Problem Solving

What are we talking about?

- One part of software development is simply about **coding**…
    - How does a for loop work?..
    - When do I use a function?..
    - How do I make use of array methods?..
- *We might know all of this*…
    - but when faced with a coursework question, a CodeWars / Codility question, or even a problem to solve in a job - **we might not know where to start!**
- This is where **problem solving** comes in

How do we *improve* our problem solving ability?

- Unfortunately, we can't become better at problem solving in a 1-hour workshop 🙁
- We need to attempt many problems (coursework, CodeWars, Codility, etc.)
- Come up with ideas, try different things, sometimes fail and sometimes succeed
- Eventually, **we'll start to see patterns** - new problems will remind us of old ones, and problem solving will become easier 😀

How do we *improve* our problem solving ability?

- This takes time ⏳ - so don't get discouraged if you're struggling with it at first!
- Be patient, **be kind to yourself** ❤️, enjoy the process
- Each new and unfamiliar problem is a learning opportunity 🧠
- **You don't have to do this alone!** 💪 Discuss the problems you are working on together - different people may have different ways of solving the same problem.

How do we start?

Example Question

Write a function to return the longest word in a given array.

Understand the question

- Make sure you *really* understand the question, **before** starting to think about the solution
  - Read it more than once if you need to
  - Are you being asked to write a function? What are the parameters / what are the types of the parameters / what is the function returning / etc.

Don’t start coding yet…

- Come up with an idea 💡 first
    - How might you normally solve a problem like this (as a human)? What is your thought process?
    - Maybe draw it out on paper or digital whiteboard ✍️

Think like a computer 💻

- How do you *translate* your **human** solution into something that can be understood by a **computer**?
  - Break your solution down into small, well-defined steps
  - Maybe write pseudocode or comments in VsCode

Start *thinking* about the code

- How would you turn those steps into code?
    - Do you need to **remember or update** a value as your program is running? Maybe you need a **variable**…
    - Do you need to make a **decision** in your program? Maybe you need an **if-statement**…
    - Do you need to look at **each of the elements** in an array? Maybe you need some kind of **loop**…

Break down bigger problems into smaller ones

- If the problem is complex, can it be broken down into smaller problems first?
- Can we put our smaller solutions together, to solve the bigger problem?

You don’t need to follow all of these steps for every problem

Try it yourself…

- Imagine you are a teacher and your students have taken a test. The tests are marked with one of the following grades: A+, A, B, C, D, or F.
- You want to get the average score of the class as a number. For this, you can assume A+ is worth 100, A is 90, B is 80, C is 70, D is 60 and F is 50.
- Write a function which,
    - given an array of grades (which are either A+, A, B, C, D, or F)
    - returns the average score of the class as a number