



UNIVERSITY OF
WATERLOO



The CENTRE for EDUCATION in
MATHEMATICS and COMPUTING



2021
*Beaver
Computing
Challenge
(Grades 5 & 6)*

Questions

Part A

Strawberry

Story

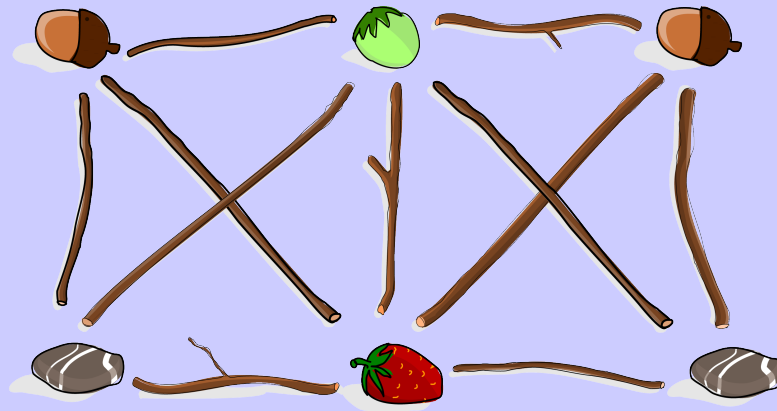
Anja makes a design on the ground using the following four types of objects.



She then places sticks in her design according to her very important rule:



Sticks cannot be placed between objects that are the same type.

Here is Anja's completed design:



Suddenly a bird swoops in and eats the ! Anja would like to avoid having this happen again.

Question

If possible, Anja would like to replace the  with a different type of object, and without moving any sticks. Without breaking her very important rule, which object can Anja replace the  with?



(D) It is not possible. Only a  could go there.

Overlapping Coins

Story

Emil has six different coins.

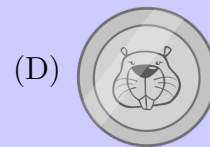
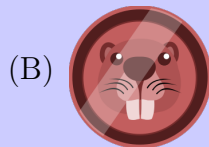


Emil placed the six coins on a table, one at a time. Some coins were placed on top of other coins so that they overlap as shown.



Question

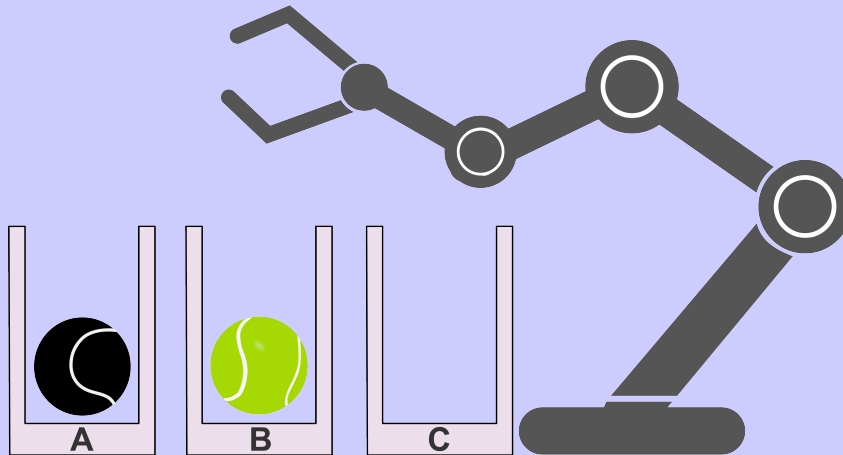
Which coin was the fourth coin that Emil placed on the table?



Robot Arm

Story

There are three bins, two balls, and a robot arm that can pick up the balls. Originally, one ball is in bin A and another is in bin B. Bin C is empty.



Then the robot arm completes the following steps in the order given:

1. Pick up the ball in bin A and put it in bin C.
2. Pick up the ball in bin B and put it in bin A.
3. Pick up the ball in bin C and put it in bin B.

Question

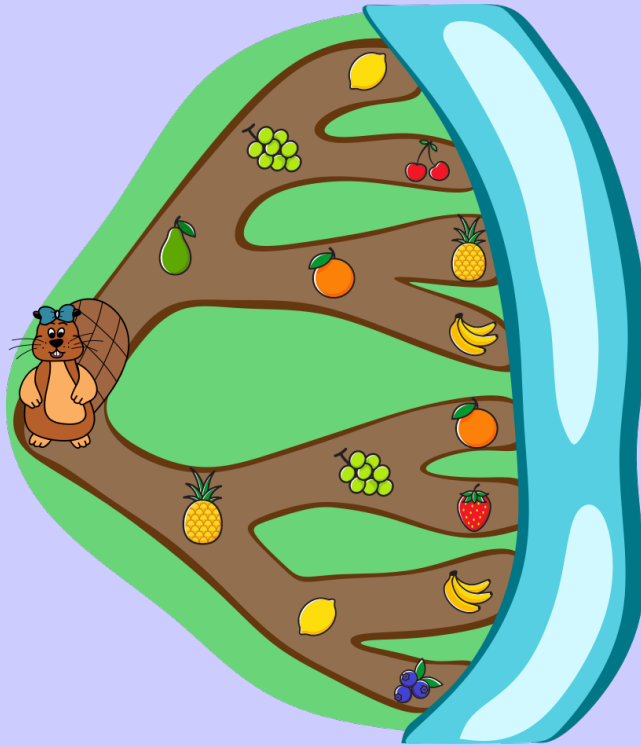
When the robot arm is finished, which of the following statements is true?

- (A) The ball originally in bin A is now in bin B, and the ball originally in bin B is now in bin A.
- (B) Both balls are in bin A.
- (C) Bin A is empty.
- (D) Nothing has changed. Each ball is back in its original bin.

Fruit Road

Story

A beaver wants to take a path to the river. Each path passes by three different types of fruit as shown.



The beaver **must** pass by a pineapple 🍍 which is its favourite fruit.

The beaver **must not** pass by an orange 🍊 which it is allergic to.

Question

How many of the eight possible paths can the beaver take?

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

Part B

Picking Up Carrots

Story

There are 5 animal homes connected by paths with a carrot on each path, as shown.



Rina Rabbit lives in house R. It takes Rina 1 minute to walk on any path between two homes.

Question

Which of the following routes allows Rina to pick up all the carrots and return home in the shortest amount of time?

- (A) $R \rightarrow S \rightarrow T \rightarrow P \rightarrow Q \rightarrow S \rightarrow P \rightarrow R$
- (B) $R \rightarrow P \rightarrow Q \rightarrow S \rightarrow R \rightarrow P \rightarrow T \rightarrow S \rightarrow P \rightarrow R$
- (C) $R \rightarrow S \rightarrow P \rightarrow Q \rightarrow P \rightarrow T \rightarrow S \rightarrow R$
- (D) $R \rightarrow P \rightarrow Q \rightarrow S \rightarrow T \rightarrow P \rightarrow R$

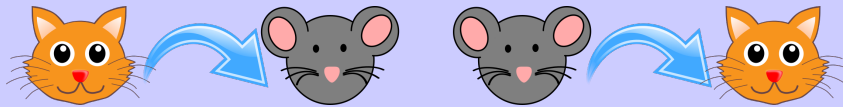
Presents

Story

Friends give presents to one another according to the following two rules.

1. Each friend must give exactly one present.
2. Each friend must receive exactly one present.

Here is an example where Cat gives a present to Mouse, and Mouse gives a present to Cat:



Question

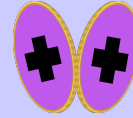
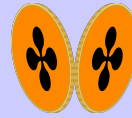
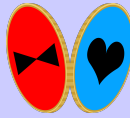
Cow, Cat, Dog and Mouse give presents to each other. Which of the following options does **not** follow the rules?

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

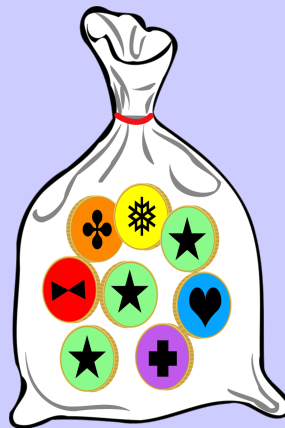
Coin Bag

Story

In Saoirse's country there are four different types of coins. Some coins are the same on both sides, and some are not. The images below show both sides of each type of coin.



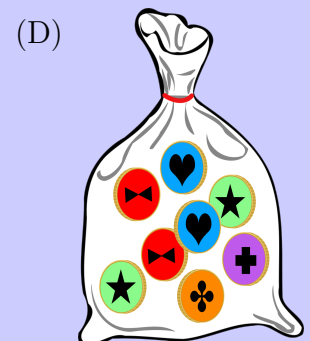
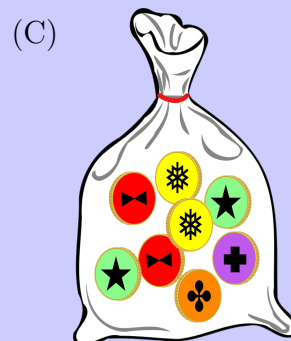
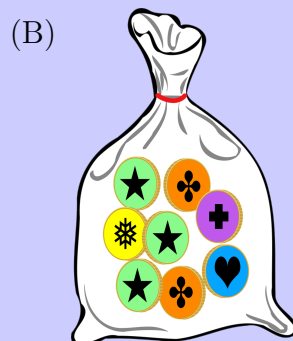
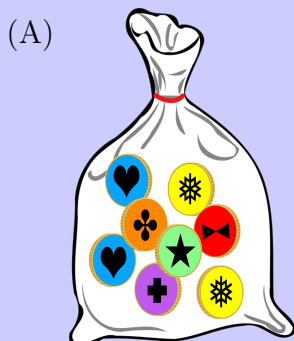
Saoirse has the following bag of coins:



Then the bag is shaken and the coins in the bag move around.




Question

Which of the following could be Saoirse's bag of coins after it was shaken?


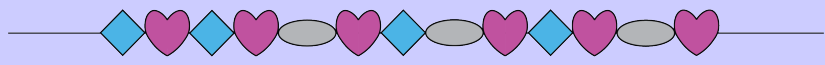


Necklaces

Story

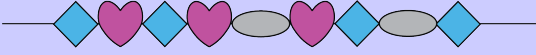
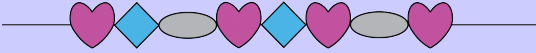
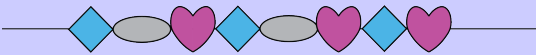

A jeweller makes necklaces with hidden messages by replacing each letter of the alphabet with a bead pattern. Bead patterns are made using heart  and diamond  beads, and the same bead pattern always represents the same letter. Letters in a message are separated by oval  beads and messages are read from left to right.

Here are two of the necklaces the jeweller has made along with their hidden messages.

Necklace	Hidden Message
	TRUTH
	CARE

Question

Which of the following necklaces has the hidden message ART?

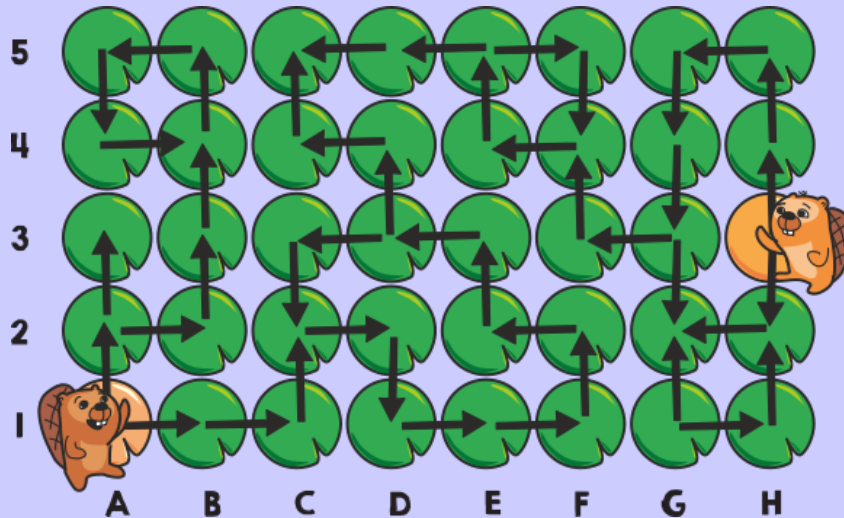
- (A) 
- (B) 
- (C) 
- (D) 

Part C

Do They Meet?

Story

On Lake Castor, lily pads are arranged in a grid, where rows are numbered from 1 to 5, and columns are labelled from A to H. Beaver Bob starts on pad A1 (in the bottom-left corner), and Beaver Nora starts on pad H3.



The beavers can move from one lily pad to another lily pad only if they are following an arrow. The beavers do not necessarily move at the same speed.

Question

Which of the following statements is true?

- (A) The beavers will never meet.
- (B) The beavers could meet on pad C2.
- (C) The beavers could meet on pad F4.
- (D) The beavers could meet on pad C5.

Paintings

Story

Paintings are brought to a warehouse for inspection before they are delivered to museums. The paintings are stacked on top of each other. When a painting arrives at the warehouse, it is put on top of the stack. When a delivery person departs with a painting, they take the painting from the top of the stack.



Records are kept of all paintings arriving at the warehouse and departing from the warehouse:

<i>Arrivals</i>		<i>Departures</i>	
<u>Time</u>	<u>Painting</u>	<u>Time</u>	<u>Delivery Person</u>
11:40	Beavers on the Grass	12:25	Pia
12:15	Happy Beaver	13:35	Raz
12:55	Sun and Moon	14:35	Stu
13:30	Enchanted Forest	14:40	Quy
14:18	Oak and Birch	15:20	Raz

Question

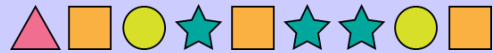
Which delivery person took “Sun and Moon” to a museum?

- (A) Pia
- (B) Quy
- (C) Raz
- (D) Stu

Shapes

Story

Here is a line of shapes.

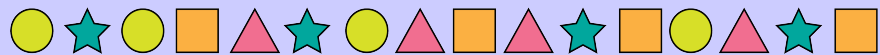


The line has a run of stars of length 2. A *run* is an unbroken chain of identical shapes.

Ali likes to create long runs by changing shapes. For example, if Ali changes the middle square to a star in the line above, then he can create a longer run of length 4.

Question

Suppose Ali chooses and changes exactly 3 of the 16 shapes in the following line:






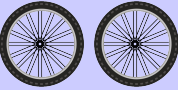





What is the length of the longest possible run that Ali can create?

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

Upcycling

Story

Doreen uses old things as supplies to make new items; this is called *upcycling*. Doreen upcycles her supplies into wheels, bicycles, and tricycles, then sells her new items at the market. The supplies needed to make each new item are shown in the table.

Supplies Needed		New Item	
 Tire	+	 Iron Bar	 Wheel
 2 Wheels	+	 Iron Bar	 Bicycle
 Bicycle	+	 Wheel	 Tricycle

Question

Doreen has 9 tires and 11 iron bars. What is the maximum number of tricycles she can make?

- (A) 1
- (B) 2
- (C) 3
- (D) 4