The University of Zambia
Department of Mathematics and Statistics
Mat 3110 Test 3

Duration : 2 hours **November 11, 2018.**

Instructions:

- This test contains 2 pages and 8questions Total marks is 80.
- Answer all the questions.
- Any sort of malpractice will be severely punishment.

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1. How many 11 letter words can you make from the letters of the word PROBABILITY that are such that the two I's are separated?

2. If X is a random variable with a distribution of $N(\mu, \sigma^2)$, find:
   $P(\mu - 3\sigma \leq X \leq \mu + 3\sigma)$

3. In an experiment two bags A and B, containing red and green marbles are used. Bag A contains four red marbles and one green marble and bag B contains two red marbles and seven green marbles. An unbiased coin is tossed. If a head turns up, a marble is drawn at random from bag A while if a tail turns up, a marble is drawn at random from bag B. Calculate the probability that a red marble is drawn in a single trial. Given that a red marble is selected, calculate the probability that when the coin was tossed a head was obtained.

4. Before starting to play the game 'Snakes and Ladders' , a player throws an ordinary unbiased die until a six is obtained. The number of throws before a player starts is the random variable Y, where Y takes the values 1, 2, 3,....
   Find $P(Y = 2)$.

5. The probabilities of events A and B are $P(A)$ and $P(B)$ respectively.
   $P(A) = \frac{5}{12}$, $P(A \cap B) = \frac{1}{6}, P(A \cup B) = q$.
   Find, in terms of q,
   (a) $P(B)$,

(b) P(A| B).

Given that A and B are independent events,

(c) find the value of q.

6. The number of customers entering a certain branch of a bank on a Monday lunchtime may be modelled by a Poisson distribution with mean 2.4 per minute.

   Find the probability that, during a particular minute, four or more customers enter the branch.

7. In practising the high jump a certain athlete has five attempts at a particular height. The probability that she succeeds at any one attempt is p. Find an expression, in terms of p, for the probability that she succeeds

   (a) exactly four times,

   (b) exactly two times.

   The probability that she succeeds exactly four times is twice the probability that she succeeds exactly two times. Find the value of p.

8. An IQ test shows that the scores follow a distribution of $N(65, 16)$. It is desirable to arrange the participants into three groups (low intelligence, average intelligence and high intelligence) so that 20% of the participants are filled under the first group, 65% in the second and 15% in the third. What are the scores that differentiate each intelligence group from one another?