

1. Find a deterministic finite state automaton whose language is those binary strings where no 1 precedes a 0.
2. Describe in words the language of $(00^*1)^*$
3. Prove the Boolean Identity $x \cdot x = x$ for all x .
4. Suppose X is a connected graph. State a condition involving the number of vertices and edges that guarantees it is a tree.
5. Determine whether or not K_5 , K_6 , Q_3 are Eulerian and/or Hamiltonian.
6. Find the incidence and adjacency matrix of the graph $K_{3,3}$.
7. State Kuratowski's theorem about planarity.
8. Consider the set of subsets of the set $\{1, 2, 3\}$ and the partial ordering given by inclusion. Draw the Hasse diagram.
9. Prove that the relation on integers of "divides" is transitive.
10. Consider the set of ternary strings. Define a relation R by wRu if w and u agree on the first n characters where n is at least as large as the minimum of half of the lengths of w and u . Is R an equivalence relation?
11. Using the characteristic equation approach, solve the recurrence relation $a_n = 2a_{n-1}$ with $a_0 = 3$.
12. Give the recurrence relation for the number of bit strings of length n that do not contain two consecutive ones. Explain your reasoning.
13. A jar contains marbles colored blue, green, red, and yellow. Assuming you are blindfolded, how many marbles must you take to be sure to get 7 of the same color?
14. Explain what $P = NP$ is all about.
15. Give a combinatorial proof that $C(n, k) = C(n, n - k)$.
16. Give a combinatorial proof that $2^n = \sum_{k=0}^n C(n, k)$
17. An exam consists of 35 true-false questions. Exactly ten of the questions have "true" as the answer. How many answer keys are possible.
18. You draw 2 cards. Find the probability that the second one is a king given that the first one is a heart.
19. Find the probability of getting a full house in 5-card poker.
20. How many ways can you order a dozen donuts from a shop selling 5 varieties?
21. How many ways can the string SUCCESS be rearranged?
22. Look at the exam1 review sheet.
23. Review all the homework, all the quizzes, the previous review sheets, the previous exams, and your notes from class. Then review everything else.