CS 381 Solutions to Homework 9

Q 1. Textbook p. 581:
2. (a) $< 1,1 >, < 1,2 >, < 1,3 >, < 1,4 >, < 1,5 >, < 1,6 >, < 2,2 >, < 2,4 >, < 2,6 >, < 3,3 >, < 3,6 >, < 4,4 >, < 5,5 >, < 6,6 >$

Q 2. Let R denote the relation to be defined.
Basis Clause: $< 0,0 > \in R$
Inductive Clause: If $< x,y > \in R$, then $< x+1, y+3 > \in R$.
Extremal Clause: Nothiung is in R unless it is obtained from the Basis and Inducive Clauses.

Q3. Every subset of $\{< 0,0 >, < 0,2 >, < 2,0 >, < 2,2 >\}$, including the empty set, is a binary relation on {0,2}. There are 16 of them altogether.

Q 4. Let A denote the set of cardinarity n. Then a unary relation on A is a set of 1-tuples of elements of A, that is a set of $< i >$'s for elements i of A. Hence the number of binary relations on A is equal to the number of subsets of A. Since a set B has $2^{|B|}$ subsets in general, the number of unary relations on A is equal to 2^n.