Computing Fundamentals

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Problem Solving

Problem solving is an art, learned mainly by practice.

> *A Pattern is the structure of a solution shared by different problems*

Typically small problems can be solved in one or a few steps, but complex problem need to:

- Be partitioned in multiple solution steps;
- The steps may be organized as nested patterns

Essential ingredient:

> *How do we represent the data?*

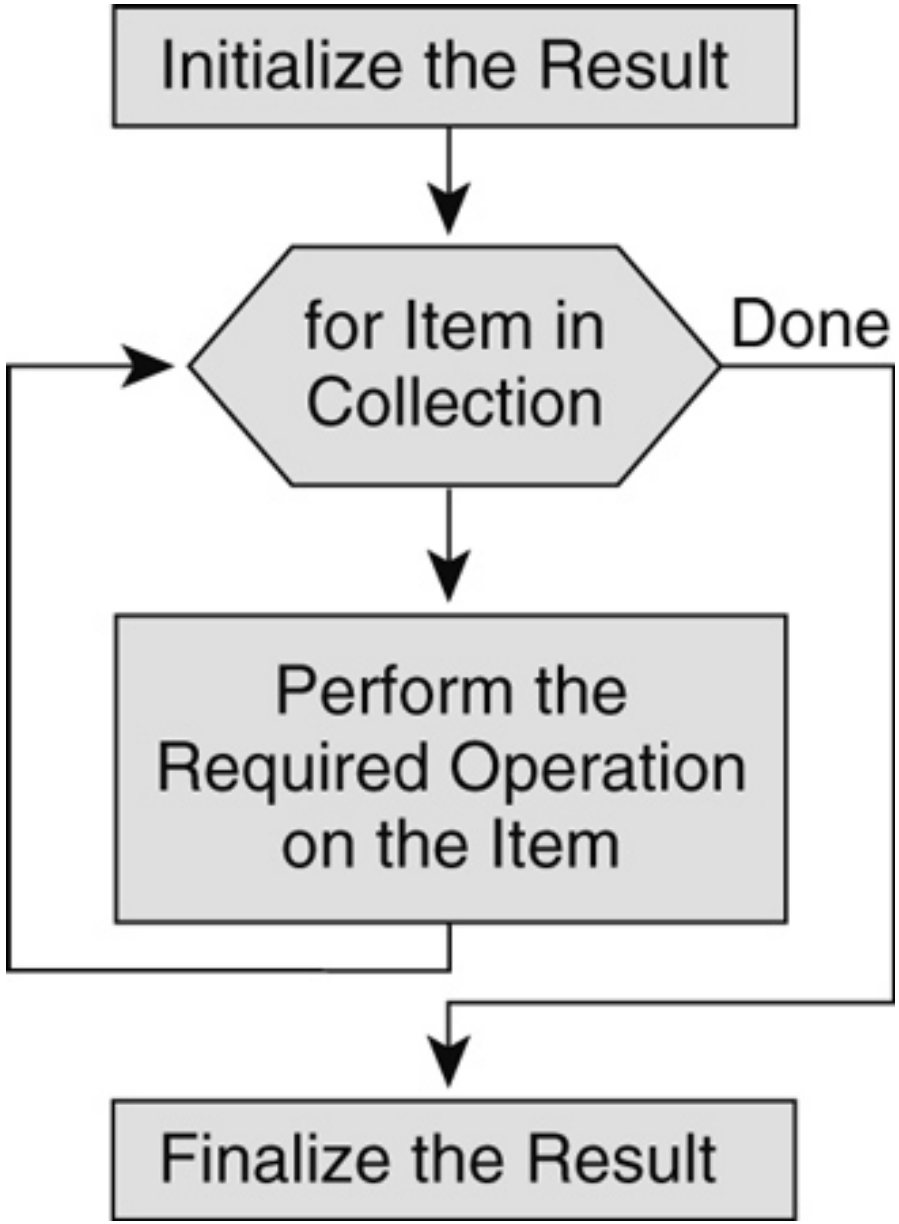
Problem Solving Patterns

Data collections: which tools should we use?

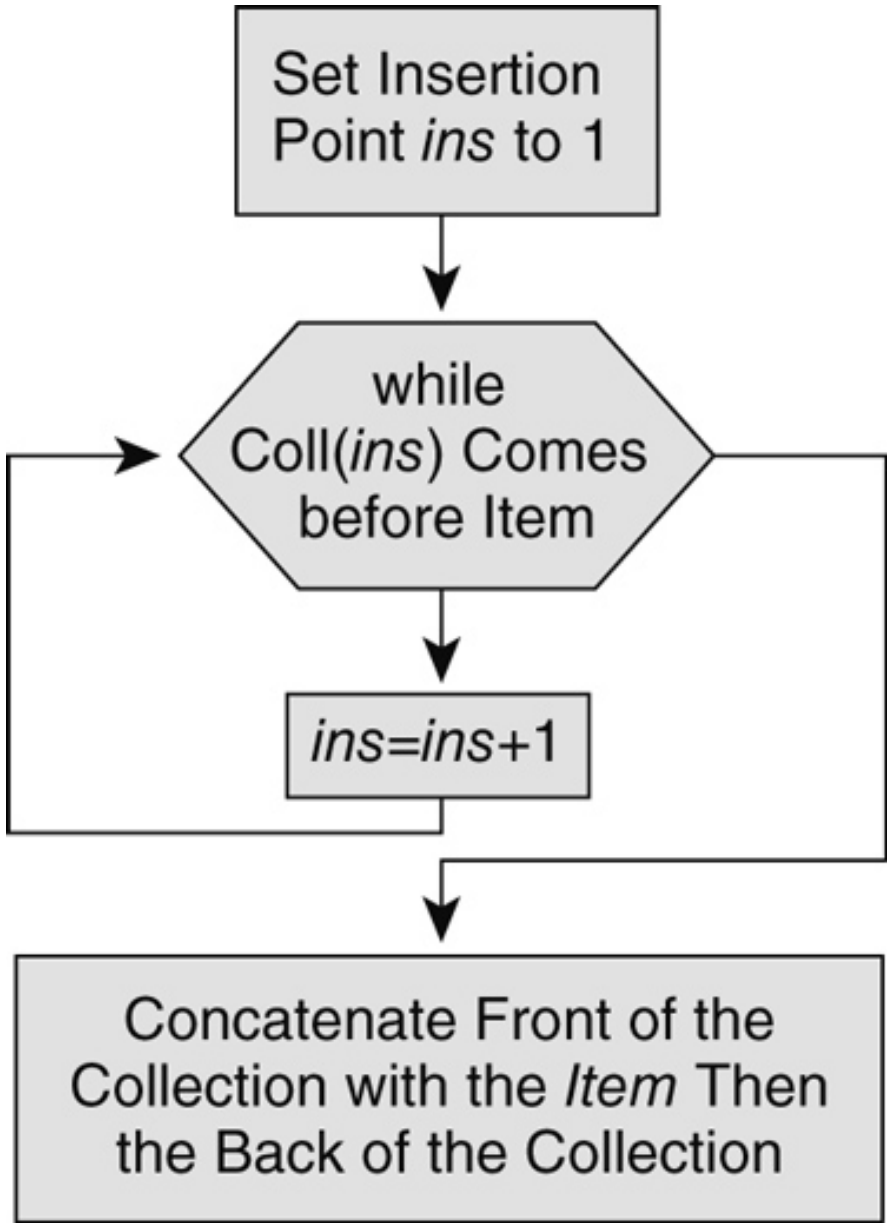
- **Vectors:** Good for linear collections of numeric data, but only numeric data;
- **Arrays:** Multidimensional entities, still only numeric; must work with columns/rows of same size;
- **Cell Arrays:** May hold arbitrary data; using the inner data may be non trivial;
- **Struct (arrays):** Natual choice for collections of uniform but complex items.

Problems involving data collections often revolew around the patterns described in the sequel.

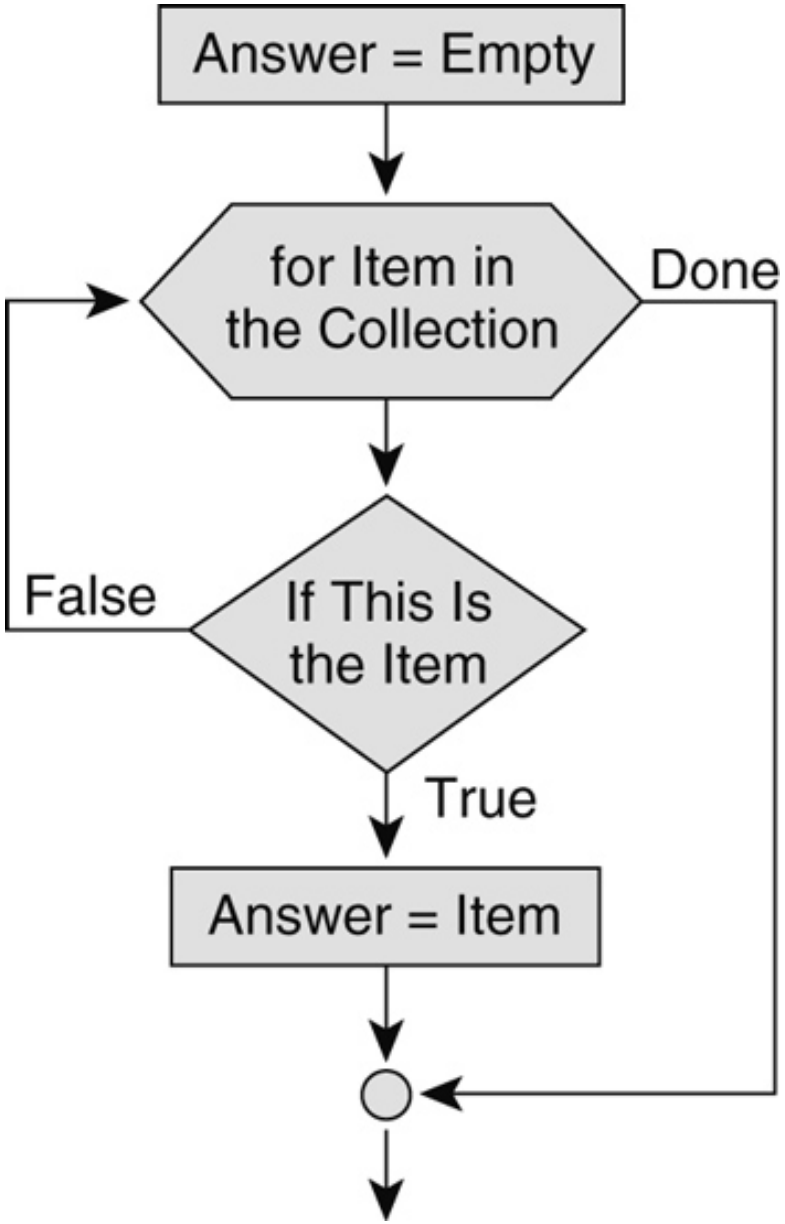
Problem Solving Patterns: traversing



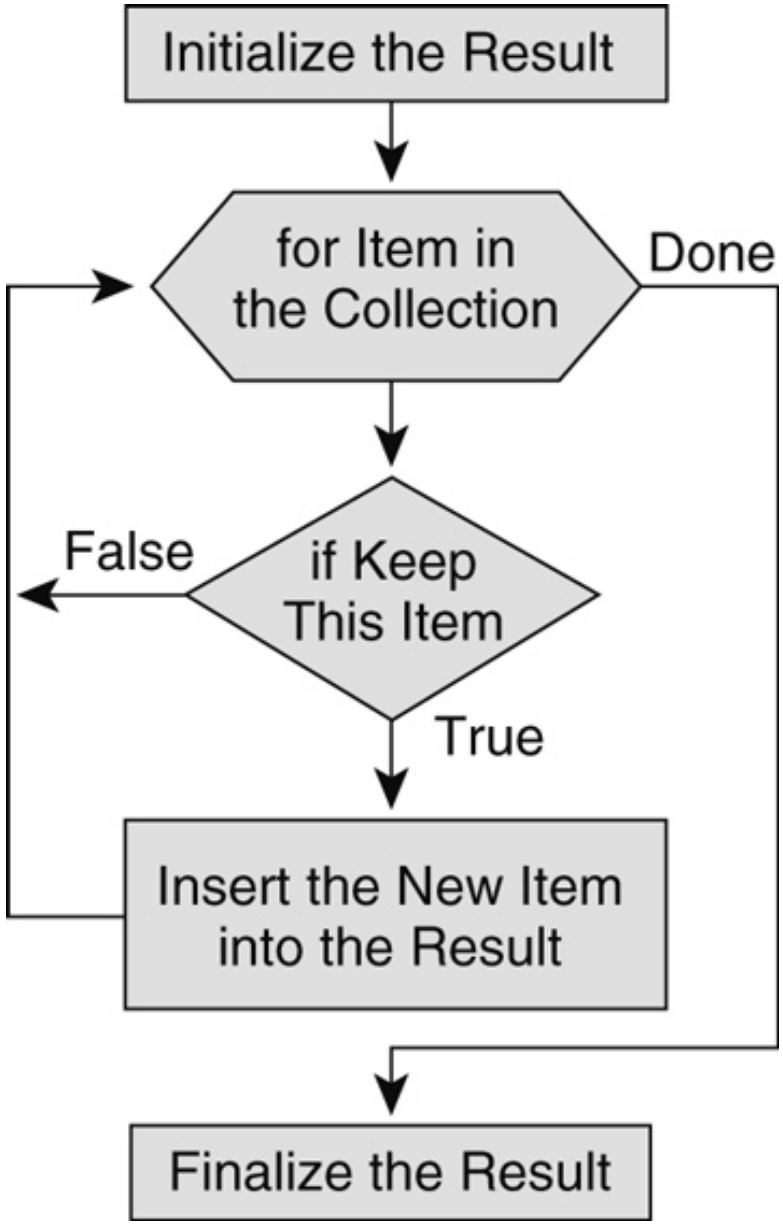
Problem Solving Patterns: insertion



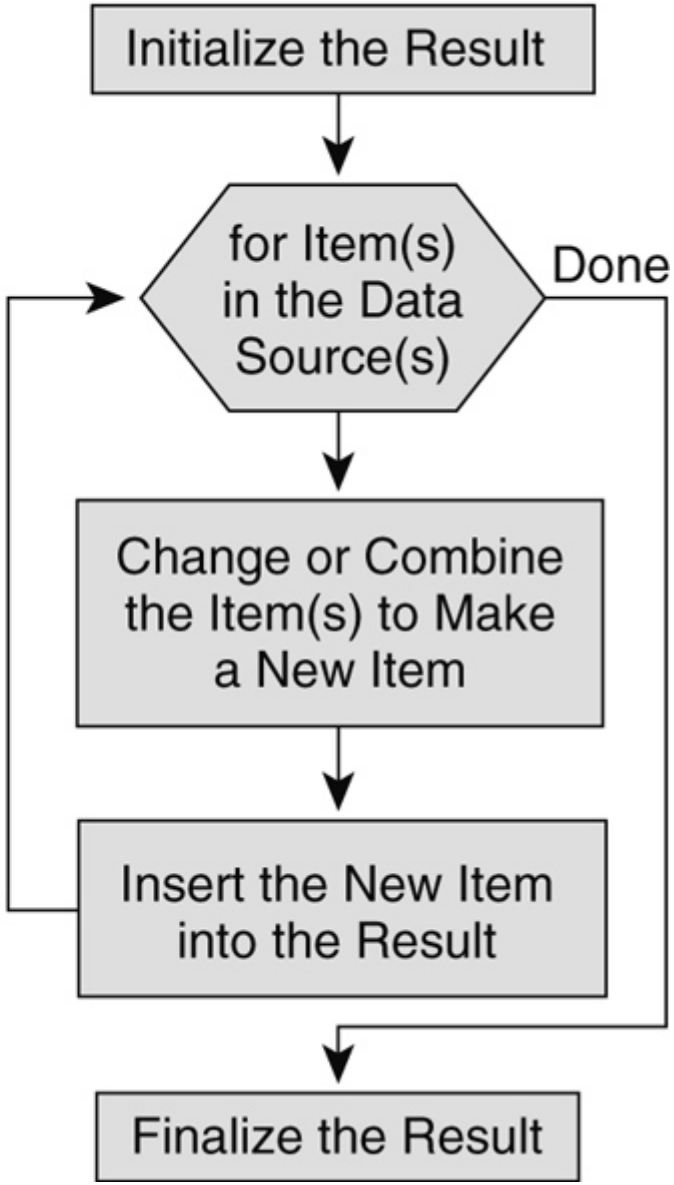
Problem Solving Patterns: finding



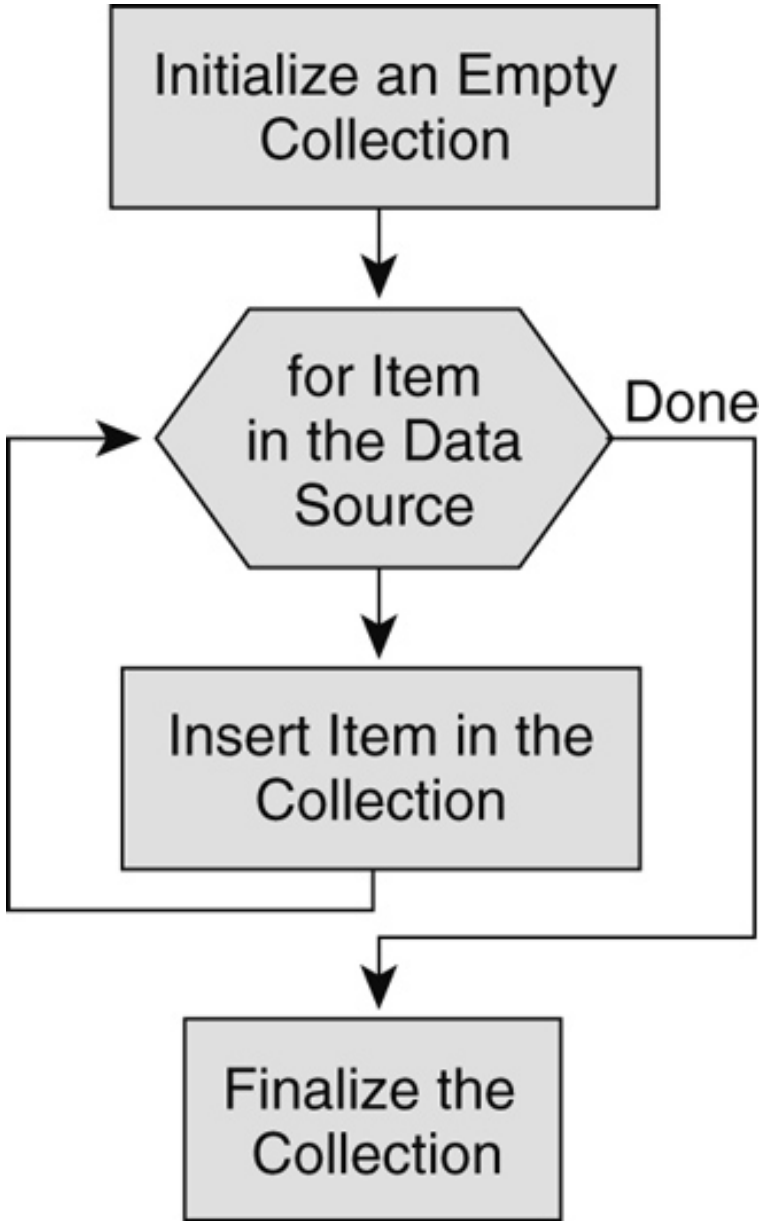
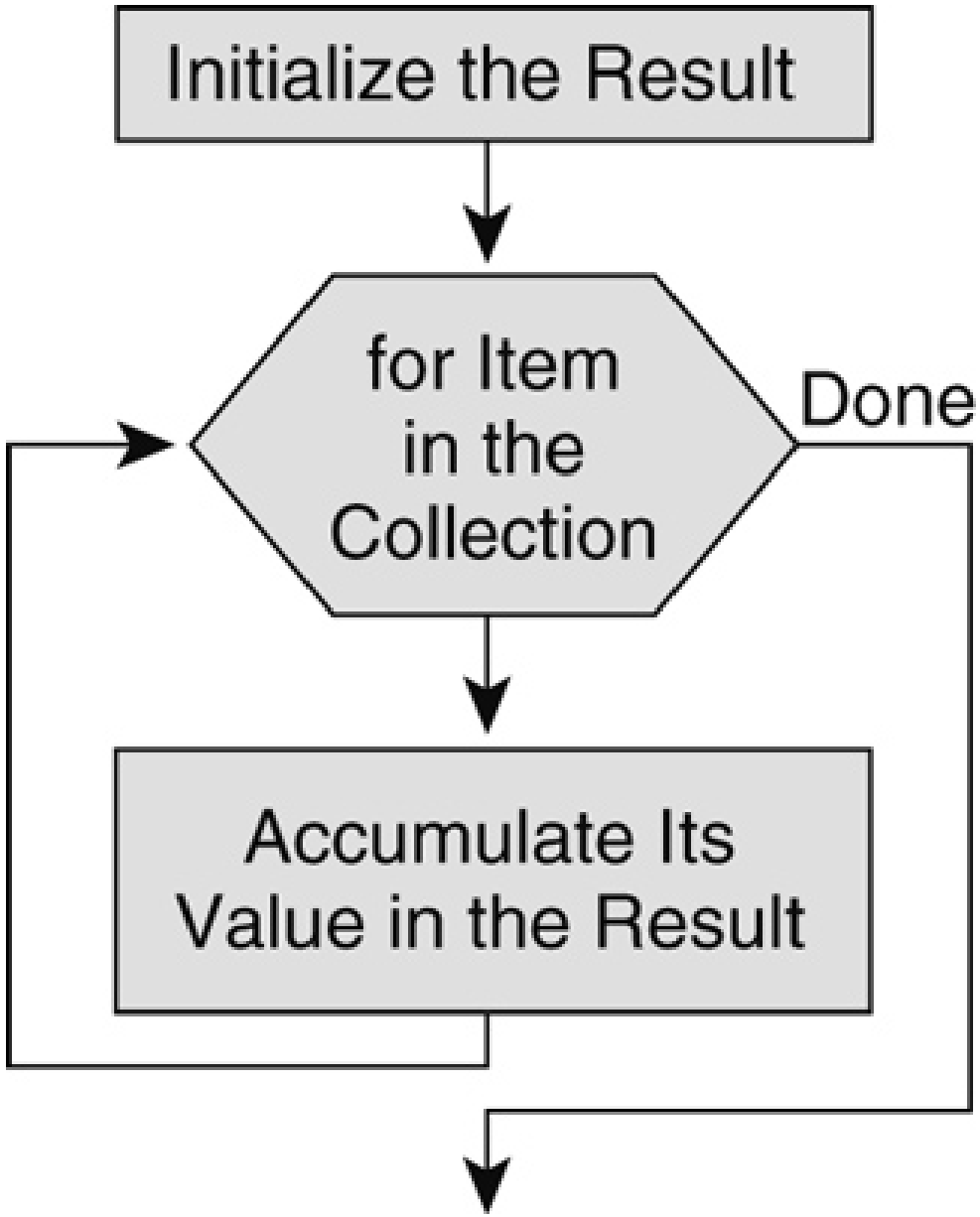
Problem Solving Patterns: filtering



Problem Solving Patterns: mapping



Problem Solving Patterns: copying



Problem Solving Patterns: folding