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Name: _____

Test III

Version A

ICS 6D

Fall 2016

Nov 18, 2016

Instructor: Sandy Irani

Instructions

- Wait until instructed to turn over the cover page.
- The total number of points on the test is 40.
- Leave your answer as an arithmetic expression, including the $P(n, k)$ or $\binom{n}{k}$ notation. You do not have to compute a final numeric value.
- **Important:** There are questions on both sides of the page. The back of the last page is for scratch work.

1. (10 points) There are seven different jobs in a printer queue. Each job has a distinct tag which is a string of three upper case letters. The tags for the seven jobs are:

$$\{LPW, QKJ, USU, CDP, BBD, PST, LSA\}$$

- (a) How many different ways are there to order the seven jobs in the queue?
- (b) How many different ways are there to order the seven jobs in the queue so that either QKJ or LPW come last?
- (c) How many different ways are there to order the seven jobs in the queue so that QKJ is either last or second-to-last?
- (d) How many different ways are there to order the seven jobs in the queue so that job USU comes immediately before CDP?
- (e) How many different ways are there to order the seven jobs in the queue so that job USU comes somewhere before CDP in the queue, although not necessarily immediately before?

2. (10 points) This question concerns strings over the alphabet $\{a, b, c, d\}$.

(a) How many strings have length 8?

(b) How many strings have length 6, 7, or 8?

(c) How many strings have length 8 and begin with "ab" or "cab"?

(d) How many strings have length 8 and exactly three a 's?

(e) How many strings have length 8 and exactly three a 's and exactly two b 's?

3. (4 points) 110 middle school students compete in a math competition.

(a) 10 kids are given honorable mention at the end of the competition. How many ways are there to select the kids who get honorable mention?

(b) The competition has a platinum medal winner, a gold medal winner, a silver medal winner and a bronze medal winner. How many different outcomes are there for the medal winners if no student can win more than one medal and none of the students given honorable mention can also win a medal?

4. (6 points) License plate numbers in California consists of seven characters. The first character is a digit (0 through 9). The next three characters are capital letters (*A* through *Z*) and the last three characters are digits. You can assume for this problem that there are no restrictions on using the digit zero or the letter "O". Therefore, a California license plate number can be any string of the form:

Digit-Letter-Letter-Letter-Digit-Digit-Digit

(a) How many different license plate numbers are possible?

(b) How many license plate numbers are possible if no digit appears more than once?

(c) How many license plate numbers are possible if no digit or letter appears more than once?

5. (4 points) A fair coin is flipped 10 times. Since the coin is a fair coin, all of the 2^{10} outcomes are equally likely.

(a) What is the probability that at least one of the 10 flips comes up heads?

(b) What is the probability that the same number of flips come up heads as come up tails?

6. (6 points) Two soccer teams in a youth league tie for first place. The "Breakways" have 18 players and the "Cyclones" have 16 players. The league must select 14 players to form a new team that will go on to the regional championship.

(a) How many ways are there to select the 14 players from the "Cyclone" and "Breakaway" players?

(b) How many ways are there to select the 14 players so that the new team has the same number of players from the "Breakaways" as from the Cyclones"?

(c) If a group of 14 players is selected at random from the pool of players on both teams, with each choice being equally likely, what's the probability that the selected team does not have any players from the "Breakaways"?

This area is for scratch work.