Appendix C

Where did it go?

When teaching the first few chapters of this book, you may be disconcerted to find some important topics apparently missing or breezed through absurdly fast. In many cases, what's happening is that the "missing" topics are covered later. This guide will help you get oriented.

It is traditional to cover most of logic and proof techniques right at the start of the course and, similarly, completely cover each topic (e.g. relations) when it first appears. This may seem intellectually tidy and it does work for the small minority who are future theoreticians. However, this method overwhelms most of the class and they get only a superficial understanding of key methods. In this book, the most difficult concepts and techniques are staged in gradually.

Counting material has been integrated with three other topics: Chapter 5 (Sets), Chapter 8 (Functions and One-to-One), and Chapter 18 (Collections of Sets).

Chapters 2-3 (Proofs and Logic). Vacuous truth is in Chapter 5 (Sets). Nested quantifiers are in Chapter 7 (Functions and Onto). Connections to circuits are in Chapter 16 (NP). Proof by contradiction is in Chapter 17 (Proof by Contradiction). The non-traditional topic of 2-way bounding is in Chapter 10.

Chapter 4 (Number theory). Equivalence Classes are introduced, but only pre-formally, in this chapter. Formal details are gradually added in Chapter

6 (Relations) and Chapter 18 (Collections of Sets).

Chapter 5 (Sets). This chapter asks them to prove subset relationships. However, proving a set equality by proving containment into both directions is delayed until Chapter 10 (2-way Bounding). Sets nested inside other sets are covered in Chapter 18 (Collections of sets).

Chapter 6 (Relations). Formal details of equivalence relations are covered in Chapter 18 (Collections of Sets). Notice that equivalence classes were introduced pre-formally in Chapter 4.

Chapters 7-8 (Functions). Set-valued functions are in Chapter 18 (Collections of Sets). The formal definition of a function as a set of pairs is delayed until Chapter 19 (State Diagrams).

Chapter 9 (Graphs). Graph in this book means undirected. Graphs are introduced early and used as examples in many later chapters. It returns as a main topic in Chapter 21 (Planar Graphs). Directed graphs are covered in Chapter 6 (Relations) and Chapter 19 (State Diagrams). The treatment of graphs is deliberately representative, not exhaustive.

Chapter 11 (Induction). This chapter introduces the basic idea, which is further developed in Chapter 12 (Recursive Definition) and Chapter 13 (Trees). Induction involving inequalities is delayed until Chapter 14 (Big-O). This organization lets us stage induction practice over several problem sets, easier examples first.