CS118 Problem Solving

Definition of Problem Solving

Problem solving is the act of specifying a sequence of tasks which use existing tools and information and are processed to produce a desired end result. [i.e. Problem solving is create a solution from steps we know how to do.]

Determine the Main Task

The "desired end result" is the overall goal of the "Main Task" and it is achieved by breaking down the Main Task into smaller tasks. But you can't break down a Main Task if you don't know what it is you're trying to achieve. To solve a problem, the first step is to identify the purpose of "Main Task" - what is the desired end result? In the provided exercises these tasks will be fairly simple. In real-world engineering, though, this is almost never a single, easily stated goal. Massive tomes are constructed to document expected results from engineering projects, whether it is the construction of the F35; the building of the Burj Khalifa; or the design of Windows 10.

For each of the exercises, state the Main Task for each of these three items as a written English description - what is the desired end result? Note that the mathematical representation will be much more concise than an English version – this is why mathematical notation exists.

Remember that you cannot define a word in terms of itself. For example, it would be inappropriate to say "To solve a problem means to find a solution" because "solve" and "solution" are different forms of the same word.

Also, you cannot assume that your knowledge is common. For example, you should not say that $\sqrt{27}$ means "Determine the square root of 27". Instead, perhaps: "Determine the positive numeric value which when multiplied by itself yields 27."

Mathematical

EXAMPLE $1 + (2 * 3)$

Main Task: Determine the mathematical result of adding 1 to the product of 2 and 3

1. `floor(-2.5)`

   Main task:

2. `round(3.1*5.4 + 2.1)`

   Main task:

3. `max(1, 2, 5, 4, -5)`

   Main task:

Non-Mathematical

Not all problems can be easily expressed mathematically. In the same document you created for exercises 1 – 3, provide English descriptions for the following tasks. Be sure to consider ALL normally expected aspects of the result. "Side effects" are results not required in the end result – and are often results which weren't anticipated. As engineers we try to minimize such by anticipating them in our task description and eliminating them in our problem solving sequence (if feasible). In this "Paint the wall" example, we're anticipating spills and painting beyond the edges of the wall, so part of the goal is to minimize these:

e.g. Paint the wall	Apply paint to the wall to achieve uniform appearance with minimal waste and minimal application to items other than the wall.

4. Lock the door

5. Set the clock