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Practical-1(A)

Aim: Classical probability

Q.1] Find the probability of getting number divisible by 5 on a fair dice.

→ code

```
> total_outcome <- 6
> divisible_by_5 <- 1
> P_of_div_5 <- divisible_by_5/total_outcome
> print(paste("answer is:", P_of_div_5))
```

O/P [1] "answer is: 0.166666666666667"

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② Axiomatic probability

Q.② find the probability of drawing an Ace from a pack of cards.

→ Code

```
> total_cards <- 52
> ace_cards <- 4
> probability_ace_cards <- ace_cards/total_cards
> print(paste("Probability is:", probability_ace_cards))
```

O/P [1] "Probability is: 0.0769230769230769"

Q.3] find the probability of drawing an king from a red cards.

→ code

```
> total_red_cards <- 26
> king_cards <- 2
> P <- king_cards/total_red_cards
> print(paste("answer is:", P))
```

O/P [1] "answer is: 0.0769230769230769"

Prac-1.(B)

(B) elementary Theorems of probability

Q.1] find the probability of rolling an even number or 4 on a fair dice.

Code:

```
# Addition Rule Example
> total_outcome <- 6
> even_number <- 3
> P_even_number <- even_number/total_outcome
> number_4 <- 1
> P_number_4 <- number_4/total_outcome
> Probability_even_number_or_4 <- P_even_number + P_number_4
                  - (1/total_outcome)
> print(paste("answer is", probability_even_number_or_4))
```

O/P [1] "answer is 0.5"

O/P "answer is : 0.0192307692307692"

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Q.2] find probability of rolling an odd number or number divisible by 3 on a fair dice.

Code:

```
>total_outcome<-6
>odd<-3
>divisible_by_3<-2
>P_odd<-odd/total_outcome
>P_divisible_by_3<-divisible_by_3/total_outcome
>probability_odd_divisible_3<-P_odd+P_divisible_by_3+
                        -(1/total_outcome)
>print(paste("answer is =",probability_odd_divisible_3))
```

O/P answer is = 0.666666666666667

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(c) Multiplication Theorems

Q] probability of drawing a red card and then drawing a face card from a pack of cards.

Code:

```
> total cards <- 52
> red_cards <- 26
> face_cards <- 12
> P_red_cards <- red_cards/total_cards
> P_face_cards <- face_cards/total cards
> probability_red_cards_and_facecards <- P_red_cards * P_face_cards
> print(paste("answer is =", probability_red_cards_and_facecards))
```

O/P answer is = 0.115384615384615

Q] probability of drawing a diamond card and then drawing a ace from black cards.

Code:
```
> S <- 52
> even_A <- 13
> T <- 26
> event_B <- 2
> PA <- event_A/S
> PB <- event_B/T
> probability <- PA * PB
> print(paste("answer is:", probability))
```
O/P "answer is : 0.0192307692307692"

Practical-2

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Ⓐ Example Based on Independence

Q1] Suppose we are rolling a fair six-sided die and flipping a fair coin. Let event A be getting a 4 on the die and event B be getting head on the coins.

Code:

```
>outcome_coin<-2
>outcome_dice<-6
>outcome_4<-1
>outcome_H<-1
>probability_4<-outcome_4/outcome_dice
>probability_H<-outcome_H/outcome_coin
>probability_4_H<-probability_4 * probability_H
>print(paste("answer is", P_4_H))
```

O/P answer is 0.0833333333333

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Q.2] A be the event of prime number on rolling a dice and B is event of getting at least 1 head on thrown of 2 coins

Code:

```
> # independent event
> outcome_dice <- 6
> outcome_coins <- 4
> event_A <- 3
> event_B <- 3
> P_event_A <- event_A / outcome_dice
> P_event_B <- event_B / outcome_coins
> Probability_A_B <- P_event_A * P_event_B
> Print(paste("answer is", probability_A_B))
```

O/P answer is 0.375

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(B) Conditional probability

Q.1) find the probability that a single toss of a die will result in a number less than 4 if it is given that the toss resulted in an odd number.

Code:

```
> outcome_dice <- 6
> odd_number <- 3
> less than_4 <- 3
> common element <- 2
> ## finding probability
> P_odd_number <- odd_number / outcome dice
> P_lessthan_4 <- lessthan 4 / outcome dice
> P_common element <- common_element / outcome dice
> probability <- P_common_element / P_odd_number
> print( paste("probability is :", probability)
```

O/P probability is 0.666666666667

Practical-3.(A)

(A) Probability Distribution of Random variable.

Q.1] Rolling a fair Six-SIDED DICE

Code:

```
> Out come <- 1:6
> # finding probability
> probability = rep(1/6,6)
> Cat(" outcome        | probability   \n")
```

O/P   outcome | probability

```
> for(i in 1:6) {
+ Cat(outcomes[i],"--------", probability[i], "\n")
+ }
```

O/P
```
1 ---------- 0.1666667
2 ---------- 0.1666667
3 ---------- 0.1666667
4 ---------- 0.1666667
5 ---------- 0.1666667
6 ---------- 0.1666667
```

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(B) Probability MASS Function:

Q.1) Rolling a fair-Six-Sided DICE

Code:-

```
> # probability mass function
> outcomes <- 1:6
> probability <- rep(1/6,6)
> pmf <- function(x){
+ if( x %in% outcomes){
+ return( probability[outcomes == x])
+ }
+ else{
+ return(0)
+ }
+ }
> for(i in outcomes){
+ cat(i,"-------", pmf(i),"\n")
+ }
```

O/P

```
1 ------- 0.1666667
2 ------- 0.1666667
3 ------- 0.1666667
4 ------- 0.1666667
5 ------- 0.1666667
6 ------- 0.1666667
```

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Q.2] A number is drawn at random form a box contains 1 to 10 numbers. Check, is it PMF? if PMF then show the outcomes and probability.

Code:

```
# Probability mass function
> box <- 1:10
> probability <- rep(1/10,10)
> pmf <- function(x){
+ if( x %in% box){
+ return( probability[box == x])
+ }
+ else{
+ return(0)
+ }
+ }
> for(i in box){
+ cat( i, "-------", pmf(i), "\n")
+ }
```

O/P

```
1 ------- 0.1
2 ------- 0.1
3 ------- 0.1
4 ------- 0.1
5 ------- 0.1
6 ------- 0.1
7 ------- 0.1
8 ------- 0.1
9 ------- 0.1
10 ------- 0.1
```

Practical-4

Aim:

(A) Mean of discrete and continuous probability distribution.

code→

```
> # mean of discrete probability distribution (a fair dice)
> outcome <- 1:6
> probability <- rep(1/6,6)
> mean <- sum(outcome * probability)
> cat("mean is", mean, "\n")
```

O/P

mean is 3.5

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② Mean of continuous probability distribution (standard normal)

code :-

```
> library(stats)
> mean_con <- mean(rnorm(500))
> cat("mean is",mean_con)
```

O/P

mean is 0.05324605

Prac-4.(B)

(1) variance and S.D of discrete and continuous probability distribution.

Code:

```
> # Discrete probability Distribution
> Outcome <- 1:6
> probability <- rep(1/6,6)
> mean <- Sum(outcome *.probability)
> variance <- Sum((outcome-mean)^2 * probability)
> S.D <- Sqrt(variance)
> Cat("variance is=", variance,"\n")
```

O/P variance is = 2.916667

```
> Cat("Standard deviation is=", S.D,"\n")
```

O/P Standard deviation is=1.707825

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② Continuous probability Distribution

```
> # variance and S.D of Continuous probability Distribution
> library(stats)
> random<-rnorm(10000)
> mean continuous <- mean(random)
> var_continuous <- var(random)
> sd_continuous<-sd(random)
> cat("mean", mean continuous, "\n")
```

O/P mean 0.01738433

```
> cat("variance is", var continuous, "\n")
```

O/P variance is 1.000106

```
> cat("sd is =", sd_continuous, "\n")
```

O/P sd is =1.000053

Practical-5

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Aim: Standard probability distribution

A] Calculate Mean, variance and S.d based on Binomial distribution

Q] A coin is tossed 5 times, find i] Mean ii] variance iii] S.D

```
> n<-5
> P<-1/2
> q<-(1-P)
> mean<-n*P
> variance<-n*p*q
> S.d<-sqrt(variance)
> cat("mean", mean,"\n")
```

O/P mean =2.5

```
> Cat("variance =", variance,"\n")
```

O/P variance = 1.25

```
> Cat("standard deviation =", S.d,"\n")
```

O/P standard deviation = 1.118034

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(B) probability of normal distribution

Q] find the probability of 2.3 in normal distribution

```
> x_values <- 2.3
> probability <- pnorm(x_values)
> cat("prob. of 2.3 in normal distribution=", probability)
```

O/P Prob. of 2.3 in normal distribution = 0.9892759