CS pathshala
Bringing computational thinking to schools

Overall goal of the lesson: To understand and recognise patterns and get geared for computational thinking
Prior knowledge required: Playing with numbers – addition, multiplication, division
Material Required: Paper, pencil
Physical:
Electronic: PPT – Computational Thinking

Procedure Summary:
1. There's two ways to go about this topic.
    a. Introduce concepts of computational thinking, and then solve an actual problem using these concepts
    b. Give them the problem straightaway and see how a solution evolves and then map it to computational thinking
    Currently, PPT & LP follow the first approach – it is easier to explain.
2. Distribute the worksheet
3. Discuss worksheet

Procedure Details:
1. Introduce computational thinking – what is it? Why do we need to read about it? Is it just a bunch of big words? No! It helps us to solve big, complex problems. Explain the 4 ways it helps us to do that. Take examples if you want of each case.
2. Explain the 4 pillars of computational thinking – decomposition, abstraction, pattern matching, algorithm – on this slide just get them to repeat the 4 words few times – let them shout out the words so that they remember them.
3. The first pillar: Decomposition. Explain with actions – show a BIG piece of cake. Ask what would happen if you tried to eat the big piece all at once? You would drop some, you wouldn't be able to chew, you might choke, you'll have cake all over your face! So, you should break off small bites which are easy to chew and swallow.
4. The second pillar: Pattern Matching. Does everyone know what a pattern is? Can you give an example of a pattern? Expected answers: pattern on a tile floor, or pattern on a leaf, or print pattern on cloth, pattern on the sole of a shoe, etc. Now show the example – try to get the answer from the kids. If they don't know it right away, proceed step by step. Make sure they understand the repeating pattern.
    Slide 13: Hieroglyphs were decoded using Rosetta stone that had translation into 3 languages for the same passage. Looking for patterns.
    Slide 14: Flower depicting a Symmetry pattern
5. Next: Abstraction. This is a little hard to understand so take your time. Take them through the two slides. There is a question at the end of second slide – get the children to answer. Department stores arrange items by grouping 'similar' items together – e.g., cleaning agents, frozen foods, flours, lentils, vegetables, candies, and so on… so a shopper quickly goes to the relevant shelf to find what she needs! Third slide talks about cars – use a different example if the children are not familiar with cars. How does abstraction of car help a car mechanic – since the basic working of cars is the same, a mechanic for a Maruti car can still find out what is wrong with a Hyundai car!
    Abstraction helps you to know that two or more things are the same 'type' – so if you are given a big problem to solve, you can find a smaller, simpler problem that is the same 'type' and find a solution for that instead!
6. Pillar 4: Algorithm – hopefully they have seen this term before but revise it and try to get them to work out the steps of a simple problem like finding the smallest number in a list.

7. Now set the task – sum up the first 200 numbers! Be serious about giving the problem and setting a time limit – call out "Time's Up!" when the one minute is over.
   The children will know you can't really expect an answer, but still see how they respond. Ask them why they were not able to do it? Expected answer – don't know how to start, how can we add so many numbers so fast, etc.
8. Now: how do we use computational thinking to solve this very big problem?
   a. Look for a problem which is similar, but smaller (Abstraction)
   b. Try to do small, simple operations instead of everything at one time (Decomposition)
      → Now while doing this we notice something – <u>let the children point this out</u> – do NOT tell them what it is. (the sum is always the same!)
      → Now because the sum is always the same, instead of doing so many additions, we can do one multiplication! Make sure they understand this… all the children may not be good with Maths
      → Emphasise how decomposition helped us!
   c. Now do several examples following the same method: we will find a pattern (Pattern Matching).
      → Wait on Slide 39 & 40. See if the children can discover the pattern – give them time.
   d. Last step, we write the ALGORITHM for finding the sum of the first N numbers.
9. Go back and solve the original problem – **see how many children solve it by directly using the algorithm!**
10. Let them practice a few more.
11. Recap how we used the 4 techniques of computational thinking to solve a difficult problem.
12. Distribute and discuss the worksheet.