CMSC 203 Spring 2005 Examination 3

1. (a) How many license plates can a state produce if the plates can contain 6 characters (from 26 letters and 10 digits) if a certain pair of letters cannot be adjacent to one another and all the characters must be distinct?
(b) How many ways can a teacher choose 8 students from a class of 13 Boys and 16 Girls, if she must choose at least 6 boys?
(c) How many orderings are there of the letters of the word *SURROUNDSOUND* ?
(d) How many ways can I seat 12 people around a circular table?
(e) How many ways can I fill a box of 60 chocolates from 20 types if I must have at least 2 of each type in the box?

2. Let R be the relation on **Z** given by R = {(*a*,*b*) | *a*,*b* ∈ **Z** and *a* ≡ *b* mod 6}.
(a) Prove the R is Reflexive. **(b)** Prove the R is Symmetric. **(c)** Prove the R is Transitive.
(d) Describe the partition of **Z** induced by R.

Let S be the relation on {1,2,3,4,5} given as S = {(*a*,*b*) | *a* ≡ *b* MOD 2}
(e) Graph S. **(f)** Find M_S, the Matrix of S.
(g) Find M_S o M_T for S = {(1,1), (1,3), (2,1), (2,2), (3,2), (3,3)} and T = {(1,2), (1,3), (2,1), (2,3), (3,1), (3,3)}, relations on {1, 2, 3}.
(h) Find the Primary Keys and $P_{3,6}$ for the trumpet database whose entries form the following table:

Make	**Model**	**Year**	**Serial No.**	**Key**	**Finish**
Conn	38A	1955	105523	Bb	Silver
Conn	40B	1938	52234	Bb	Brass
Conn	22A	1966	212203	C	Silver
Olds	Special	1966	524366	Bb	Silver
Olds	Super	1955	161230	C	Gold
Olds	Mendez	1966	210658	Bb	Silver
Selmer	24A	1953	14522	Bb	Gold
Selmer	Paris	1955	18502	Bb	Silver
Selmer	Radial	1974	64299	C	Brass

3. (a) For a collection of 144 coins, if 36 are quarters, 15 are quarters from the 1990's, and 60 are coins from the 1990's, show that the probability the a coin chosen at random is a quarter is INDEPENDENT from coins from the 1990's?
(b) What is the probability rolling 2 fair dice and getting a total of at least 9 if the first die rolls at least 5?

4. (a) Find the Disjunctive Normal Form for the Boolean Polynomial F(*w*,*x*,*y*,*z*) = *w'z* + w*xy'*
(b) Find the Conjunctive Normal Form of the polynomial with Truth Table:

x	*y*	*z*	F(*x*,*y*,*z*)
1	1	1	0
1	1	0	1
1	0	1	1
1	0	0	1
0	1	1	0
0	1	0	0
0	0	1	1
0	0	0	1