

Math 112

Quantitative Reasoning

April 19, 2010

Schedule 4/19/10

- **Return HW and distribute HW notes**
- **Practice some problems related to the HW**
- **Reminder about Test 3**
- **Game theory**
- **Identification numbers**
- **Review for the test as necessary**
- **Course evaluations**

Test 3 Reminder

- **Reminder about Test 3**
 - **Take-home part given out today (due 4/26)**
 - **Topics: fair division, bin packing, ID numbers**
 - **There will be a brief in-class test next week**
 - **It will be at the beginning of class**
 - **Whoever doesn't finish by the time we're ready to start class can stay after class and finish**
 - **In class: Weighted voting systems, game theory (2 person total conflict games only), ID numbers**

Two-Player Total Conflict Game

- **When one player wins, the other loses**
 - There is no incentive for cooperation
- **There is a straightforward way to determine the best strategy**
 - Payoff table with minimax/maximin strategy
- **The value of the game is the best outcome that both players can guarantee. If a game has a saddlepoint, that's the value.**

Identification Numbers 1

- **Postal money orders: 11 digits**
 - A 10-digit code, followed by the check digit
 - Check digit = remainder when sum of first 10 digits is divided by 9
- **Travelers checks:**
 - The check digit is chosen so that the sum of all the digits is evenly divisible by 9
- **Bank ID numbers: The ninth digit a_9 is the last digit of:**
 - $7a_1+3a_2+9a_3+7a_4+3a_5+9a_6+7a_7+3a_8$

Identification Numbers 2

- **Credit cards:**
 - Add digits in odd positions and multiply by 2
 - Count # of digits in odd positions that are greater than 4
 - Add digits in even positions
 - All the above 3 numbers
 - The check digit is what is needed to make the sum end in 0
- **10-digit ISBN: This number is evenly divisible by 11:**
 - $10a_1+9a_2+8a_3+7a_4+6a_5+5a_6+4a_7+3a_8+2a_9+a_{10}$

Identification Numbers 3

- **ZIP codes: XYYZZ**
 - **X = region of the country from 0 (east) to 9 (west)**
 - **YY = sectional center**
 - **ZZ = town or local post office, often in alphabetical order**
- **Postnet Code is used to encode ZIP+4 numbers**
 - **Each group of 5 bars (2 short, 3 long) represents 1 digit**
 - **There are long “guard” bars at each end**
 - **The check digit ensures that the sum of the digits is evenly divisibly by 10**

Error-Correcting Codes

Message	→	Code Word	Message	→	Code Word
0000	→	0000000	0110	→	0110010
0001	→	0001011	0101	→	0101110
0010	→	0010111	0011	→	0011100
0100	→	0100101	1110	→	1110100
1000	→	1000110	1101	→	1101000
1100	→	1100011	1011	→	1011010
1010	→	1010001	0111	→	0111001
1001	→	1001101	1111	→	1111111