**Experiment-X**

**Chi-Square Test**

**Problem 1:** A pair of dice is thrown 360 times and the frequency of each sum is indicated below:

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sum | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Frequency | 8 | 24 | 35 | 37 | 44 | 65 | 51 | 42 | 26 | 14 | 14 |

Would you say that the dice are fair on the basis of the chi-square test at 0.05

Solution :

Aim : To Test the dice are fair or not fair

Null Hypothesis H0: the dice are fair

Alternative Hypothesis H1: the dice are not fair

Formula

R-Commands:

Frequency<-c(8,24,35,37,44,65,51,42,26,14,14)

> names(Frequency)<-c("two","three","four","five","six","seven","eight","nine","ten","eleven","twelve")

> names

function (x) .Primitive("names")

> Frequency

two three four five six seven eight nine ten eleven twelve

8 24 35 37 44 65 51 42 26 14 14

probability<-c(1/36,2/36,3/36,4/36,5/36,6/36,5/36,4/36,3/36,2/36,1/36)

> chisq.test(Frequency,p=probability)

Chi-squared test for given probabilities

data: Frequency

X-squared = 7.4483, df = 10, p-value = 0.6825

p-value = 0.6825

p-value

0.6825

alpha=0.05

alpha

0.05

if(pvalue < alpha){print("Null Hypothesis is Rejected")}else{print("Null Hypothesis is Accepted ")}

H0  is accepted

Since p-value 0.6825>0.05, therefore H0 is accepted

Conclusion : Since H0 is accepted , .we may conclude that the dice are fair.

**Problem 2:** Given the following contingency table for hair colour and eye colour. Find the value of chi-square. Is there good association between the two?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Hair colour | | | | | |
| Eye colour |  | Fair | Brown | Black | Total |
| Blue | 15 | 5 | 20 | 50 |
| Grey | 20 | 10 | 20 | 50 |
| Brown | 25 | 15 | 20 | 60 |
|  | 60 | 30 | 60 | 150 |

Solution:

Aim: To test is there goo association between hair colour and eye colour

Null Hypothesis H0: the two attributes hair and eye colour are independent

Null Hypothesis H1: The attributes are dependent

Formula

R-Commands:

M<-as.table(rbind(c(15,5,20),c(20,10,20),c(25,15,20)))

dimnames(M)<-list(eye\_colour=c("blue","grey","brown"), hair\_colour =c("fair","brown","black"))

> dimnames(M)

$eye\_colour

[1] "blue" "grey" "brown"

$hair\_colour

[1] "fair" "brown" "black"

> M

hair\_colour

eye\_colour fair brown black

blue 15 5 20

grey 20 10 20

brown 25 15 20

> chisq.test(M)

Pearson's Chi-squared test

data: M

X-squared = 3.6458, df = 4, p-value = 0.4561

p-value = 0.4561

p-value

0.4561

alpha=0.05

alpha

0.05

if(pvalue < alpha){print("Null Hypothesis is Rejected")}else{print("Null Hypothesis is Accepted ")}

Null Hypothesis is Accepted

Or

Since p-value 0.4561>0.05, therefore H0 is accepted

Conclusion : Since, H0 is accepted, there is good association between the hair colour and eye colour