beaver tries a different code and writes down how many seconds pass before the alarm sounds. But one night, while running from the guards, he accidentally drops his notes in the mud. Some letters are now covered in mud and can't be read, shown by asterisks (\*).

Guess	Number of Seconds Before Alarm
*CORN*DOG***	1
*****DOG***	8
*E*VER*Y****	7
***VER*Y****	2
BE*B*R*AS***	4
*****R*AS***	9
**A***DAM***	5
*****M***	10

Despite this accident, the Burglar Beaver says that he can still identify the first 9 letters of the secret code to open the box.

**Question / Challenge**

What are the first 9 letters of the secret code to open the box?

- A) CORNDOGDA      B) BEAVERDAM      C) BEBRASEVE      D) EVERYBEBR

**T19. Communication**

Some beavers have to encrypt a word. They use the table shown below. Each letter will be encrypted using 3 numbers. The first number will be the column in which the letter is located, the second number will be the row. The third one will be the position of the letter in the block of letters it is part of.

The table is as follows:

AB	CD	EF	GH
IJ	KL	MN	OP
QR	STU	VWX	YZ_

The word "FIND" is encrypted into: 312-121-322-212. The underscore symbol "\_" (following the letter Z) represents a space between words.

**Question / Challenge**

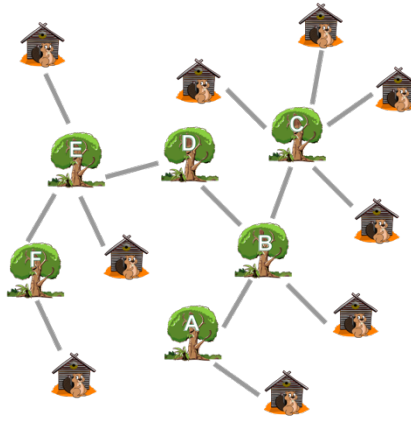
How would the Beavers encrypt "HELP US"?

- A) 412-131-222-422-433-323-231      B) 412-311-222-421-433-233-321
- C) 412-312-222-242-433-323-321      D) 412-311-222-422-433-233-231

**T20. Meeting point**

In the picture below, you can see an area where several beavers have constructed their own lodges. These lodges are connected by paths, indicated by grey line segments, and at the intersections of these paths, there are large trees. All the paths have the same length.

The beavers want to hold their next group meeting at one of the large trees. They want to choose a tree so that the maximum distance traveled by any beaver from their lodge to the tree is as small as possible.



**Question / Challenge**

Which large tree should be chosen as the location for their meeting?

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

**T21. Weights**

Genaro uses his balance scale to weigh the herbs he sells. He uses only the following 5 masses: 1 gram, 3 grams, 9 grams, 27 grams, and 81 grams.

The image below shows how he measures 11 grams of herbs. He always put the herbs on the right side.



To help train new employees, Genaro creates codes for different amounts of herbs. In his code, R means the weight is placed on the right side, L means the weight is placed on the left side, and O means the weight is placed off the scale. The code for 11 grams of herbs is RLLOO, as shown below.

Weight	1 gram	3 grams	9 grams	27 grams	81 grams
11	R	L	L	O	O

**Question / Challenge**

What is Genaro's code for 34 grams?

- A) LORLO                      B) RRRRL                      C) LRLLO                      D) OLRLO

END