ALGOVATE

Let's Do Step-Wise Thinking

Point of Contact

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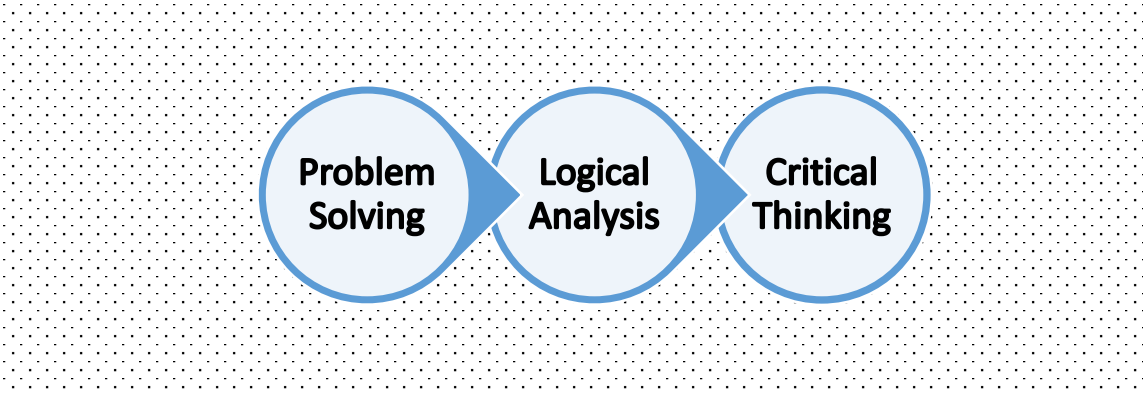

LOGICAL AND CRITICAL THINKING TEAM

WHAT YOU WILL FIND HERE...

Contents

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WHY ALGOVATE:

Students will learn to breakdown problem and come up with solution.

WHAT IS ALGOVATE?

The students will be required to design solutions to real life problems/ mathematical puzzles using sequential flow of logic and proper iteration.

TAKEAWAY SKILLS

1. Logical Analysis
2. Breakdown of Process
3. Optimizing the Process
4. Solution Designing

WHAT IS ALGORITHM?

An **algorithm** is a procedure or formula for solving a problem.

In simple terms, it is a step by step procedure to solve a mathematical or real life problem. It is a set of rules that defines a sequence of operations.

Although modern computing technologies and processes use highly complex algorithms, in reality algorithms are language independent. An algorithm can be designed for simple things like to find directions from one place to another, selecting an item from a departmental store, searching a book in library to complex puzzles like Tower of Hanoi and Einstein's puzzle.

The statements in an algorithm can be classified as input/output, decision making, process etc. and has different symbols/boxes for each of them when represented in a flowchart.

ONE PICTORIAL EXAMPLE TO EXPLAIN THE BASIC IDEA OF AN ALGORITHM

Steps to pick up the pen and give it to Moz.

Move to the table. Pick up the pen. Give the pen to Moz.

Moz: Now I will make it a little bit more difficult. Give more detailed steps for each of these three steps.

Jyoti: I will give the steps for "Move to the table".

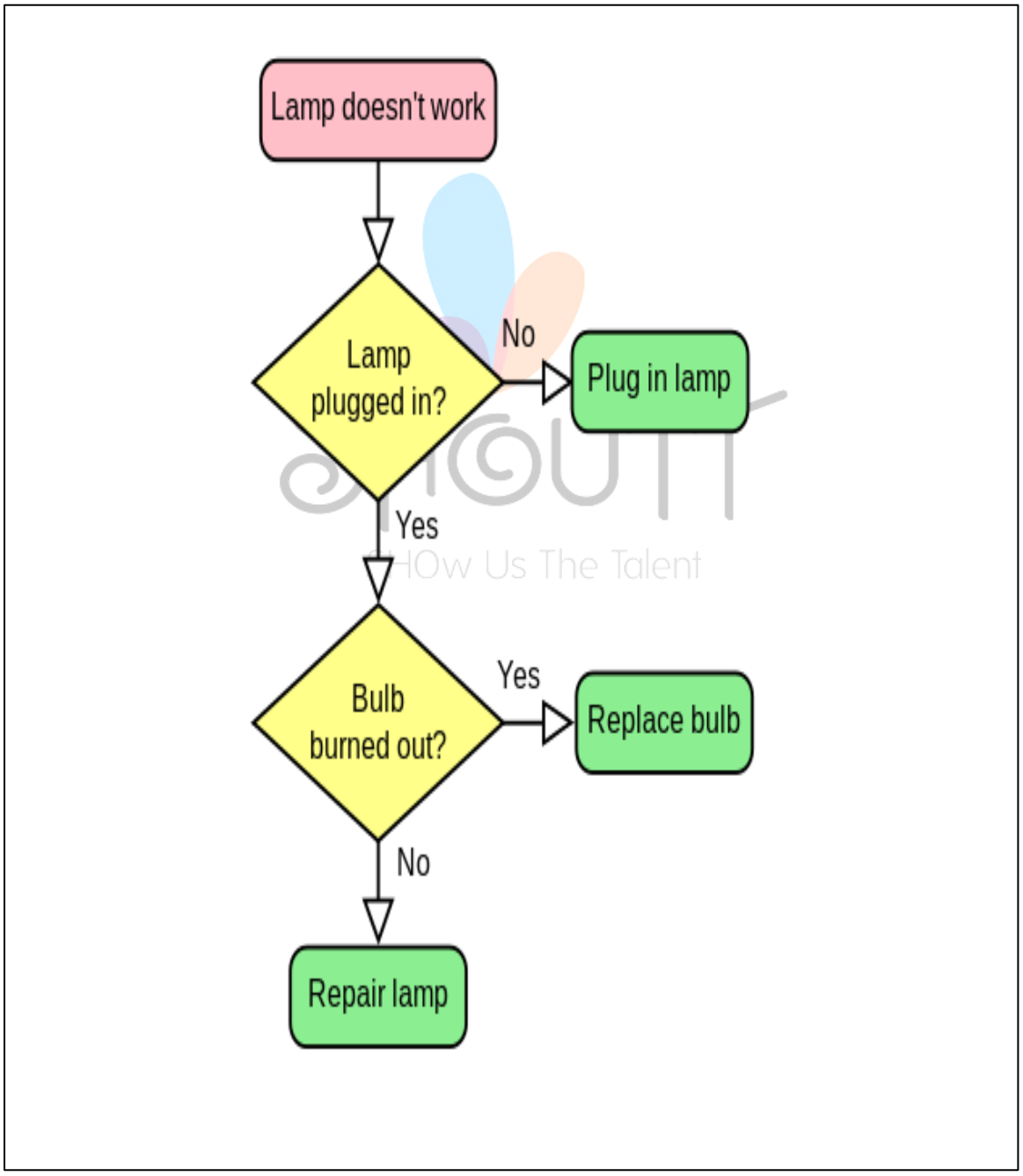
Jyoti: Here are the steps to "Pick up the pen".

Moz: Good. Now outline the steps to "Give the pen to me".

WHAT IS FLOWCHART?

A **flowchart** is a type of diagram that represents an algorithm, workflow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation illustrates a solution model to a given problem. **Basically, it is a diagrammatic representation of the algorithm.**

SAMPLE FLOWCHART



DIFFERENT SYMBOLS AND THEIR MEANINGS

Symbol	Name	Function
	Start/end	An oval represents a start or end point
	Arrows	A line is a connector that shows relationships between the representative shapes
	Input/Output	A parallelogram represents input or output
	Process	A rectangle represents a process
	Decision	A diamond indicates a decision

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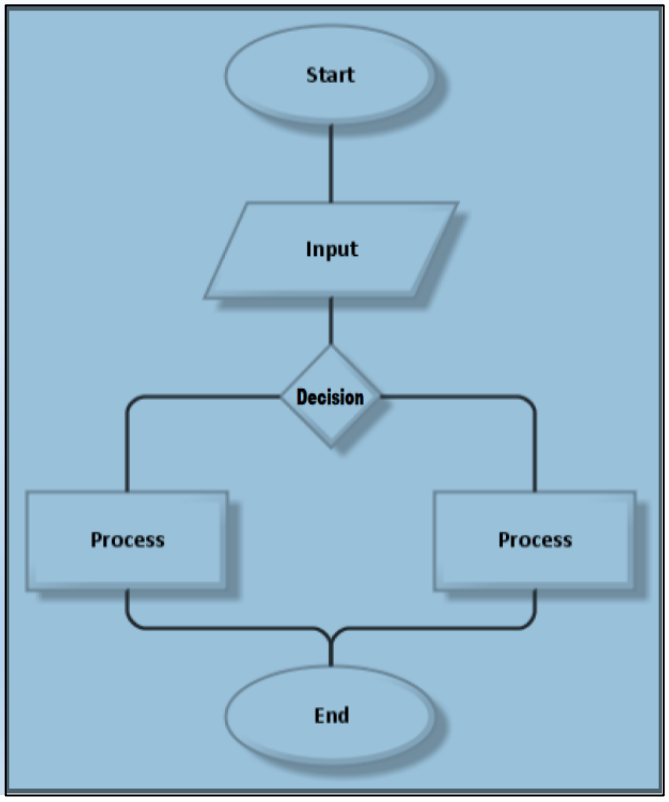
THE SYMBOLS USED IN FLOWCHART: -



SAMPLE EXAMPLE

PROBLEM STATEMENT

Three numbers are given to you. Arrange the numbers in ascending order.

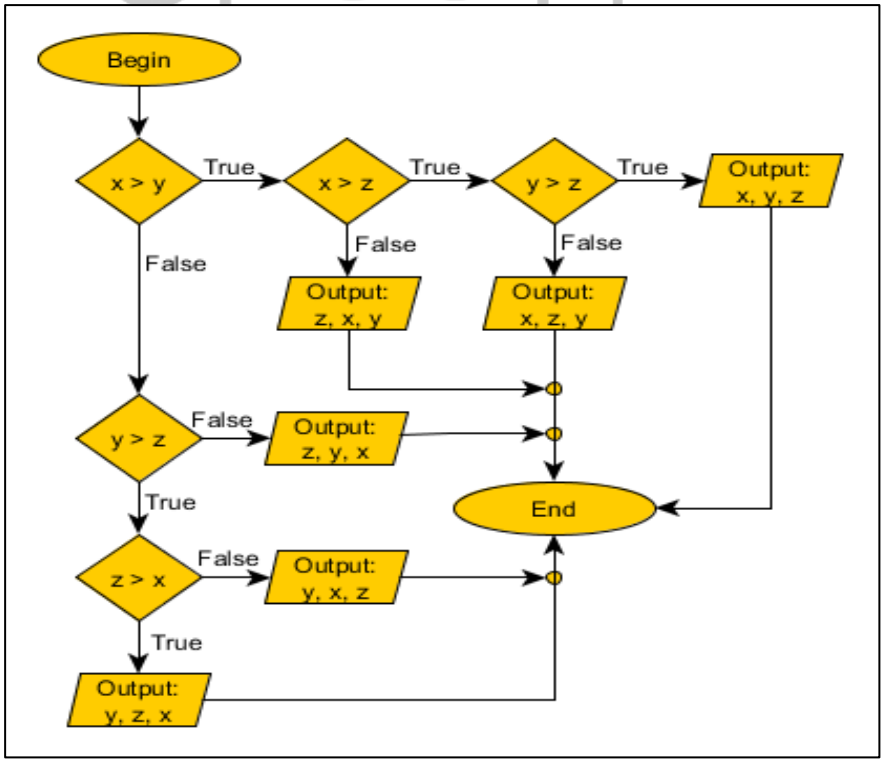
UNDERSTAND THE PROBLEM

1. You will read three given numbers.
2. Arrange the numbers in Ascending Order.

ALGORITHM:

Step 1: Start
Step 2: Accept three numbers from user (x, y, z) **<Input Statement>**
Step 3: If x < y then go to step 4 else go to step 8
Step 4: if x < z then go to step 5 else go to step 7 **<Decision Statement>**
Step 5: If y < z then go to step 9 else go to step 6
Step 6: Interchange y and z and go to step 9
Step 7: Interchange x and z and go to step 3 **<Process Statements>**
Step 8: Interchange x and y and go to step 3
Step 9: Display "Ascending order"
Step 10: Display x, y, z **<Output Statement>**
Step 11: Stop

FLOWCHART



PROBLEM STATEMENT

Four friends, Shyam, Sreeja, Fatima and George, go on a trek one new moon night. They see a flooded stream that they have to cross. They find an old wooden bridge across the flooded stream. There is a notice near the bridge.

The water level in the stream is rising. A native of the place comes and tells the trekkers that they should cross the bridge in 20 to 25 minutes. Otherwise they will not be able to cross, as the water will start flooding the bridge. They have only one flash light. Each of the trekkers says aloud:

Shyam: I can cross in 1 minute.
Seeja: I can cross in 2 minutes.
Fatima: I can cross in 5 minutes.
George: I can cross in 10 minutes.

STEP-WISE THINKING TO SOLVE PROBLEM

I. UNDERSTAND THE PROBLEM

The four trekkers have to cross the bridge while satisfying the conditions.

II. IDENTIFY AND SOLVE

INFORMATION - What is the information available?

- There are four friends - Seeja, Shyam, Fatima and George.
- It is dark. Shyam has a flash light in his hand.
- Length of bridge is 100 meters.
- Shyam can cross in 1 minute.
- Seeja can cross in 2 minutes.
- Fatima can cross in 5 minutes.
- George can cross in 10 minutes.
- Water level is rising.
- If they do not cross in 20-25 minutes they will not be able to cross.

CONDITIONS - What are the conditions?

- Only two persons can cross the bridge at a time.
- Flash light should be used on dark nights.
- The trekkers have to cross the bridge within 25 minutes.

Solve

Achieve the goal by using the given information, while satisfying the conditions.

Reasoning

One of the friends has to keep moving up and down the bridge as there is only one flash light. The one who takes least amount of time to cross the bridge, should keep coming back to accompany the next person.

Solution

Work out the solution in a step-wise manner. Since Shyam can cross in the least amount of time, Shyam moves up and down the bridge. Shyam holds the flash light and one by one the others should accompany him and cross the bridge.

The sequence of crossing the bridge:

1. Shyam and Seeja cross the bridge and Shyam goes back.
   Time taken = 2 + 1= 3 minutes.
2. Shyam and Fatima cross the bridge and Shyam goes back.
   Time taken = 5 + 1= 6 minutes.
3. Shyam and George cross the bridge and no one goes back.
   Time taken = 10 + 0 = 10 minutes.

Total time taken = 3+6+10 = 19 minutes.
All four friends cross the bridge in 19 minutes.

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RULES

- Only one team is allowed from one School in each category. (i.e. Middle and Secondary).
- A team can be formed with members from two different classes. (A team can be made up with participants from Grade 5 and Grade 6)
- There will be an elimination-round to select final teams for main events
- Write all the steps on chart paper
- All the steps should be in a sequential manner
- During the presentation explain all the steps and the process for both the problem statement
- Make final solution on chart paper and draw a flow chart
- Flow chart should include all the steps in sequential manner
- Use correct symbols for flow chart.

MORE...

- TWO Problem Statements will be given.
- Students will be given basic format of how to provide the solution to given problem.
- You can brainstorm ideas and come up with their own format.

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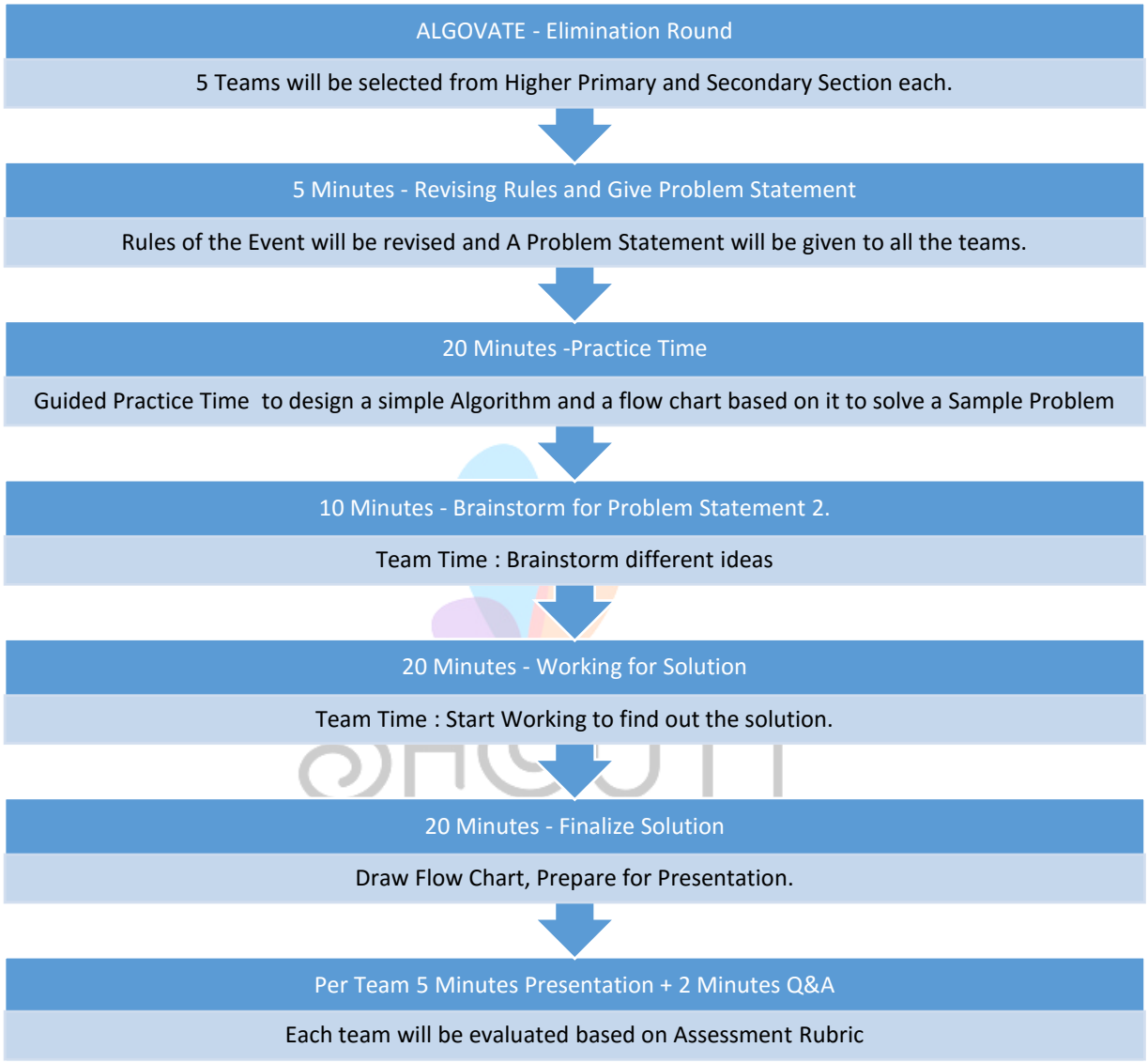
FLOW OF THE EVENT

ALGOVATE



EVALUATION PROCESS

- Each team will be evaluated on the basis of **ALGOVATE-RUBRIC**.
- Decision of Judge Panel will be final.

FELLOW EXPECTATIONS

- Fellows are expected to go through **ALGOVATE** Pre work and prepare their students for the event.

REFERENCE BOOKS FOR PREPARATION

1. COMPUTER MASTI BOOKS

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