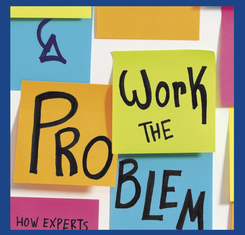
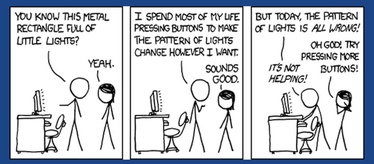
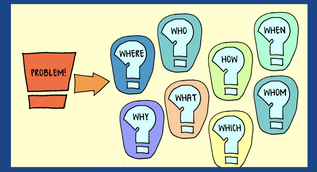
Think like a Computer Scientist

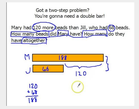
Don't just learn to code: learn to think like a computer scientist







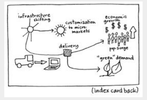
Abstraction



How can I represent this problem differently to help understand it?

Draw the problem;
Reduce the data set;
Summarize the problem;
Explain it to the duck;
Explain it to someone else;

Draw
Write
Talk



Check your assumptions:

Have you identified the essential details?
Have you identified **all** of the essential details?
Have you removed all the **unessential** details?

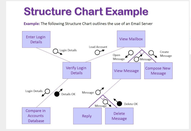
Decomposition

How can I usefully break this problem down into its component parts?

List its parts - no more than one point per list item;

Group list items into a hierarchy structure - most important elements at the top, and related sub-points connected below;

Isolate each group of components from the others, so that it represents a single step in the process;



Hierarchy Charts
Jackson Structure Diagram
High-level view of the problem

Pattern Recognition

Learn from your errors and those of others;

Record common errors for future reference;

Pay attention to **known pitfalls**;

Pay attention to **error messages**. Learn to understand them;

Replicate the problem;

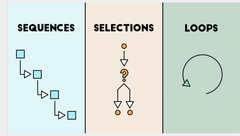
Identify the **exact scenario** that causes the problem;

Be **systematic** in your investigation;

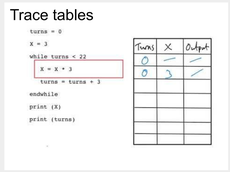
Trace the data through your algorithm/program using a **trace table** or variable **watches**, **stepping** through your code;

Algorithmic Thinking

Use the Tools



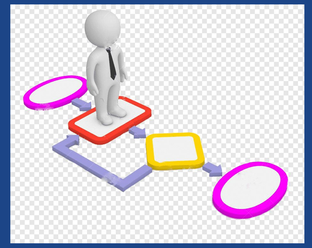
Trace tables



Mini whiteboards

Pencil and paper

Communication



Always have a plan

Have a hypothesis:
What do you ***think*** is causing the problem?
Investigate the hypothesis;

Listen to your instincts;

Don't give up

Take a break

Catch problems early

Work in small steps;

Save and test regularly;

Change one thing at a time

Retrace your steps

What was the last thing that you did before you noticed the problem?

Undo it;

Does the problem still occur?