17 Nov 2014

Math 181

The third exam covers Sections 8.1, 8.2, 8.3, and all of Chapter 9. You should be able to define all bolded definitions in these sections. (Thus I won't explicitly mention them in what follows; if it's bolded, it's fair game.)

8.1

- Video that I posted on Nov 3
- Table 8.1
- Be familiar with the game from the handout on Nov 5 (two-card poker hands)
- Poker probabilities video from Nov 5
- Probability rules on page 289. In particular, when is adding or multiplying probabilities allowed?

8.2

- Think about data sets for which Benford's law would or would not hold.
- Have an answer for "why" Benford's law holds on many data sets. I'm not looking for some exact phrasing; we gave several such reasons in discussion.
- You do NOT need to know the exact distribution probabilities for each digit in Benford's law (p291).

8.3

- Understand the differences between Examples 7, 8, 9, and 10
- All of Table 8.2 (not just the parts we talked about in class)
- There are a lot of "blue boxes" in this section. They are all really important.
- The notation and application of permuations and combinations.
- Recall that ${}_n\mathrm{C}_k = \frac{n!}{k!(n-k)!}$. Explain what each "piece" of the formula is doing. (e.g. why do we need a $k!$ in the denominator?)

Recommended review problems (page 315+): 3–6, 10–14, 16–18, 20–30.

9.1 (nothing particularly special in this really short section)

9.2

- Know the three desirable properties of majority rule
- May's Theorem

- Know how to determine when there is a Condorcet winner and when Condorcet's voting paradox occurs.

9.3

- Table from my notes for Nov 14: all voting systems and all properties
- Soon-to-be-released video about how to show that a voting system fails to have a particular property under a particular set of ballots.
- Examples 3, 4, 6, and 7 illustrate examples of the previous point.

9.4

- Arrow's Impossibility Theorem (you must mention preference lists, otherwise, the theorem is not correct)
- I do not care about the "weak version" on page 343.

9.5

- Is it possible for approval voting to satisfy IIA and the Pareto condition?
- Does this contradict Arrow's Impossibility Theorem? Explain.
- What properties does approval voting satisfy? In each case, state why or why not.

Recommended review problems (page 349+): Skills check 1–30 are good to start with. Exercises 1–5, 9–38, 41–42. (The problems for section 9.3 are really good. At least one of them will be used verbatim on the exam.)

Here is the table I put on the board.

	CWC	IIA	Pareto	Mono
Plurality	No Ex1 p330	No #30a	Yes	Yes
Borda	No, #31 Quiz10 #1	No, p337 Quiz10 #1	Yes	Yes
Seq. Pairwise	Yes (Homework)	No Quiz10 #4	No Ex4 p338	Yes
Hare	No (Homework)	No #30	Yes	No, Ex6 p340 #32,33
Plurality Runoff	No #28	No #30	Yes	No #29