

**Math 110**  
**Exam 2**  
**Fall 2005**

Justify all answers with neat and organized work. Clearly indicate your answers. 100 points possible.

The following formulas may or may not be useful.

$$PMT = PV \frac{\frac{r}{n}}{1 - \left(1 + \frac{r}{n}\right)^{-nt}} \quad PMT = PV \frac{i}{1 - (1 + i)^{-m}} \quad C = \frac{n(n-1)}{2}$$

$$\text{Standard divisor} = \frac{\text{total population}}{\text{total number of seats}}$$

$$\text{Standard quota for a state} = \frac{\text{population of that state}}{\text{standard divisor}}$$


---

1. (30 pts.) Several baseball writers are asked to vote their preferences among the following four baseball players to determine the winner of the Holy-Cow-Award: Nellie Fox (F), Ernie Banks (B), Dick Allen (A), and Phil Cavarretta (C). The votes of the writers are summarized in the following preference table.

Number of Votes	15	11	10	6	2
1st choice	B	A	F	C	C
2nd choice	C	F	A	A	F
3rd choice	F	C	C	F	B
4th choice	A	B	B	B	A

- How many baseball writers voted in this election?
- How many baseball writers selected Phil Cavarretta as their first choice for the Holy-Cow-Award?
- Who is declared the Holy-Cow-Award winner using the plurality method?
- Who is declared the winner of the Holy-Cow-Award using the plurality-with-elimination method? Show enough work to justify your answer.
- Who is declared the Holy-Cow-Award winner using the pairwise comparison method? Show enough work to justify your answer.

**2.** (30 pts.) Four students are running for president of the CD-Sharing Club: Ann (A), Barbara (B), Charlie (C), and Devon (D). The preference table for the election is shown. The Borda count method is used to determine the winner.

Number of Votes	7	4	2
1st choice	A	B	D
2nd choice	B	D	A
3rd choice	C	C	C
4th choice	D	A	B

(a) Using the Borda count method, who is the winner? Show enough work to justify your answer.

(b) Is the majority criterion satisfied? Using one or more complete sentences, explain your answer.

(c) Is the head-to-head criterion satisfied? Using one or more complete sentences, explain your answer.

(d) Suppose that Charlie drops out. Construct the new preference table for the election with Charlie removed. Using the Borda count method, who among the remaining candidates is the winner? Is the irrelevant alternatives criterion satisfied? Using one or more complete sentences, explain your answer.

**3.** (20 pts.) A country is composed of four states, White Plume (WP), Barrier Peaks (BP), Hommlet (H), and Tamoachan (T). The population of each state, in thousands, is given in the following table.

State	WP	BP	H	T
Population (in thousands)	285	492	711	748

According to the country's constitution, the congress will have 43 seats, divided among the four states according to their respective populations.

(a) Find the standard divisor, in thousands. How many people are there for each seat in congress?

(b) Find each state's standard quota.

(c) Find each state's lower quota.

(d) Find each state's upper quota.

(e) Use Hamilton's method to find each state's apportionment of congressional seats.

4. (20 pts.)

(a) A loan of \$85,000 is to be amortized with 9 equal semiannual payments. If the interest rate is 10%, compounded semiannually, what is the periodic payment?

(b) A loan of \$100,000, with interest at 12% compounded quarterly, is to be repaid by making several equal quarterly payments of \$7,961.08. Fill in the first two rows of the amortization schedule, for the first two quarterly payments.

Period	Payment	Interest	Balance Reduction	Unpaid Balance
				100,000.00
1				
2				