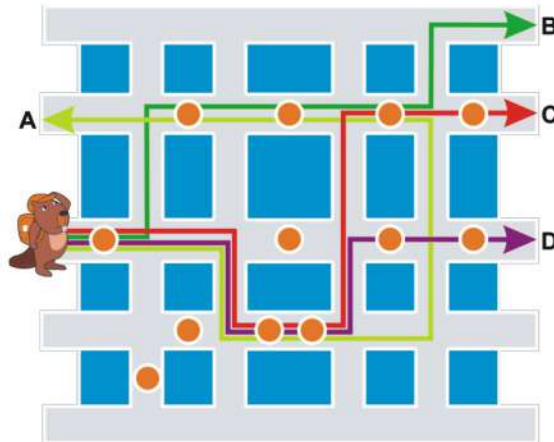


Tasks T1 – T7 carry 3 points each

T1. Bus Travel

Young Beaver is visiting Beaver City and he wrote down information about his bus trip. He recorded every turn but not whether the turns were left or right. Sometimes he also recorded information about bus stops (circle symbols) and streets.



His notes are looking as following:

- Start from starting point
- Turn
- Turn
- Continue for 3 bus stops and then turn
- Continue and turn into the next street

Question / Challenge

What was the destination of young Beaver?

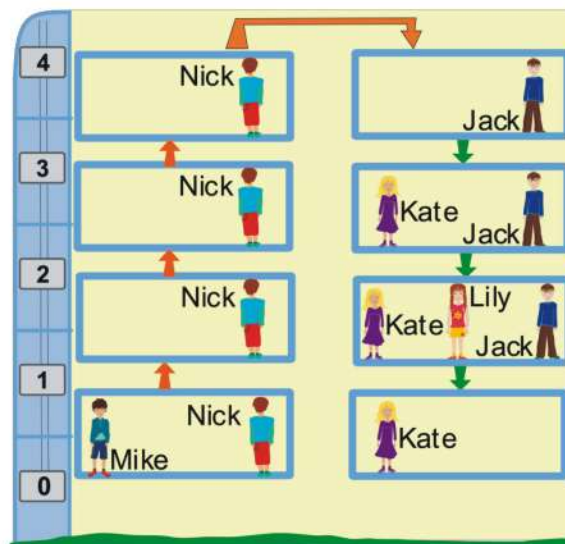
- A) A B) B C) C D) D

T2. Lift

There is an elevator at school.

On a recent trip, the elevator started from ground floor 0, went up to the top floor 4, and then went back down to floor 0. On its way, it made several stops.

See who was in the lift between the floors:



Question / Challenge

Which of these statements is true?

- A) Jack went from floor 4 to floor 0.
- B) Only Mike took the elevator to go one floor only.
- C) Two people left the elevator at floor 1.
- D) Jack and Kate each took the elevator to go 3 floors.

T3. Longest Sequence

Here is a sequence of length 16 made using three different shapes:



You may change the shape of exactly two items in the sequence.

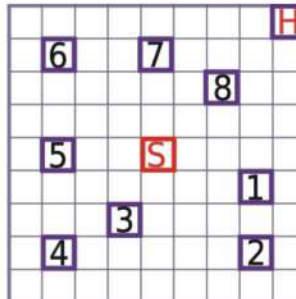
Question / Challenge

What is the [length of the] longest unbroken chain of identical shapes possible?

- A) 4
- B) 5
- C) 6
- D) 7

T4. Encrypted Path

Bella walks from school S to house H with a group of friends. Along the way, friends go to their own houses marked with numbers 1 to 8 in this order (look at the square grid below).



The path they walk can be described by a code. A piece of code is formed of a number followed by one of the the letters U, D, L or R.

- U = up
- D = down
- L = left
- R = right

The number represents the number of squares the group moves and the letter determines the direction they move in. For example, “4D” means “four squares down”. When they get to a house, the group waits for their friend to enter the house. This is marked with * in the code.

Question / Challenge

Which code represents the path from S to H so all friends reach their house in the correct order?

- A) 3R1D*2D*3L1U1L*1L1D1L*3U*3U*3R*1R1D1R*2R2U
- B) 3R1D2D*3L1U1L*1L1D1L*3U*3U*3R1R*1D1R*2R2U
- C) 2R1D*2D*3L1U1L*1L3D1L*3U*3U*3R*1R1D1R*2R5U
- D) 3R*1D2D*3L1U1L*2L1D1L*3U*3U*3R*1R1D1R*2R2U

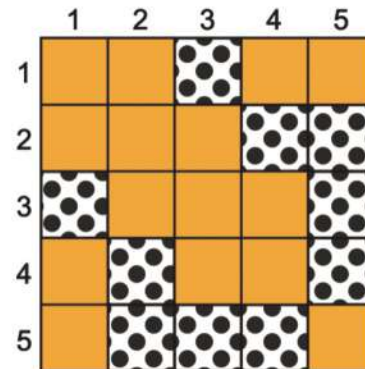
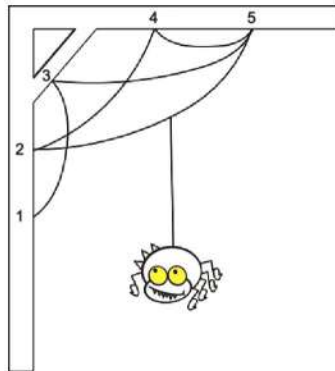
T5. Spider Quilts

When Wanda sees an interesting web she uses it to design a new quilt.

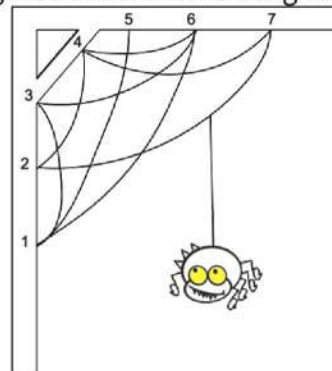
She numbers the web's anchor points from 1 to N and then arranges squares of fabric into an N-by-N grid as follows:

- For every piece of silk, if its anchors are numbered X and Y, she places two dotted fabric squares in her grid:
 - One dotted fabric square is placed where row X and column Y meet.
 - Another dotted fabric square is placed where row Y and column X meet.
- The rest of the grid is filled using solid fabric squares.

For example, the spider web on the left inspired the quilt on the right.

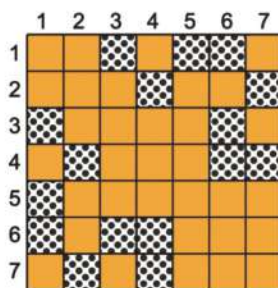


Wanda now sees the following web and wishes to design a new quilt:

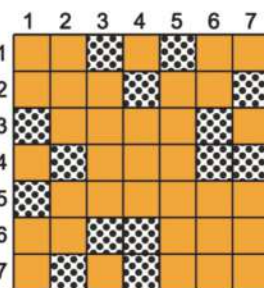


Question / Challenge

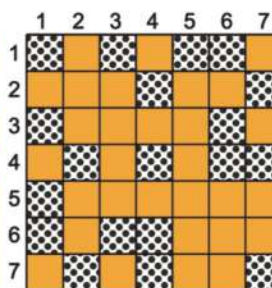
What might her quilt look like?



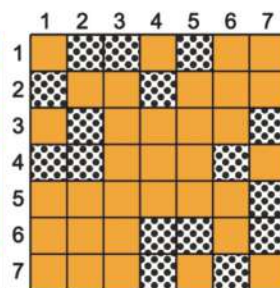
A)



B)



C)



D)

T6. Ada's Marble Machine

Ada the engineer has been asked to create a sorting machine to sort marbles.

Ada knows the following restrictions on the marble designs:

1. marbles made of metal cannot be large-sized
2. marbles made of stone cannot be red
3. the glitter decoration cannot be applied to large marbles
4. the mosaic decoration cannot be applied to red marbles



Question / Challenge

Which of the following marble designs is allowed by the restrictions?

Answer	Size	Colour	Material	Design
A)	Small	Red	Stone	Glitter
B)	Small	Red	Metal	Mosaic
C)	Large	Red	Metal	Mosaic
D)	Large	Yellow	Stone	Mosaic

T7. Decorations

Lara and Michaela decorated the Christmas tree. They had 18 unique decorations.



Michaela challenged Lara to guess which of these decorations she liked the most. Michaela told Lara that she could only ask questions:

Is it green? Is it red? Is it blue? Is it a ball? Is it a star? Is it a bell? Does it have an ornament?

Michaela answered her questions only „yes“ or „no“.

Question / Challenge

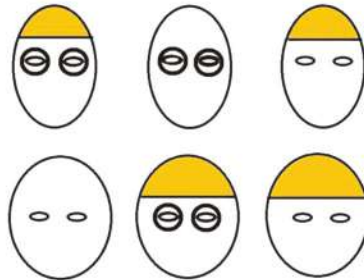
How many questions, at most, does Lara have to ask in order to determine Michaela's favorite decoration?

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

Tasks T8 – T14 carry 4 points each

T8. Egg Queries

Mary painted 6 easter eggs as shown in the image below.



Simone chooses one of them, without telling her choice.

In order to guess which egg Simone selected, Mary is allowed to ask 2 questions – whether on the size, color of the top or if the egg has glasses.

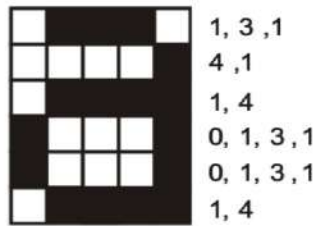
Question / Challenge

Which combination of questions offers the best chance to be able to know the selected egg?

- A)
- B)
- C)
- D) It does not matter

T9. Coloring Code

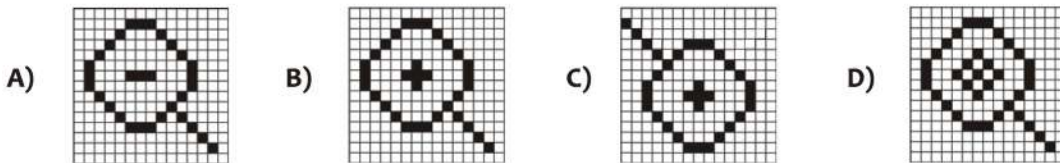
Raster images consist of small dots called pixels (picture elements). Each pixel represents a certain color. For example, in a black and white picture, each pixel is either black or white. To avoid wasting disc space while saving pictures a compression method is applied. An example of saving a picture of letter “a” is provided below. The first number in each row always relates to the amount of white pixels at the beginning of the row. If the first pixel is black the row begins with a zero.



Question / Challenge

What picture is saved with the following code?

- 15
- 5, 3, 7
- 4, 1, 3, 1, 6
- 3, 1, 5, 1, 5
- 2, 1, 7, 1, 4
- 1, 1, 4, 1, 4, 1, 3
- 1, 1, 3, 3, 3, 1, 3
- 1, 1, 4, 1, 4, 1, 3
- 2, 1, 7, 1, 4
- 3, 1, 5, 1, 5
- 4, 1, 3, 1, 1, 1, 4
- 5, 3, 3, 1, 3
- 12, 1, 2
- 13, 1, 1
- 15



T10. Alphabet Order Cypher

Martians developed an algorithm for encryption. An encrypted word has two parts: the first part consists of the numerical value of the word to be encrypted, and the second part consists of the alphabetical order of each letter in the word.

They use the table below for all encryption operations:

A	B	M	N	O	R	S	T	U
1	2	4	10	50	180	300	650	960

For example, the word "MARS" is encrypted as follows. The numerical value of the word is formed by summing the corresponding values of the letters in the table ($4+1+180+300=485$).

In the word "MARS", if we order all letters alphabetically we have A-M-R-S. So, the alphabetical order index is A=1, M=2, R=3, S=4.

Therefore, the encryption for the word "MARS" is 485;2134.

Question / Challenge

If the word SATURN was encrypted using the same algorithm, which of the following would be the correct encryption?

- A) 1440;415632
- B) 1440;718964
- C) 2101;415632
- D) 2101;718964

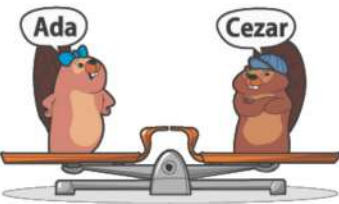
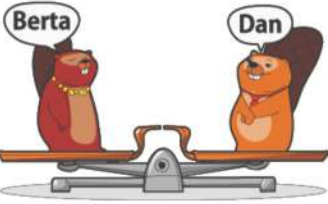


T11. Compare

Four beavers Ada, Berta, Cezar, and Dan are playing with a scale and took many photos. Three photos are shown below.



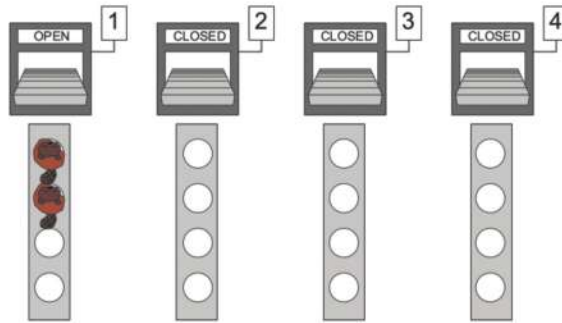
Question / Challenge

Which of the following photos could also have been taken?

- A) 
Photo showing Ada weights the same as Cezar.
- B) 
Photo showing Berta weights the same as Dan.
- C) 
Photo showing Cezar weights less than Ada.
- D) 
Photo showing Berta weights more than Dan.

T12. Shop Counters

A shop has four counters numbered 1, 2, 3, 4. Initially, all counters are closed except for the first one (counter 1). For each counter, customers can stand in a queue with a maximum length of 4 (including the customer currently served). It takes 2 minutes for each customer to be served at a counter (counters will serve customers one at a time).



If a customer has no queue to go to because all of them are full, a new counter opens and he goes there instead. However, it will take 1 additional minute to serve a customer to a new counter because the cashier needs some time to set up the counter, so it will take 3 minutes to serve the first customer at a newly opened counter. Following customers will be served in 2 minutes as usual.

When a customer wants to check out his shopping basket, he goes to the first counter that is not full (tries counter 1, if full then counter 2 etc.) and goes to the last place in the queue. If at a time there are both customers who leave a queue (have been served) and customers who want to join a queue, you can consider that served customers leave the queue first and the new customers can join those queues if they were initially full.

Question / Challenge

If 12 customers arrive at the counters, two at a time each minute (two customers arrive initially, another two after 1 minute etc.), how long does it take to serve them all?

- A) 12 minutes
- B) 11 minutes
- C) 13 minutes
- D) 8 minutes

T13. Art Mafia

TransArt is a logistic company specialized in the transport of paintings. Paintings are brought to a store for inspection, and then couriers transport them to their final destination. Every arriving painting is put on top of the stack of paintings. Every courier who takes a painting for transportation to its final destination, takes the painting from the top of the stack.

For security reasons, TransArt keeps good records of all paintings coming in and out.



Paintings brought in the store	
Time	Painting
11:40	Beavers on the grass
12:15	Happy beaver
12:55	Sun and moon
13:30	Enchanted forest
14:18	Oak and birch
15:10	Swampy romance

Paintings taken from the store	
Time	Courier
12:25	A
13:35	C
14:35	A
14:40	B
15:20	C
15:35	D

One evening TransArt was told that “Sun and Moon” never reached the museum that was supposed to receive it. The courier who took it from the store might have stolen it.

Question / Challenge

Who took “Sun and Moon”?

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

T14. Sorting Beavers

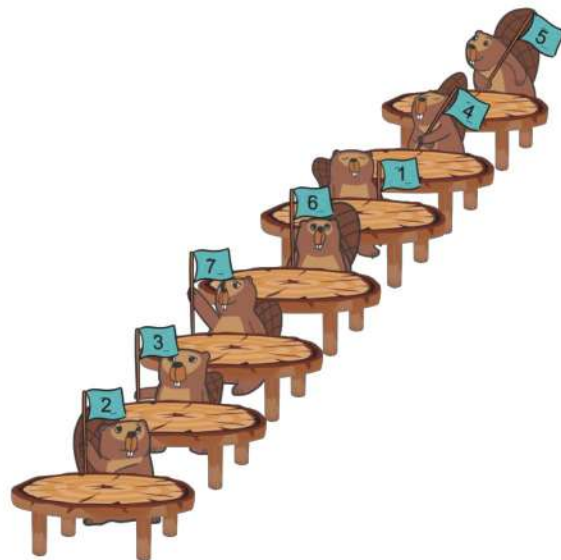
One classroom in Beaver school has only seven beavers, each given a flag with a number on it. They are seated in a row behind one another.

At the beginning, the beavers are sitting randomly as shown in the picture.

The class's teacher wants to sort the beavers from number 1 at the front to number 7 at the back. They can only be sorted using swapping operations, in each swap only two beavers are able to change their places by exchanging them.

For example: when beavers 3 and 1 swap, it means that beaver 3 goes to 1's place and 1 goes to 3's place.

Using a finite number of swaps, the beavers will be sorted ascending from the first desk to the last.



Question / Challenge

Which is the minimum number of these swaps to obtain the desired order?

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

Tasks T15 – T21 carry 5 points each

T15. Beavers market

Joe the beaver is in the Beavers market. He finds a seller with the following fruits:



He wants to sort the fruits by price in ascending order by using a method that only implies counting and adding.

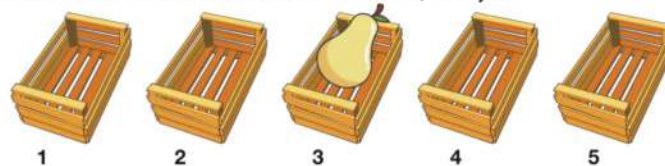
For counting he uses stones that he puts in jars. He noticed that the fruits have only three unique prices, so he needs three jars labeled with \$0.70, \$1.00 and \$1.50 exactly in this order.

He puts one stone in the \$0.70 jar, because only the orange costs \$0.70. Then in the \$1.00 jar he puts three stones, because there are two fruits that cost \$1.00 each: the pear and the apple, and he also adds to the counting the number of stones in the previous jar: one, for the orange that costs \$0.70.

In the \$1.50 jar he puts five stones, because there are two fruits that cost \$1.50 each: the bananas and the grapes, and he also adds to the counting the number of stones in the previous jar, three.



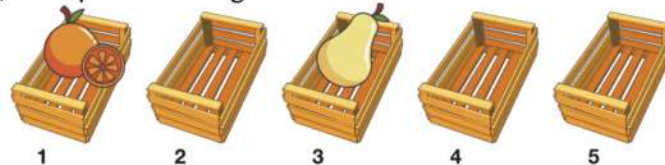
Now Joe starts sorting the five fruits by price in five boxes. The first fruit is the pear, that costs \$1.00. He checks the \$1.00 jar and he finds that it has three stones in it. So he puts the pear in the third box and removes a stone from the \$1.00 jar.



The jars are now the following:



He applies the same steps on the orange, that costs \$0.70. He sees in the \$0.70 jar there is only one stone, so he puts the orange in the first box and removes the stone from the jar.



So the jars are now the following:






Question / Challenge

Which is the content of the jars after all the fruits are sorted?

A)	 \$0.70	 \$1.00	 \$1.50
B)	 \$0.70	 \$1.00	 \$1.50
C)	 \$0.70	 \$1.00	 \$1.50
D)	 \$0.70	 \$1.00	 \$1.50

T16. Chez Connie

Beavertown's favorite takeaway, *Chez Connie*, is about to open and lots of beavers are already waiting in line, impatient to order one of the three treats on the menu:

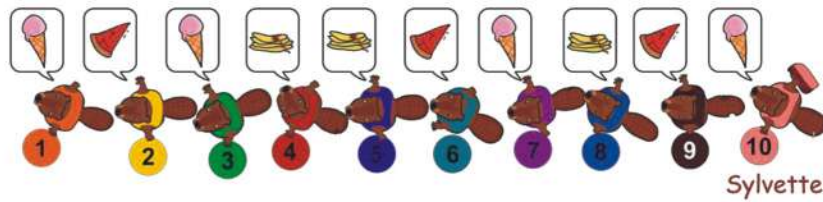
- an ice cream , which is prepared in 3 minutes,
- a crêpe , prepared in 8 minutes, or
- a pizza , prepared in 12 minutes.

 3 min	 8 min	 12 min
---	---	--

To reduce the waiting time, *Chez Connie* offers its treats at three different windows, **A**, **B**, and **C**, operated by **Connie** and her two best beaver friends, **Ben** and **Anne**.

A beaver at the front of the queue will always choose the first available window in alphabetical order (window **A** if it is free, then **B**, then **C**), or wait until one becomes available. Once at a window, a beaver will place its order, wait for it to be prepared and then leave with the treat as soon as it's ready.

The image below illustrates the first ten beavers in the queue and the actual treats they are about to order (shown in the speech bubble above each beaver). Have you noticed Sylvette, number 10, right at the end of the queue?



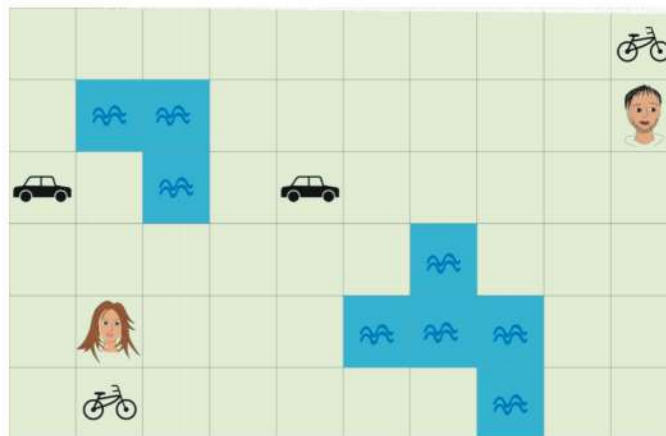
Question / Challenge

Who will take Sylvette's ice cream order: Anne, Ben, or Connie?

- A) Anne (at window A)
- B) Ben (at window B)
- C) Connie (at window C)
- D) It is not possible to determine.

T17. Meeting race

Two friends need to meet urgently - see the map below. They can walk from a square to a horizontally or vertically adjacent square in exactly one minute. If they reach a bike or car they can use it to travel faster – 2 squares in one minute with a bike, 5 squares with a car. They cannot travel over water.



Question / Challenge

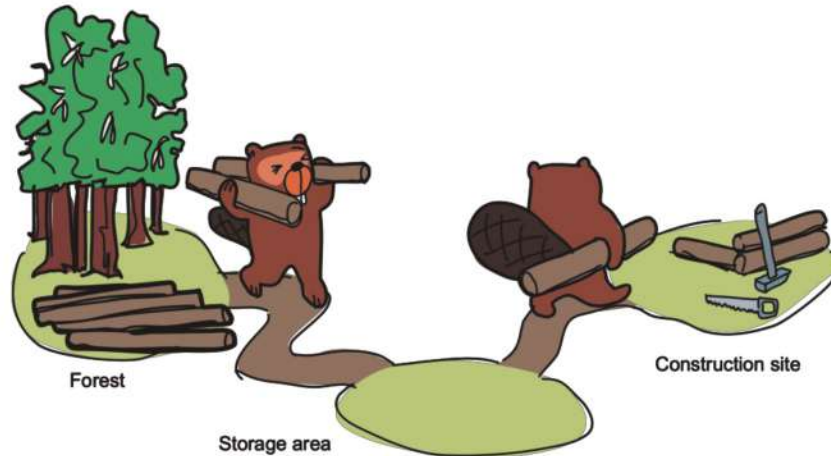
What is the minimum number of minutes they need to end up on the same square?

- A) 2
- B) 3
- C) 4
- D) 5

T18. Logs

Jack and Sam are building a log house. Jack is bringing logs from the forest to the storage area. He can move from the forest to the storage area in 5 minutes and drag two logs at the same time. Sam is taking the logs from the storage area to the construction site. He can move from the storage area to the construction site in just 2 minutes, but only carry one log. Both beavers move at the same speed to and from the storage area with or without logs. They are working as follows:

- When Jack arrives at the storage area with new logs, he will drop the logs and call out to Sam before returning to the forest; Sam will then stop working at the construction site and take the logs from the storage area.
- When Sam takes the last log from the storage area and returns to the house, he will resume doing his work at the construction site; but if there are logs left at the storage area, Sam will drop the log at the house and immediately return for more logs to the storage area.



Question / Challenge

How many logs will be at most at the construction site 30 minutes after the friends start working?

- A) 3 B) 5 C) 17 D) 20

T19. K-POP Contest

A singing contest was held in Beaver Village with 6 singers in the final round.



Four experts were invited to judge them. Each expert gave points according to their own criteria. The score table looks as following:

Singers	Judges	Nancy	Michael	Grace	James
Anna		80	8	60	0
Betty		90	10	80	50
Carrie		85	7	90	100
Dennis		100	9	100	30
Elin		95	6	70	10
Frank		75	5	50	20



The organizer decided to rank the singers in each of the judges' lists according to the given scores as 1st, 2nd, 3rd..., and then to declare the winner the singer who had the smallest sum of all his ranks.

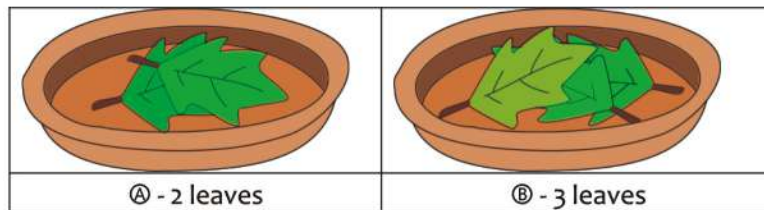
Question / Challenge

Who is the winner?

- A) Anna B) Betty C) Carrie D) Dennis

T20. Taking leaves

Beavers Miley  and Justin  take turns playing a game of "taking leaves". As shown in the picture below, leaves are piled on two plates A and B. When it is a beaver's turn, he or she must take 1 or more leaves from any one plate. The winner of this game is the beaver who takes the last leaf.



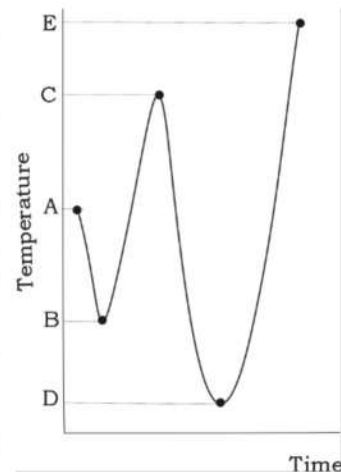
Question / Challenge

What is the starting move where Miley  can win regardless of what her opponent does.

- A) Miley starts by taking 2 leaves from Ⓐ.
B) Miley starts by taking 2 leaves from Ⓑ.
C) Justin starts by taking 1 leaf from Ⓐ.
D) Justin starts by taking 1 leaf from Ⓑ.

T21. Comfort temperature

Every day beaver Theophilus measures the water temperature and records measurements in a table. He records the first measurement immediately after waking up, and the last one shortly before bedtime. Theophilus knows that the temperature changes constantly, so during the day he records only the extreme temperatures - those before which the temperature increased and then began to decrease, or vice versa - decreased and then began to increase. For example, if the temperature changed as in the drawing, Theophilus would have written the numbers A, B, C, D, E in the table. There is exactly one temperature value, the comfort temperature, at which Theophilus feels best.



Question / Challenge

What are the limits of the comfort temperature if the comfort temperature was met exactly five times yesterday and yesterday's observations are the following:

5.1, 5.8, 5.5, 5.9, 5.3, 5.7, 5.4, 5.8, 5.6?

A) 5.2 – 5.3

B) 5.3 – 5.4

C) 5.4 – 5.5

D) 5.5 – 5.6

