Stat 134 Midterm

Instructor: Mike Leong   Summer 2014

Name: ______________________________

SID: ______________________________

To get credit for work, you **must** show your work. $\boxed{\text{Box in your final answer}}$.

No calculators are allowed. So you may leave your answer as a numerical expression. Examples are listed below.

$$123^2 + 17^3 e^2$$

$$\Phi\left(\frac{123 - 100}{17}\right)$$

All summations must be evaluated for full credit. Scan through the test first to see which problems are easier for you. Manage your time.

#	Your Score	Points Possible
1		10
2		10
3		10
4		10
5		10
Total		50

(Blank for scratch work.)

1. Suppose the X_i 's are all independent with the following distribution.

$$X_i \sim Pois\left(\lambda_i = 81\left(\frac{1}{3}\right)^i\right)$$

a) Let $S_4 = X_1 + \cdots + X_4$. Find $P(S_4 = 50)$. (5 pt)

b) Let $S = \lim_{n\to\infty}(X_1 + \cdots + X_n)$. Find $E(S^2)$. (5 pt)

2. Suppose $X \sim Geom(p_1)$ on $\{1, 2, 3, \ldots\}$, $Y \sim Geom(p_2)$ on $\{1, 2, 3, \ldots\}$, and $X \perp Y$. Let $S = X + Y$.

a) Assuming $p_1 = p_2 = p$, find $P(S = s)$. (2 pt)

b) Assuming $p_1 \neq p_2$, find $P(S = s)$. (4 pt)

c) Find $P(Y \geq X)$. (4 pt)

3. A bag contains 3 types of coins.

(hh)	(ht)	(tt)
7 double headed coins	2 regular coins	1 double tailed coin

Select a coin from the bag and flip it twice. Let H_i be the event the i^{th} toss lands heads. Find:

a) $P(H_1)$ (3 pt)

b) $P(H_2)$ (1 pt)

c) $P(H_2|H_1)$ (4 pt)

d) Are H_1 and H_2 independent? Justify your answer. (2 pt)

4. Suppose $X \sim Pois(\mu)$, $Y \sim Geom(p)$ on $\{0, 1, 2, ...\}$, and $X \perp Y$.

a) Find $P(X \geq 1)$. (2 pt)

b) Find $P(Y \geq y)$. (3 pt)

c) Find $P(Y \geq X)$. (5 pt)

5. In a class of 85 students, let X be the number of students who share a birthday with at least two other members of the class.

a) Write $E(X)$ as an unsimplified expression. (There should be no summation.) (5 pt)

b) Estimate the probability using a Poisson distribution that at least 3 people have the same birthday. Your solution should not depend on part a). (5 pt)