

Department of ECE
(School of Technology)



1

MATH2361: Probability and Statistics

(No. of hrs/week: 3 Credits: 3)

@Semester –II

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UNIT-I Problems on Probability

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1. If you roll a dice. Find the following Probabilities



1. $P(\text{face one Appears})$
2. $P(\text{face two Appears})$
3. $P(\text{face three Appears})$
4. $P(\text{face four Appears})$
5. $P(\text{face five Appears})$
6. $P(\text{face six Appears})$
7. $P(\text{ Even face Appears})$
8. $P(\text{odd face Appears})$
9. $P(\text{prime face Appears})$.
10. $p(\text{ It is divisible by two})$

Sol:

Sample space $S=\{1,2,3,4,5,6\}$

$$1.p(1)=1/6$$

$$7.p(\text{even})=P(2,4,6)=3/6=1/2$$

similarly

we can find Ans. to all the remaining Q's.

2. If you roll two dice simultaneously. Find the following Probabilities

1. $P(\text{The sum on two dice is } 8)$ 2. $P(\text{The sum on two dice is } 11)$

2. $P(\text{The sum on two dice is either } 8 \text{ or } 11)$

3. $P(\text{The sum on two dice is neither } 8 \text{ nor } 11)$

Sol: Sample space

$S = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), \dots, (6,6)\}$, $n=36$

1. $p(\text{sum}=8) = p\{(2,6), (3,5), (4,4), (5,3), (6,2)\} = 5/36$

2. $p(\text{sum}=11) = p\{(5,6), (6,5)\} = 2/36$

3. $p(\text{sum}=8 \text{ or } 11) = p(8 \cup 11) = p(8) + p(11) = 5/36 + 2/36 = 7/36$

4. $p(\text{sum is not } 8, 11) = 1 - p(\text{sum}=8 \text{ or } 11) = 1 - 7/36 = 29/36$



3. A speaks truth in 75% cases and B speaks in 80% cases in what % of cases are they contradict each other in stating the same fact.

Sol: Given that

$$P(A) = 75/100, P(A^c) = 25/100$$

$$P(B) = 80/100, P(B^c) = 20/100$$

We need to find $P(A \text{ \& } B \text{ contradict each other})$

$$= P(A \& B^c) + P(A^c \& B)$$

$$= P(A) P(B^c) + P(A^c) P(B)$$

$$= 75/100 \times 20/100 + 25/100 \times 80/100 = 35/100 = 35\%$$

4. A bag contains 6 white, 4 red and 9 black balls. Three balls are drawn at random. Find the probability that 1. Two of the balls are white 2. one is of each color 3. None is red 4. one black & two red 5. one must be black.

Given that total no of balls = $6W + 4R + 9B = 19$

i.e. $n(S) = n = C(19, 3)$

1. $P(\text{Two balls are white})$
2. $P(\text{one is of each color})$
3. $P(\text{none is red})$
4. $P(\text{one is black \& 2 red})$
5. $P(\text{one must be black})$

$$\begin{aligned}
 &= \frac{{}^6C_2 \times {}^3C_1}{{}^{19}C_3} \\
 &= \frac{{}^6C_1 \times {}^4C_1 \times {}^9C_1}{{}^{19}C_3} \\
 &= \frac{{}^{15}C_3}{{}^{19}C_3} \\
 &= \frac{{}^9C_1 \times {}^4C_2}{{}^{19}C_3} \\
 &= 1 \times \frac{{}^{10}C_2}{{}^{19}C_3}
 \end{aligned}$$

A **permutation** is an act of arranging the items or numbers in order.

$P(n, r)$

Combinations are the way of selecting items or numbers from a group of items or collection, in such a way that the order of the items does not matter

$C(n, r)$

Tutorial Problems for Practice

Three coins are tossed simultaneously Find the probability that

- (i) no head
- (ii) one head
- (iii) two heads
- (iv) at least two heads.
- (v) at most two heads appear.

Tutorial Problems for Practice

2. When two dice are thrown, find the probability of getting doublets (Same number on both dice).

Tutorial Problems for Practice



3. A card is drawn at random from a well shuffled pack of 52 cards. What is the probability that it is (i) an ace (ii) a diamond card.

Tutorial Problems for Practice



4. A ball is drawn at random from a box containing 5 green, 6 red, and 4 yellow balls. Determine the probability that the ball drawn is (i) green (ii) Red (iii) yellow (iv) Green or Red (v) not yellow.

Tutorial Problems for Practice

5. Two dice are thrown, what is the probability of getting the sum being 8 or the sum being 10? 6. Two dice are thrown simultaneously. Find the probability that the sum being 6 or same number on both dice.

Tutorial Problems for Practice

7. Two persons A and B appeared for an interview for a job. The probability of selection of A is $\frac{1}{3}$ and that of B is $\frac{1}{2}$. Find the probability that (i) both of them will be selected (ii) only one of them will be selected (iii) none of them will be selected.

Tutorial Problems for Practice

8. There are three T.V programmes A , B and C which can be received in a city of 2000 families. The following information is available on the basis of survey. 1200 families listen to Programme A 1100 families listen to Programme B 800 families listen to Programme C 765 families listen to Programme A and B 450 families listen to Programme A and C 400 families listen to Programme B and C 100 families listen to Programme A, B and C Find the probability that a family selected at random listens at least one or more T.V programmes.

Tutorial Problems for Practice

9. A stockist has 20 items in a lot. Out of which 12 are non defective and 8 are defective. A customer selects 3 items from the lot. What is the probability that out of these three items (i) three items are non-defective (ii) two are non defective and one is defective.



Tutorial Problems for Practice

10. A test paper containing 10 problems is given to three students A, B, C. It is considered that student A can solve 60% problems, student B can solve 40% problems and student C can solve 30% problems. Find the probability that the problem chosen from the test paper will be solved by all the three students.



Tutorial Problems for Practice

11. A box containing 5 green balls and 3 red color balls. Find the probability of selecting 3 green color balls one by one (i) without replacement (ii) with replacement.
12. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?
13. If $P(A \& B) = 0.3$, $P(A) = 0.6$, $P(B) = 0.7$ Find the value of $P(B/A)$ and $P(A/B)$
14. If two events A and B are not mutually exclusive and are not connected with one random experiment $P(A) = 1/4$, $P(B) = 2/5$ and $P(A \cup B) = 1/2$ then find the value of $P(B/A)$



Tutorial Problems for Practice

16. For two events A and B, $P(A) = 1/3 = P(B)$, $P(B/A) = 1/4$ find $P(A/B)$

17. If $P(A) = 0.3$, $P(B) = 0.2$ and $P(C) = 0.1$ and A,B,C are independent events, find the probability of occurrence of at least one of the three events A , B and C

18. If the letters in a word REGULATIONS are arranged at random. What is the chance that there will be exactly four letters in between U and I.



Tutorial Problems for Practice

19. The odds that A speaks the truth are 3:2 and the odds that B speaks the truth 5:3. In what percentage of cases are they likely to contradict each other on an identical point?

20. In a certain town, males and females form 50 percent of the population. It is known that 20 percent of the males and 5 percent of the females are unemployed. A research student studying the employment situation selects unemployed persons at random. What is the probability that the person selected is (i) a male (ii) a female?



Bayes Rule

Tutorial Problems for Practice

1. In a bolt factory machines M_1 , M_2 , M_3 manufacture respectively 25%, 35% and 40% of the total output. Of these 5, 4, and 2 percent are defective bolts. A bolt is drawn at random from the product and is found to be defective.

What is the probability that it was manufactured by machine M_2 ?

Also find the What is the probability that it was manufactured by machine M_1 , M_3



Tutorial Problems for Practice

2. Machines A and B produce 10% and 90% respectively of the production of a component intended for the motor industry. From experience, it is known that the probability that Machine A produces a defective component is 0.01 while the probability that machine B Produces a defective component is 0.05. If a component is selected at random from a day's production and is found to be defective. Find the probability that it was made by (a) machine A; (b) machine B.



Tutorial Problems for Practice

3. The chance that doctor A will diagnose a disease X correctly is 60%. The chance that a patient will die by his treatment after correct diagnosis is 40% and the chance of death by wrong diagnosis is 70%. A patient of the doctor A, who had disease X died. The chance that his disease was diagnosed correctly.

Sol: Let us define the following events:

E1 : Disease X is diagnosed correctly by doctor A.

E2 : A patient (of doctor A) who has disease X dies. Then we are given $P(E1)=0.6$ and $P(E1 \text{ bar})=0.4$ and

$P(E2/E1)=0.4$ and also $P(E2/E1 \text{ Bar})= 0.7$

We require to know $P(E1/E2)= P(E1 \text{ and } E2)/P(E2) = 6/13$

Where $P(E2)=P(E1 \text{ \& } E2)+P(E1 \text{ bar}\&E2)=$



Tutorial Problems for Practice

The contents of urns I, II and III are as follows:

- I : 1 white, 2 black and 3 red balls,
- II : 2 white, 1 black and 1 red balls, and
- III : 4 white, 5 black and 3 red .balls.

One urn is chosen at random and two balls drawn. They happen to be white and red. What is the probability that they come from urns I, II or III ?

Any Questions? Suggestions?



22



Thank you

Feedback to
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