

# 1 Our Goal

The fundamental goal of this book / chapter / section is to endow the reader with an operational level of conceptual and methodological understanding of the discrete mathematics that is used to study and understand computing. We construe an “operational” level of understanding to be one that enables the reader to “do” mathematics.

Somewhat surprising to the non-mathematician, a large portion of “doing” mathematics, the widely touted “queen of the sciences”, is pattern-matching—albeit of a monumentally sophisticated variety. Mathematicians are trained to understand pieces of reality to a depth that allows them to understand how apparently unrelated concepts  $A$  and  $B$  can be conceptualized via the same abstract representation, and to analyze (computational, in our bailiwick) advantages to exploiting such representations.

Toward the end of guiding the reader through this forest of abstractions, we categorize our targets in three ways

1. fundamental sums
  - of intrinsic interest
  - e.g.: arithmetic sums, geometric sums, mathematically “smooth” sums
2. fundamental techniques
  - that work in many distinct situations
  - e.g.: using integration for summation; grouping/replication; verification via induction
3. fundamental representations
  - that enable one to study the same phenomenon in many seemingly unrelated ways
  - e.g.: numbers, Riemann sums, slices of pie, tokens arranged in stylized ways