

CMSC 203 Spring 2004 Examination 3

1. (a) How many license plates can a state produce if the plates can contain 8 characters (from 26 letters and 10 digits) if they can only use one digit?
- (b) How many ways can the teacher choose 10 students from a class of 14 Boys and 16 Girls, if she must choose at least 8 boys?
- (c) How many orderings are there of the letters of the string ACCACABBABACACBB ?
- (d) How many ways can I select either a RED card or a FACE card (including ACE) from a standard bridge deck of cards?
- (e) How many ways can I fill a box of 100 chocolates from 25 types if I must have at least 3 of each type in the box?

2. Let R be the relation on \mathbf{Z} given by $R = \{(a,b) \mid a,b \in \mathbf{Z} \text{ and } a \equiv b \pmod{2}\}$.

- (a) Prove the R is Reflexive. (b) Prove the R is Symmetric. (c) Prove the R is Transitive.
- (d) Describe the partition of \mathbf{Z} induced by R.

Let S be the relation on $\{1,2,3,4\}$ given as

$$S = \{(1,2), (1,4), (2,3), (2,4), (3,1), (3,3), (3,4), (4,1), (4,2), (4,3)\}$$

- (e) Graph S. (f) Find M_S , the Matrix of S. (g) Find $M_S \circ M_S$

(h) Find the **Primary Keys** and **$P_{3,6}$** for the database:

Make	Model	Year	Engine ID	Vehicle ID	Color
Ford	Mustang	1972	A1222	FO13579	Black
Ford	Fiesta	1989	C54322	FO24245	Yellow
Chevy	Camaro	1991	754342AH	CH172389	Black
Chevy	Caprice	1989	442355CC	CH156738	Yellow
Olds	Cutlass	1992	ANDU33	OL64332	Blue
Olds	Cutlass	1992	ANGH28	OL61998	White
Volvo	P1800	1969	44325XX	VO44526	White
Volvo	240	1986	53526PD	VO64690	Black
Volvo	760	1992	578868R	VO83529	Blue

3. (a) For a collection of 100 coins, if 35 are quarters, 20 are quarters from the 1990s, and 60 are coins from the 1990s, what is the probability the a coin chosen at random is a quarter or is a coin from the 1990s?
 - (b) In one year, Baltimore plays 75 games away from home and 60 games at home. They win 50 of their away games and 40 of their home games. Verify that Baltimore's chances of winning are independent of whether or not they play on the road or at home.
4. (a) Find the truth table for a 3-way switch controlling a lightbulb so that the light is ON whenever all the switches are ON.
 - (b) Find the Disjunctive Normal Form (i.e. Sum of Products Form) of the polynomial in part (a).