

Question Bank for **Sufficient Statistics**:

1. Toss a coin n times, and the probability of head is an unknown parameter θ . Let T = the total number of heads. Is T sufficient for θ ?
2. Let X_1, X_2, \dots, X_n be a random sample from an exponential distribution with parameter θ . Find a sufficient statistic for the parameter θ .
3. Let X_1, X_2, \dots, X_n be a random sample from uniform distribution on $(0, \theta)$. Let $T = X(n)$ and f be the joint density of X_1, X_2, \dots, X_n . Is T sufficient statistic for θ ?
4. Let X_1, X_2, \dots, X_n denote a random sample from a Poisson distribution with parameter $\lambda > 0$. Find a sufficient statistic for the parameter λ .
5. Let X_1, X_2, \dots, X_n be a random sample from a normal distribution with mean μ and variance 1. Find a sufficient statistic for the parameter μ .
6. Let X_1, X_2, \dots, X_n denote a random sample from a normal distribution $N(\theta_1, \theta_2)$. That is, θ_1 denotes the mean μ and θ_2 denotes the variance σ^2 . Use the Factorization Theorem to find joint sufficient statistics for θ_1 and θ_2 .

Question Bank on **R Software**:

1. Write an R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
2. Write an R program to create a simple bar plot of five subjects marks.
3. Write an R program to create a list of dataframes and access each of those data frames from the list.
4. Write the output for the following R Programs:

```
M = matrix(c(1:16), nrow = 4, byrow = TRUE)
print("Original Matrix:")

print(M)

list1 = list(g1 = 1:10, g2 = "R Programming", g3 = "HTML")
print("Original list:")
print(list1)

print("Add a new vector to the said list:")
list1$g4 = "Python"
print(list1)
```

5. Write an R program to get the following output.

```
6. [[1] "Original Matrix:"
7.      col1 col2 col3 col4
8. row1    1    2    3    4
9. row2    5    6    7    8
10.      row3    9   10   11   12
11.      row4   13   14   15   16
12.      [1] "1 dimensional array (column wise):"
13.      [1]  1  5  9 13  2  6 10 14  3  7 11 15  4  8 12 16
14.      [1] "1 dimensional array (row wise):"
15.      [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16
```

7. Write an R program to print the numbers from 1 to 40 and print "Apple" for multiples of 3, print "Mango" for multiples of 5, and print "Orange" for multiples of both.
8. Write an R program to check if the input number is prime or not.
9. Write an R program to create a data frame from four given vectors. Vector 1 has name of 10 students, vector 2 has marks scored out of 25, vector 3 has the number of attempts and vector 4 qualifying status given as yes or no. A student is qualified if score is 50%.
10. Write an R program to access the element at 3rd column and 2nd row, only the 3rd row and only the 4th column of a matrix whose entries are numbers from 1 to 16 arranged row wise.
11. Obtain output of the following R program

```
(i) a<-c(1,2,3)

b<-c(4,5,6)

c<-c(7,8,9)

m<-cbind(a,b,c)

print("Content of the said matrix:")

print(m)

(ii) x<-2

while(x < 15) {x <- x^2-10; if (x == 20) break; print(x^2); }

(iii) print_factors = function(n) {

print(paste("The factors of",n,"are:"))

for(i in 1:n) {

if((n %% i) == 0) {

print(i)

}

}

}
```

```
}  
  
print_factors(4)  
  
print_factors(7)  
  
print_factors(12)
```

12. Write a R program to create 4x4 matrix which contain vectors from 1 to 16 values should be by row and define the column and row names. Display the Matrix. Also write program to extract submatrix whose rows have column value > 7 from a given matrix. Display the sub matrix.

13. Write an R program to print the first 10 Fibonacci numbers.

14. Write an R program to find the sum of first 50 natural numbers.

15. `x = c(10, 20, 30, 20, 20, 25, 9, 26)`
Write an R program to sort vector in ascending and descending order. Also write an R code to find Highest Value, Second Highest Value and Count of total vectors contain in x.

16. `row_names= c("row1","row2","row3","row4")`
`col_names= c("col1","col2","col3","col4")`
`M = matrix(c(1:16),nrow=4,byrow= TRUE,dimnames=list(row_names,col_names))`
`print(M)`
`print(M[2,3])`
`print(M[3,])`
`print(M[,4])`

Write the output of the above code.