Assignment 5

Problem 1 (Backgammon)
Let W and B be two men of opposite color, separated by exactly k points, on a completely open backgammon board. Compute the probability that W can hit B in one roll for $1 \leq k \leq 24$.

Problem 2 (Relations)
Let X be any finite set. How many relations are there on X that are ...

a) symmetric

b) reflexive

c) symmetric but not reflexive

d) reflexive but not symmetric

Problem 3 (Functions)

Let A and B be any nonempty finite sets, and let $n = |A|$ and $M = |B|$. Let $\mathcal{F}$ denote the class of all partial functions with source A and target B. (Recall that every total function is also partial.)

How many elements of $\mathcal{F}$ are ...

a) total

b) partial

c) total and injective

d) partial and injective

e) total and surjective

f) partial and surjective

g) total and bijective

h) partial and bijective

i) computable

Carefully justify your answers. (Caution: Be sure to handle all possible values of n and M.)