

1. Find the domain and range of these functions:
  - a. the function that assigns to each pair of integers the maximum of these two integers
  - b. the function that assigns to each set of integers the maximum of these integers
2. How much time does an algorithm take to solve a problem of size  $n$  if this algorithm uses  $2n^2 + 2^n$  bit operations, each requiring  $10^{-9}$  second, with these values of  $n$ ?
  - a. 10, b. 100
3. Prove using mathematical induction that
$$1*2 + 2*3 + \dots + n*(n+1) = n*(n+1)*(n+2)/3$$
 whenever  $n$  is a positive integer
4. A test contains 100 true/false questions. How many different ways can a student answer the questions on the test, if answers may be left blank?
5. What is the variance of the number of times a 6 appears when a fair die is rolled 10 times?
6. A group of 5 people begin a chain letter, with each person sending the letter to three other people. Each of these people then sends the letters to three additional people.
  - a. Find a recurrence relation for the number of letters sent at the  $n$ th stage of the chain letter, if no person ever receives more than one letter
  - b. How many letters are sent at the  $n$ th stage of the chain letter?
7. Explaining how partial orderings on the sets  $A^1$  and  $A^2$  can be used to define a partial ordering on the set  $A^1 \times A^2$
8. Given the set of vertex pairs associated to the edges of an undirected graph,  $E$ , please write an algorithm to find the degree of each vertex.
9. What is a spanning tree of a simple graph?
10. Determine whether 1011 belongs to each of these regular sets:
  - a.  $10^*1^*$
  - b.  $0^*(10 \cup 11)^*$