TALENT SEARCH 2015

ELITE: Grade 12+

Not to be used before 16 March

If you are NOT in grade 12 or above, please report that you have the wrong paper.
Only when the teacher says "START", may you begin.

1. Write your personal details and your answers on the answer sheet provided.
2. You will have 45 minutes to complete the 15 tasks.
3. You may answer the questions in any order, but it is important to place the answer in the correct line on the answer sheet.

The mark allocation is as is used in Europe for these competitions.
You get 45 marks to start off with.
A section: +6 marks for every correct answer -2 for every wrong answer.
B section: +9 marks for every correct answer -3 for every wrong answer.
C section: +12 marks for every correct answer -4 for every wrong answer.
If you do not answer a question, you get 0 (zero) for that task.
The maximum mark is 180.

Wait for the teacher to say "START".

A1: Beavers on the Run

A colony of beavers is travelling through a dark forest. The path is narrow, so they travel in a row without passing each other.

Sometimes there is a hole in the path. A hole is passed in the following manner:

- First as many beavers jump into the hole as can fit in.
- The entire colony will then pass across the hole.
- The beavers that jumped in will then climb out, and join the end of the line.

The images on the right show how five beavers pass a small hole that fits three beavers.

A colony of 7 beavers passed through the forest. They pass over 3 holes. The first hole fits 4 beavers, the second fits 2, and in the last hole fits 3 beavers.
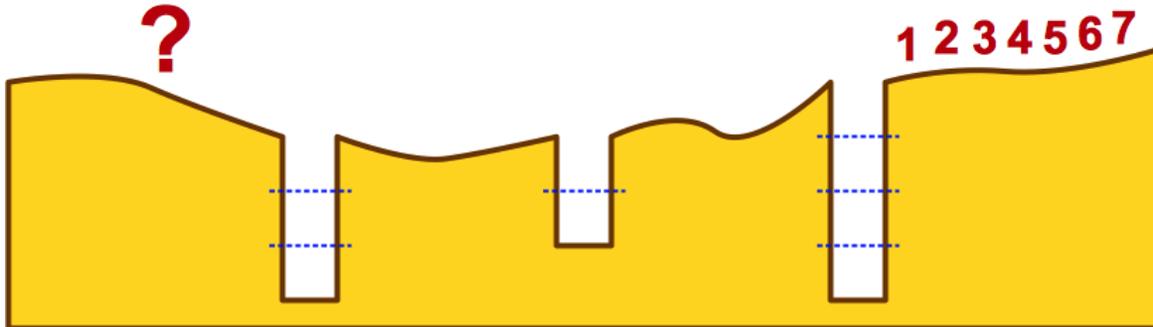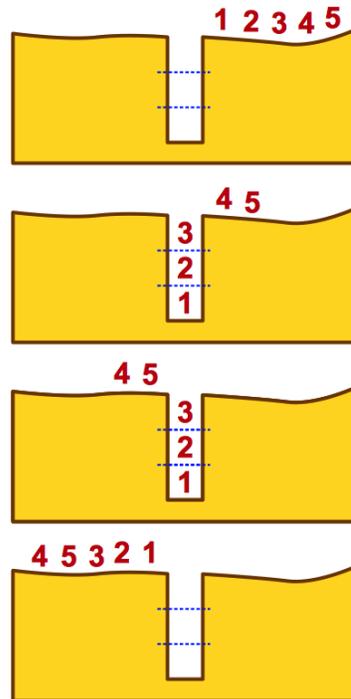
In what order do the beavers find themselves after they have passed the third hole?

Write down the letter of the correct answer only in the correct block on your answer sheet:

A: 4 7 5 6 1 2 3

B: 6 5 7 4 3 2 1

C: 2 1 6 5 3 4 7

**D: 5 7 6 1 4 3 2**

When beavers gnaw on tree trunks they enjoy placing the pieces in a special way.

The beavers start with a single log. In stage one a big log is gnawed into smaller logs. In the next stage each individual log is again gnawed into even smaller logs but always keeping to the starting pattern. This keeps repeating.
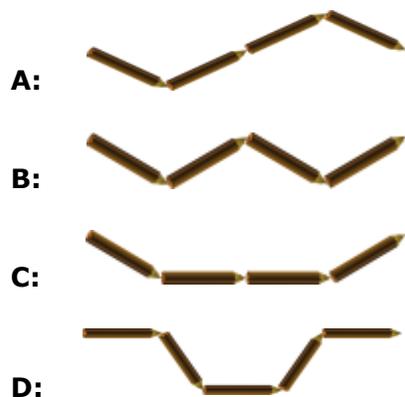
Here are three examples. On each line you see how the beaver started, the result after stage one and the result after stage two.

Example 1

Example 2

Example 3
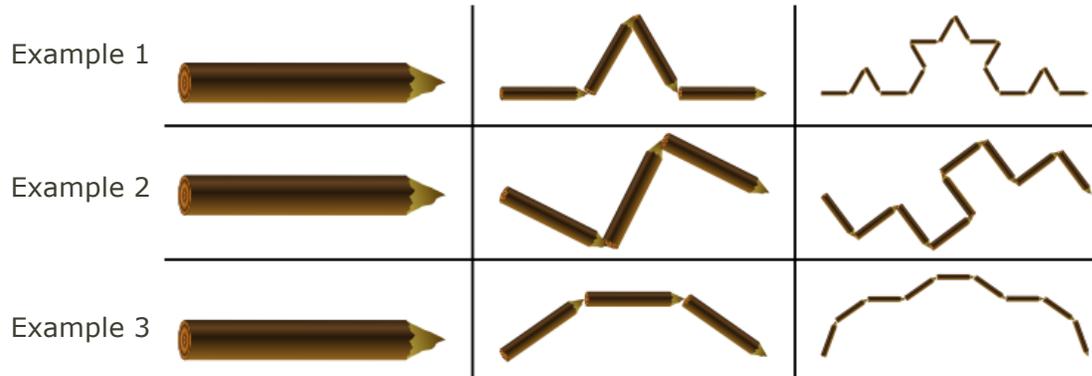
If the result of the second stage looks like this:

What was the result of the first stage? Write down the letter of the correct answer in the appropriate space on your answer sheet.

A:

B:

C:

D:

A3: Space Maze

Some space explorers went to an uninhabited planet. From their ship they had seen a maze with an unknown golden object in it.

The explorers dropped their robot into the maze hoping it could take a closer look at the unknown object. Unfortunately the robot broke during the fall and can now only send and receive garbled instructions about where to go.
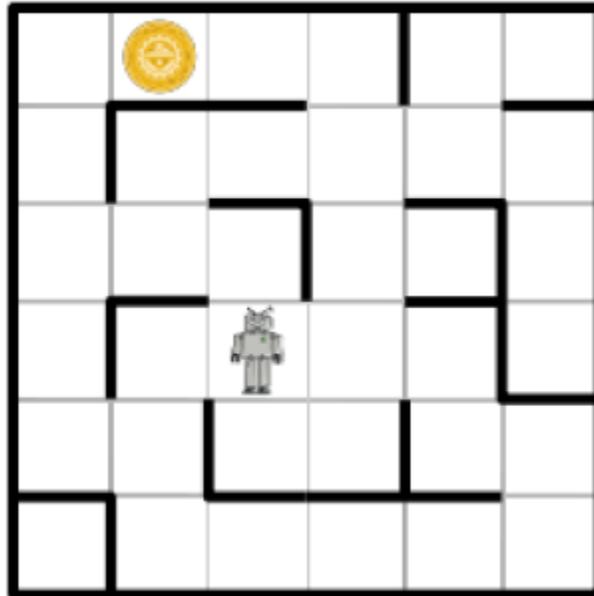
The explorers know that the robot can obey the following instructions: poS, Ha', nlH, and vl'ogh.

They know that the instructions mean:

"Go one square North", "go one square South", "go one square East", or "go one square West". However they do not know which is which.

Which instruction was the one that got the robot to the golden object?

A: **Ha', poS, poS, Ha', Ha', nlH**

B: **Ha', poS, poS, Ha', nlH, Ha'**

C: **Ha', Ha', poS, Ha'**

D: **Ha', poS, nlH, vl'ogh, Ha', poS**
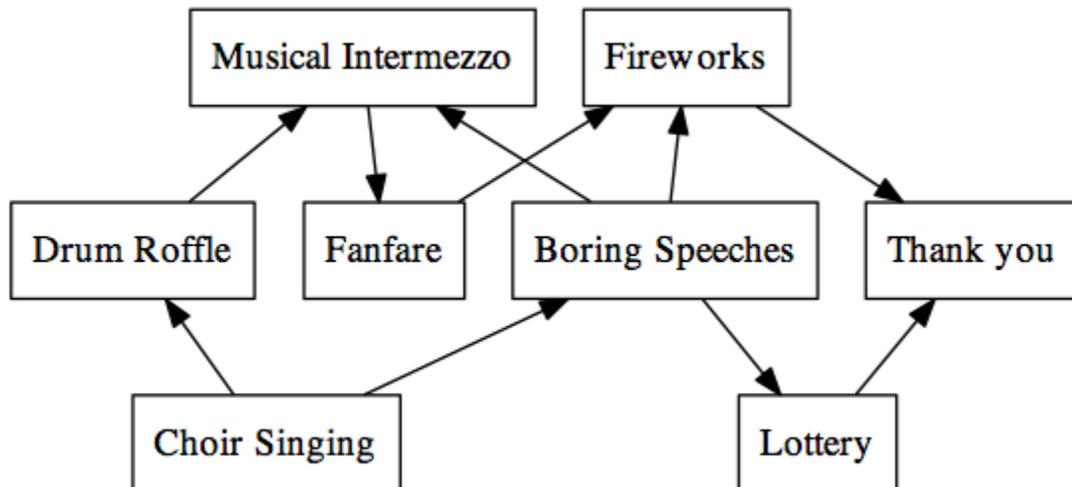
Write down the letter of the correct answer in the appropriate block on your answer sheet.

A4: Ceremony

Organizing a festive day is a lot of work in Bebras City. All the events on the programme must occur in a specific order.

The diagram shows all the events that must be included. The arrows indicate that an event has to occur before another event. For example, the *Musical Intermezzo* can only happen after both the *Drum Roffle* and the *Boring Speeches* have finished.

In which order must the events come? Place the letter of the correct answer in the appropriate block on your answer sheet:

A: Musical, Fireworks, Drum, Fanfare, Speeches, Thanks, Choir, Lottery

B: Drum, Fanfare, Speeches, Musical, Choir, Lottery, Thanks. Fireworks

C: Fireworks, Lottery, Thanks, Speeches, Drum, Choir, Fanfare, Music

D: Choir, Drum, Speeches, Musical, Fanfare, Lottery, Fireworks, Thanks

A5: Footprints

Footprint-trees are made by stepping in the sand in a special way:

The instructions for a **1-tree:**
Step forward 1 step to make one footprint, go back in your own prints.

1-tree

When you know how to make a 1-tree, you can learn how to make a **2-tree**:
Step forward 2 steps to make two footprints.

Turn left and make a 1-tree.

Turn right and make a 1-tree.

Go back in your own prints.

2-tree

It is easy to explain how to create a **3-tree** because a 3-tree consists of 2-trees.

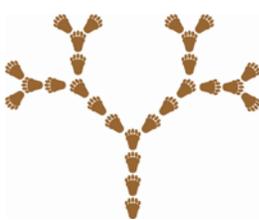Step forward 3 steps to make three footprints.

Turn left and make a 2-tree.

Turn right and make a 2-tree.

Go back in your own prints.

3-tree

In a similar way you can create a **4-tree**.

Which of the following trees is a proper 4-tree? Write A, B, C or D in the appropriate block on your answer sheet.
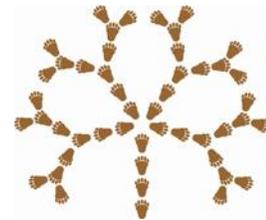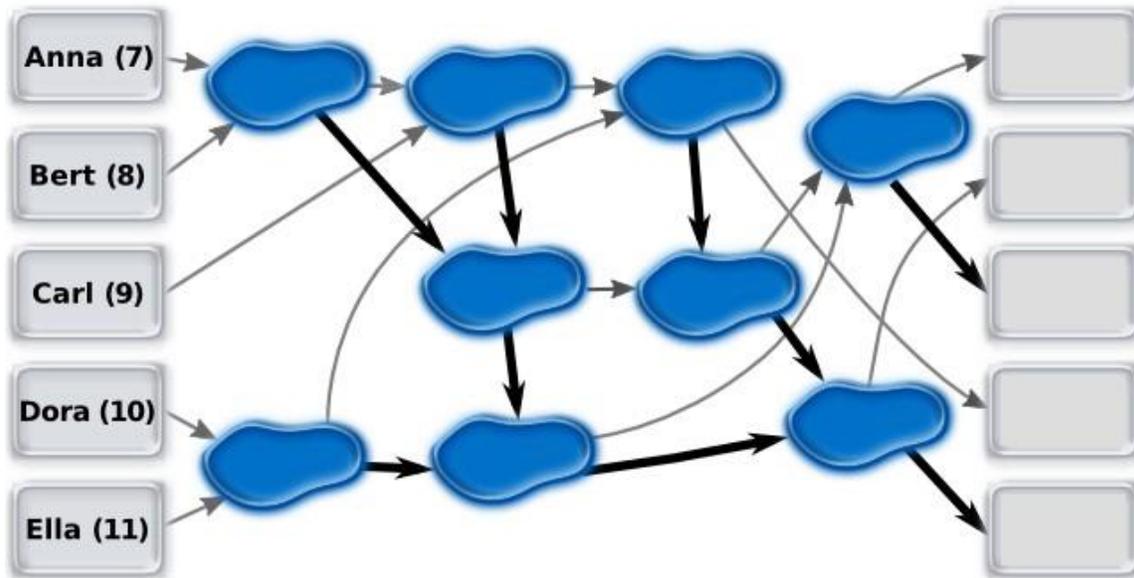
A   **B**   **C**   **D**

B1: Puddle Jumping

Anna (age 7), Bert (age 8), Carl (age 9), Dora (age 10) and Ella (age 11) are playing a game where they jump from puddle to puddle.

They have placed arrows between the puddles, and they all start on the left side as indicated.

When a child jumps into a puddle he or she waits for a second child to arrive. The older child in the puddle will then jump according to the thick arrow, the younger follows the narrow arrow.

Which is the order (top to bottom) in which the children will end on the right? Write the letter of the correct answer in the appropriate block on your answer sheet.

A: Bert, Dora, Ella, Anna, Carl

B: Bert, Dora, Carl, Anna, Ella

C: Ella, Anna, Carl, Dora, Bert

D: Carl, Anna, Dora, Bert, Ella

B2: Stormproof Network

A network of mobile phone towers is set up on a small island. Every tower covers a circular area of the island.
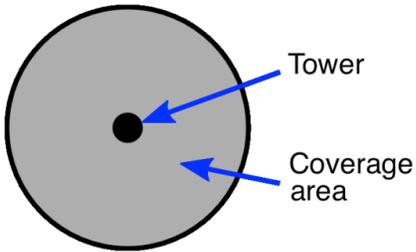

When the coverage area of two towers overlaps the towers are said to be directly connected. Towers can also be indirectly connected if there is a chain of directly connected towers between the two towers.

The operators want to make the network of towers Storm Proof. This means that even if one tower breaks down all other towers must still be connected, either directly or indirectly.
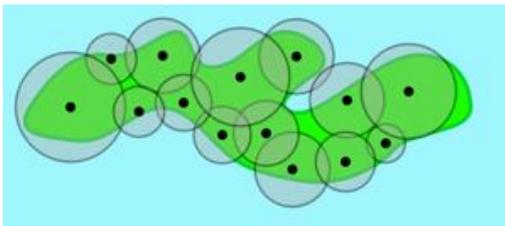
Which is a way to create a stormproof network on the island? Enter the letter of the correct solution in the appropriate block on your answer sheet.
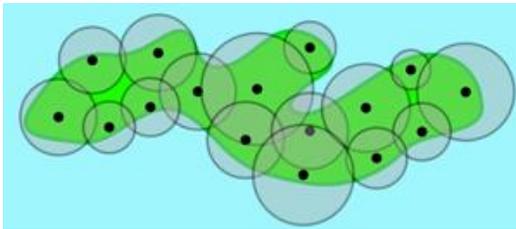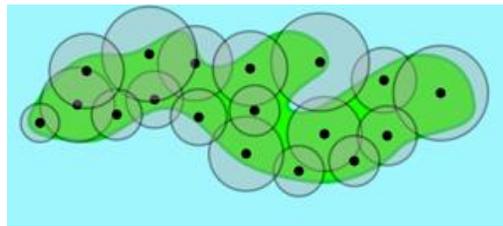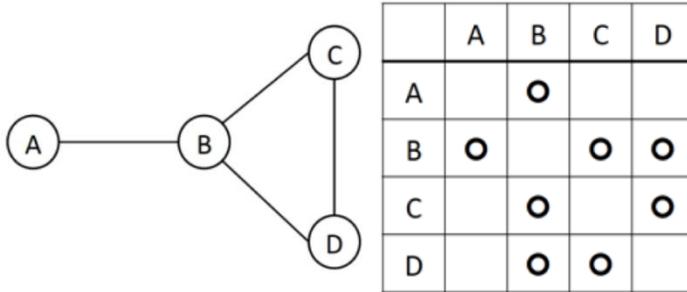

A
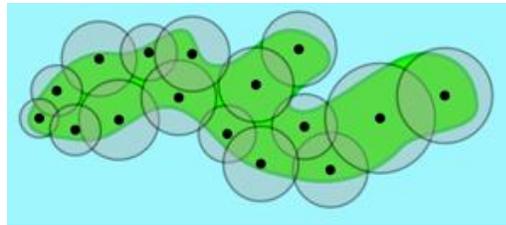
B

C

D

B3: Social Network

Both pictures show the same information about friendships between beavers that live in a lodge.

	A	B	C	D
A		O		
B	O		O	O
C		O		O
D		O	O	

For example, beaver A is only friends with beaver B (and beaver B is also friends with beaver A).

If beaver A wishes to become friends with beaver C, he would need to get an introduction by beaver B.

The following diagram shows the friendships between 7 beavers.

	A	B	C	D	E	F	G
A		O	O	O			
B	O		O	O			
C	O	O		O			
D	O	O	O		O		
E				O		O	O
F				O			O
G				O	O		

What is the minimum number of introductions beaver A needs in order to become friends with beaver G?
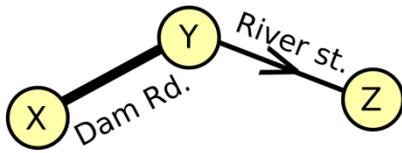
A: 1

B: 2

C: 3

D: 4

Write down the letter of the correct answer in the appropriate block on your answer sheet.

B4: Traffic in the City
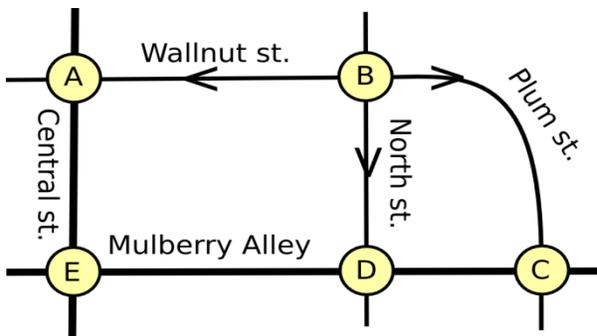
In a small village there is a one-way street and a two-way street. In order to help the village taxi driver a table is made to show which routes can be taken. Below is the map and the corresponding table.

		To		
		X	Y	Z
From	X	(shaded)	✓	
	Y	✓	(shaded)	✓
	Z			(shaded)

Beaversville is a little larger and also wishes to have a table for its taxi drivers:

Which one of the tables below is the correct one for Beaversville? In the appropriate place on your answer sheet, fill in the letter of the correct table.

A

	A	B	C	D	E
A	(shaded)				√
B	√	(shaded)	√	√	
C			(shaded)	√	
D			√	(shaded)	√
E	√			√	(shaded)

B

	A	B	C	D	E
A	(shaded)				√
B	√	(shaded)	√	√	
C			(shaded)	√	
D	√		√	(shaded)	
E		√	√		(shaded)

C

	A	B	C	D	E
A	(shaded)	√			
B		(shaded)	√	√	√
C		√	(shaded)		
D				(shaded)	√
E		√	√		(shaded)

D

	A	B	C	D	E
A	(shaded)	√			√
B	√	(shaded)	√		√
C	√		(shaded)	√	
D	√		√	(shaded)	√
E	√			√	(shaded)

B5: True or False

Alice and Tom are playing a game of "True or False" on their colourful, magnetic whiteboard in their classroom. Alice has stuck seven different magnetic shapes on the board.

She then makes four statements about the shape, colour, size and position of the shapes.

The top three shapes are white, the bottom four are blue [If you are using a monochrome print-out, blue will show as black]

If you are working on a monochrome printout, blue will show up as black.

Only one statement is allowed to be true. Tom must figure out which one it is.

Which one of the following statements is true?

   A. **There are two shapes X and Y, so that X is blue and Y is white and X is higher than Y.**
   B. **For all pairs of shapes X and Y, if X is a square and Y is a circle, then X is higher than Y.**
   C. **For all pairs of shapes X and Y, if X is small and Y is big, then X is to the right of Y.**
   D. **For all pairs of shapes X and Y, if X is white and Y is blue, then X is below Y.**

Write down the letter of the correct answer in the appropriate block on your answer sheet.

C1: Best Translation

Betty is trying to translate an English sentence into an ancient language. Every word translates into an ancient symbol. There are several possible symbols for each word. Betty wants to find the best translation.

Under each English word Betty has written down the possible ancient symbols. Between each pair of symbols, she has inserted a number, indicating how well they fit together in that order. (A higher number means a better fit.)

The best translation would be the five symbols which together produce the highest total maximum score.

Betty has prepared the translation of 'our school serves fish today'
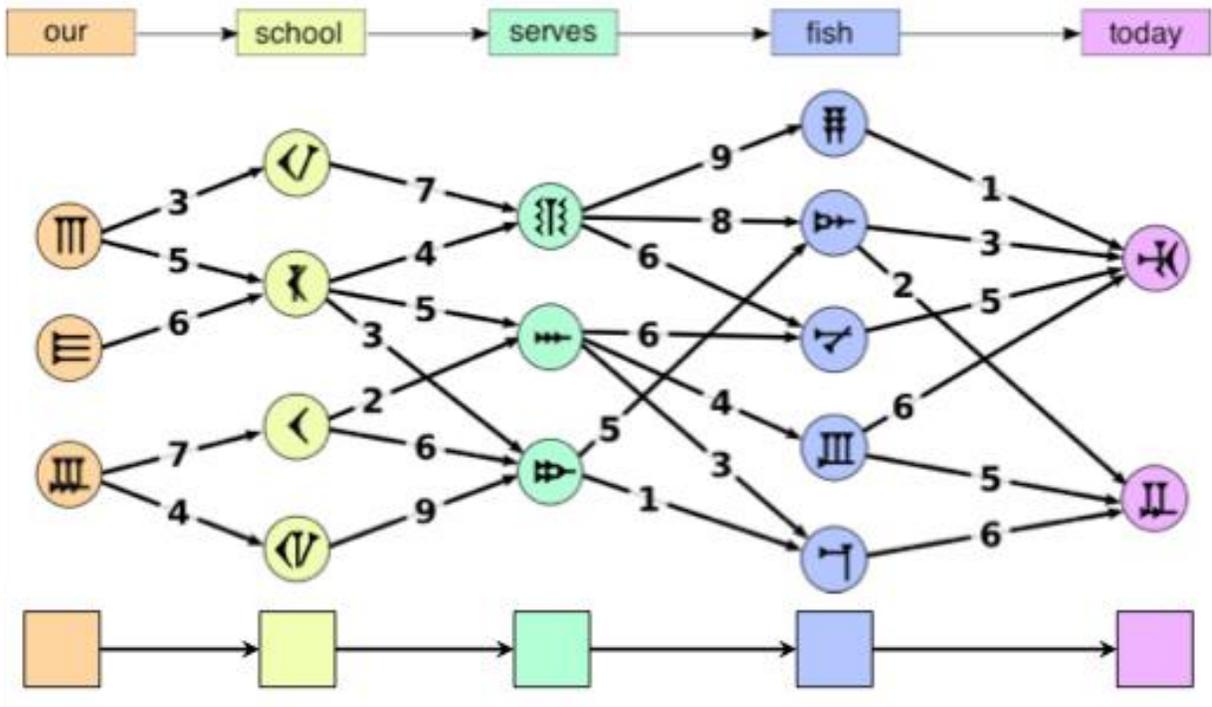
What is the highest possible total score she can get? Write down the number in the appropriate block on your answer sheet.

C2: Meeting Point

Three friends Anne, Bernie and Clara live in a city with an excellent train system. The map of the system below shows the stations and connections between the stations. The map also indicates how many minutes each connection takes.
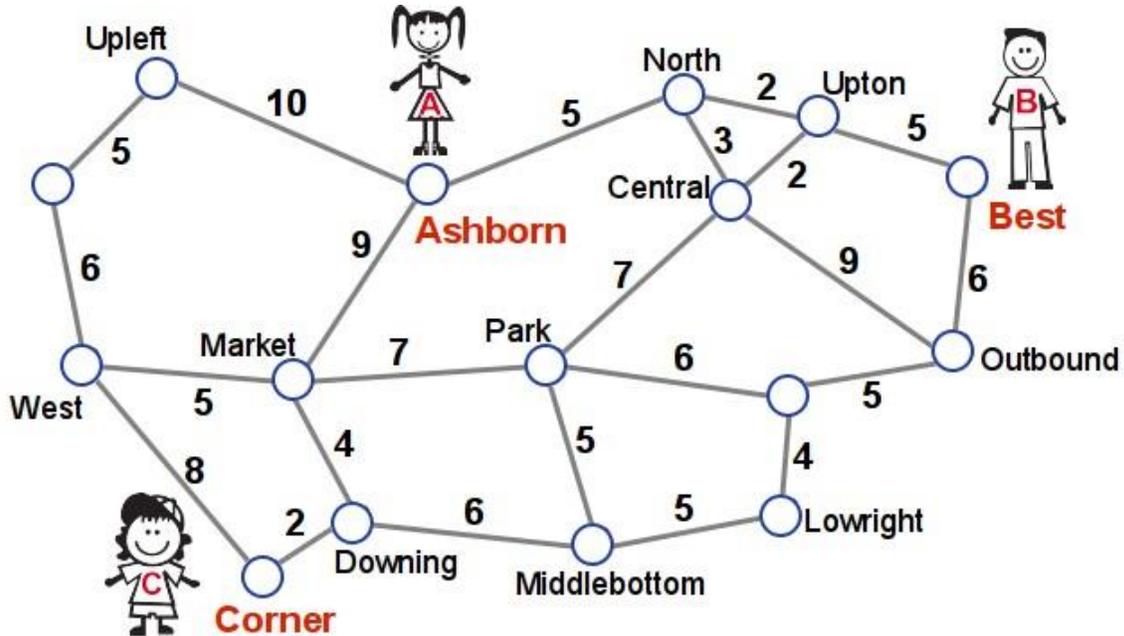
Anne lives next to Ashborn station, Bernie's nearest station is Best, and Clara's is Corner. They wish to select a station for a meeting. None of the friends should take more than 15 minutes of travel to reach the meeting point.

Which stations qualify as possible meeting points? In the appropriate block on your answer sheet, write down the names of all the stations that would qualify as suitable meeting points.

C3: Height Game

Young beaver girls Amy, Beavy, Cuttree, Diggy and Eary, all being of different heights, want to play a game with you.

They all stand in a line. Then they each count how many beavers are taller than they are in front of them and behind them. They give you the results on a slip of paper:

Number of taller beavers

Name	In front	behind
Amy	1	2
Beavy	3	1
Cuttree	1	0
Diggy	0	0
Eary	2	0

In what order are the beavers standing? Put A, B, C, or D in the appropriate space on your answer sheet.

A: **Diggy, Cuttree, Amy, Beavy, Eary**

B: **Amy, Cuttree, Diggy, Eary, Beavy**

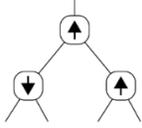C: **Diggy, Amy, Cuttree, Beavy, Eary**

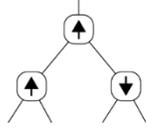D: **Diggy, Amy, Eary, Beavy, Cuttree**

C4: Broken Machines

Hilda constructed three machines, which were all supposed to output the second largest value from a list of four numbers.

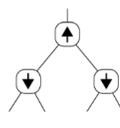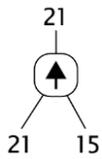Machine 1   Machine 2   Machine 3
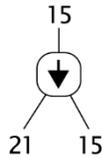

The machines can use two different components, called '*max*' and '*min*'.

'*max*' takes two values and outputs the largest.

'*min*' takes two values and outputs the smallest.
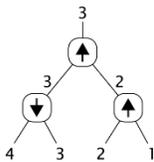
In other words, if numbers represented by a, b, c and d are input to a machine in this order, the results would be as follows:

Machine 1: outputs max(min(a,b), max(c,d))
Machine 2: outputs max(max(a,b), min(c,d))
Machine 3: outputs max(min(a,b), min(c,d))

For example, if Hilda inputs the numbers 4, 3, 2, 1 into Machine 1, the output she will get is 3, which is indeed the second largest value:

However, as she continued working with the devices she quite quickly realized that none of the machines actually work. In fact, she only needed to try two number combinations in order to discover this.

Which of the following combinations did she use to prove none of the machines work?
A: 1, 2, 4, 3 and 2, 3, 4, 1
B: 2, 1, 3, 4 and 2, 3, 4, 1
C: 1, 4, 2, 3 and 2, 3, 4, 1
D: 1, 4, 2, 3 and 4, 1, 2, 3

Write down the letter of the correct answer in the appropriate block on your answer sheet.

C5: Right Rectangles

A robot has been programmed to draw rectangles. It can execute the following instructions:

|	
Orange	draw an orange line of length 1
Black	draw a black line of length 1
Turn	turn 90° clockwise

NB. A black line of length (Black) 1 is much longer than an orange line with length (Orange)1.

If you are using a monochrome print-out, the orange will appear as grey.

Besides those simple instructions the robot can also execute complex instructions by combining instructions. If A and B are instructions (either simple or complex) the robot can do:

A, B	first execute A and then execute B
n×(B)	execute B n-times

The robot must draw the following:
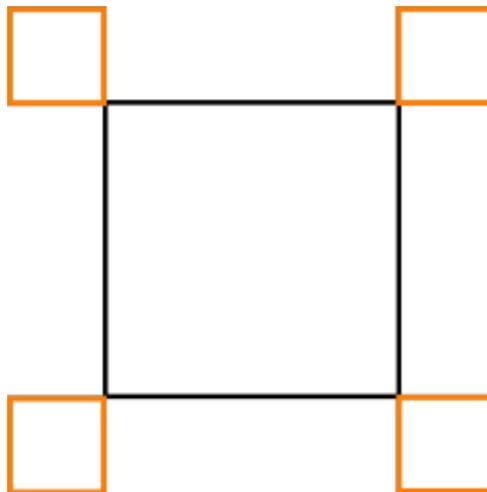
Which set of instructions does **NOT** result in the requested drawing?

Write down the letter of the correct answer in the appropriate block on your answer sheet.

A: 4 x (2 x (Orange, Turn), Orange, 3 x (Black), Orange, Turn)
B: 4 x (2 x (Orange, Turn), 3 x (Black), 2 x (Orange, Turn))
C: 4 x (3 x Black, 3 x (Orange, Turn), Orange)
D: 4 x (Black, 3 x (Orange, Turn), Orange, 2 x (Black)).