# Algorithms
## Lesson Plan: Class 01 / ALG / 02

**CS pathshala**
Bringing computational thinking to schools

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| **Overall goal of the lesson** | **Reiterate the meaning of new word - Algorithm learnt in previous class, introduce the concept of loops** |
| **Prior knowledge required** | Basic English |

**MODULE 1:**        **Module time:** 35 minutes

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| **Goal:** | Revise Algorithms, Introduction to Loops |
| **Description:** | Help students of Class 1 remember the new concept taught in previous class - Algorithm and explain a new concept called 'loop' using day-to-day life examples and fun activities. |
| **Material required:** | **Physical:  Projector, Laptop, internet connection, worksheet for 01-ALG-02-WS**<br><br>**Electronic:  Lesson Plan for 01-ALG-02-ppt,** |
| **Procedure Summary:** | Read the lesson plan first, go over the worksheet document and check out the presentation before the actual class happens.  Refer to speaker notes section of each slide for additional details and insights on how to explain the slide to the students.<br><br>Be ready with enough hard copies of the worksheet and distribute those to the children (one per child) at the end of the class as homework.<br><br>Go over the presentation, slide by slide and cover the topic with the students.  If time permits, one of the worksheet questions can be solved together in the class after completing the presentation. |
| **Procedure Details:** | Slide #1:   Class Topic Introduction slide<br><br>Slide #2:  What will we learn today? This class 01-ALG-02  is a follow up on class titled 01-ALG-01. The primary agenda is to revise the new word 'algorithm' and its meaning, revisit some more examples of algorithms, understand how to make an algorithm for a daily task and learn a new concept - loops.<br><br>Slide #3: What is an Algorithm?  In this slide, we revise the concept learnt earlier.<br>First of all, before you show this slide, ask the students to spell out the word 'Algorithm' loudly.  Then ask them if anyone remembers what it means.  Show this slide once the students have spelt out the word loudly and can't remember its meaning.  Please go through these bullet points slowly and give students time to grasp the meaning of the word 'algorithm' in case they did not get it in the previous class.  Give them more examples from your class and day-to-day activities to explain that an Algorithm tells us how to do a thing such as climbing steps or tying shoelaces etc.<br><br>The second bullet highlights the 'problem solving' aspect of the word algorithm.  Algorithm can help us to not only do something such as tying shoelaces or how to get ready for school but also solve many difficult problems.  Let us take an easy problem first.  How will you go about finding the shortest way to school canteen from the classroom?  Algorithm tells us how to find the shortest way.  Or how to share sweets amongst friends so that everyone gets equal number of sweets or equal share. |

Read out the last bullet aloud.  It is self explanatory.  In the lower half of the slide, if student do not understand the word 'instructions' then help them understand that it is a command or order or method or way to do something or complete some work or solve a problem.

Slide #4: Algorithm to make a cup of tea. Let us revise once again - what is an algorithm with the help of a task - let us see what is the algorithm to make tea.
The task is 'make tea'.  How do we make tea? We need to find out what we should do first and what needs to be done next so that in the end we get a cup of tea.  This step by step thing is called Algorithm.

Look at the picture towards the right side of the slide.  How do you make tea?
● First we heat water and bring it to a boil.
● The second step is to put one teabag in a cup or mug.
● Next, we pour boiling water in the cup.
● We dip the tea bag in hot water for 5 minutes and remove the bag.
● Task completed.
● Tea is ready.

Slide #5: How do Algorithms help us? In the last slide, we revised the meaning of algorithm - it is a list of steps to do a task.  This slide lists some examples of tasks that can be done using an algorithm or a collection (sequence or set) of steps.  Can you think of some more tasks in day-to-day life?  Ask children to write down 3 more tasks that can be done by an algorithm.
● Tie shoelaces
● Get ready for school
● Taking a bath

Slide #6-9:  These slides 6 to 9 are same as previous class.  Let's revise these slides again in order to reiterate the concept of algorithm by taking the example of climbing up the staircase to reach from one floor to another. Help children focus attention on the slides by asking leading questions such as Can you climb while sitting down on your desk?  Yes/No. Answer:  Loud NO
Break the monotony of the algorithm by asking Thinking question:  Can you climb up if you go from step 4 to step 3?  Answer NO. Another thinking question: Can you climb up if you miss step 3 and go directly from step 2 to step 3?  Answer YES.

Slide #10: How to make Algorithms for a task?  Explain to children that to do something, you need to know how to do it.  Now if you have a friend who does not know how to say sharpen a pencil, how will you teach him?  YOu will tell him step by step in simple terms how to hold a pencil in one hand, hold sharpener in another and then rotate the pencil so that the tip becomes pointed.  This step by step is called algorithm to sharpen a pencil.  To make sure someone else can do the job correctly, you need to have an algorithm so that even if they don't know how to do a task, they can follow the step by step 'orders' and complete a job. In this slide, we explain the process of how to come up with algorithm for some simple tasks.  Note, algorithms help to solve problems too, not just do tasks.  THat is where it is important to know what algorithms are and how to make one.

Next, let's talk about how these algorithms are made?  Who makes them? Your dad? or Mom?  That is correct.  Sometimes we don't know how to do something, then we take help from others.  Our parents and elders know how to do things.  They use algorithms to complete tasks and solve problems.  They have become so used to them that it no longer looks like a special thing we do.  Just as walking.  What is the algorithm for walking.  Do we say - put right leg one step ahead and then put left leg one step ahead and keep doing that. That is walking.  We don't say those 'steps' or method for common task which we get so

used to. For other tasks which we need to learn algorithms to do those tasks or make new algorithms if we can figure out a better way to do the same thing.  We all can make algorithm ourselves.  Here is how.

1. First we need to think about how to do an activity.  For example:  Brushing your teeth.  Now if you have to teach your younger sibling how to brush your teeth can you think of what all you need to do to brush teeth?
2. Next, think of small steps which can be done one after another in order to complete this task.  In this case, first you need to have toothbrush, get toothpaste, go to washbasin.  Put toothpaste on the brush, cover the toothpaste with its cap and put it aside.  Next, put the brush against your teeth and rub left to right, cover upper teeth then lower set, then inside right cheek then inside left cheek.  Spit out extra froth and paste if your mouth feels too full and repeat. In the end, rinse your mouth and toothbrush.  Put it back in its place next to toothpaste in the bathroom.
3. It is important to order the small steps correctly.  For brushing teeth - what is the correct order? Can you brush your teeth without putting the toothpaste on the brush?  So to teach your sibling correctly, you need to know which step comes first and which one comes later.

That is all,  once you do all these three above - you have 'made' an algorithm to brush teeth (or some other activity).  Remember, sometimes there can be more than one way to complete a task.

Slide #11: Different Algorithm for doing a task - possibility of more than one way to accomplish a task. Highlight the fact that there are more than one correct way to do certain things.  So there can be more than 1 correct algorithm to complete a task or solve a problem.

Also, it is important to note the order of steps in the algorithm.  By order we mean - who comes first and who comes next.

Slide #12: Activity - making a paper plane.  Let's follow an algorithm and do a task.  Task is - make a paper plane.  Ask children if they already know how to make a paper plane. Tell them, they need to follow the algorithm step by step and not use the method they already know.  In this slide,  we will learn how to make algorithm for paper plane.  The picture on the right shows how to make a paper airplane.  Numbers indicate the steps.  You need to follow the steps in order.  What happens if you don't follow the steps one by one?  What if you miss the steps?  You cannot make a plane correctly.

Ask students to take a rough sheet of paper and make a paper plane following these steps and the picture guides shown above.

Slide #13: Many paper planes.  In this slide and subsequent ones, we will lead children into the concept of loops.  Hence, the focus on the word 'many'.  After revising the word algorithm and its meaning, let's take a dig into making many airplanes.  We are doing this in order to introduce the concept of loops and 'repetition'.  Ask children once they have completed making 1 paper plane about how they would go about and make 6 paper planes.  Ask them to think of the algorithm.  Then show them the slide above that indicates one way to do so - make 6 paper planes of different color paper.  Focus on 6 steps in the algorithm - highlight the fact that each step is actually saying the same thing again and again other than the fact that you need a different color paper.

Slide #14: That is so boring - repetition!  Ask children if there is a better simpler way or an algorithm that can help us make 6 paper planes without having to say the same thing again and again?  Do not give them the answer yet, move to next slide.

Slide #15: Example of an easier way - in this slide we will introduce loops.  Here is an

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| | example of how children can think of a simpler way or easy algorithm to make 6 planes. Ask them - how will they ask their friend to sing a favorite song 4 times - will they say the same thing 4 times or is it easier to simply say it once and clearly instruct to do the singing - 4 times?<br><br>Slide #16: Easy way - many paper planes - In this slide we introduce the word repeat in order to show children that there is an easier way or algorithm which is not boring to make many paper planes. Highlight the fact that this algorithm has only 1 step. Earlier we were saying the same thing 6 times. Now we can just ask it once and it is easier to understand because of the word 'repeat'. Explain repeat - it means doing the same thing more than once. Ask children if they know another word for repeat? If they can't think don't give them the answer yet - go to next slide.<br><br>Slide #17: New word - Loop! Highlight the new word Loop!<br>It means doing the same thing again and again just like the word 'repeat'.<br><br>Slide #18: This slide gives more examples of loop.<br>When we replay a song on the phone - we are 'looping' a song.<br>Similarly, if we climb from floor 1 to floor 2, we follow an algorithm. Now if we have to climb from floor 2 to floor 5, we will repeat the same algorithm until we reach floor 5. Dance is another example. There are some dance moves such as clap, kick in the air, sway side to side or jump and we repeat these moves in a loop to make a complete dance routine.<br><br>Slide #19-20: These two slide contain activity for children based on Loop. It helps to internalize what a loop is by looking for loop or repetition in dance moves. Tell the children to stand up. Talk about dance - ask them to raise hands if they love to dance. If they don't ask them to sit on their seat. Let us do an activity in the class. In this slide - we show some dance moves or dance steps. Ask children to stand up next to their desks and practise each move when the teacher says out loudly - clap, hands behind head, hands on waist, let hand up, right hand up. Once everyone knows the individual moves, tell them we will now practise a dance in which some of these steps will be repeated - that is - will be done in a loop.<br><br>Now go to the next slide, Slide #20. Ask the children to follow these dance moves shown on the slide one by one as the teacher calls out each move. Once the complete move is done - ask them to repeat. Do the complete loopy dance once more, if time permits. Then ask the children if they noticed that some steps were in a loop - meaning they were repeated more than once. Ask them to identify those steps. Answer: Clap, Left Up, Right Up.<br><br>Slide #21: Real life examples of 'loop'. Ask children to sit down after the dance activity and settle / be quiet. Now bring up this slide and discuss with them the real life examples of loop. If someone brings in more real life examples - let them talk for a minute if time permits. To involve children, ask them about who plays cricket. Ask them how cricket is played? Ask them if they can identify loop in the way cricket is played. Then point them to this slide and discuss 1 over - throwing ball 6 times one by one until either a run is made or no run is made or the batsman gets out. The spelling mistake example can also be internalized by kids easily as it highlights loops.<br><br>Slide #22: Recap - This slide is a recap. Say out aloud with the children and encourage them to ask questions if they have any doubts. Share worksheets with them at this point and if there is time, ask them to do the first question in class and do the remaining at home as homework. |
| **Assessment:** | Question in the worksheet can be used as assessment. For additional questions refer to https://code.org/curriculum/course1/6/Activity6-RealLifeAlgorithms.pdf and |

| | https://code.org/curriculum/course1/6/Assessment6-RealLifeAlg.pdf<br>https://code.org/curriculum/course1/12/Teacher |
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| **Information Broadcast:** | What did we learn today? Answer: Meaning of 'Algorithm', there can be more than one ways to do a task and hence more than one type of correct algorithm. New word Loop What does it mean? Ask students to complete the worksheet and think of one activity that their parents do which is in a loop. Make jokes about how parents keep saying 'No' to children 100 times a day - no this activity - no that activity. Don't do this, don't do that, especially to children who are naughty. It is almost as if busy parents are operating in a 'Loop' :-) |