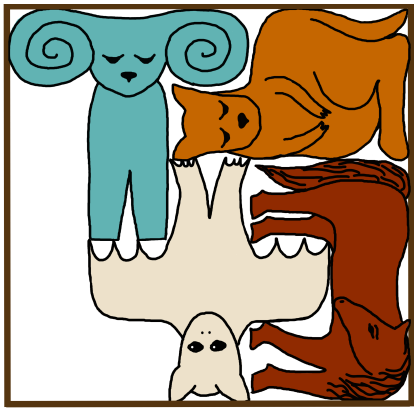
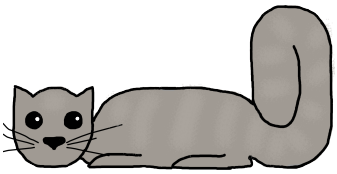
SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST

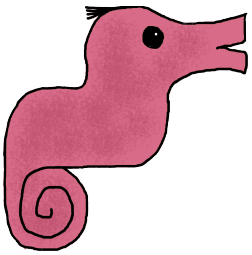
Ecolier

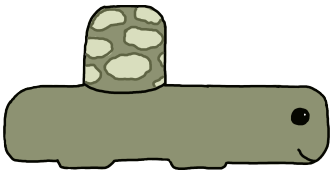
3 points

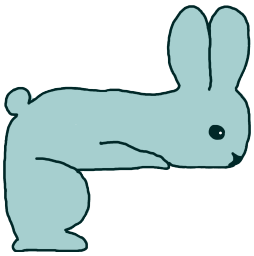
1 (Uzbekistan). 

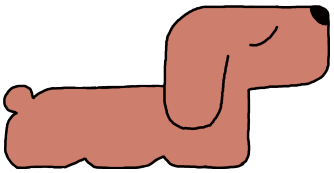
Which animal should Lisa put in to fill the square?

(A) 

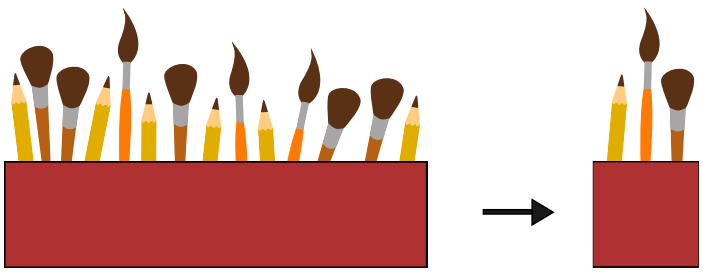
(B) 

(C) 

(D) 

(E) 

Solution: 

2 (Switzerland). 

Anita wants to make up some small boxes containing a pencil and one of each type of paint brush.

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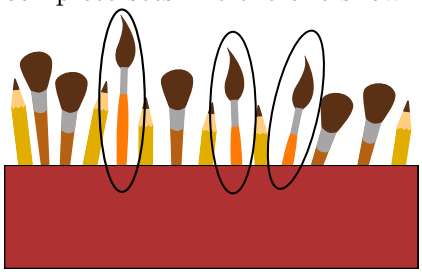
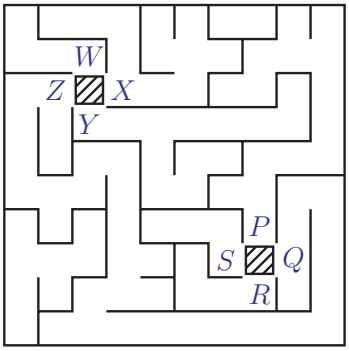
How many complete small boxes can Anita make from the larger box shown above?

(**A**) 2 (**B**) 3 (**C**) 4 (**D**) 5 (**E**) 6

SOLUTION: The number of sets is determined by the type of item with the smallest quantity. There are 6 pencils, 5 regular brushes, and 3 pointed brushes. Therefore, it is possible to create only 3 complete sets like the one shown.

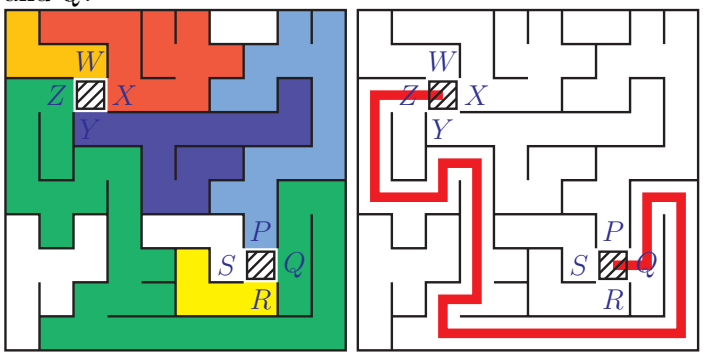


3 (Mexico). Vilka stands on the shaded square between W, X, Y and Z.
Kelia stands on the shaded square between P, Q, R and S.
Which route should Vilka take in order to meet Kelia?

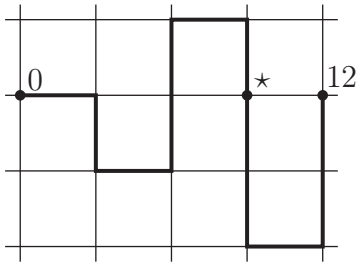


(**A**) X to P
(**B**) Y to P
(**C**) Z to P
(**D**) X to Q
(**E**) Z to Q

SOLUTION: Let's indicate the regions that can be reached with each letter. The only common region is the one corresponding to the letters D and Q. The figure on the right shows a path connecting D and Q.



4 (Sweden). Alina folds a number line in several places, as shown below.
What number is on the line at the place marked by the $\star$?



(**A**) 3 (**B**) 5 (**C**) 6 (**D**) 7 (**E**) 9

SOLUTION: The sides of each square in the grid measure 1 unit. Starting from the number 0 and

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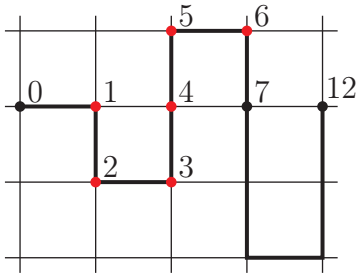
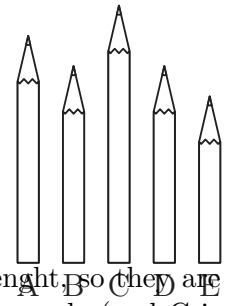
moving along the line, we walk over 7 square sides before reaching the $\star$. This means the number 7 should be at the $\star$, as shown below.



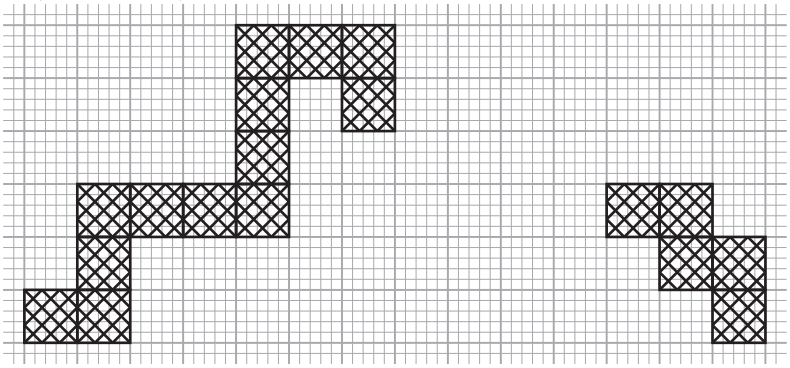
5 (Germany). Finn has 5 pencils.
The shortest one is blue.
The green and red pencils are the same length.
The purple pencil is shorter than the yellow one.
Which pencil is the purple one?



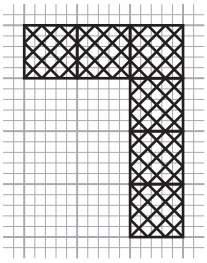
(**A**) A (**B**) B (**C**) C (**D**) D (**E**) E

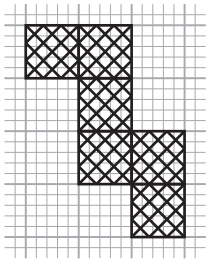
SOLUTION: Pencil E is the shortest, so it is blue. Pencils B and D are the same lenght, so they are green and red. Among the remaining pencils, A is shorter than C; therefore, A is purple (and C is yellow). Note that we do not know the exact colours of pencils B and D.

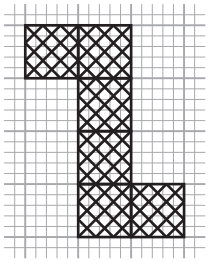
6 (Denmark). The path shown needs a section to join the 2 parts.

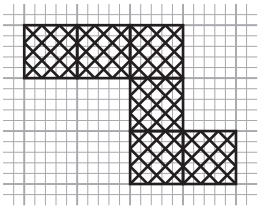


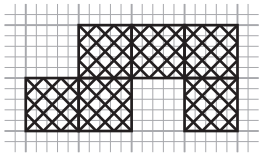
A section may not be turned.
A section needs to share a side with another section of the path.
Which section will complete the path?

(**A**) 

(**B**) 

(**C**) 

(**D**) 

(**E**) 

SOLUTION: The new piece must have at least four squares horizontally, as indicated below. Then, the answer options (A), (B), and (C) are incorrect.

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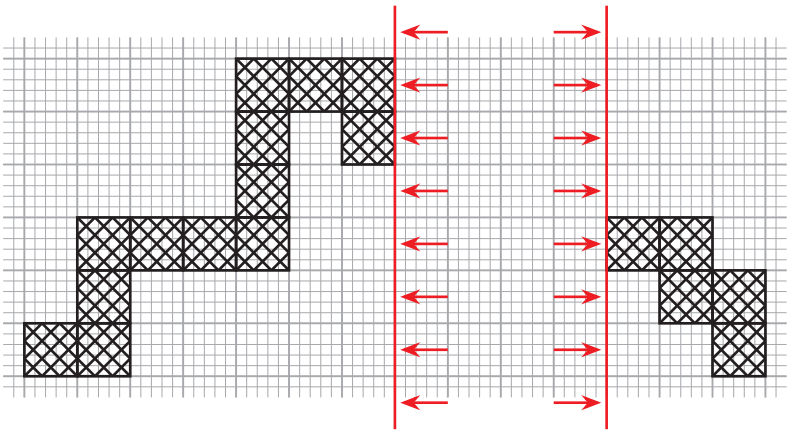
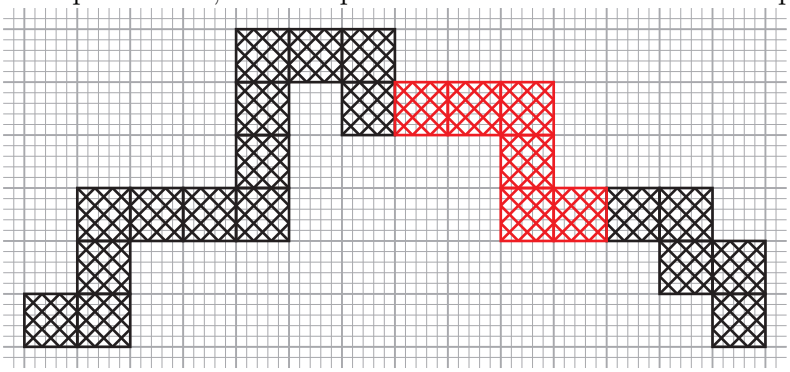
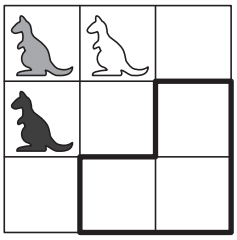


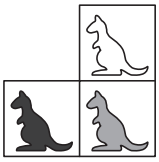
We need to try both (D) and (E). Only (D) completes the bridges, as shown below. Note that in all valid placements, the new piece must share a side with both parts of the bridge.

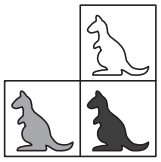


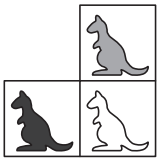
SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST

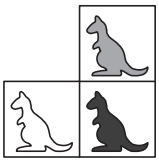
7 (Germany). Dan draws a white, grey or black kangaroo in every small square. After that, each row and each column contains exactly 1 white, 1 grey and 1 black kangaroo.
What does Dan draw in the outlined section?

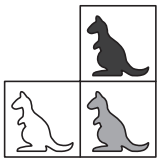


(A) 

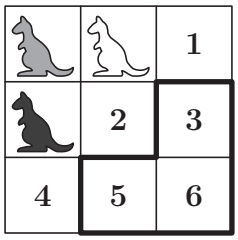
(B) 

(C) 

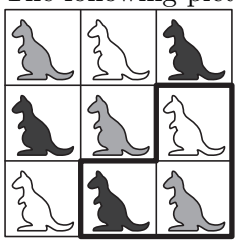
(D) 

(E) 

SOLUTION: Let the empty squares be numbered 1, 2, 3, 4, 5, and 6 as indicated.



The kangaroo in square number 1 must be black, and the one in number 4 must be white.
Therefore, the kangaroo in square number 6 must be grey.
The kangaroo in square number 3 cannot be black, so it must be white.
The kangaroo in square number 5 cannot be white, so it must be black.
Therefore, answer option (A) is correct.
The following picture shows the completed grid with the kangaroos.



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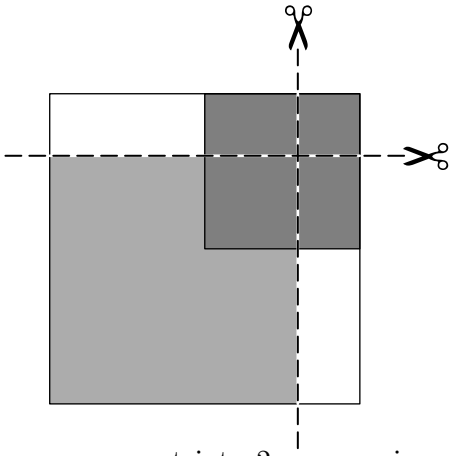
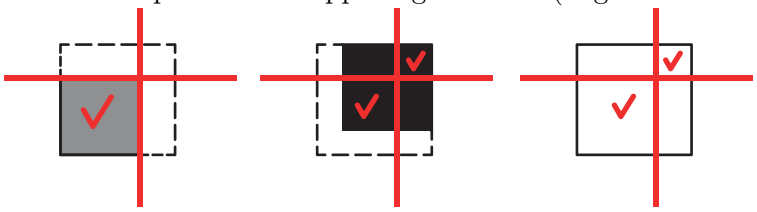
8 (Russia). Ann places a white square on the table.
She then places a grey square and a black square on top, as shown.
Then she cuts the stack of squares along the two lines.
How many squares does she get?



(**A**) 3
(**B**) 4
(**C**) 5
(**D**) 7
(**E**) 9

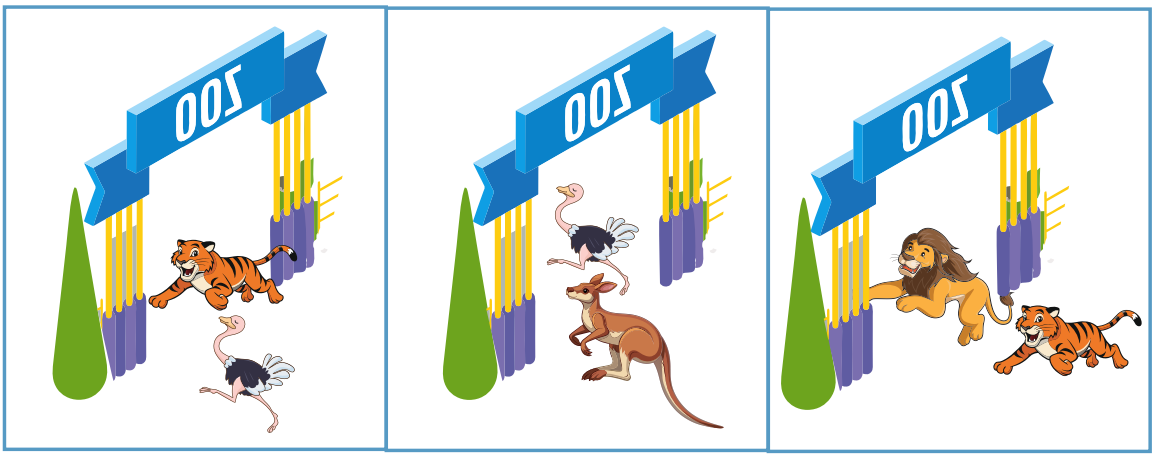
SOLUTION: The grey square remained unchanged. The black square was cut into 2 square pieces: one larger square in the center and one small square in the upper right corner. In the same way, the white square was cut into 2 square pieces: one larger square (aligned with the full gray square) and one small square in the upper right corner (aligned with the black one).



So in total Ann got $1 + 2 + 2 = 5$ squares. All other resulting shapes are not square.

4 points

9 (Slovakia). The 3 photographs show a tiger , a kangaroo , a lion , and an ostrich  escaping from the zoo.



In what order did they escape through the gate?

(**A**) lion, ostrich, tiger, kangaroo (**B**) lion, tiger, ostrich, kangaroo (**C**) tiger, ostrich, kangaroo, lion
(**D**) ostrich, kangaroo, lion, tiger (**E**) tiger, kangaroo, lion, ostrich

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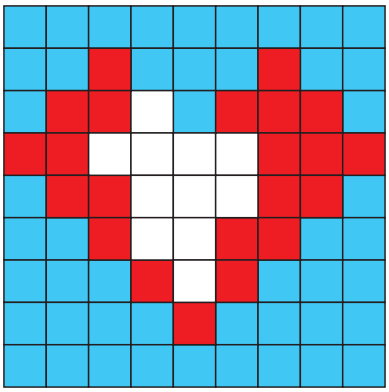
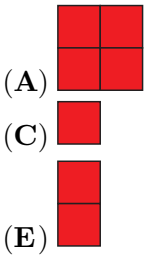
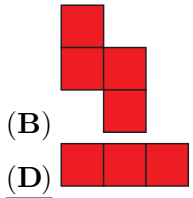
SOLUTION: In the first picture we see that the tiger escapes right before the ostrich. In the second picture we see that the ostrich escapes right before the kangaroo. So, the order of these three animals is: tiger, ostrich, kangaroo.

In the third picture we see that the lion escapes right before the tiger. So the order of all four animals is: lion, tiger, ostrich, kangaroo.

10 (China). Bella is making a heart puzzle for her friend. She intends to use 4 of the following pieces to finish it. Which one does she leave out?

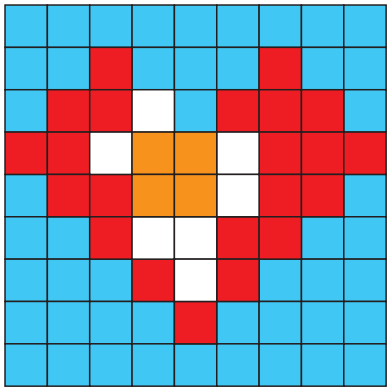






SOLUTION: In the heart puzzle we count 11 empty squares. The pieces in the options consist of a total of 14 squares. So, a piece consisting of $(14 - 11 =)$ 3 squares must be left out. That must be the piece in option (D).

The problem can also be solved by filling the empty squares starting with the biggest piece (A).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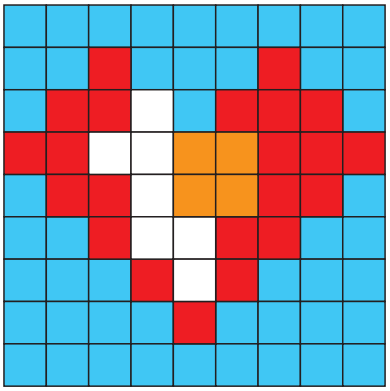
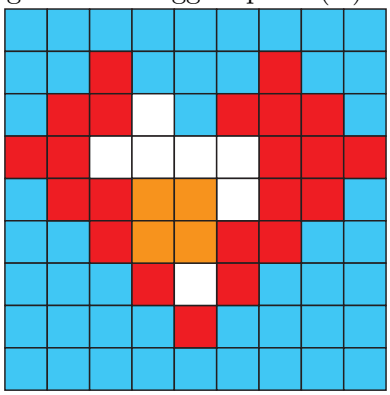
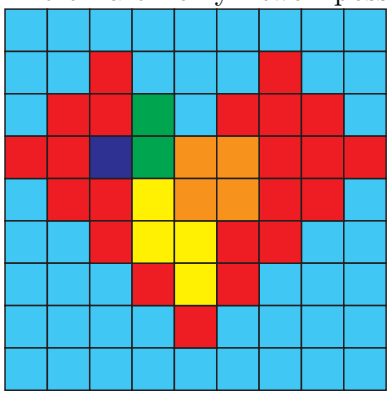

or


There are only two possibilities to fill the rest of which this one is one option:


if you are not allowed to turn the tiles.

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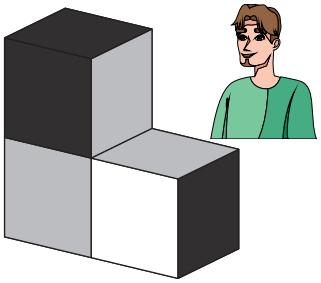
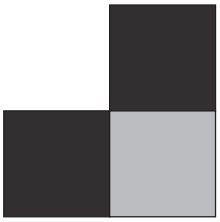
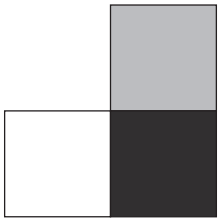
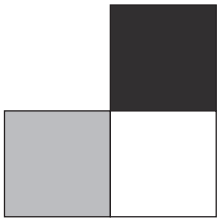
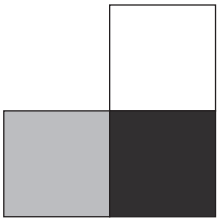
11 (Brazil). Julio has put 3 identical blocks together, as shown.
On every block, each black face is opposite a white face, and each grey face is opposite a grey face.
Julio looks at the building, as shown.
What does he see?

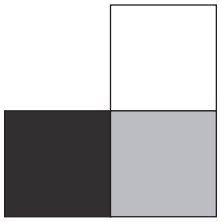


(**A**) 

(**B**) 

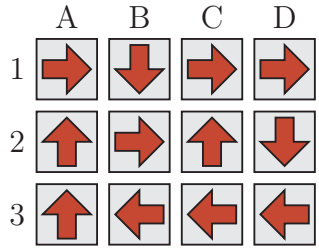
(**C**) 

(**D**) 

(**E**) 

SOLUTION: From the front, there is a black face on top left. So, Julia sees a white face on the top right. This is shown only in option (D) or (E). From the front, there is a grey face on the bottom left. So, Julia sees a grey face on the bottom right. So, the answer is (E).
We can check that the third face in option (E) also shows the correct color.

12 (Indonesia). Each arrow shows how Indira must move from one square to the next.
From which square should Indira start to visit all the squares exactly once?



(**A**) A1
(**B**) B1
(**C**) C2
(**D**) D2
(**E**) A3

SOLUTION: On whatever square we start , we always leave the grid from D1. This can be found out by trying or by examinating the grid carefully.
So, in order to visit all squares exactly once, we must start from D2.

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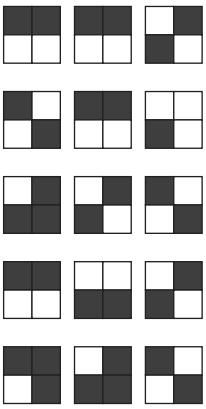
13 (China). Each pattern in the 5 rows shown in the picture represent one of the three-digit numbers: 183, 451, 521, 872, and 882, but not in this order.
Each digit from 0 to 9 has its own unique pattern.
Which number is represented by the pattern in the last row?



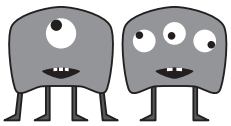
(**A**) 183
(**B**) 451
(**C**) 521
(**D**) 872
(**E**) 882

SOLUTION: We examine the figure to find out whereelse the squares in the last row are found. The first square does not appear in any other row, so it represents a digit that appears exactly once as the hundreds digit of one of the numbers. This is only true for the number 451, so this is the answer.

A second solution which starts with examining the numbers instead of the figure is the following:
Two of the numbers, 872 and 882, start with the same digit. Only the patterns in the first and in the fourth row have the same square on the left, so these represent 872 and 882. Only in the first row the first and the second square are identical, so this row represents 882, and hence the fourth row represents 872.
The digit 2 which appears in 882 and 872 can also be found in the number 521. The corresponding square (the right one in the fourth row) can be found in the third row as the second square. So, the third row represents the number 521.
The digit 1 which appears in 521 can also be found in the number 451. The corresponding square (the right one in the third row) can be found in the second row as the first square and in the last row as the third square. So, the second row represents the number 183, and the last row represents the number 451.

SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST

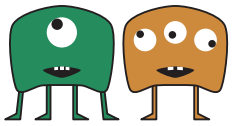
14 (Germany). In a village, there are two types of monsters:



- monsters with 1 eye and 4 legs,
- monsters with 3 eyes and 2 legs.

The monsters have 9 eyes and 16 legs in total.
How many monsters with 1 eye are there?

(**A**) 1 (**B**) 2 (**C**) 3 (**D**) 4 (**E**) 5

SOLUTION: Colour version: 
There can be at most 3 monsters with 3 eyes, because 4 such monsters already have $3 \cdot 4 = 12$ eyes in total.
If there were 3 monsters with 3 eyes, there would be $9 - (3 \cdot 3) = 0$ monsters with 1 eye. In total the monsters would have 9 eyes and $3 \cdot 2 = 6$ legs, which is less than the requested 16.
If there were 2 monsters with 3 eyes, there would be $9 - (2 \cdot 3) = 3$ monsters with 1 eye. In total the monsters would have 9 eyes and $(2 \cdot 2) + (3 \cdot 4) = 16$ legs, as requested.
If there was 1 monster with 3 eyes, there would be $9 - (1 \cdot 3) = 6$ monsters with 1 eye. In total the monsters would have 9 eyes and $(1 \cdot 2) + (6 \cdot 4) = 26$ legs, which would be too many.
And if there were no monsters with 3 eyes, there would be 9 monsters with 1 eye. In total the monsters would have 9 eyes and $9 \cdot 4 = 36$ legs, which would also be too many.
So, there are 2 monsters with 3 eyes and 3 monsters with 1 eye in the village.

15 (Germany). Selina has built towers from cubes on a square grid.
Looking from above, the number on each tower shows the tower's height.
Looking from the front in the direction of the arrows, Selina cannot see towers that are behind higher towers.
How many towers can she see?

4	8	8	6
2	6	6	8
6	4	2	4
2	2	4	6

↑ ↑ ↑ ↑

(**A**) 8 (**B**) 9 (**C**) 10 (**D**) 11 (**E**) 12

SOLUTION: We mark the towers that Selina can see in grey.

4	8	8	6
2	6	6	8
6	4	2	4
2	2	4	6

↑ ↑ ↑ ↑

Selina can see 11 towers.

16 (Poland). Cela, Ela, and Fela go to an ice cream shop.

One of the girls buys strawberry ice cream ,

another buys vanilla ice cream ,

and another buys chocolate ice cream .

Each girl buys a different number of scoops: 1, 2, or 3.
We know that:
• Cela does not buy strawberry ice cream and chooses the smallest amount,

SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST

• Ela does not buy chocolate ice cream,
• The chocolate ice cream is the largest.
Which ice cream does Fela buy?

(**A**)  (**B**)  (**C**)  (**D**)  (**E**) 

Solution: As the chocolate ice cream is the largest, there are 3 scoops of chocolate ice cream.

As Cela chooses the smallest amount and Ela doesn't buy chocolate ice cream, the 3 scoops of chocolate ice cream are chosen by Fela. It is shown in answer (E).

5 points

17 (Poland). Rosy wishes to write the numbers 2, 0, 2, 6 in the square grid shown, so that in each row and in each column there is exactly one 0 and one 6 and two 2's. She has already written some of the numbers.
When she has finished, what will the sum of the numbers in the squares with the question marks be?

2			
	0		?
		2	
	?		6

(**A**) 0 (**B**) 2 (**C**) 4 (**D**) 6 (**E**) 8

Solution: In the second row there are the numbers 2, 2 and 6 missing. The 6 can only be in the first or third column and the two numbers 2 are in the remaining two cells. We have two cases, as shown in the pictures. In each case we can fill in the missing two numbers 6 by looking at the columns. Then we can fill in the missing numbers 0 by looking at the rows. Finally, we fill the remaining empty cells with numbers 2. In both cases we find that the two cells with a question mark contain a number 2. So, the solution is $(2 + 2 =)$ 4.

2			
6	0	2	2
		2	
			6

→

2		6	
6	0	2	2
	6	2	
			6

→

2		6	0
6	0	2	2
0	6	2	
		0	6

→

2	2	6	0
6	0	2	2
0	6	2	2
2	2	0	6

2			
2	0	6	2
		2	
			6

→

2	6		
2	0	6	2
6		2	
			6

→

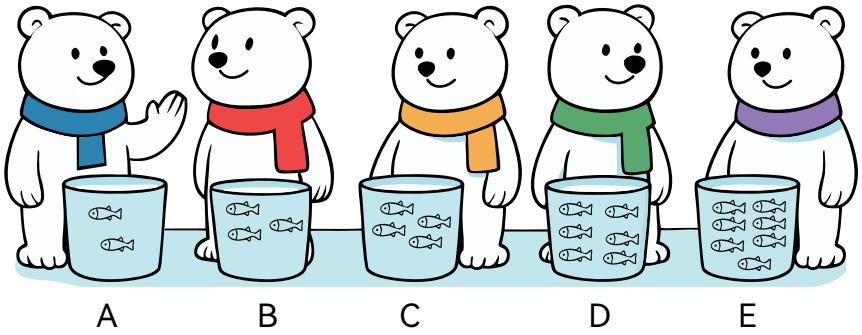
2	6	0	
2	0	6	2
6		2	0
0			6

→

2	6	0	2
2	0	6	2
6	2	2	0
0	2	2	6

18 (China). The 5 polar bears, Karen, Lisa, Marieke, Nadja and Peter, each keep the fish they have caught in a bucket.
Karen tells Lisa: "Give me 2 fish, and we will have the same number of fish."
Marieke tells Karen and Lisa: "I have half the number of fish that you two have in total."
Which bucket is Lisa's?

SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST



(**A**) A (**B**) B (**C**) C (**D**) D (**E**) E

SOLUTION: Karen and Lisa had the same number of fish if Lisa gave 2 of his fish to Karen. That means, that Lisa has 4 fish more than Karen. Hence, Karen has bucket A and Lisa bucket D, or Karen has bucket B and Lisa bucket E. That means, we have two cases.
Marieke has half the total number of fish of Karen and Lisa, that means in the first case she would have $(2+6):2=)$ 4 fish and in the second case she would have $(3+7):2=)$ 5 fish.
Bucket C contains 4 fish and there is no bucket that contains 5 fish. Hence the first case is the only one possible, and it is clear that Marieke's bucket is bucket C and Lisa's is bucket D.

19 (Vietnam). Five children, Hoa, My, Toa, Ly and Chi, hold hands to make a circle, facing upwards.

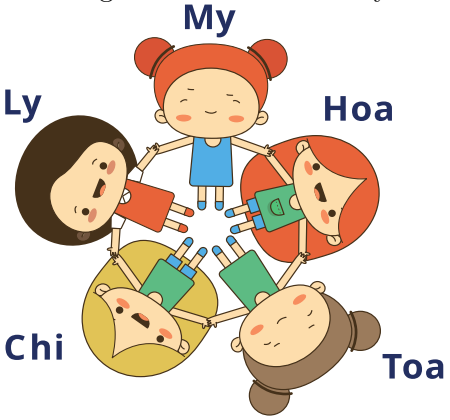


- Hoa is holding My's left hand,
- Ly is not holding Toa's hand,
- Toa is holding Chi's right hand.

Who is Ly holding hands with?

(**A**) Hoa and Chi (**B**) Hoa and My (**C**) Toa and My
(**D**) Chi and My (**E**) Toa and Chi

SOLUTION: Hoa's position can be determined first. Since Ly is not standing next to Toa, from the three children that we don't know yet, Chi must be the middle one between Toa and Ly. Given that Toa is holding Chi's right hand, Toa's position and then Ly's position can finally be identified. Ly is standing between Chi and My.

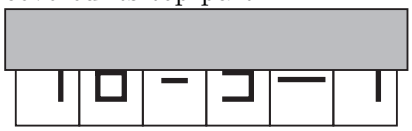


20 (Russia). Alex has 13 cards with digits and arithmetic symbols:



SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST

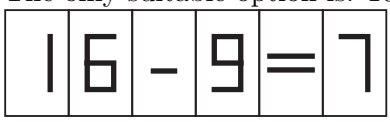
Using some of these cards, without rotating any of them, he formed a valid calculation and then covered its top part:



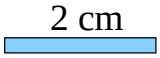
What is the sum of the 4 digits Alex used?

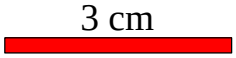
(**A**) 19 (**B**) 21 (**C**) 23 (**D**) 25 (**E**) 32

SOLUTION: We first note that the third and the fifth card are the minus sign and the equal sign. We compare the other cards with the 13 cards shown above.
The first digit could be either 1 or 7, but 7 does not work because a one-digit number is being subtracted and the result after the equal sign is also a one-digit number. So, the first digit is 1.
The second digit could be 6 or 8. The digit after the minus sign could be 3, 5, or 9. Because the result is a one-digit number, the digit after the minus sign must be greater than the digit before the minus sign, i.e. it is 9.
The digit after the equals sign could be 1 or 7.
The only suitable option is: $16 - 9 = 7$. The sum of the digits used is: $1 + 6 + 9 + 7 = 23$.



21 (Poland). The 3 girls Lea, Ida and Mia, each have a box of sticks.
One girl has 

sticks, another 

sticks, and another 

sticks.
We do not know which one has which.
Lea places her stick on the ground.
Then each girl places her stick to the right of the previous stick in the order Mia, Ida, Lea, Mia, Ida, Lea and so on.
This makes a straight line 50 cm long.
Which 2 sticks are at the beginning and at the end of the line?

(**A**) 

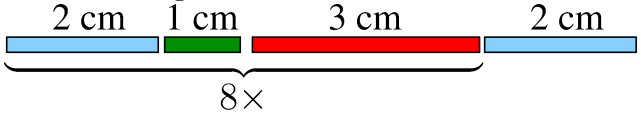
(**B**) 

(**C**) 

(**D**) 

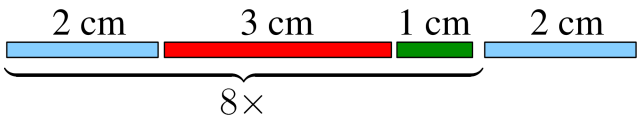
(**E**) 

SOLUTION: After each girl arranges one stick, we get a segment 6 cm long. After eight such arrangements, we get a segment 48 cm long. This is 2 cm less than 50 cm, so the last stick in the "train" was 2 cm long. As they always placed their sticks in the same order, the first stick the girls arranged was also 2 cm long. The train could therefore look like this



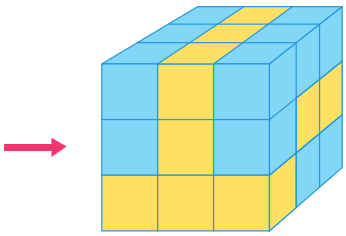
or this

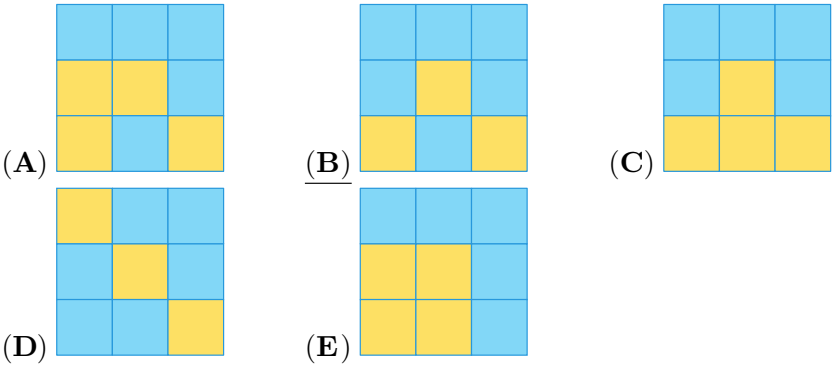
SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST



and definitely starts and end with a stick of length 2 cm.

22 (United States). The big cube is made out of 16 blue cubes and 11 yellow cubes, all of the same size.
Lily is looking towards the cube in the direction shown.
What could she see?

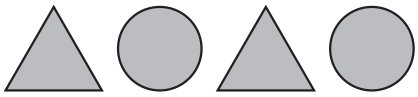




Solution: There are 11 yellow cubes in total: 9 are visible, and hence 2 are hidden. From the left side, Lily can at most see only 3 yellow cubes (the 1 in the corner that is visible from the front and 2 hidden ones).
A, C, and E show more than 3 yellow cubes.
In choice D, the top row has a yellow cube, but the top row must be all blue, as can be seen in the original picture.
So, we can eliminate these choices.
Only B shows 3 yellow cubes, and the top row is all blue. So, the answer is B.

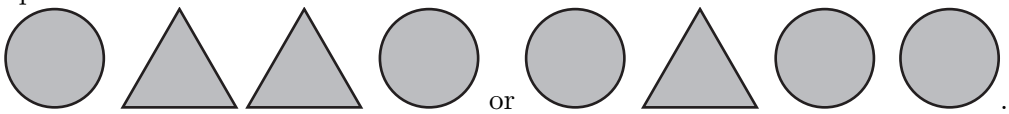
SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST

23 (Puerto Rico). There are 4 buttons in a row on a screen.
2 of them show circles and 2 show triangles.
When a button is pressed, its shape and the shapes of any buttons directly next to it change.
A circle becomes a triangle and a triangle becomes a circle.
What is the smallest number of button presses needed for the screen to show 4 circles?

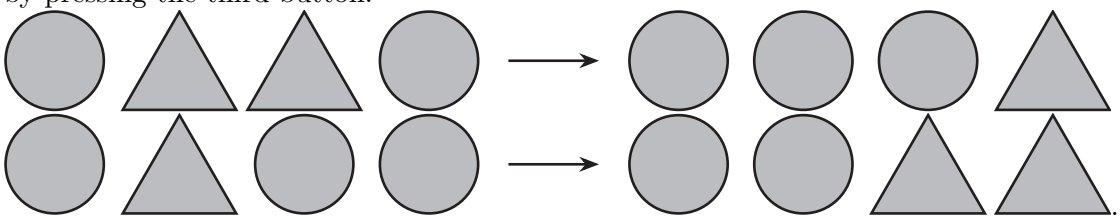


(**A**) 2 (**B**) 3 (**C**) 4 (**D**) 5 (**E**) 6

SOLUTION: We can state that the order you press the buttons does not matter and if you press one button twice the pattern is the same as the pattern without pressing this button. So if you look at the solutions you can directly rule out the answers (D) 5 and (E) 6 because there you have would press one button twice.
Now we look at the first triangle. In order to make it a circle you need to press the first or the second button but not both because then you would have the triangle again. This gives us the following options:

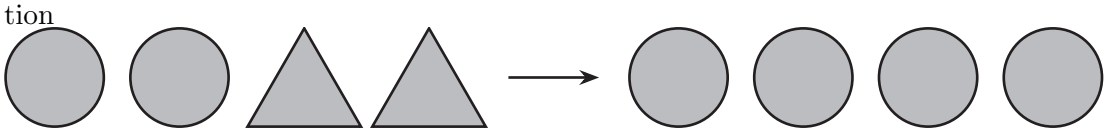

or .

Both options make the second button a triangle. The only way to make this second button a circle is by pressing the third button:


or .

We are not finished, and the only button left to press is the one on the right. This leads to the pattern we are looking for.


is not a solution


is a solution

So the correct answer is (B) 3.

SOLUTIONS INCLUDED - DO NOT USE FOR CONTEST

24 (Estonia). Each square in a grid contains at least 1 sweet.
The grid in the figure shows for each square how many sweets are in total in the neighbouring squares.
Two squares are neighbours if they share a side.
How many sweets are there in total in the 9 squares?

2	4	3
7	7	3
4	6	5

(**A**) 16 (**B**) 17 (**C**) 18 (**D**) 20 (**E**) 21

SOLUTION: In the figure there are two squares (marked in grey, 2 and 3) where there is only one possibility how to place the sweets in the neigbouring squares. So we can start by filling these in (see below).

2	4	3
7	7	3
4	6	5

	·	·
·	·	
		·

Now the squares marked grey in the next picture have a unique solution on how to place the sweets because they have only one neighbouring square which is not determined yet.

2	4	3
7	7	3
4	6	5

This leads to this:

··	·	·
·	·	··
::	···	·

Now we have all squares determined and can calculate the sum. $2+1+1+1+1+2+4+3+1=16$, so the answer is (A).
We can finally also check the placement of the sweets by looking at squares which we haven't looked at (marked grey below) and we see that the placement of the sweeets is indeed correct.

2	4	3
7	7	3
4	6	5