Problem Solving
&
Algorithm Design

Problem solving

- The act of finding a solution to a perplexing, distressing, vexing, or unsettled question

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    - > **With simple wording changes his list of suggestions are applicable to all types of problems**

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  - » **What does the solution look like?**
  - » **What sort of special cases exist?**
  - » **How will I recognize that I have found the solution?**

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- A good programmer sees a task, or perhaps part of a task (subtask), that has been solved before and plugs in the solution.

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- Abstraction plays an important role
- The divide-and-conquer approach can be applied over and over

Abstraction

An explanation, idea or model that removes complex details

This is a key concept

Abstraction will reappear throughout the course

Algorithm

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Instructions are unambiguous

Who writes algorithms?

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Anyone who wants to write a set of instructions for solving a problem

An Example Algorithm

How to prepare Hollandaise sauce

Never-Fail Blender Hollandaise

1 cup butter
4 egg yolks
1/4 teaspoon salt
1/4 teaspoon sugar
1/4 teaspoon Tabasco
1/4 teaspoon dry mustard
2 tablespoons lemon juice

Heat butter until bubbling. Combine all other ingredients in blender. With blender turned on, pour butter into yolk mixture in slow stream until all is added. Turn blender off. Keeps well in refrigerator for several days. When reheating, heat over hot, not boiling, water in double boiler. Makes about 1-1/4 cups sauce.

Algorithm Written in Pseudocode

A mixture of English and formatting to make the steps in the algorithm explicit

```
Put butter in a pot
Turn on burner (low heat)
Put pot on the burner
While (not bubbling)
        Leave pot on the burner
Turn off burner
Put other ingredients in the blender
Turn on blender
While (more butter needed)
        Pour butter into blender in a slow stream
Turn off blender
```

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  - » **Begin with a problem statement**
  - » **Conclude with a plan that can be easily coded**