digitalcareers

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Bebras Australia Computational Thinking Challenge

Tasks and Solutions 2016

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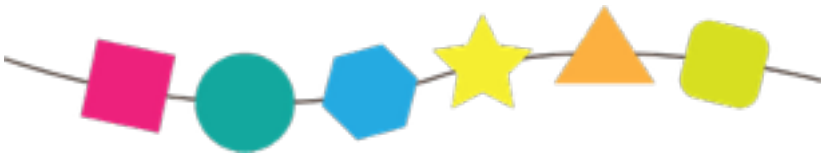
26.3.2016

Bracelet

Age Group:	Difficulty
3+4:	A
5+6:	A
7+8:	A

Emily has broken her favourite bracelet. The broken bracelet now looks like this:



Question:

Which of the following four bracelets shows what the bracelet looked like when it was whole?

A

B

C

D

Dream Dress

Age Group:	Difficulty
3+4:	A
5+6:	A
7+8:	A

Kate wants to buy her dream dress.

It must have:

- short sleeves,
- more than 3 buttons,
- stars on its sleeves.

Four shops sell only the dresses shown.

Question:

Which of these shops sells Kate's dream dress?

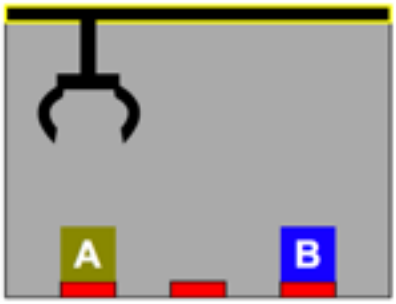
BeaverYorker, BeaverNova, B&B or TomTeaver

Crane Operating

Age Group: Difficulty
3+4: A
5+6: A

The crane in the port of Lodgedam has six different input commands:

left
right
up
down
grab
let go



Crate A is in the left position, crate B is in the position on the right.

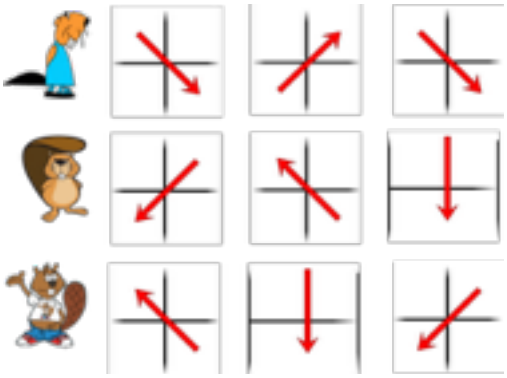
Question:

Using the command buttons, swap the position of the two crates.

Mushrooms

Age Group: Difficulty
3+4: A
5+6: A

Three beavers are standing in a forest.
Each wants to go where there are mushrooms.
Arrows in the picture to the right show the directions the beavers will walk.



Question:

Where do the beavers end up?

Birthday Balloons

Age Group: 3+4: Difficulty A

Mother Beaver bought ten balloons of three colours with the numbers as shown:

0	Green
1	Yellow
2	Red
3	Green
4	Yellow
5	Red
...	etc.

Question:

If Mother Beaver was born in the year 1983, can you pick up the balloons in the correct order to show Mother Beavers' year of birth?

Yellow, Red, Green, Red

Yellow, Green, Green, Green

Yellow, Red, Red, Green

Yellow, Green, Red, Green

Setting the Table

Age Group: Difficulty
3+4: B
5+6: A

Beaver Bob has set the breakfast-table as shown in the picture.

Question:

In which order has he placed the objects on the table?

A. table cloth, napkin, cup and saucer, knife, plate

B. table cloth, napkin, cup and saucer, plate, knife

C. napkin, knife, table cloth, cup and saucer, plate

D. table cloth, cup and saucer, napkin, plate, knife

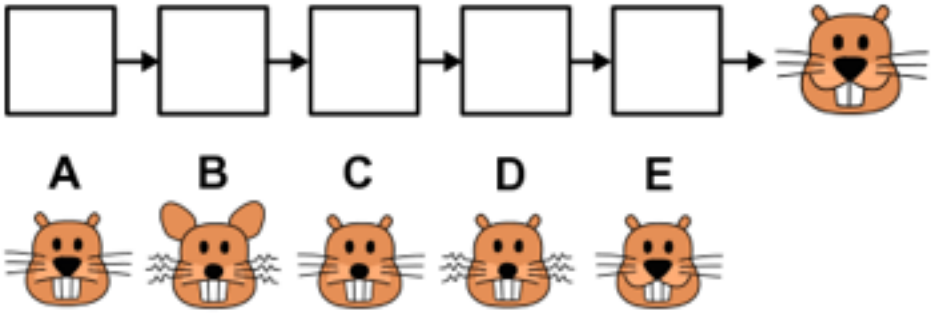
Animation

Age Group:	Difficulty
3+4:	B
5+6:	B
7+8:	A

Taro is planning an animation of a face that is made from a sequence of pictures.

To make the animation run smoothly, only one feature of the face should change from one picture to the next.

Unfortunately, the pictures got mixed up. Now Taro must find the correct order again. Luckily, he knows which picture is last.



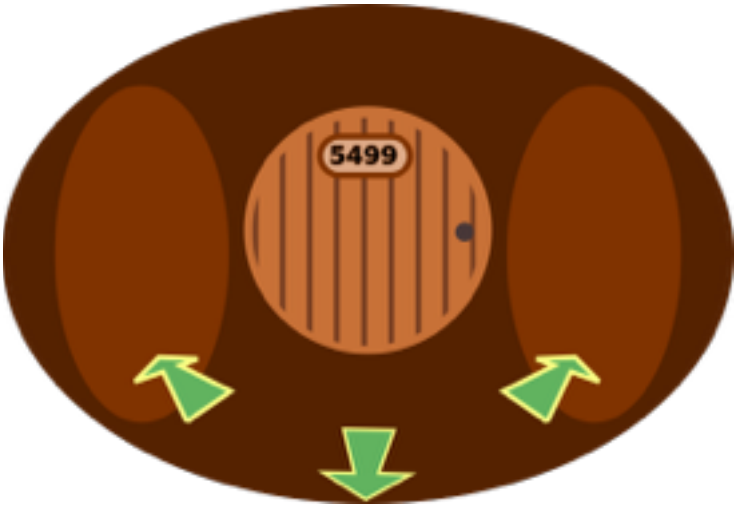
Question:

Put the pictures in the correct order by dragging them onto the squares.

Answer:

Over the years, the beavers constructed a huge beaver den with many, many rooms. The rooms are numbered and arranged in a particular tunnel structure.

Click on the arrows in the picture to move through the den.



Question:

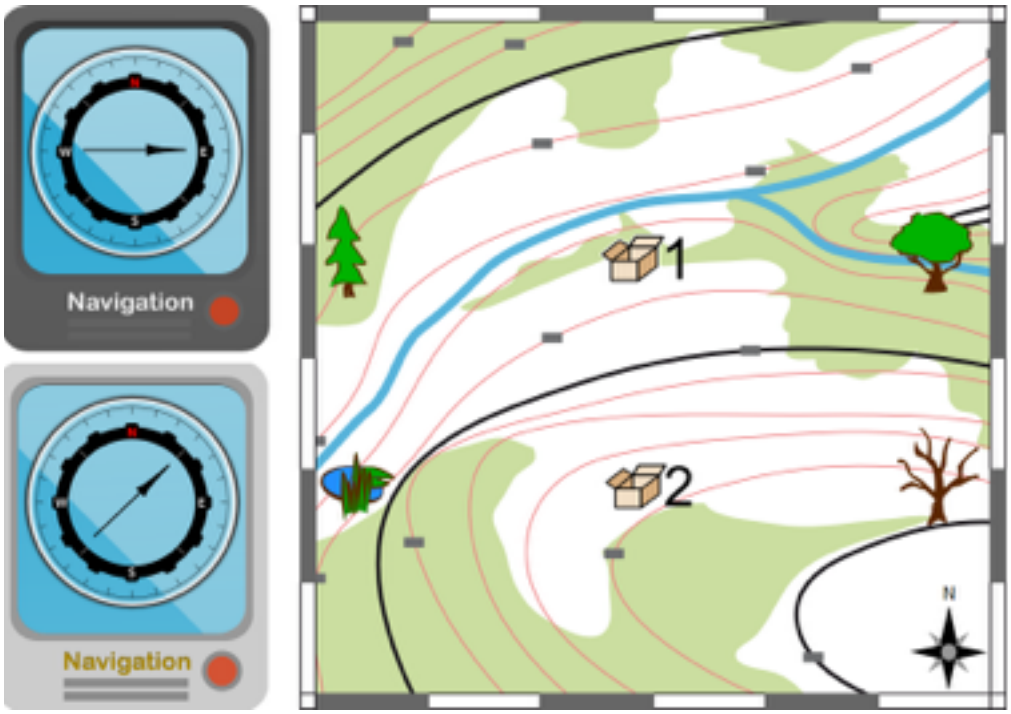
Find the room with **number 1337**. Click on 'Save' once you've found it.

Two friends, Anna and Bob, are searching for treasure.

They have a smartphone app that shows them the direction to the treasure they are looking for.

The two boxes on the map show where the treasure is.

Anna is searching for box 1. Bob is looking for box 2.



Anna and Bob are standing in the same place. The picture shows the map and a screenshot of the smartphones.

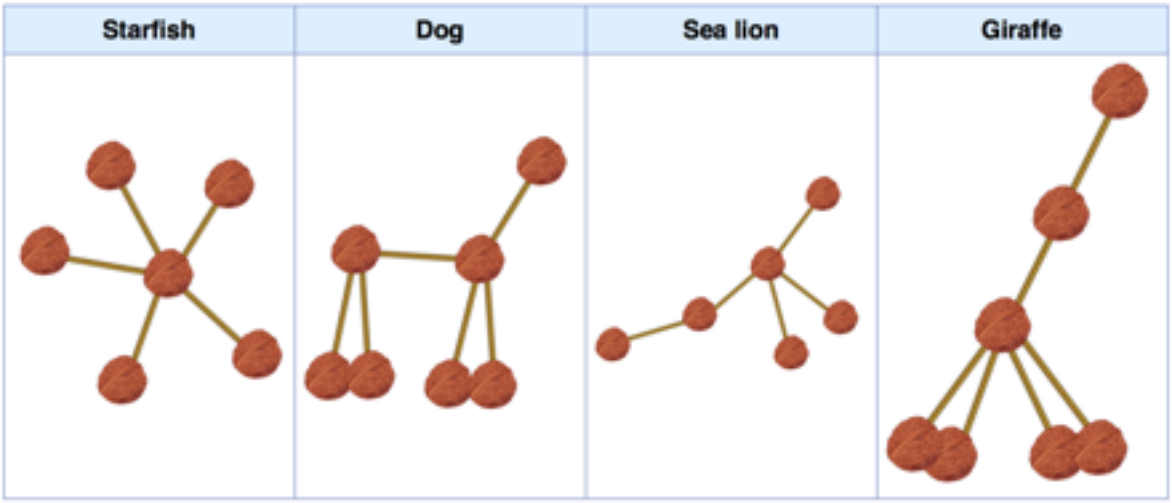
Question:

Where are Anna and Bob standing?

Walnut Animals

Age Group: Difficulty
3+4: B
5+6: B

Gerald was playing in the woods. He used nuts and sticks to create four nice animals.

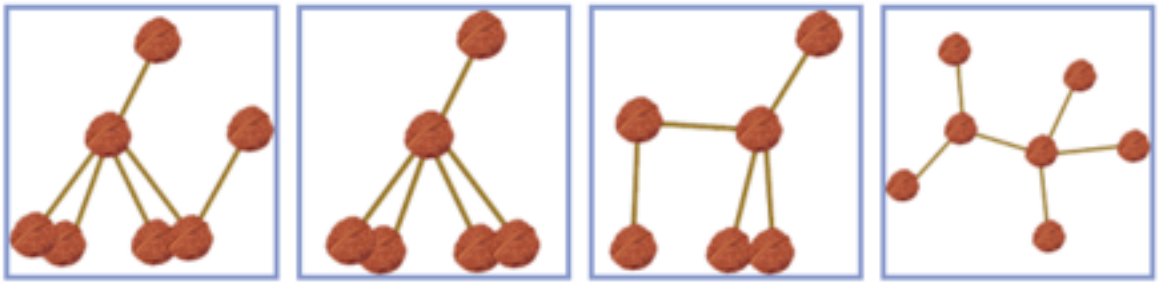


His sister managed to bend the animals around without removing any of the sticks.

Gerald was very upset because he really loved the figure of a dog.

Question:

Which of the following figures can be bent back to make the figure of the dog again?



Trains

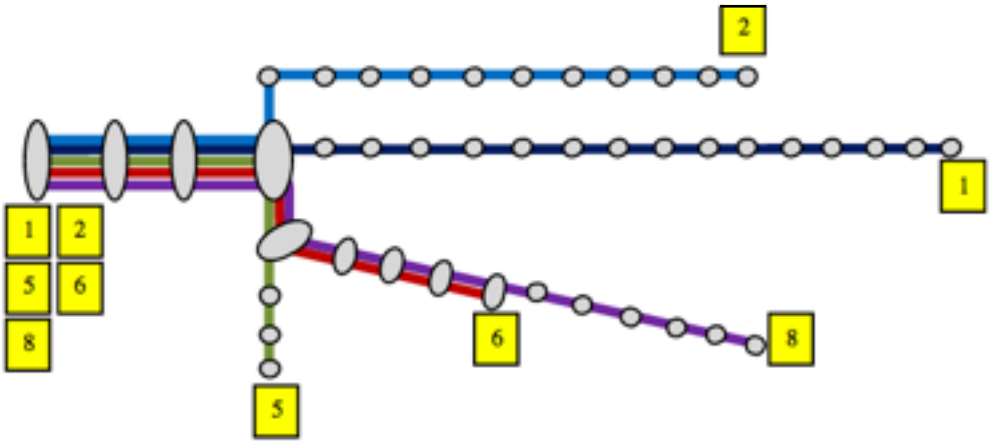
Age Group: Difficulty
3+4: C
5+6: B

The train lines in Beaver City all have their own number.

Unfortunately the numbers are only shown on this map.

When you are on a train you cannot see the line number anywhere!

You get onto a train at the main station where all the lines begin.



After three stations your train makes a turn.

At the next station it makes another turn.

Four stations later you have arrived at your destination.

Question:

Which train line were you on?

1, 2, 5, 6 or 8

Throw the Dice

Age Group:	Difficulty
3+4:	C
5+6:	C
7+8:	B
9+10:	B

After school the young beavers often play together.

To avoid quarrels about where to play, they throw a normal six sided die.

The decision is found according to this rule:

```
1 IF the first throw is greater than the second throw
2 THEN we go to play in the woods
3 ELSE
4     IF the third throw is less than the first throw
5     THEN we go to play at the river
6     ELSE we go to play on the sport field
```

Question:

Which sequence of throws will send the young beavers to the sports field?

Drawing Patterns

Age Group:	Difficulty
3+4:	C
5+6:	C
7+8:	B

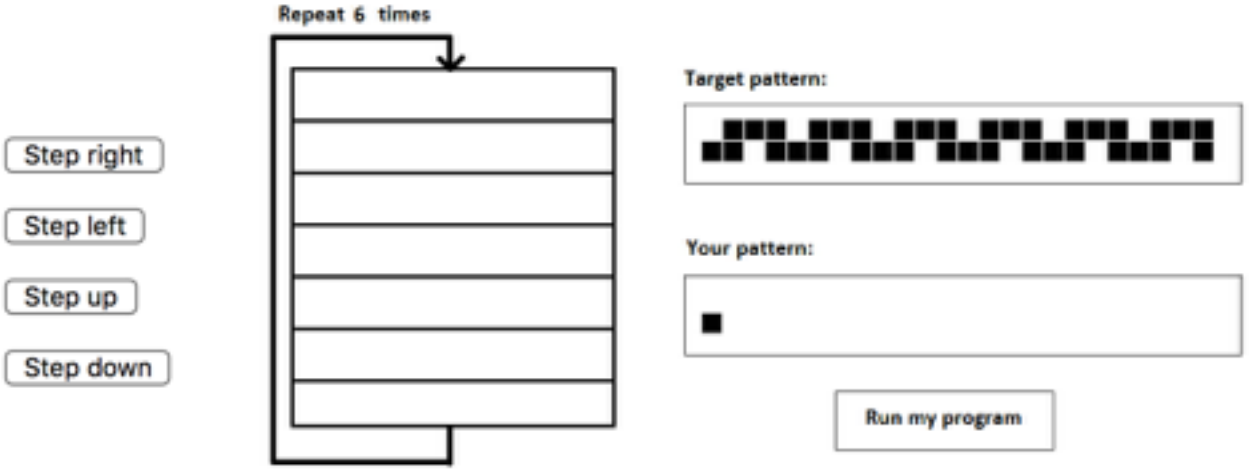
Your job is to create a program that draws the image shown below.

Clicking the buttons on the left, will put the instruction in the slot on the right.

The instruction clicked first will go at the top, the second below that, etc. The pattern of instructions you make will be repeated six times.

Test your program by clicking the button labeled "Run my program".

When you are happy with the result remember to save your answer.



Fair Share

Age Group:	Difficulty
3+4:	C
5+6:	C
7+8:	C
9+10:	B

Hamid has a 4 litre beaker full of a hazardous chemical.
Kazim has an empty 3 litre beaker and another empty 1 litre beaker.

Hamid and Kazim want to share the chemical between them equally and need a machine to do this safely.

The machine can pour one beaker in to another. It stops pouring when a beaker is completely emptied or filled, whichever happens first.

Question:

Find the sequence of pours that produces equal shares of the chemical for Hamid and Kazim. Your sequence must use the minimum number of pours possible.

Start	Choose the pours	Build the sequence
	4 -> 3 4 -> 1 3 -> 4 3 -> 1 1 -> 4 1 -> 3	

Beaver Gates

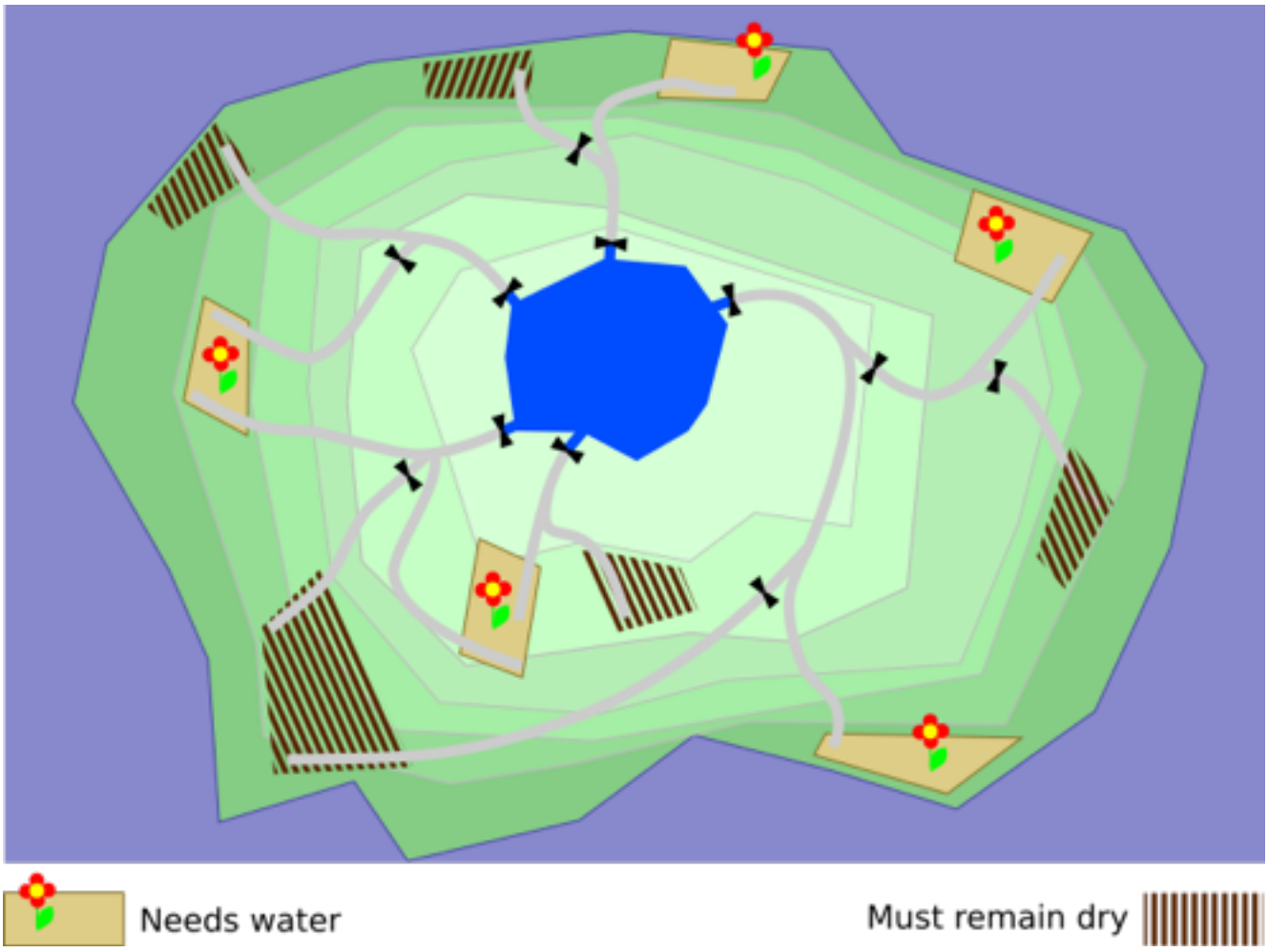
Age Group: Difficulty
3+4: C
5+6: C

The Birchtree family needs to water their fields. Only fields with flowers need to be watered. The other fields must remain dry.

Click on a black gate to close or open it.

If it is open, water will flow from the lake in the middle to the fields below.

Help the Birchtree family produce a plan by clicking on the gates to open or close them.



Cross Country

Age Group: Difficulty
5+6: C
7+8: B

Three very fast beavers will compete in a cross-country run.

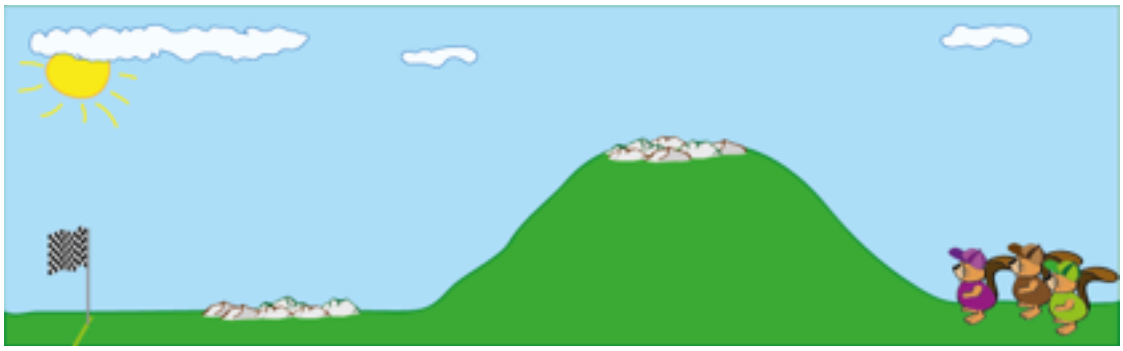
Mr. Brown will overtake one beaver when running uphill. 

Mrs. Pink will overtake one beaver when running downhill. 

Mrs.Green will overtake one beaver when running across rocks. 

The terrain is shown in the picture: uphill, followed by some rocks, downhill and then some more rocks.

Mrs. Pink starts in the first position, followed by Mr. Brown and Mrs. Green.



Question:

In which order will the beavers finish the race?

A. Mrs Pink, Mr Brown, Mrs Green

B. Mr Brown, Mrs Pink, Mrs Green

C. Mr Brown, Mrs Green, Mrs Pink

D. Mrs Green, Mrs Pink, Mr Brown

Drawing Stars

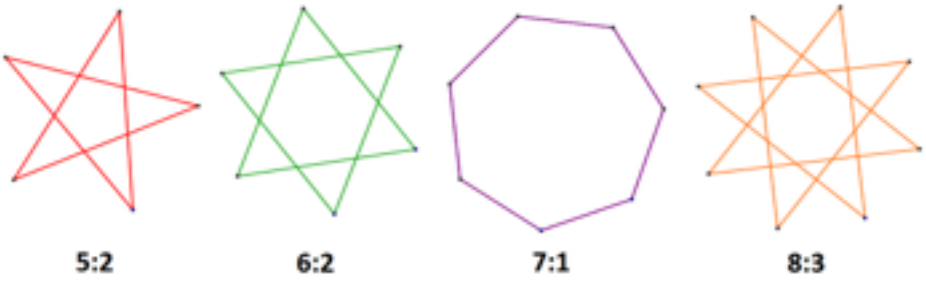
Age Group:	Difficulty
7+8:	B
9+10:	A
11+12:	A

Stella the beaver loves to draw stars. She has devised a system for labelling her stars according to their shape. She uses two numbers:

A number of dots for the star.

A number indicating if a line from a dot is drawn to the nearest dot (the number is 1), the second closest dot (the number is 2), etc.

Here are four examples of Stella's labelling system:



Question:

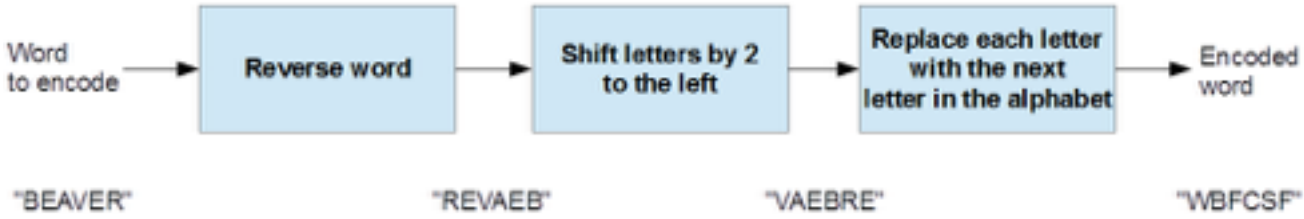
How would Stella label the following star?

9:3 9:4 10:4 or 10:5

You Won't Find It

Age Group:	Difficulty
7+8:	B
9+10:	A
11+12:	A

Beaver Alex and beaver Betty send each other messages using the following sequence of transformations on every word.



For example, the word "BEAVER" is transformed to "WBFCSF".

Beaver Betty receives the encoded message "PMGEP" from beaver Alex.

Question:

What did Alex want to say?

RIVER, KNOCK, FLOOD or LODGE

Theatre

Age Group: Difficulty
7+8: C
9+10: B

Three spotlights are used to light the theatre stage in the beavers' forest, a red one, a green one and a blue one.

The colour of the stage depends on which of the three spotlights are turned on.

This table shows the possible combinations of colours.

Red light	Green light	Blue light	Stage colour
off	off	off	Black
off	off	on	Blue
off	on	off	Green
off	on	on	Cyan
on	off	off	Red
on	off	on	Magenta
on	on	off	Yellow
on	on	on	White

From the beginning of the show, the lights will be switched on and off in this pattern:

- The red light repeats the sequence: two minutes off, two minutes on.
- The green light repeats the sequence: one minute off, one minute on.
- The blue light repeats the sequence: four minutes on, four minutes off.

Question:

What will the colour of the stage be in the first 4 minutes of the show?

Drag the correct colour onto the block of the minute.

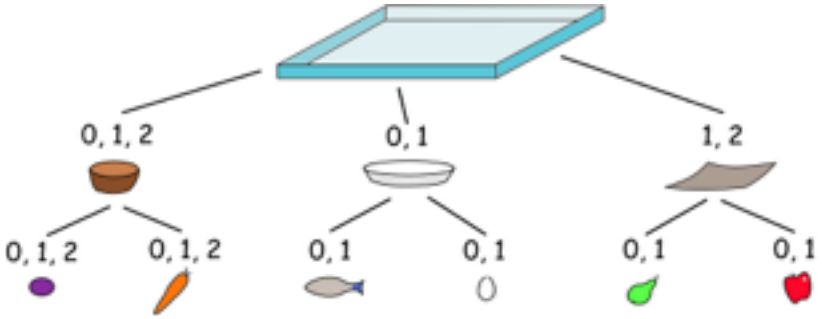
Beaver Lunch

Age Group: Difficulty
7+8: C
9+10: C

Hm, what to take for lunch today?

The cafeteria gives instructions on how to choose a Beaver lunch.

This is shown as a diagram:



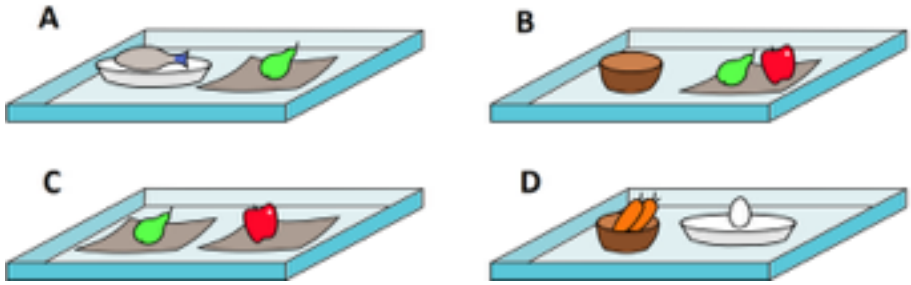
Below the tray you see different types of food containers.

The numbers indicate how many containers of this type can be added to a tray.

Each container can only have food items put in it that are shown below it.

The numbers indicate how many food items of this type can be added to the containers.

Question:
Which of the following lunches is not a proper Beaver lunch?



Animal Competition

Age Group: 7+8:
Difficulty: C

The beavers and dogs had a competition. In total nine animals took part.

The nine participants had the following scores: 1, 2, 2, 3, 4, 5, 5, 6, 7.

No dog scored more than any beaver.

One dog tied with a beaver.

There were also two other dogs that tied with each other.

Question:

How many dogs took part in the competition?

2, 3, 5, 6 or 7

Chakhokhbili

Age Group: 7+8: Difficulty C

Sergo the beaver loves to cook. His favourite meal is Chakhokhbili.

When cooking in the garden he uses a single gas burner. He performs the following actions after each other:

1	Cook an onion	10 minutes
2	Cook a bell pepper	10 minutes
3	Combine the cooked onion and cooked bell pepper, add a tomato and cook this together	20 minutes
4	Cook a chicken	30 minutes
5	Combine everything from steps 3 and 4, add some spices, and cook it all.	20 minutes

In total Sergo needs 90 minutes to prepare his Chakhokhbili on a single gas burner.

Question:

When Sergo cooks at home he has many gas burners available. He is able to use more burners so his meal is ready sooner.

Which of the following statements is NOT correct?

A. Sergo can reduce the cooking time by 10 minutes when using 2 burners

B. Sergo can reduce the cooking time by 30 minutes when using 2 burners

C. Sergo can reduce the cooking time by 40 minutes when using 3 burners

D. Sergo can reduce the cooking time by 50 minutes when using 4 burners

Email Scam

Age Group: Difficulty
9+10: A
11+12: A

Edgar is looking for a new home to live in.

He searched the internet and found a perfect flat for a very good price.

He has sent an e-mail to Francis, who is selling the flat, and received a quick reply:

> Hi,
>
> Thank you for your interest in my flat.
>
> Although I am not in town, I can send you the key to the flat so you can inspect it, but I need a security deposit of $5.000,- beforehand.
>
> To show my trustworthiness, I attach a copy of my ID.
>
> Cheers,
>
> Francis

Edgar is unsure what to do and is asking for your help.

Question:

What would be your best advice?

A. Pay the deposit. With the ID you can always go to the police if you don't get the deposit back.
B. That is perfect. If you like the flat, you can keep the key right away.
C. Don't pay the deposit, there is a high chance that this is a mail fraud.
D. Pay the deposit, go and have a look and decide later on.

Super Power Family

Age Group: 9+10: Difficulty: A

All members of a beaver family have abilities.

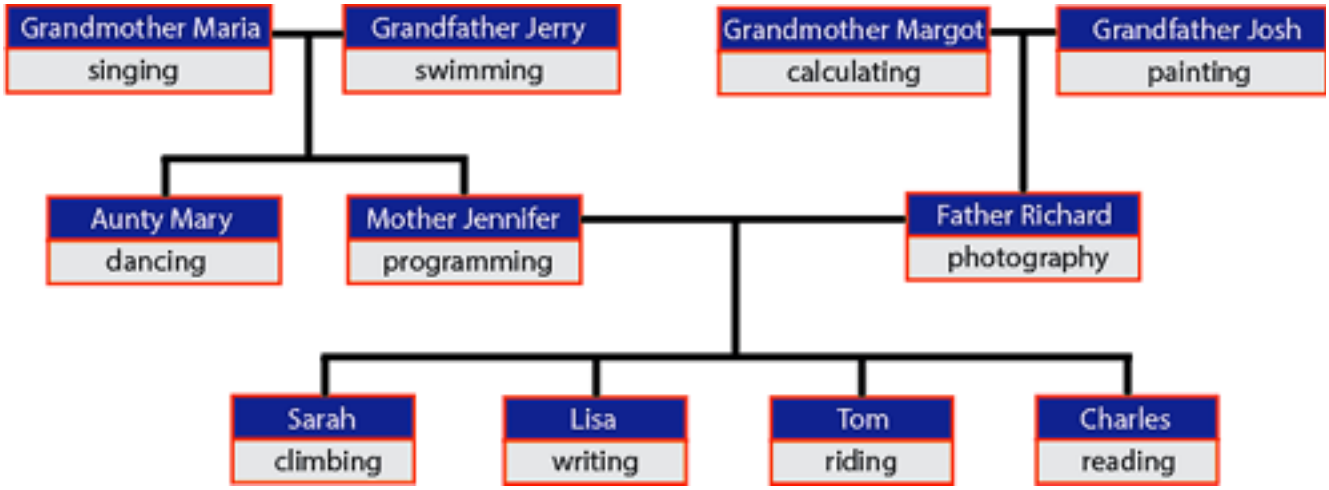
- A daughter inherits all her abilities from her mother.
- A son inherits all his abilities from his father.
- Each family member also has one extra ability.

The diagram below shows the relationships between the beavers. It also shows the extra ability for each beaver.

Examples:

Mother Jennifer has inherited the ability to sing from Grandmother Maria, and she also has the ability to program.

Lisa inherits two abilities from her mother and also has the ability of writing. This means she can write, program and sing.



Question:

Look at the diagram above. Which of these answers is true?

A. Tom's abilities are riding, painting and photography.

B. Sarah has abilities in reading, programming and singing.

C. Tom inherits from Grandmother Margot the ability to calculate.

D. Aunt Mary has abilities in dancing and swimming.

Answer: Please refer to page 49

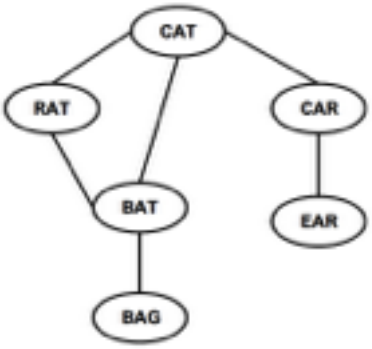
Word Chains

Age Group: Difficulty
9+10: B
11+12: A

For his homework, Thomas had to write words on cards and connect them with rubber bands.

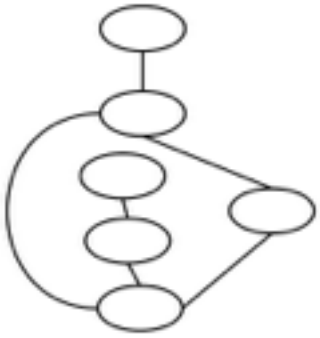
The teacher told him to connect any two words that differ by exactly one letter.

Thomas did this, as you can see in the picture on the right.



When Thomas returned from having a break he got a surprise.

Peter, his little brother, had erased all the words!



Also, the cards were completely mixed up, as you can see in the image on the left.

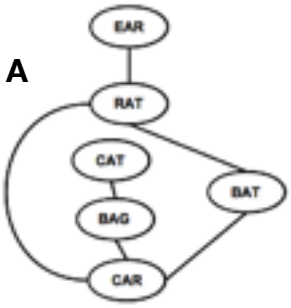
Importantly, the rubber bands still connected them as before.

Thomas was sure he could put the words back in the correct place.

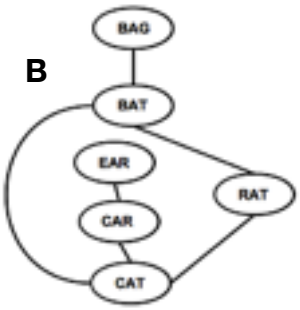
Question:

Which of the pictures below contains the words in exactly the right places?

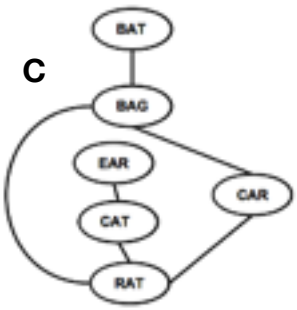
A



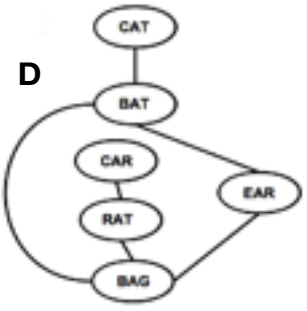
B



C



D



Popularity

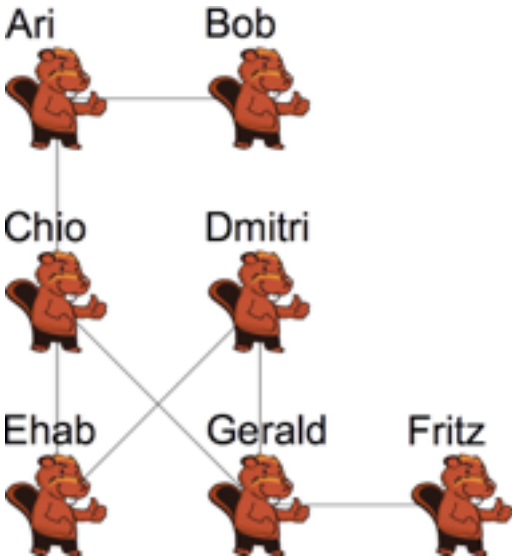
Age Group: Difficulty
9+10: B
11+12: B

Seven beavers are in an online social network called Instadam.

Instadam only allows them to see the photos on their own and their friends' pages.

In this diagram, if two beavers are friends they are joined by a line.

After the summer holidays everybody posts a picture of themselves on all of their friends' pages.



Question:

Which beavers' picture will be seen the most?

Ari, Bob, Chio, Dmitri, Ehab, Fritz or Gerald

Stack Computer

Age Group: Difficulty
9+10: C
11+12: B

The Stack Computer is loaded with boxes from a conveyer belt. The boxes are marked with a Number or an Operator (+, -, * or /).

The computer is loaded until the top box is a box marked with an operator. This operator is then used on the two boxes below it. The three boxes are then fused into one single box and marked with the outcome of the calculation.

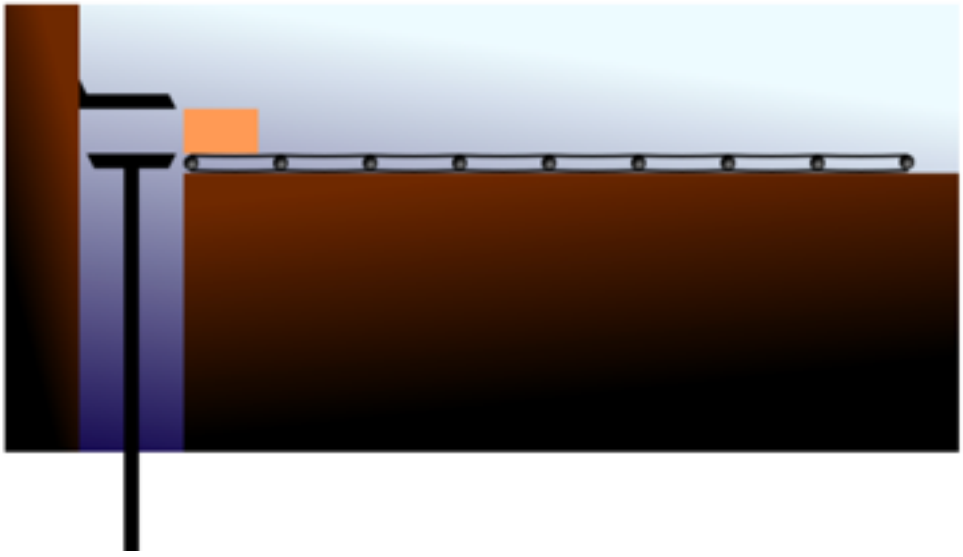
In the Stack Computer, calculations are entered in a different way to a normal calculator.

Examples:

2+3 must be entered as 2 3 +
10-2 must be entered as 10 2 -
5*2+3 must be entered as 5 2 * 3 +
5+2*3 must be entered as 5 2 3 * +
(8-2)*(3+4) must be entered as 8 2 - 3 4 + *

Question:

How should the following computation be entered: 4*(8+3)-2?

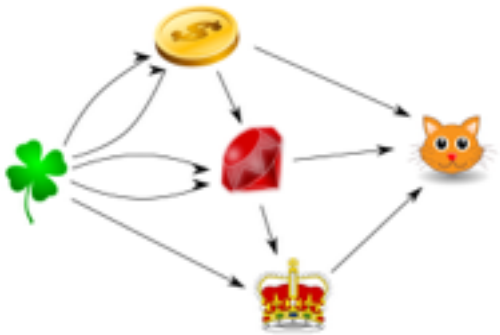


Beaver the Alchemist

Age Group: Difficulty
9+10: C
11+12: A

Beaver the Alchemist can convert objects into new objects. He can convert:

- Two clovers into a coin
- A coin and two clovers into a ruby
- A ruby and a clover into a crown
- A coin, a ruby, and a crown into a kitten.



After an object has been converted into another object, it disappears immediately.

Question

How many clovers does Beaver the Alchemist need to create one kitten?

5, 10, 11 or 12

Fireworks

Age Group: 9+10: Difficulty C

Two beavers live in lodges separated by a large forest.
They decide to send messages to each other by shooting fireworks into the sky above the trees.

Each message is a sequence of words, though the beavers only know five different words.
The beavers can shoot two types of fireworks, one after the other, and know the following codes:

Word	Code
Log	
Tree	
Rock	
River	
Food	

For example, to send the (rather strange) message "food, log, food", a beaver would shoot:

Question?

How many **different** meanings can the following sequence of fireworks have?

0, 1, 2, 3, or 4

Mobiles

Age Group: 9+10: Difficulty C

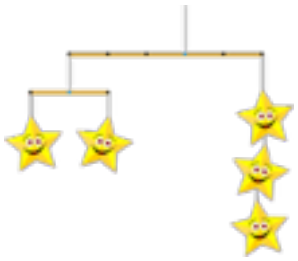
A mobile is a piece of art that hangs from a ceiling. You may remember one hanging from the ceiling in your bedroom.

A mobile consists of sticks and figures. Each stick has a few points to which figures or other sticks may be attached.

Also, each stick has a hanging point, from which it is attached to a stick further above (or to the ceiling).

The following example mobile can be described using these numbers and brackets:

(-3 (-1 1) (1 1)) (2 3)



Question:

Which of the following mobiles could be constructed using these instructions:

(-3 (-1 4) (2 (-1 1) (1 1))) (2 (-1 6) (2 3))

A

B

C

D

The teacher in the beaver school wants to give some material to his students.

He found a portal with a scanned book which declares in its front page that it should be distributed according to a “Creative Commons License” (CC-BY-ND) that makes everyone free to share, copy and redistribute the material in any medium or format for any purpose, even commercially, provided that appropriate credit is given.

The license also specifies that if one remixes, translates, or builds upon the book, the modified book may not be distributed.

Question:

Which of these actions is not permitted under the terms of this license?

A. Selling copies of the book to students

B. Translating the book, keeping the translated copy for himself

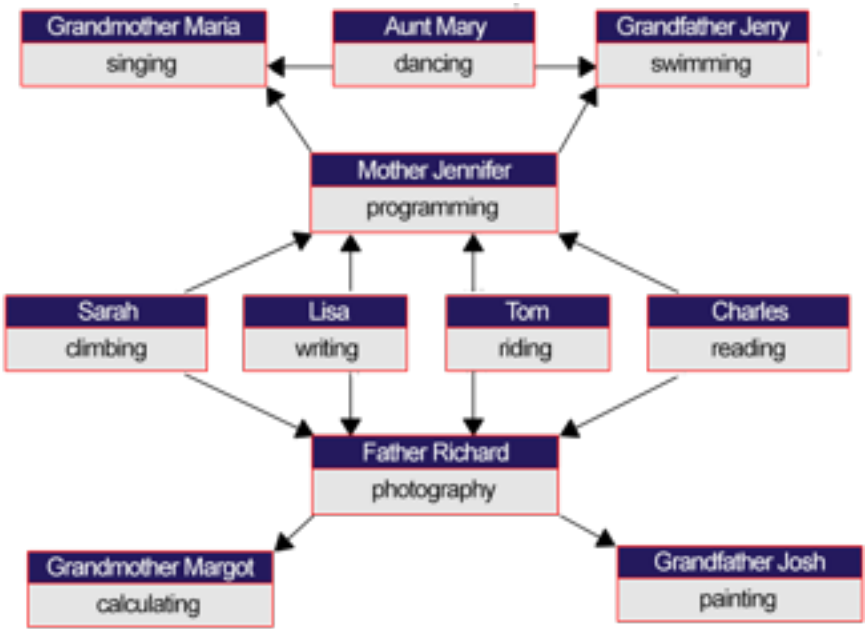
C. Giving the students one chapter of his translation of the book

D. Putting a scanned copy of the book on the school website

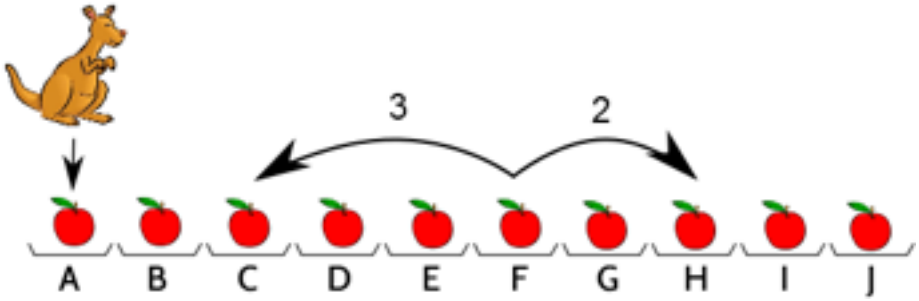
Super Power Family (hard)

Age Group: 11+12 Difficulty: A

The Year 11+12 students had the same question but with a possibly more difficult to interpret diagram, shown here:



There are 10 plates in a row. There is one apple on each plate.



Thomas the kangaroo loves to jump. First, he jumps onto the leftmost plate with the letter A.

On each single jump after this, he either jumps forward two plates, or backwards three plates. (An example of the two possible jumps from one plate is shown with arrows in the picture.)

Thomas only jumps onto plates with an apple.
If he jumps onto a plate, he collects the apple from it.

Question:

If Thomas collects all 10 apples, which apple does he collect last?

A, B, C, D, E, F, G, H, I or J

Bowl Factory

Age Group: 11+12: Difficulty: C

A factory produces sets of 6 bowls of different sizes. A long conveyor belt moves the bowls one by one, from left to right.

Bowl production places the 6 bowls of each set onto the conveyor belt in a random order.

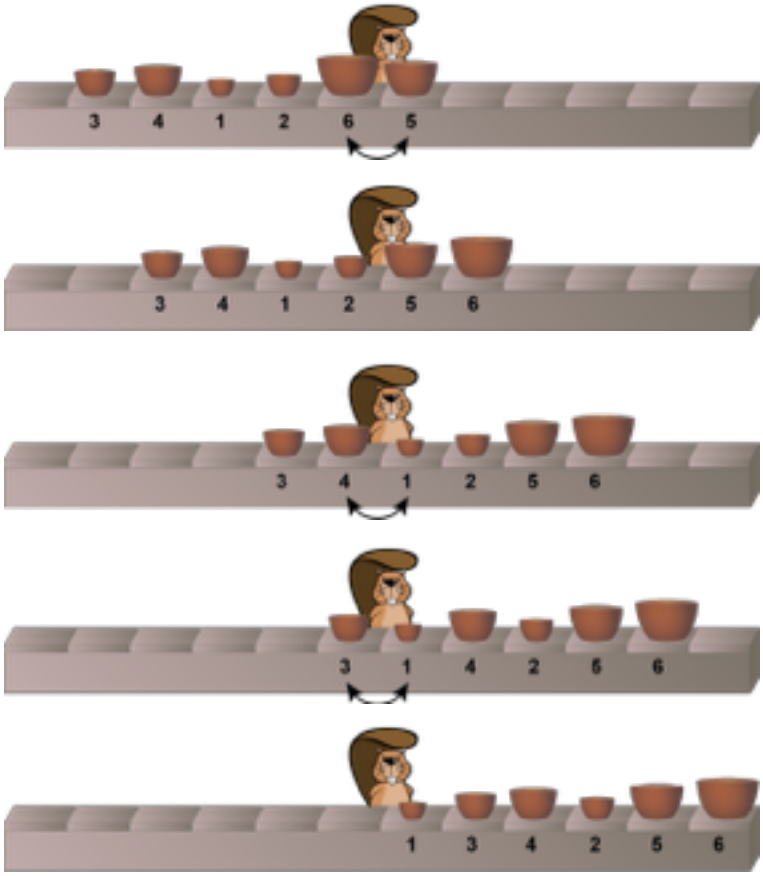
Before packing the bowls, they need to be sorted to look like this:

To help with the sorting, the factory places workers along the conveyor belt.

When a set of bowls passes a worker, the beaver will swap any two neighbouring bowls which are in the wrong order.

The worker will keep doing this until the set of 6 bowls has finished passing.

See how the order of a set of bowls changes as it passes one worker:



Question:

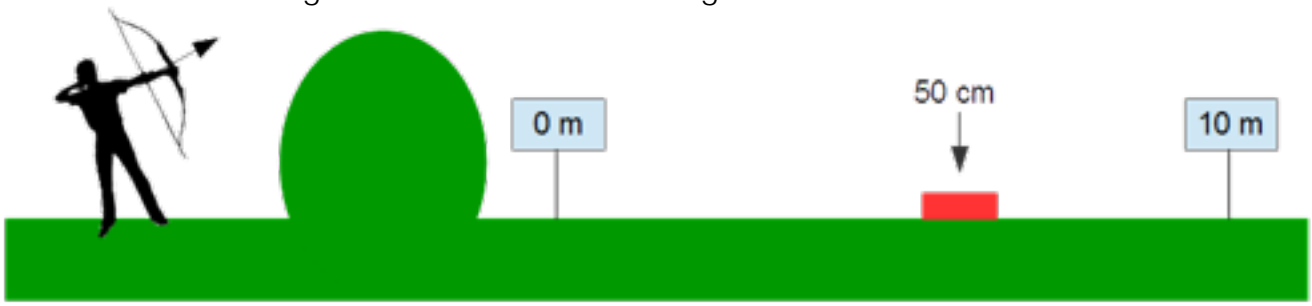
How many workers should be put along the line to sort the set of bowls on the right?

Reaching the Target

Age Group: 11+12: Difficulty: C

Arnaud would like to reach a target with his arrow. He can adjust the arc to shoot an arrow in a range between 0 m and 10 m.

The position of the target is unknown, but after each shoot, his friend Marc tells Arnaud whether the arrow reached the ground before or after the target.



Question?

Given that the target has a width of 50cm, what is the minimal number of arrows needed to be sure to hit the target, no matter where it is located?

3, 4, 5 or 6

Fireworks (hard)

Age Group: 11+12: Difficulty C

The year 11+12 students had the same question but there was a free choice of input rather than a multi-choice question.

Mobiles (hard)

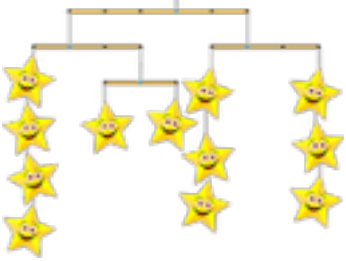
Age Group: 11+12: Difficulty: C

A

B

C

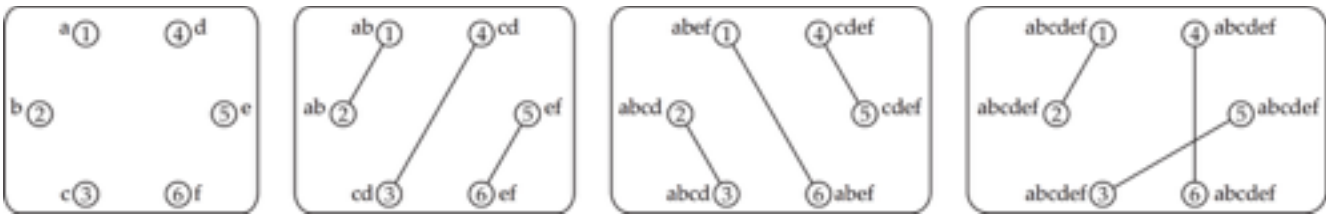
D



Every Friday, six spies exchange all the information they have gathered during the week. A spy can never be seen with more than one other spy at the same time. So, they have to have several rounds of meetings where they meet up in pairs and share all the information they have at that point.

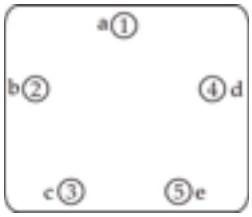
The group of 6 spies needs only three rounds to distribute all their secrets:

Before the meetings each spy holds a single piece of information. (spy 1 knows 'a', spy 2 knows 'b, etc.). In the first round spies 1 and 2 meet and exchange information so now both know 'ab'. The diagrams show which spies meet in each round with a line. It also shows which pieces of information they all have. After three rounds all information has been distributed.



Which of the following statements is true?

After an international incident one spy has stopped attending the meetings. What is the minimum number of rounds needed for the five remaining spies to exchange all information?



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