

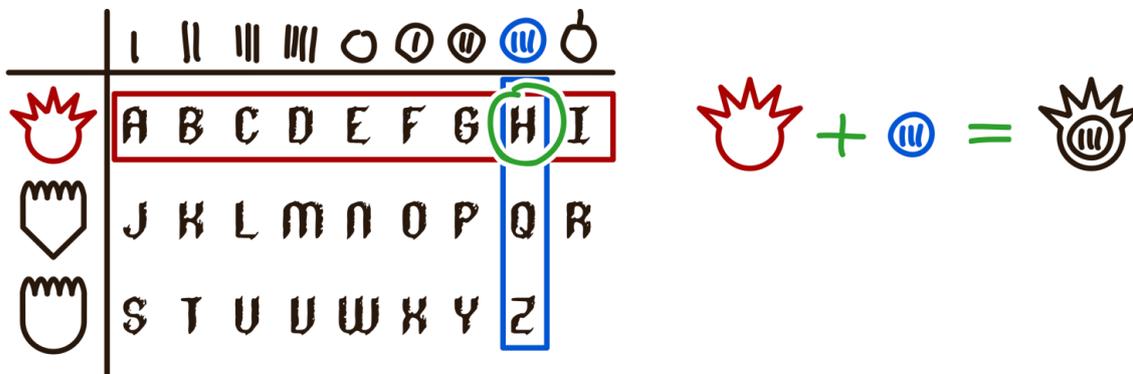
Tasks T1 – T7 carry 3 points each

T1. Message from the Elder Beavers

Beaver Cleveria discovered deep down at the base of the dam an ancient tree. On closer inspection she discovers mystical signs carved in the wood. Cleveria reasons that it must be a coding-table from the time when the Elder Beaver still lived in the dam.

	I	II	III	IIII	○	○	○	○	○
	A	B	C	D	E	F	G	H	I
	J	K	L	M	N	O	P	Q	R
	S	T	U	V	W	X	Y	Z	

After a long study of the table, Cleveria figured out how it works: The new signs are a combination of the symbols assigned to the corresponding rows and columns. For example: The letter <H> is coded as follows:



Cleveria remembers that she has seen such signs on another place in the beaver dam. She goes there and indeed, this is what is written on the other tree:



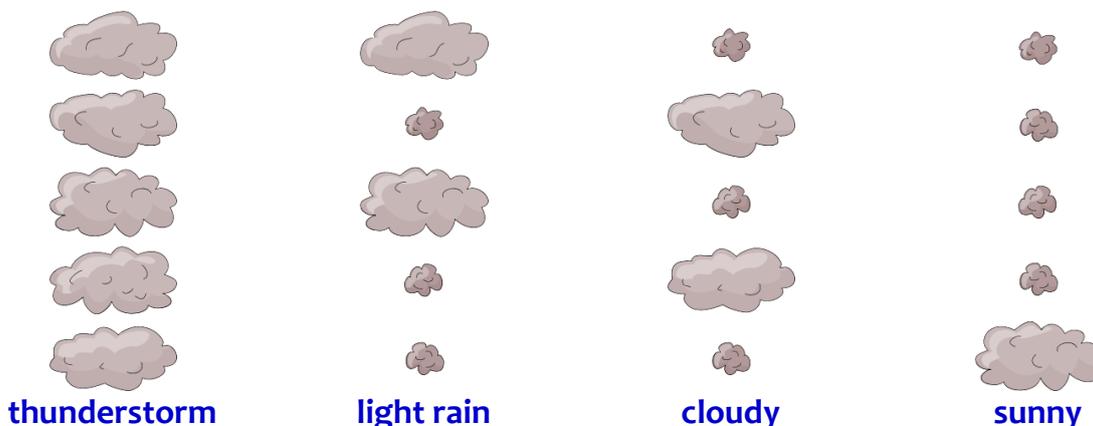
Question / Challenge

Which is the message of the elder beavers?

- A) LOVEWATER
- B) SLEEPDAYS
- C) LOVEMYSUN
- D) CAREFORME

T2. Cloud Communication

A weather beaver sends messages from the top of a mountain to beavers in the valley below. She makes small and large smoke clouds and uses the code below.



One day, the beavers in the valley think they saw this:



Something went wrong. Either one small cloud was mistaken for a large cloud or one large cloud of smoke was mistaken for a small cloud.

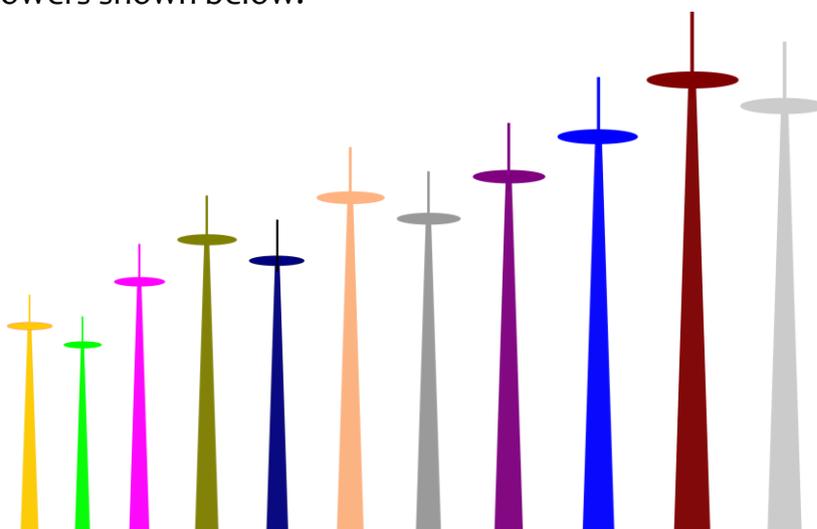
Question / Challenge

Which message was sent?

- A) thunderstorm
- B) light rain
- C) cloudy
- D) sunny

T3. Special Towers

Look at the towers shown below.



A tower is **special** if all towers to the left of it are shorter, and all towers to the right of it are taller.

Question / Challenge

How many special towers are there?

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

T4. Classifier

Beaver King wants to have information on all the animals in his forest. He has invited them to his castle so they can be counted. To make his task easier, the King has bought a machine that can identify the animals based on some characteristics of their faces.

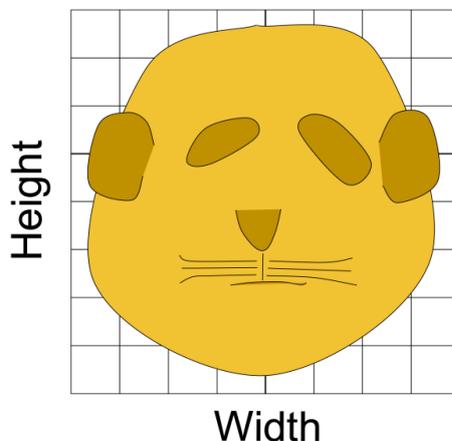
We know the machine identifies some of the animals as follows:

Characteristics	Rabbit	Beaver	Bear	Cat
Ear height	half of head height	quarter of head height	quarter of head height	half of head height
Mustache width*	head width	half of head width	half of head width	head width
Head width	half of head height	half of head height	head height	head height

***Note:** the width of the mustache is measured by adding both left and right parts.
 General note: all measurements should be the maximum width and the maximum height.

Question / Challenge

The next animal to be identified has the following face:



Which of the four animals on the table is this?

- A) Rabbit B) Beaver C) Bear D) Cat

T5. Colorful Chinese character

The Chinese character deeply attracts the attention of the little Beaver who intends to study its structure. A beaver creates a Color and Pattern-filled Structure Board, which is shown as follows:



According to this board the following Chinese characters can be expressed as:



"川"



"儿"



"吕"

as left-middle-right structure as left-right structure as upper-lower structure

Question / Challenge

Which option represents the characters "三", "二", "八" all in the right way?

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

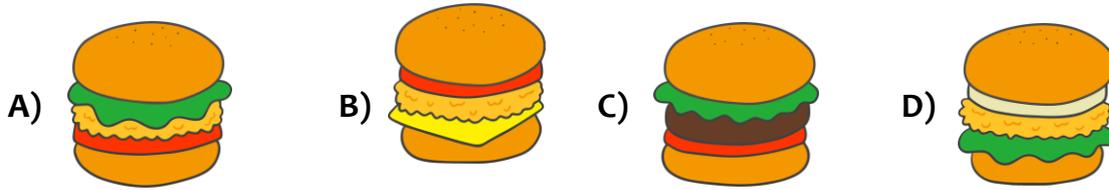
T6. Burger Fillings

Beaver KingWay uses six types of fillings (A, B, C, D, E, and F) in order to make a burger. The following table shows the burgers and their fillings. The fillings are not listed in any particular order.

Burger				
Fillings	C, F	A, B, E	B, E, F	B, C, D

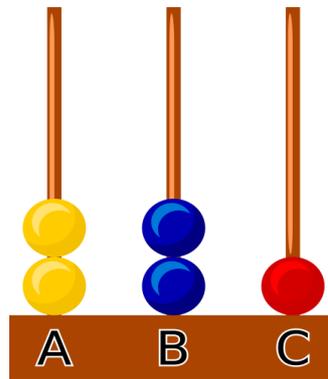
Question / Challenge

Which burger has the fillings A, E, and F?



T7. Arranging Balls

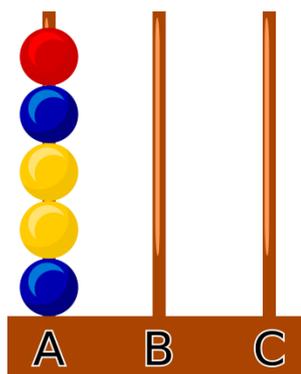
Consider the following arrangement of beads on three beams A, B, and C.



We can move one bead from a beam and put it at another beam. This is considered as one step.

Question / Challenge

What is the minimum number of steps to arrange the beads to be like the following?



A) 4

B) 5

C) 6

D) 7

Tasks T8 – T14 carry 4 points each

T8. Bus schedule

The following tables show when buses will stop at each bus stop.

Bus stop	Route 1	Route 1	Route 1
Stop A	10:00	11:00	12:00
Stop B	10:20	11:20	12:20
Stop C	10:40	11:40	12:40
Stop D	11:00	12:00	13:00
Stop E	11:20	12:20	13:20

Bus stop	Route 2	Route 2
Stop A	10:10	11:10
Stop F	10:20	11:20
Stop C	10:30	11:30

Question / Challenge

If beaver James is at stop A at 11:05, what is the earliest time that he can reach stop D?

- A) 13:00 B) 11:00 C) 12:00 D) 11:30

T9. Digital Number

Alyna wants to display numbers using her light emitting diodes (LEDs). She wants to use 7 LED segments to represent each number. Segments are labeled A, B, C, D, E, F, and G, as shown below.



In order to turn on a certain LED segment, she needs to indicate it in the corresponding cell of the table. For example, the following table will show the three-digit number 103:

	A	B	C	D	E	F	G
↓							



Question / Challenge

What will be shown on the display, if we use the following table?

	A	B	C	D	E	F	G
↓	Red	Red	Red	White	White	White	White
	Red	Red	White	Red	White	White	Red
	Red	White	Red	Red	White	Red	Red
	Red	White	Red	Red	White	Red	Red
	Red	Red	Red	Red	Red	Red	Red

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

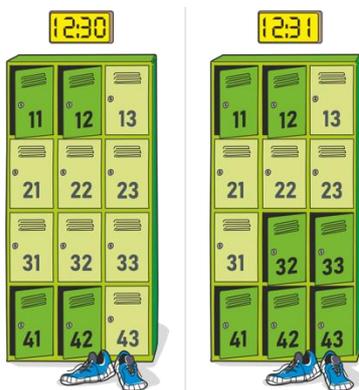
T10. Lockers and Coding

There are many lockers installed in an aqua park. To evaluate how they are used, data is collected each minute and appended to a database.

Initially, at 12:30, the data in the database looks like: 1 1 0 0 0 0 0 0 1 1 0
 (see left picture)

After one minute we will have the following data in the database
 (see right picture):

1 1 0 0 0 0 0 0 1 1 0 1 1 0 0 0 0 0 1 1 1 1 1

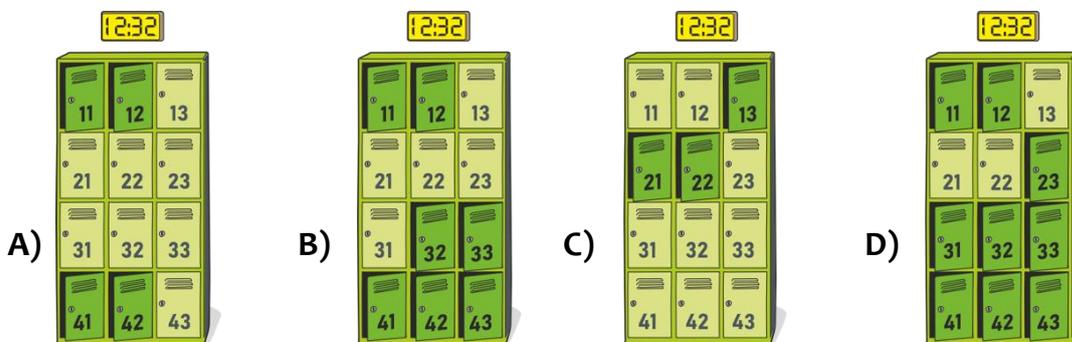


After another more minute the data in the database looks like:

1 1 0 0 0 0 0 0 0 1 1 0 1 1 0 0 0 0 0 1 1 1 1 1 1 1 0 0 0 0 0 0 0 1 1 0

Question / Challenge

How the lockers look like?



T11. Breaking into the school library

A thief (or thieves) stole a large amount of IT books from the school library and drove away with them.

The police identified three well-known IT “specialists”. They were asked to come to the police station and were questioned. The following information was revealed during the questioning.

1. No one apart from **Adam**, **Bob** or **Claire** could have taken part in the theft.
2. **Claire** never participates in any activity unless **Adam** does also.
3. **Bob** cannot drive.

Question / Challenge

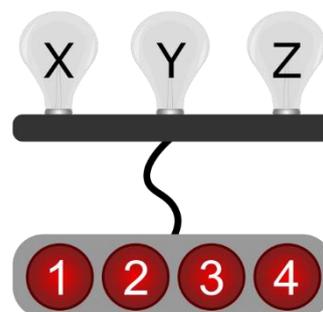
Must **Adam** be guilty?

- A) Yes B) No C) It is impossible to determine

T12. Light Buttons

There are 3 light bulbs in a room, labeled X, Y and Z. There are also four buttons that work as follows:

- Button 1: Turns on Y, turns off X
- Button 2: Turns on X and Y, turns off Z
- Button 3: Turns on Z, turns off Y
- Button 4: Turns on X



Turning on a bulb that is already on leaves the bulb on. Similarly, turning off a bulb that is already off leaves the bulb off.

Question / Challenge

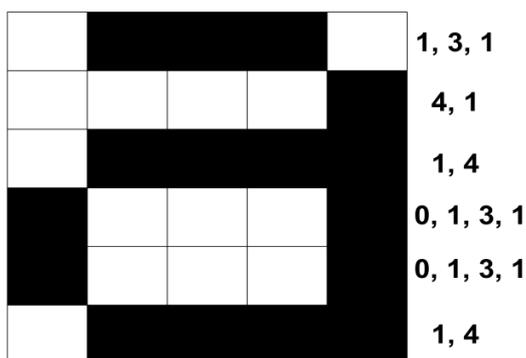
When all the bulbs are off, we want to turn them all on by pressing the buttons in a certain order. We wish to do this while pressing as few buttons as possible. Which of the following is the best order in which to press the buttons?

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

T13. Image Representation

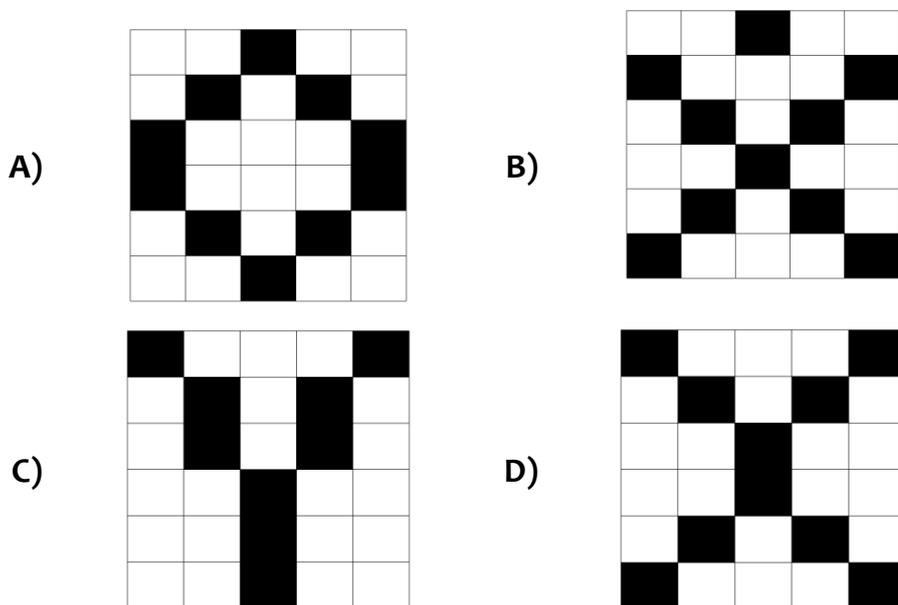
Computer images are divided up into a grid of small squares called pixels (picture elements). In a black and white picture, each pixel is either black or white. When a computer stores a picture, all that it needs to store is which pixels are black and which are white.

For example, the image of the letter “a” has been magnified below to show the pixels. One way to represent this image is by the encoding 1,3,1 – 4,1 – 1,4 – 0,1,3,1 – 0,1,3,1 – 1,4, where each row always starts encoding with number of white pixels and “-” indicates end of a row.



Question / Challenge

Using the same encoding as before, which of the following images is represented by 2,1,2 – 0, 1,3,1 – 1,1,1,1,1 – 2,1,2 – 1,1,1,1,1 – 0, 1,3,1?

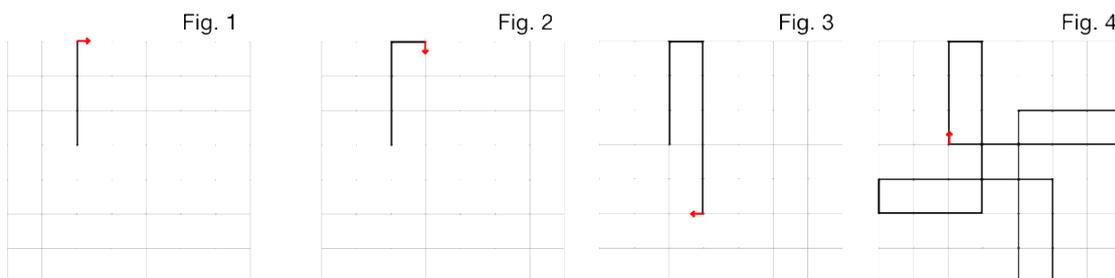


T14. Drawing triplets

A robot draws a line creating a picture while it moves on a square grid. Each picture is represented by a sequence of three numbers.

For example, the sequence 3,1,5 represents Fig. 4 because it means:

- move forward 3 squares, then turn right (Fig. 1)
- move forward 1 square, then turn right (Fig. 2), and
- move forward 5 squares, then turn right (Fig. 3).



It repeats all of this forever.

Question / Challenge

Which sequence of pictures has the correct representation above it?

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

Tasks T15 – T21 carry 5 points each

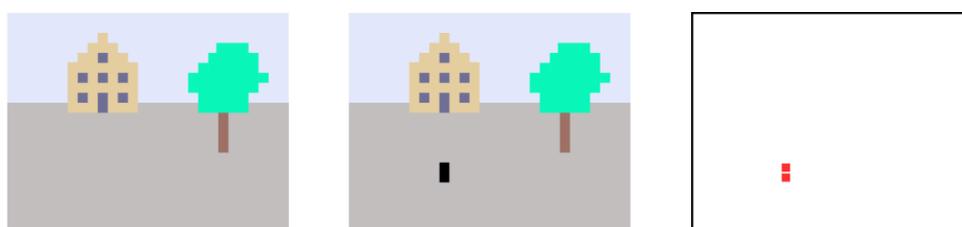
T15. Watched

Every 10 seconds a digital camera takes a photo of the market place as shown on the right. A computer program compares each new photo with the previous photo and creates a *difference image*. On a difference image there is a little red square at each position where the new photo looks different from the previous photo.



If the difference image is white, there is no difference between the two photos.

For example for the two photos below, the different image (on the right) shows the difference between the first and the second photo.



Below you see a sequence of difference images covering 50 seconds. Five events happened during that time.

Question / Challenge

What is the correct sequence of events?

			<p>A: Tom meets Tina. B: Somebody opens the door of the city hall. C: Tom and Tina walk together arm in arm. D: It starts getting windy. E: Somebody closes the door of the city hall.</p>
00	10	20	
30	40	50	

A) BCAED

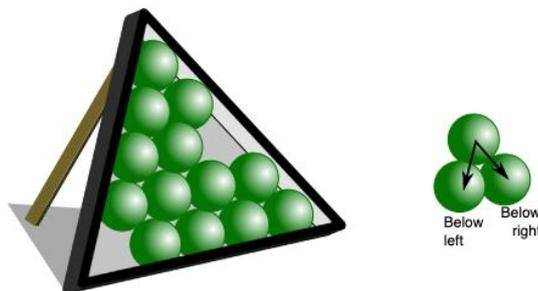
B) BCADE

C) BACED

D) CBADE

T16. In Danger

We have put 13 balls in a triangular box - as shown in the picture. If we lift up the top corner of the box then, because of the gaps, some of the balls are in danger of rolling down.



We say that a ball is 'in danger' if either of the following is true:

- There is at least one gap to the left or right immediately below that ball.
- There is at least one ball that is 'in danger' to the left or right immediately below that ball.

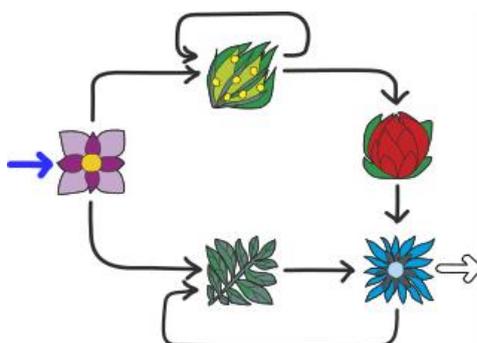
Question / Challenge

How many balls in the box shown are NOT 'in danger'?

- A) 0 B) 5 C) 6 D) 8

T17. Carpeting

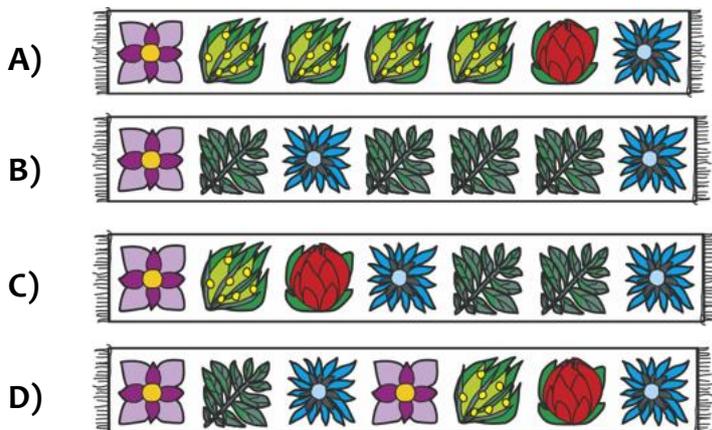
A machine has been created that can make a scarf automatically. The rules that the machine follows to create the pattern for the scarf is shown in the following diagram:



The machine starts a new scarf pattern by following the blue arrow on the left. When the machine follows an arrow, it adds the picture at the end of the arrow to the pattern. The machine then follows one of the arrows pointing away from that picture to add the next picture. The machine continues adding to the pattern until it follows the outlined arrow on the right. The pattern is then finished and the machine makes the scarf.

Question / Challenge

Which scarf can be made by following the above rules?



T18. Binary bulbs

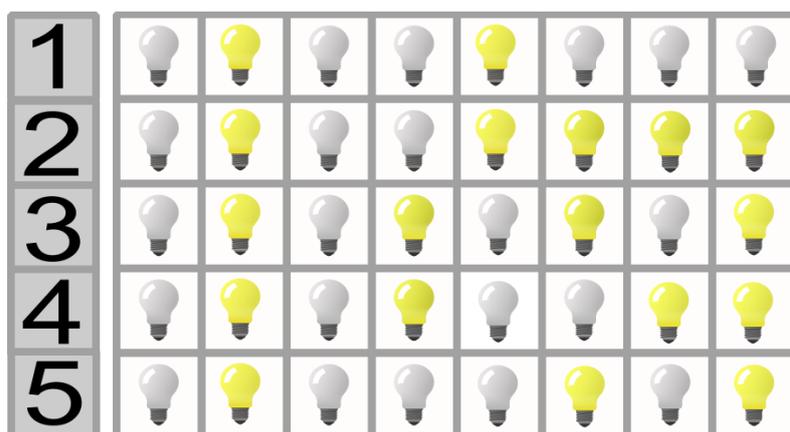
Beavers use Binary bulbs to send a message remotely. To send a message they are using the following table and the following rule:

A	01000001	J	01001010	S	01010011
B	01000010	K	01001011	T	01010100
C	01000011	L	01001100	U	01010101
D	01000100	M	01001101	V	01010110
E	01000101	N	01001110	W	01010111
F	01000110	O	01001111	X	01011000
G	01000111	P	01010000	Y	01011001
H	01001000	Q	01010001	Z	01011010
I	01001001	R	01010010		



Question / Challenge

By using the table and the specified rule, the beavers sent the following message:



Which message they sent?

- A) HOUSE B) HAPPY C) HORSE D) HONEY

T19. Patterns

Beaver is playing with a system that executes text commands to draw line patterns. The initial drawing direction is to the right, and the following commands can be used:

- forward(XX): advance XX cm in the present drawing direction;
- left(): turn the present drawing direction 90° to the left;
- right(): turn the present drawing direction 90° to the right.

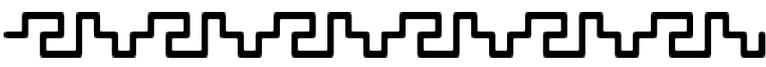
For example, the commands: “forward(20), left(), forward(10), right(), forward(10)” will draw this (from the initial drawing direction): 

Question / Challenge

Here is a **fragment** of a sequence of commands that creates a pattern:

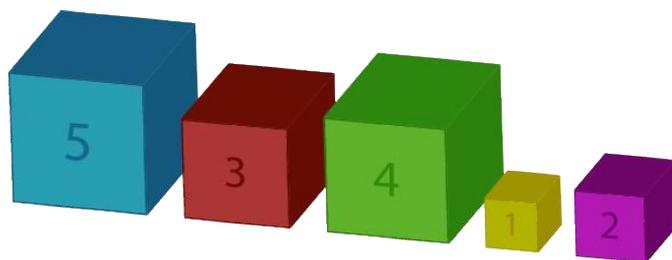
“..., forward(20), left(), forward(10), left(), forward(10), left(), forward(20), ...”

Which of the following patterns could have been created by a sequence of commands including that fragment?

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

T20. Arranging cubes

Rebecca has several cubes of different heights that she wants to place in the form of a staircase (from the smallest to the largest). On the face of each cube is written its height. After arranging the cubes, the lowest one must be on the left. She starts to arrange the cubes from left to right. She looks at all the cubes, and if a smaller cube is placed to the right of a bigger cube, she switches their positions. When she's reached the two last boxes (far right boxes), she starts over from the left.



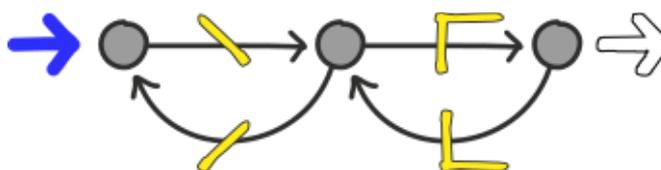
Question / Challenge

What is the number of switches she has to make?

- A) 6 B) 7 C) 8 D) 9

T21. Making Stitches

A sewing machine can make 4 different types of stitches. The rules that the machine follows to select the next stitch to make is shown in the following diagram:



The machine starts a new line of stitches by following the thick blue arrow on the left. It moves from circle to circle along the arrows and makes the stitch that is shown on that arrow. If a circle has more than one arrow leading away from it, the machine can select either one of those arrows to follow. The machine finishes the line of stitches it is making by following the outlined arrow on the right.

Question / Challenge

Which line of stitches cannot be made using the above rules?

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

