Statistics 100a Exam

Rick Paik Schoenberg, 3/12/15, 11am - 12:15pm.

PRINT YOUR NAME:

SIGN YOUR NAME:

Do not turn the page and start the exam until you are told to do so.

You may use a dark pen or dark pencil, calculator, the textbook, and any notes.

There are 15 multiple choice questions worth 6.7 points each.

For each question, mark one answer only. No need to show work on these, and no partial credit will be given.

Final answers are rounded to 3 significant digits.

7s means the seven of spades. Qh means the queen of hearts, etc.

Heads up means one against one.

$e \approx 2.718$.

1. Suppose X_1 and X_2 are independent uniform random variables on $(0, 1)$, and let $Z = min\{X_1, X_2\}$. Let $f(c)$ denote the pdf of Z. What is $f(c)$, for c between 0 and 1?
Hint: First find $P(Z > c)$ and use this to find the cdf of Z.

a) 1. b) $4 - 2c^3$.
c) $c^2 + 2c - 1$. d) $2 - 2c$. e) None of the above.

2. What is the probability that you will flop either 3 of a kind or a full house, given that you are dealt a pocket pair? (Note that this includes the case where you have 77 and the flop comes 333, for instance.)

a) 6.33%. b) 7.17%.
c) 11.8%. d) 12.1%. e) None of the above.

3. Suppose you know that your opponent would go all in before the flop with 100% probability if she had AK or AQ, and she would go all in before the flop with 50% probability if she had a pocket pair. With other hands, there is 0% probability that she would go all in before the flop. Given that she has gone all in before the flop, and given no other information about her cards or her opponents' cards, what is the probability that she has a pocket pair?

a) 54.9%. b) 58.8%.
c) 59.1%. d) 60.3%. e) None of the above.

4. What is the probability that you will flop a straight flush but not a royal flush?

a) 0.00101%. b) 0.00139%.
c) 0.00177%. d) 0.00186%. e) None of the above.

5. What is the probability that you will flop a flush, but neither a straight flush nor a royal flush?

a) 0.197%. b) 0.311%.
c) 0.415%. d) 0.527%. e) None of the above.

6. Suppose you start with 1 chip at time 0 and that your tournament is like a simple random walk, where each minute you either gain a chip or lose a chip, each with probability 1/2, but if you hit 0 you are eliminated. What is the probability that you have not hit zero by the time 27 minutes have elapsed?

a) 11.4%. b) 12.6%.
c) 14.9%. d) 16.0%. e) None of the above.

7. Suppose you and your opponent are heads up and all in, you have 10c 10h, your opponent has 9s 8s, and the flop is 10s 7s 2h. Thus, you have the nuts but your opponent has an open ended straight flush draw. What is your probability of winning the hand?

a) 54.1%. b) 55.3%.
c) 57.9% d) 58.3%. e) None of the above.

8. Suppose X_1 and X_2 are independent exponential random variables, each with mean 1/3, so $\lambda = 3$, and let $Y = max\{X_1, X_2\}$. Let $f(c)$ denote the pdf of Y. What is $f(1/3)$? (*You may use the approximation* $e \approx 2.718$.)

a) 0.793. b) 0.917.
c) 1.40. d) 1.72. e) None of the above.

9. Suppose X_1 and X_2 are independent exponential random variables, each with mean 1/3, and let $Z = min\{X_1, X_2\}$. Let $f(c)$ denote the pdf of Z. What is $f(1/3)$? (*You may use the approximation* $e \approx 2.718$.)

a) 0.812. b) 1.23.
c) 1.74. d) 1.95. e) None of the above.

10. Suppose that a 100 dollar per player winner-take-all tournament has $256 = 2^8$ players. So, you need to double up 8 times to win, and the winner gets \$25,600. Assume there is only doubling up in the tournament, and because of your outstanding skill, you have probability p = 0.6 to double up each time. What is your expected profit in the tournament?

a) \$110. b) \$142.
c) \$244. d) \$330. e) None of the above.

11. In a given hand of holdem, let X = the number of kings in your hand and Y = the number of queens in your hand. What is $P\{E[Y|X] = 1/12\}$?

a) 10.2%. b) 14.5%. c) 22.2%. d) 25.4%. e) None of the above.

12. Suppose we take a slightly above average poker player, who has an expected daily profit of \$1, and a standard deviation of \$50. Over a 100 day period, she gets very lucky and wins a total of \$2,000, for an average of \$20 per day. Which of the following is true, based on the law of large numbers, if she keeps playing indefinitely?

a) Her \$2,000 in winnings will ultimately be cancelled out by \$2,000 in future losses, after which her profit will be steady at \$1 per day.

b) We expect her short term good luck over the 100 days to be cancelled out by short term bad luck over the next 100 days.

c) The expected value of her profit over the next 100 days is -\$1,800, which will make her total profit over these 200 days equal to \$200.

d) Her \$2,000 in winnings will eventually become negligible and her average profit will ultimately converge to \$1 per day.

e) None of the above.

For the next two questions, let X be the number of hands you play until you get pocket aces for the tenth time.

13. What is E(X)?

a) 104. b) 1275. c) 1804. d) 2210. e) None of the above.

14. What is the standard deviation of X?

a) 697. b) 803. c) 1107. d) 1897. e) None of the above.

15. Suppose you are dealt two cards. X is the number of cards you have that are aces, and Y is the number of cards you have that are diamonds. Are X and Y independent?

a) No. b) Yes. c) It is impossible to answer without more information.