**IF100**

**Practice 1**

**Description**

In this practicing example, you will answer the following five questions.

1. Boza is a popular fermented beverage in some countries like Turkey, Kazakhstan,... etc. Assume that you have an unlimited amount of Boza in a very big storage. Additionally, you have two containers (let’s say A and B) where their sizes are 3 litres and 8 litres respectively (containers are initially empty). Your goal is to have exactly 4 litres of Boza in one of these two containers.  
     
   You have a set of instructions which are given below. You can only use these instructions to solve the question.

|  |  |
| --- | --- |
| **Instruction** | **Meaning** |
| Fill A | Fill container A with 3 litres of Boza |
| Fill B | Fill container B with 8 litres of Boza |
| Empty A | Empty the container A |
| Empty B | Empty the container B |
| A → B | Move the available amount of Boza from container A to container B. |
| B → A | Move the available amount of Boza from container B to container A. |

An example to consecutive set of instructions is given below:

|  |  |  |
| --- | --- | --- |
| **Instruction** | **Volume in A** | **Volume in B** |
| Fill B | 0 | 8 |
| B → A | 3 | 5 |
| Empty B | 3 | 0 |

At the end, you will have a table like above to reach your goal.  ***You MUST clearly indicate how you utilized the component(s) of computational thinking.***

1. As a family of 4, you have decided to go to a football match. While you were going there by car, suddenly your car’s engine broke down just at the beginning of the tunnel which leads you to the match. But there is a problem: you need to use a cresset because of darkness, but you have only 1 cresset and unfortunately at most 2 people can go through the tunnel at the same time. Also, you have to bring back the cresset to the remaining ones after reaching the end. Your grandfather can walk through the tunnel in 10 minutes, while it takes 5 minutes for your father. Your sister is a little bit faster and it takes 3 minutes for her. As the fastest one, you can walk in 1 minute. You have 20 minutes left for the match and as it is a derby, you don’t want to miss any second from it. Can you figure out a way to have everyone in the match before it starts?

Describe the way that the family can follow to accomplish the objective and state (discuss) at least 2 computational thinking concepts or problem solving heuristics applied for this purpose.  
  
***You MUST clearly indicate how you utilized the component(s) of computational thinking.***

1. Each team in Turkish Super League plays 34 football matches in total for each season. They earn 3 points if they win a game, they get 1 point if there is a draw and they get nothing if they lose.   
     
   You are required to draw a flowchart for the algorithm that calculates and prints the points earned by a specific team during the season. Below are the instructions that you *should* use:
   1. Set *played* matches as 0
   2. Set *points* as 0
   3. If *played* matches smaller than 34
   4. Match result
   5. Increase *points* by 1
   6. Increase *points* by 3
   7. Increase *played* by 1
   8. Print *points*

Together with the begin/end symbols, your flowchart will include 10 boxes of various kinds. You have to decide on which shape the instructions should be written and in what order they should be connected with each other.  
  
Hint: A decision box may have more than two (2) outgoing edges. In fact, the number of branches is equal to the number of different values that the condition may have.

Note: You may use <https://www.draw.io/> to draw your flowcharts. It’s not mandatory, just a suggestion.

1. Draw a flowchart for an algorithm followed by a supermarket cashier, whose specifications are given below. The system should accept different types of products, cash and credit card as inputs, and it should supply the requested products and cash balance as outputs.   
     
   The user will pass the products that (s)he wants to buy to the cashier, one by one. At each iteration, the cashier will get an item and update the bill, until there are no more products left to be bought. Then, the cashier will ask the user whether (s)he wants to pay in cash or with a credit card. If the user wants to pay in cash, then the cashier will get the payment and check the paid amount. If the payable balance is equal to the paid amount, then the cashier will print the bill and hand over the products to the user. If it is an overcharge, then the cashier will first give the remainder (change) to the user, and then (s)he will print the bill and hand over the products to the user. Otherwise, i.e. if it is an insufficient fund, the cashier will ask the user whether (s)he wants to cancel his/her transaction (shopping) or not. If the user wants to cancel, then the cashier gives the paid amount back to the user and (s)he is done with that customer. If the user wants to continue, then the cashier will ask whether the user wants to pay the remaining amount by cash or credit card, and depending on the answer of the user, the above-mentioned procedures will be carried out.   
     
   On the other hand, if the user wants to pay with a credit card, then the cashier will get the credit card of the user and check whether there is enough credit or not. If there is, then (s)he will print the bill and hand over the products to the user. Otherwise, the cashier will ask the user whether to cancel the transaction or not, and depending on his/her answer, the procedures to be followed will be as described above.
2. At the end of each year, companies get the revenues of each quarter (i. e for every three months period like January-March, April-June etc...). They analyze each quarter separately (depending on the revenue for each quarter, the companies give some bonus to their employees), and then calculates their average revenue (average of the four quarter) of the year.  
   1. For a particular company, write a pseudocode to calculate and print their average revenue for the year.
   2. Draw a flowchart for the algorithm in part (a).
   3. Assume that there are 1000 such companies in Turkey. Calculate and print the average revenue of the year for each company.
   4. Draw a flowchart for the algorithm in part (c).