IIT DHARWAD AUTUMN 2019

MODULE - PROBABILITY & STAT.

Sample Solutions - Quiz 01

In-Class Test #1 - Module Probability and Statistics

Engineering Mathematics for Advanced Studies

IIT Dharwad

Autumn 2019

Time - 20 minutes

Maximum score - 20

Rule for absentee - Minimum 30% penalty, discuss reasons absense in person to get a chance for re-test.

Note:

1. Combination is represented as $\binom{n}{r}$ or ${}^nC_r$ for selecting r out of n
2. Permutation can be represented as ${}^nP_r$ for arranging r out of n
3. $P(A)$ expresses the probability of event A
4. Do not evaluate exact value unless stated explicitly. Provide the simplified formula or expression in terms of the variables. e.g.

$$\frac{\binom{10}{2}\binom{8}{3}}{\binom{10}{5}}$$

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1. There are three vehicles that can accommodate 2,3, and 5 passengers each. A travelling group has 10 people. Please state number of possibilities in which they can split themselves for a journey. (Marks 4)

$({}^{10}C_2)({}^8C_3)({}^5C_5) = \frac{10!}{2!\,3!\,5!}$

2. How many different words can be formed using all the 8 characters in the word "EMPLOYER"? (Marks 2)

   (a) 8!

   (b) 7!

   (c) $\frac{7!}{2!}$

   (d) $\frac{8!}{2!}$

   ANSWER: $\frac{8!}{2!}$ 'E' is repeated twice in 8 alphabets

3. A dice has 3 colors, namely, Red(R) , Green (G), and Blue (B) such that same color is on its opposite faces. Outcome is the color that upper face shows up. Which *all* of the following options *can* be used to correctly state the sample space of a trial which involves throwing this dice twice (no partial score) (Marks 2)

   (a) $S = \{(R,R),(R,G),(R,B),(G,G),(G,B),(B,B)\}$

(b) $S = \{(i,j) : i = 1 \text{ to } 6 \text{ and } j = 1 \text{ to } 6\}$

(c) $S = \{(R,R),(R,G),(R,B),(G,R),(G,G),(G,B),(B,R),(B,G),(B,B)\}$

(d) $S = \{(i,j) : i = 1 \text{ to } 3 \text{ and } j = 1 \text{ to } 3\}$

ANSWER: (c) & (d) (Note - sequence matters e.g. {G,B} & {B,G} are not same.

4. If the outcome of the first throw being red is the event A in question 3 and outcome of the second throw being red is defined as event B

(a) A and B are mutually exclusive events (TRUE or FALSE) (Marks 2)

ANSWER: FALSE

(b) A and B are independent events (TRUE or FALSE) (Marks 2)

ANSWER: TRUE

5. With reference to above questions 3 and 4:

(a) Can you state in words (single line sentence) what means by $P(A \cup B)$ for the experiment and outcomes stated in Q3 and Q4 (Marks 2)

ANSWER: At least one of the two throws is Red.

(b) Can you state in words (single line sentence) what means by $P(A \cap B)$ for the experiment and outcomes stated in Q3 and Q4 (Marks 2)

ANSWER: Both throw result in Red

6. Which of the following are correct (TRUE or FALSE):

(a) $P(A) = 1 - P(B)$ if $B = A^C$ (Marks 1)

ANSWER: TRUE

(b) For any event A in any scenario, $0 < P(A) \leq 1$ (Marks 1)

ANSWER: ~~TRUE~~ FALSE

$\leq$ Not a Typo

(c) For mutually exclusive events A and B, $P(A \cap B) = P(A) + P(B) - P(A \cup B)$ (Marks 1)

ANSWER: TRUE

(d) We can seat n people on a round dinner table in $(n-2)!$ possible ways (in which atleast two neighbors would be different) (Marks 1)

ANSWER: FALSE (n-1)!