

section 1.1: # 1, 2, 3, 4, 5

section 1.2: # 1, 3, 6, 10, 12, 13, 14, 16

section 1.3: # 3, 4, 5a, 6, 7

section 1.4: # 1acd, 2bc, 5, 6, 10

section 1.5: # 1ace, 2bcd

section 1.6: # 1a, 3de, 5, 6ad

section 2.1 # 8, 13

A. problems on recursive functions (defined on the natural numbers) and inductive sets:

1. Define  $f(n)$  by  $f(1) = 1$  and  $f(n + 1) = f(n) + n + 1$ . What does  $f$  compute ?

2. Define  $f(n)$  by  $f(1) = 1$  and  $f(n + 1) = f(n) \cdot (n + 1)$ . What does  $f$  compute ?

3. Define the set  $S$  of natural numbers by  $2 \in S$  and the condition if  $n \in S$  then  $n + 5 \in S$ . How would you describe the resulting set  $S$  ?

4. Define the set  $S$  of natural numbers by  $1 \in S$  and the condition if  $n \in S$  then  $2 \cdot n \in S$ . How would you describe the resulting set  $S$  ?

5. Define the set  $S$  of binary strings by  $\lambda \in S$  (where  $\lambda$  is the empty string) and the condition if  $w \in S$  then  $01w \in S$ . How would you describe the resulting set  $S$  ?

6. Define the set  $S$  of binary strings by  $\lambda \in S$  (where  $\lambda$  is the empty string) and the condition if  $w \in S$  then  $0w1 \in S$ . How would you describe the resulting set  $S$  ?

7. Describe an optimal method of solution of the Towers of Hanoi puzzle.

B. problems on induction: Prove by induction each of the following:

(a) In any tree,  $V - E = 1$ , where  $V$  is the number of vertices and  $E$  is the number of edges.

(b)  $|P(X)| = 2^{|X|}$  for any finite set  $X$ , where  $P(X)$  is the power set of  $X$ .

(c) If a big chocolate bar can be broken up into  $N$  small rectangles, then any way of doing it always involves  $N-1$  breaks.

(d) A  $2^n \times 2^n$  chessboard with a single square marked off can be covered by L-shaped pieces.

(e) Let  $\text{sum}(k) = 1 + 2 + \dots + k$ . Show that  $\text{sum}(m + n) = \text{sum}(m) + \text{sum}(n) + mn$

section 2.2 # 2ad

section 2.3 # 1,4, 6, 8, 9a

section 3.1 # 3, 7abc, 9ab, 13ab

section 3.2 # 1, 7

section 3.3 # 1, 10, 13

section 3.4 # 12, 14

section 3.5 # skip

section 4.1 # 1, 3, 4, 6

section 4.2 # 1, 5, 7, 8

section 4.3 # 1, 3ab, 7a, 8

section 4.4 # 1ab, 3, 5, 7a

section 4.5 # 1, 2ab, 4, 5, 6a, 12

Read the handout about probability and do all the problems on it

section 5.1 # 5, 6, 9a, 11abiii

section 5.2 # 1, 2ab, 5, 6ab

section 5.3 # 1, 2, 3ab, 7abd

skip ahead to chapter 7

section 7.1 # 3, 5, 9, 11, 12, 13

section 7.2 # 2, 4, 6, 7

section 8.1 # 1, 2, 3

section 8.2 # 1ace, 2b