

MATH1007

Homework 7

Due Friday, October 28

When submitting homework, please remember the following:

- Show all work leading to each solution.
- *You must use a staple* (not paper clip) if your answers are longer than a single page.
- Do not submit crossed-out or sloppy work.
- Do not submit ripped or torn pages.
- Be sure to submit your own work.

1. At Sylvania Tech, the probability that a student will default on his or her loans is 11%. There are 2500 students enrolled at Sylvania Tech. What is the probability that at least 260 of them will default on their loans?

2. In American roulette, the probability of the ball landing on a red square is $p = \frac{18}{38}$. Suppose that I bet on red 10,000 consecutive times. Let Y be the number of times that I lose.

- (a) What are the mean μ and standard deviation σ for the random variable Y ?
- (b) Approximately what is the likelihood that I will lose more than 5263 times?
- (c) What is the approximate likelihood that I will lose between 5163 and 5363 times?
- (d) What can you say about the likelihood of winning at least half of the 10,000 bets?

3. The school newspaper at Sylvania Tech has polled a random sample of 800 students to determine how they will vote in the student government election. The newspaper's story, written by a statistics major, states:

The election for student government president is less than a week away. Our most recent poll shows that Groucho leads Chico by 56% to 44%.

The usual practice is to use $p = 0.5$ for all close elections. Follow that practice below.

- (a) Estimate the standard error for this poll.
- (b) Compute a 95% confidence interval for the poll.
- (c) Compute a 99.7% confidence interval for the poll.

4. Here is a preference schedule for three candidates A, B, and C:

	Number of voters			
	9	5	3	6
First choice	A	C	B	A
Second choice	C	A	A	B
Third choice	B	B	C	C

- (a) How many people voted?
- (b) Which candidate(s) would win using the plurality system?
- (c) Which candidate(s) would win using the Borda count?
- (d) Which candidate(s) would win using instant runoff voting?

(e) Suppose that candidate A withdraws because of an e-mail scandal. Which candidate wins the head-to-head competition between B and C?

5. Here is a preference schedule for 4 candidates A, B, C, and D:

	Number of voters			
	8	4	9	7
First choice	C	B	B	D
Second choice	B	D	A	A
Third choice	A	A	D	B
Fourth choice	D	C	C	C

- (a) How many people voted?
- (b) Which candidate(s) would win using the plurality method?
- (c) Which candidate(s) would win using the Borda count?
- (d) Which candidate(s) would win using instant runoff voting?
- (e) Suppose that candidate A leaves the race.
 - (i) Which candidate(s) would win using the plurality method?
 - (ii) Which candidate(s) would win using the Borda count?
 - (iii) Which candidate(s) would win using the instant runoff voting?
- (f) Who wins the head-to-head competition between B and C?

6. Here is a preference schedule for the 5 candidates A, B, C, D, and E:

	Number of voters					
	5	5	3	3	3	2
First choice	A	C	A	B	D	D
Second choice	B	E	D	E	C	C
Third choice	C	D	B	A	B	B
Fourth choice	D	A	C	C	E	A
Fifth choice	E	B	E	D	A	E

- (a) How many people voted in this election?
- (b) Which candidate(s) would win using the plurality method?
- (c) Which candidate(s) would win using the Borda count?
- (d) Which candidate(s) would win using instant runoff voting?
- (e) Who wins in a head-to-head match-up between candidates B and E?
- (f) Which candidate has the fewest last place votes?
- (g) Suppose that candidate E decides not to run, so that there are only 4 candidates running.
 - (i) Which candidate(s) would win under the plurality method?
 - (ii) Which candidate(s) would win using the Borda count method?
 - (iii) Which candidate(s) would win using the instant runoff voting?