Sets

1. Write Power set of
   1. {1}
   2. 1
2. Suppose A = {4,3,6,7,1,9}, B={5,6,8,4} and C ={5,8,4}, find the followings
   1. AUB
   2. A
   3. C-B
   4. B-C

Relations

1. Is the “divides” relation on the set of positive integers reflexive?
2. Which of the following relation holds one or more of these properties i.e symmetric, reflexive or transitive
   1. R1 = {(1, 1), (1, 2), (2, 1), (2, 2), (3, 4), (4, 1), (4, 4)},
   2. R2 = {(1, 1), (1, 2), (2, 1)},
   3. R3 = {(1, 1), (1, 2), (1, 4), (2, 1), (2, 2), (3, 3), (4, 1), (4, 4)},
   4. R4 = {(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3)},
   5. R5 = {(1, 1), (1, 2), (1, 3), (1, 4), (2, 2), (2, 3), (2, 4), (3, 3), (3, 4), (4, 4)},
   6. R6 = {(3, 4)}

Loops

1. Make an appropriate table. Define the series in terms of K. Specify and domain of K and finally find time complexity of the following loops



Counting:

1. A new company with just two employees, Sanchez and Patel, rents a floor of a building with 12 offices. How many ways are there to assign different offices to these two employees?
2. The chairs of an auditorium are to be labeled with an uppercase English letter followed by a positive integer not exceeding 100. What is the largest number of chairs that can be labeled differently?
3. How many different bit strings of length seven are there?
4. There are four major auto routes from Boston to Detroit and six from Detroit to Los Angeles. How many major auto routes are there from Boston to Los Angeles via Detroit?

Permutations and Combinations

1. How many ways are there to select a first-prize winner, a second-prize winner, and a third-prize winner from 100 different people who have entered a contest?
2. How many permutations of the letters *ABCDEFGH* contain the string *ABC* ?
3. How many ways are there to select five players from a 10-member tennis team to make a trip to a match at another school?
4. Suppose that there are 9 faculty members in the mathematics department and 11 in the computer science department. How many ways are there to select a committee to develop a discrete mathematics course at a school if the committee is to consist of three faculty members from the mathematics department and four from the computer science department?

Binomial Theorem

1. What is the expansion of ?
2. What is the coefficient of in the expansion of ?
3. What is the coefficient of in the expansion of

Pigeonhole Principle

1. What is the least number of area codes needed to guarantee that the 25 million phones in a state can be assigned distinct 10-digit telephone numbers? (Assume that telephone numbers are of the form NXX-NXX-XXXX, where the ﬁrst three digits form the area code, N represents a digit from 2 to 9 inclusive, and X represents any digit.)
2. Show that if you pick 5 integers from 1 to 8, you will definitely find two of them must add up to 9.

Inclusion-Exclusion Principle

1. Every student in a discrete mathematics class is either a computer science or a mathematics major or is a joint major in these two subjects. How many students are in the class if there are 38 computer science majors (including joint majors), 23 mathematics majors (including joint majors), and 7 joint majors?