

Discrete Math Exam 2

Do the problems in order in your bluebook. Show your work.

1. How many ternary strings of length 120 are there ?
2. 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 ? Explain it using the pigeonhole principle.
3. Give a combinatorial proof that $C(n, k) = C(n, n - k)$.
4. An exam consists of 40 true-false questions. Ten of the questions have “true” as the answer. How many answer keys are possible.
5. You flip a coin 4 times. Show that the events “the first three flips are heads” and “the 4th flip is heads” are independent.
6. Find the probability of getting a full house in 5-card poker.
7. Find the recurrence relation for the number of ways of climbing n stairs, assuming you can take them one or two or three stairs at a time.
8. Consider the set of subsets of the set $\{1, 2\}$ and the partial ordering given by inclusion. Draw the Hasse diagram.
9. Let $f : X \rightarrow Y$ be a function. Define a relation R on X by $x_1 R x_2$ iff $f(x_1) = f(x_2)$. Prove that R is an equivalence relation.