UC Berkeley Math 10B, Spring 2015: Midterm 1

Prof. Sturmfels, February 26, 2015

Name: _____

SID: _____

Neighbors: Please write the names of the students next to you (or "None"):

Left: _____

Right: _____

Section: Circle your discussion section below:

Sec	Time	Room	GSI
101	MWF 8-9	121 Latimer	Jason Ferguson
102	MWF 9-10	104 Barrows	Jason Ferguson
103	MWF 10-11	237 Cory	Minseon Shin
104	MWF 11-12	121 Latimer	Indraneel Kasmalkar
105	MWF 12-1	237 Cory	Indraneel Kasmalkar
106	MWF 1-2	206 Wheeler	Joe Kileel
107	MWF 2-3	283 Dwinelle	Joe Kileel
108	MWF 9-10	110 Wheeler	Minseon Shin
109	MWF 1-2	250 Dwinelle	Elina Robeva
110	MWF 2-3	228 Dwinelle	Elina Robeva

Other/none, explain: _____

Grading

1	/ 5
2	/ 5
3	/ 5
4	/ 5
5	/ 5
6	/ 5
7	/ 5
8	/ 5
	/40

Instructions:

- Closed book: No notes, no books, no calculators.
- The exam time is 80 minutes. Do all 8 problems.
- You must justify your answers for full credit.
- Write your answers in the space below each problem.
- Answers in complete sentences are encouraged.
- If you need more space, use reverse side or scratch pages. Indicate clearly where to find your answers.

1. (5 points) Find the coefficient of x^6y^4 in $\left(2x + \frac{1}{2}y\right)^{10}$.

2. (5 points) We toss a biased coin, where the probability that heads comes up is 0.4. What is the expected number of heads that come up when it is flipped 20 times?

3. (5 points) Seven people stand in line to greet the President of the United States. However, one of the seven people is nervous and does not want to be the first person in line. In how many different ways can the seven people stand?

4. (5 points) An unbiased coin is tossed 5 times. What is the expected value of the number of times you will see an H immediately followed by a T?

5. (5 points) How many ways are there to divide 5 people into 2 or 3 groups?

(The order of the groups and the order of the people in each group do not matter. In your answer, you must state the actual number, which is a positive integer.)

6. (5 points) Box A contains 1 white ball and 4 black balls. Box B contains 1 white ball and 3 black balls. We flip a fair coin. If the outcome is heads, then a ball from box A is selected at random. If the outcome is tails, then a ball from box B is selected at random. Suppose that a white ball is selected. What is the probability that the coin landed tails?

7. (5 points) Give the definitions of "random variable" and "event." To receive full credit you must define other words from probability that appear in your definitions.

8. (5 points) Let X be the most number of heads you get in a row after flipping a fair coin five times. For example, if you got "HHHTH" then $X = 3$; if you got "HTTHT" then $X = 1$; and if you got "TTTTT" then $X = 0$.

(a) Explain why X is a random variable by showing it fits your definition in 7.

(b) Explain why "$X \geq 2$" is an event by showing it fits your definition in 7.

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(Scratch Paper, Page 2)

(Scratch Paper, Page 3)