



Computer Talent Search

A project of the Institute of IT Professionals South Africa

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ELITE

Grade 12+

Not to be used before 7 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.
4. Leave the tasks you find difficult for later.

The mark allocation is as follows.

A section: +6 marks for every correct answer.

B section: +7 marks for every correct answer.

C section: +7 marks for every correct answer.

If you do not answer a question or answer correctly, you get 0 (zero) for that task.

The maximum mark is 100.

Wait for the teacher to say “START”.



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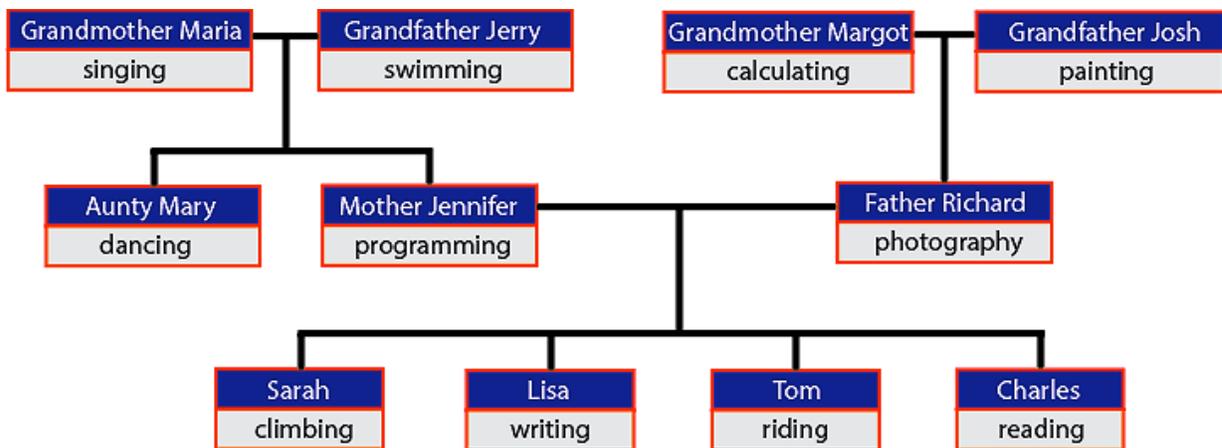
A1 Super Power Family ID329 JB4 / IA4 / SA3 / EA1

- All members of this 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 members. It also shows the extra ability for each member.

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 one of the following statements is true? Write down the letter of the answer in the appropriate block on your answer sheet.

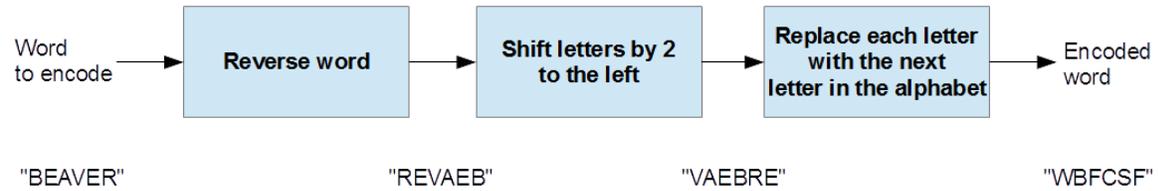
- A. Sarah has abilities in reading, programming and singing.
- B. Aunt Mary has abilities in dancing and swimming.
- C. Tom inherits from Grandmother Margot the ability to calculate.
- D. Tom's abilities are riding, painting and photography.

A2 You Won't Find It

ID374 / IB3 / SA2 /

EA2

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



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

Betty receives the encoded message "PMGEP" from Alex.

Question:

What did Alex want to say? Write down the word in the appropriate block on your answer sheet.

LODGE
FLOOD
RIVER
KNOCK

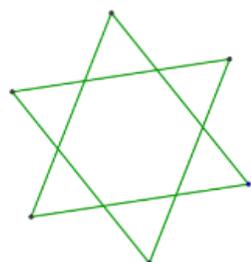
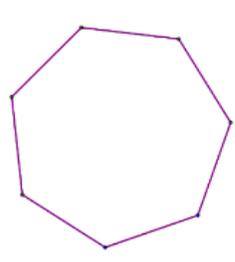
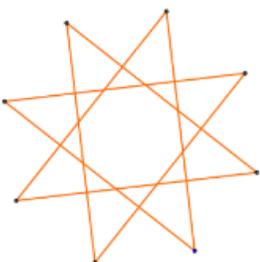
A3 Drawing Stars

ID342 / IB1 / SA4 / EA3

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

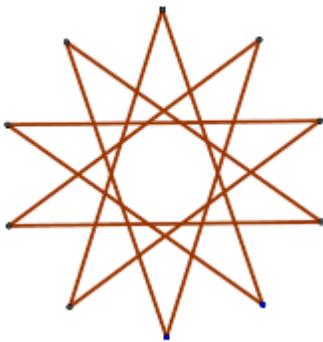
- A number of points for the star.
- A number indicating if a line from a dot is drawn to the nearest point (the number is 1), the second closest point (the number is 2), etc.

Here are four examples of Stella's labelling system:

			
5:2	6:2	7:1	8:3

Question:

How would Stella label the following star? Write down the letter of the correct answer in the appropriate block on your answer sheet.



- A. 9:3
- B. 9:4
- C. 10:4
- D. 10:5

A4 E-mail

ID330 / SA5 / EA4

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 R50 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? Write down the letter of the best advice in the appropriate block on your answer sheet.

- 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.

A5 Beaver Tutorials

ID347 / EA5

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

He found a portal with a scanned book which declares on its front page that it should be distributed according to a "Creative Commons License" (CC-BY-ND) that allows everyone to freely 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 the students
- B. Translating the book, keeping the translated copy for himself
- C. Giving the students his translation of one chapter of the book
- D. Putting a copy of the scanned book on the school website.

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

B1 Word Chains

ID337 / SB2 / EB1

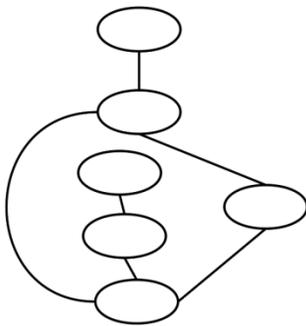
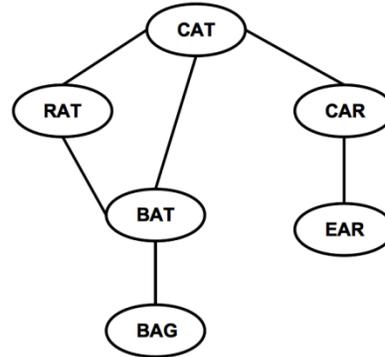
For his homework, Thomas had to write words on cards and connect them with rubber bands.

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!



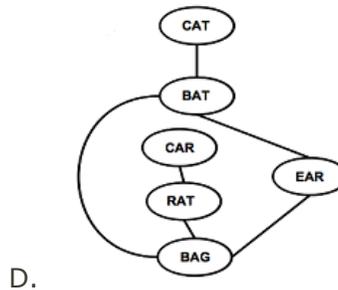
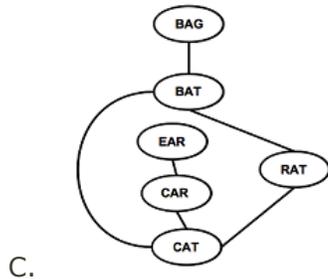
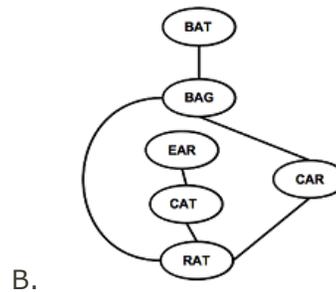
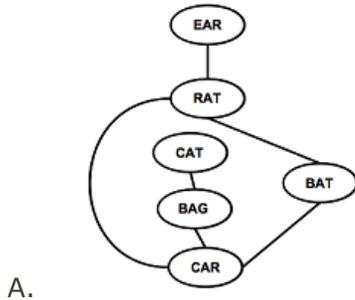
Also, the cards were completely mixed up, as you can see in the image on the left.

Importantly, the rubber bands still connected them as before.

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

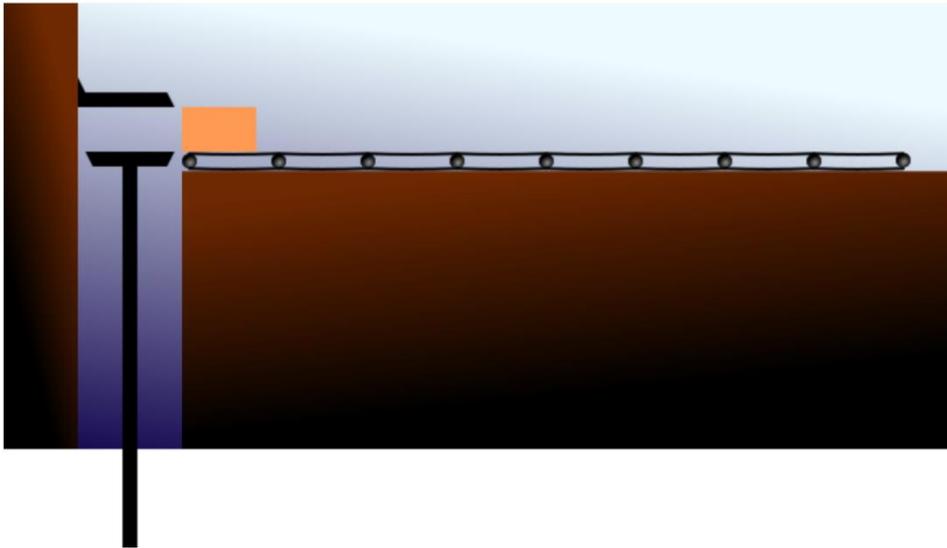
Question:

Which picture below contains the words in exactly the right places? Write down the letter of the answer in the appropriate block on your answer sheet.



B2 Stack Computer

ID339 / SC1 / EB2



The Stack Computer is loaded with boxes from a conveyor 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: $4*(8+3)-2$? Enter the letter of your answer in the appropriate block on your answer sheet.

- A. 8 3 + 4 * 2 -
- B. 4 8 * 3 + 2 -
- C. 4 8 3 2 * + -
- D. 8 3 + 4 2 - *

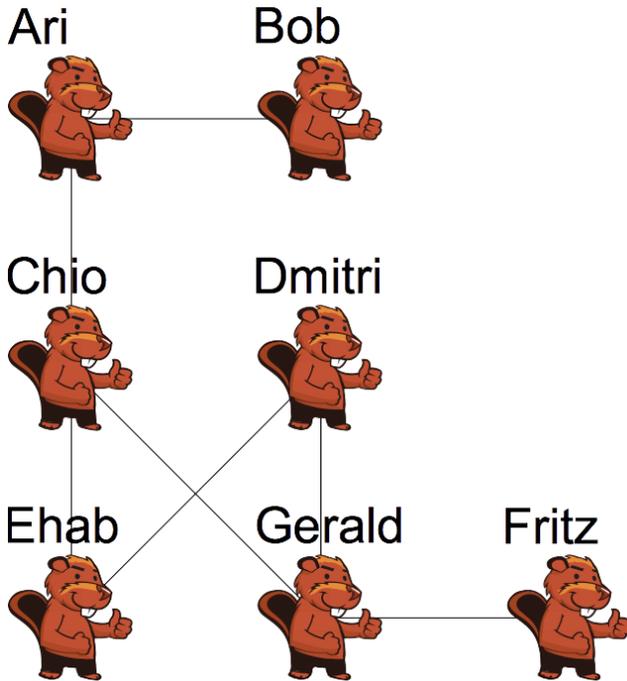
B3 Popularity

ID334 / SB4 / EB3

Seven beavers are in an online social network called Instadam.

Instadam only allows them to see the photos on their own, and the friends' of 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:

Whose picture will be seen the most? Write down the name in the appropriate block on your answer sheet.

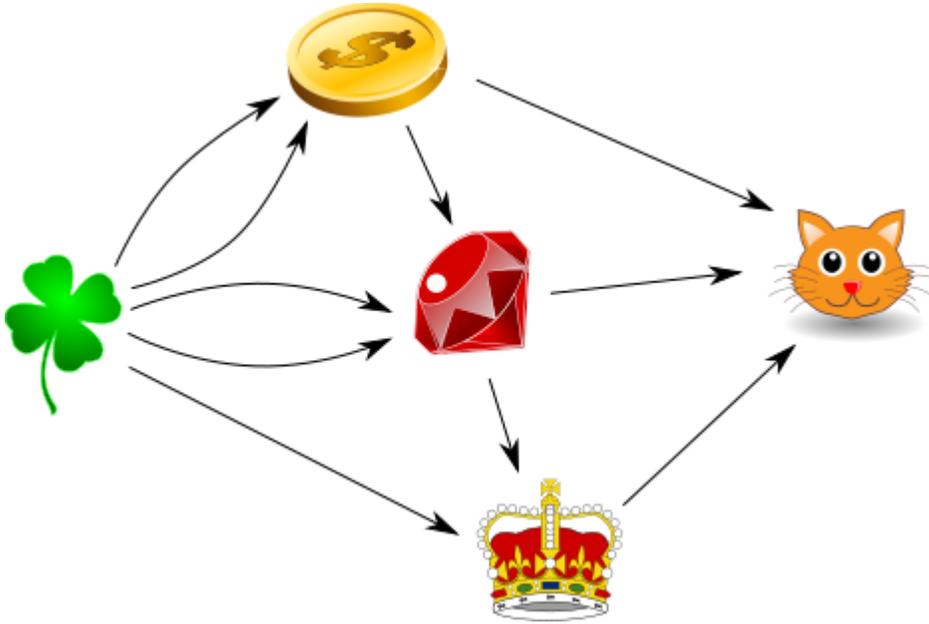
B4 Beaver the Alchemist

ID352 / SC5 / EB4

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:

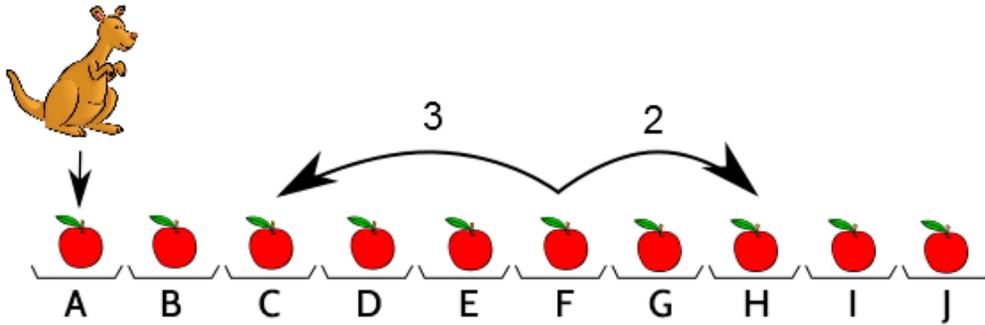
How many clovers does Beaver the Alchemist need to create one kitten?

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

B5 Kangaroo

ID356 / EB5

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 plate F 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? Write the letter of the correct answer in the appropriate block on your answer sheet.

A B C D E F G H I J

C1 Pirate Hunters

ID338 / EC1

In the game of "Pirate Hunters" players take turns moving a pirate or a policeman.

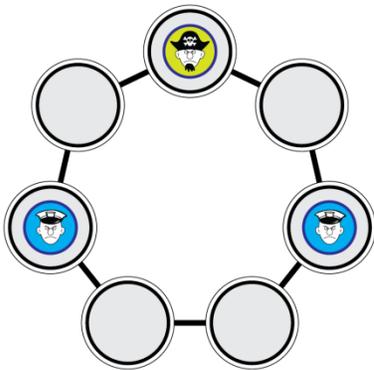
When it is the police's turn, the player moves a policeman over to a neighbouring field.

The pirate is faster than a policeman, and skips a field on its turn, moving two fields.

A policeman cannot move to a field that is occupied -- either by his colleague policeman, or the pirate.

The game ends when the pirate is forced to move to a field occupied by one of the policemen.

A policeman goes first.



Question:

If the pirate plays the best way possible and makes no mistakes, how many moves will it take the police to capture him? Write down the answer in the appropriate block on your answer sheet.

- A. The police can win in 2 turns.
- B. The police can win in 5 turns.
- C. The police can win in 3 turns.
- D. The police have no chance of winning.

C2 Bowl Factory

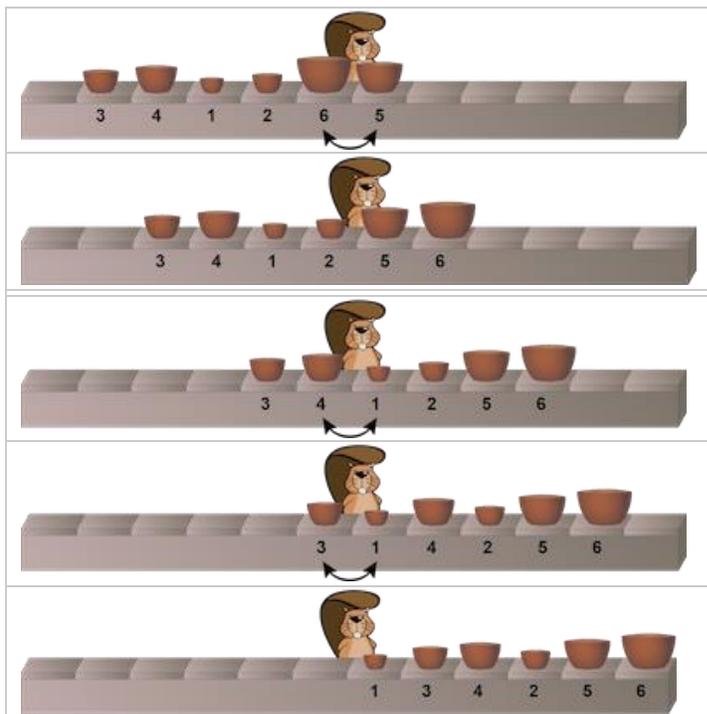
ID336 / EC2

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, he will swap any two neighbouring bowls which are in the wrong order. He will keep doing this until the set of 6 bowls has finished passing him.

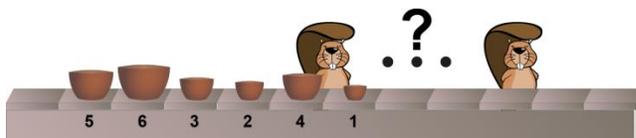
See how the order of a set of bowls changes as it passes one worker:



Three workers will therefore be required to put this set in proper order.

Question:

How many workers should be put along the conveyor belt to sort the following set of bowls?



Write down the correct answer in the appropriate block in your answer sheet.

C3 Quick Beaver Code

ID366 / EC3

The beavers want to encode numbers. They developed the Quick-Beaver-Code (QB-Code).

This is a code consisting of squares. Every square has a certain value.

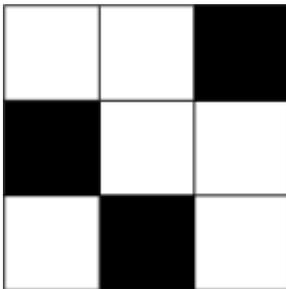
The squares are filled line by line from the bottom to the top and from RIGHT to LEFT.

The value of the bottom right square is 1. The other squares have double the value of the square before them.

Example:

Here is a 3x3 QB-Code. The beavers have encoded a number by darkening some squares.

The number encoded is the sum of the values of the dark squares.



So the number encoded in this QB-Code is $2 + 32 + 64 = 98$.

Question:

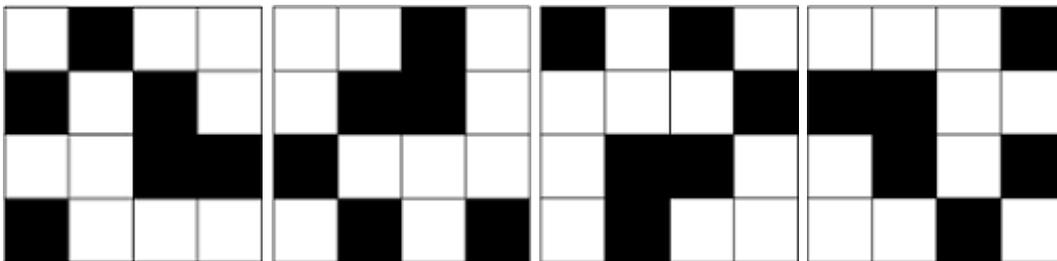
Of the following 4x4 QB-Codes, which one encodes the highest number?

A

B

C

D



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

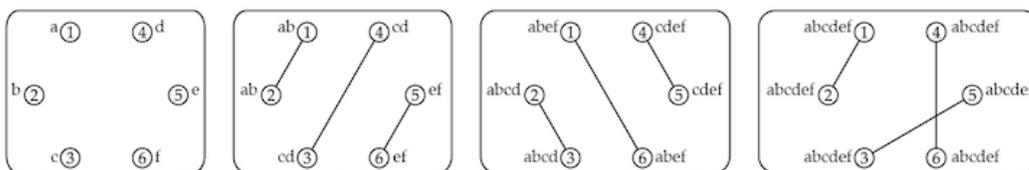
C4 Spies

ID357 / EC4

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.

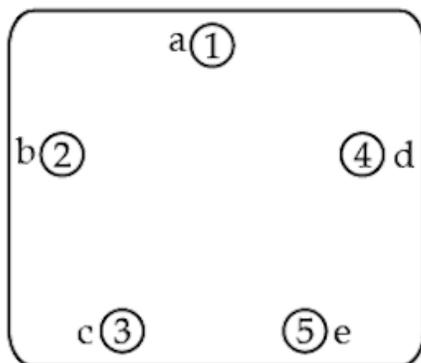
The group of 6 spies needs only three rounds to distribute all secrets:

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.



Question:

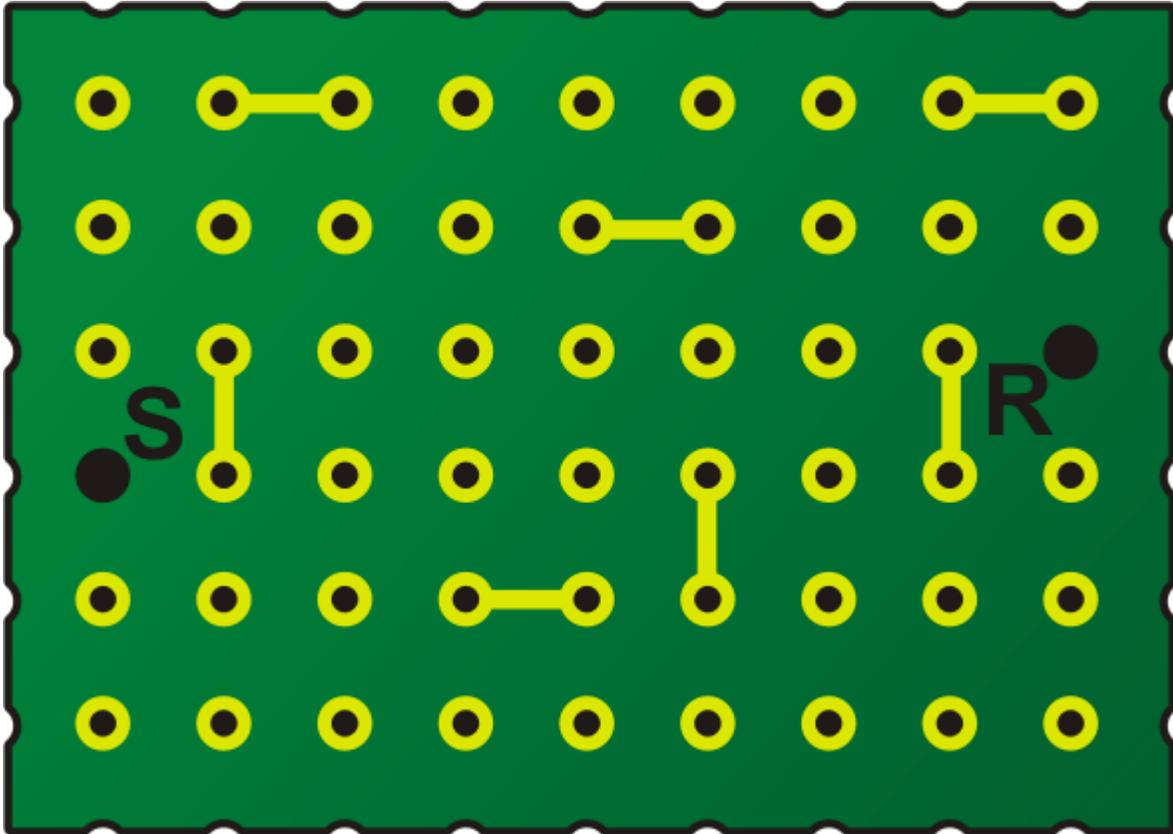
After an international incident one spy has stopped attending the meetings. What is the minimum number of rounds needed for the five remaining spies to exchange all information? Enter the number in the appropriate block on your answer sheet.



C5 Building a chip

ID355 / EC5

A small chip is composed of a grid of contacts (marked as dots). Some are already connected (marked as line segments). Connectors are always only between adjacent contacts, horizontally or vertically. We want to connect S and R with a continuous sequence of connectors, which do not touch any already connected contacts.



Question:

How many different ways are there to connect S and R with the least possible number of connectors? Write down the correct answer in the appropriate block on your answer sheet.