PRACTICAL No.1

Topic - Basic of 'R' software.

1) R is a software for data analysis and satisfied computing.

2) This software is used to bring in effective data handling and output storage is possible.

3) It is possible of graphical display.

4) It is a free software

Ex.

1) $2^2 + \sqrt{25} + 35$

⇒ 2^2 + sqrt (25)+35

[1] 44.

2) $2 \times 5 \times 3 + 62 \div 5 + \sqrt{49}$

[1] 49.4.

3) $\sqrt{76 \times 4 \times 2 + 9 \div 5}$

⇒ sqrt (76 + 4 * 2 + 9/5)

[1] 128

4) $42 + |-10| + 7^2 + 9 \times 5$

⇒ [1] 128

5) find x^2+y^2, $\sqrt{y^3-x^3}$, $x+y$, $|x-y|$

```
x = 20
y = 30
```

x^2+y^2

```
x^2+y^2
[1] 1300
```

$x+y$

```
x+y = [1] 50
```

$|x-y|$

```
x-y = [1] 10
```

$\sqrt{y^3-x^3}$

```
sqrt (y^3-x^3)
[1] 137.84
```

6)

```
[2,3,4,5]^2
c [2,3,4,5]^2
4,6,9,25
```

```
c(4,5,6,8)*3
[1] 12, 15, 18, 24
```

7)

```
c(2,3,5,7)*c(-2,-3,-5,-4)
[1] -4, -9, -25, -28
c(1,2,3,4,5,6) ^ c(2,3)
[1] 8 9 64 25 216
```

Find the sum product maximum, minimum of the values
5, 8, 6, 7, 9, 10, 15, 5.

Sol^n

```
x = c(5,8,6,7,9,10,15,5)
length (x)
[1] 8
Sum(x)
65
```


Q) for matrix $\begin{bmatrix} 1 & 5 \\ 2 & 6 \\ 3 & 7 \\ 4 & 8 \end{bmatrix}$

Sol^n

```
x <- matrix (nrow = 4, ncol = 2,
      data = c(1,2,3,4,5,6,7,8)
```

	[1]	[2]
[1]	1	6
[2]	2	7
[3]	3	8
[4]	4	9

Q) $x = \begin{bmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{bmatrix}$ $y = \begin{bmatrix} 2 & 4 & 10 \\ -2 & 8 & -11 \\ 10 & 6 & 12 \end{bmatrix}$ find $x+y$, $x \times y$, $2x+3y$.

Sol^n

```
x <- matrix (nrow = 3, ncol = 3)
      data = c(1,2,3,4,5,6,7,8,9)
y <- matrix (nrow = 3, ncol = 3,
      datac( 2,-2,10,4,8,6,10,-11,12)
```

$x+y$

	[1,]	[2,]	[3,]
[1]	3	8	17
[2]	0	13	-3
[3,]	13	12	21

$x \times y$

	[1]	[2,]	[3,]
[1,]	2	16	70
[2,]	-4	40	-88
[3,]	-30	36	-108

$2x+3y$

8	20	44
-2	34	-17
36	30	54

34

Q→7 x = c(2,4,6,1,3,5,7,18,16,14,17,14,19,3,2,5,0,15,
9,14,18,19,~~12~~)

length = x
23

a = table (x)
transform (x)

x	freq
0	1
1	1
2	2
3	3
4	1
5	2
6	1
7	1
8	1
9	1
10	1
11	2
12	1
13	1
14	2
15	1
16	2
17	1
18	1
19	2

```
> breaks = seq (0,20,5)
> b = cut (x, breaks, right = F)
> c = table (b)
transform (c).
```

b	freq
[0,5]	8
[5,10]	5
[10,15]	4
[15,20]	6

PRACTICAL No. 2

Topic - Problems on pdf and cdf

i) Can following be cdf

i. $f(x) = \begin{cases} 2-x & ; 1 \le x \le 2 \\ 0 & \text{o.w} \end{cases}$ ii. $f(x) = \begin{cases} 3x^2 & , 0 < x < 1 \\ 0 & \text{ow} \end{cases}$

iii. $f(x) = \begin{cases} 3x^2 & 0 < x < 1 \\ 0 & \text{ow} \end{cases}$ iv. $f(x) = \begin{cases} 3x\left(1-\frac{x}{2}\right) & 0 \le x \le 2 \\ 0 & \text{ow} \end{cases}$

Solution.

ii) $\int_0^1 3x^2 \cdot dx = \left[\frac{3x^3}{3}\right]_0^1 = x^3\Big]_0^1 = 1$

So pdf.

i) $\int f(x)\, dx = 1$ condition for pdf

$\int_1^2 (2-x) \Rightarrow \int_1^2 2dx - \int_1^2 x\,dx \Rightarrow [2x]_1^2 - \left[\frac{x^2}{2}\right]_1^2$

$(4-2)-(2-0.5) \ne 1$ ∴ not pdf

iii) $f(x) = \begin{cases} \frac{3x}{2}\left(1-\frac{x}{2}\right) \cdot 0 \le x \le 2 \end{cases}$

$\Rightarrow f(x) = \int_1^2 \frac{3x^2}{2} - \frac{3x^2}{4}\, dx \Rightarrow \int_0^2 \frac{3x}{2}\, dx = \int_0^2 \frac{3x^2}{4}\, dx$

$\left[\frac{3x^2}{4}\right]_0^2 - \left[\frac{x^3}{4}\right]_0^2 \Rightarrow \left[\frac{3(2)}{4} - 0\right] - [2]$

∴ 3-2 = 1

∴ its pdf.

2. following be pmf ?.

1.

x	1	2	3	4	5
$p(x)$	0.2	0.3	-0.1	0.5	0.1

2.

x	0	1	2	3	4	5
$P(x)$	0.1	0.3	0.2	0.2	0.1	0.1

3.

x	10	20	30	40	50
$p(x)$	0.2	0.3	0.3	0.2	0.2

Solⁿ

1. Since 1 valid ~~[illegible]~~ -ve , so it is not pmf

2. Since $p(x) \geq 0$, $\forall x$
and $\sum p(x) = 1$ if ex pmf
prob = c (0.1, 0.3, 0.2, 0.2, 0.1, 0.1)
sum (prob)
1

3. prob1 = c(0.2, 0.3, 0.3, 0.2, 0.2)
sum (prob)
-1.2
it is not pmf.

3) find $P(x \leq 2)$, $P(2 \leq x \leq 4)$, $P(\text{atleast } 4)$, $P(3 < x < 6)$

x	0	1	2	3	4	5	6
$P(x)$	0.1	0.1	0.2	0.2	0.1	0.2	0.1

① $P(x \leq 2) = P(0) + P(1) + P(2) = 0.1 + 0.1 + 0.2 = 0.4$
$P(2 \leq x < 4) = P(2) + P(3) = 0.2 + 0.2 = 0.4$
$P(\text{atleast } 4) = P(4) + P(5) + P(6) = 0.1 + 0.2 + 0.1 = 0.4$
$P(3 < x < 6) = P(4) + P(5) = 0.1 + 0.2 = 0.3$

4) find cmf

x	0	1	2	3	4	5	6
$P(x)$	0.1	0.1	0.2	0.2	0.1	0.2	0.1

```
prob = c(0.1, 0.1, 0.2, 0.2, 0.1, 0.2, 0.1)
cumsum(prob)
[1] 0.1, 0.2, 0.4, 0.6, 0.7, 0.9, 1
```

$f(x) = 0$ if $x < 0$
.1 if $x \leq x < 1$
.2 if $2 \leq x < 2$
.4 if $x \leq x < 3$
.6 if $x \leq x < 6$
:7 if $x \leq x \leq 7$
.9 if $x \leq x < 9$
1 if $6 < x$.

AM

2)

x	0	12	14	16	18
$P(x)$	0.2	0.35	0.15	0.2	0.1

$f(x) = 0$ if $x < 0$
$= 0.2$ if x $0 \leq x < 12$
$= 0.35$ if x $12 \leq x < 14$
$= 0.7$ if $14 \leq$
$= 0.9$ if $16 \leq$
$= 1$ if $18 <$

PRACTICAL NO 3

Topic - Probability distribution and binomial distribution.

1) Find the cds of following pmf and Draw the graph

x	10	20	30	40	50
P(x)	0.15	0.25	0.3	0.2	0.1

Sol^n

```
x = c(10,20,30,40,50)
prob = c(0.15,0.25,0.3,0.2,0.1)
cumsum (prod)
[1]  0.15  0.40  0.7  0.9  1.00
```

$F(x) = 0$ if $x<10$
0.15 $10 \le x < 0$
0.40 $20 \le x < 30$
0.70 $30 \le x < 40$
0.40 $40 \le x < 50$
1 $x \geq 50$

```
plot(x, prob, xlab="values", ylab="probability", main="graph"cdf"5")
```

Binomial distribution

Suppose there are 12 MCQ in a text Each Question 5 options only one of them corrected. Find the problem of having one 5 correct answer ② alternate 4 correct answer.

Sol^n

It is given that $n=12$, $p = 1/5$ $q = 4/5$
X = total no. of correct answer.
$x \sim B(n,p)$

```
> p = 1/5
> n = 12
> q = 4/5
```



```
> dbinom (5,12,1/5)
[1] 0.05315022
```

q.2) atmost 4

```
pbinom (4,2,1/5)        [1]  0.9274445
```

q.3) There are 10 members in committee the probability any memb altering a meeting 0.9 find probability ① 7 member attended ② atleast 5 member ③ atmost 6 members attended

Sol^n If 'x' given $n=12$, $p=9$, $q=1$, $x=7$

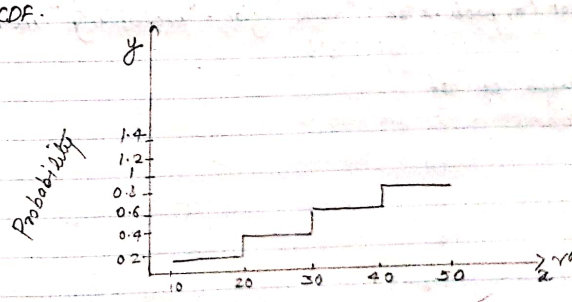
7member > dbinom (7,10,0.9)

```
[1]  0.05739563
```

atleast 5 members

```
1-pbinom (5,10,0.9)        [1] 0.9986351
```

Graph of CDF.



atmost 6 members

```
pbinom (6,10,0.9)        [1] 0.0127952.
```

4) Find the cdf and draw the graph.

x	0	1	2	3	4	5	6
P(x)	0.1	0.1	0.2	0.2	0.1	0.2	0.1

x = c(0,1,2,3,4,5,6)

prob = c(0·1, 0·1, 0·2, 0·2, 0·1, 0·2, 0·1)

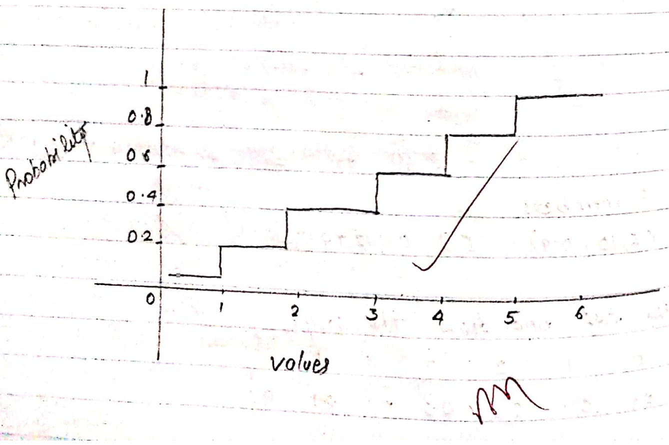
cumsum (prob)

[1] 0·1 0·2 0·4 0·6 0·7 0·9 1

F(x) = 0	if x < 0
= 0·1	0 ≤ x ≤ 1
= 0·2	1 ≤ x < 2
= 0·4	2 ≤ x < 3
= 0·6	3 ≤ x < 4
= 0·7	4 ≤ x < 5
= 0·9	5 ≤ x < 6
= 1	6 ≤ x.

plot (x, prob . x tab = "value" , glab = "probability", main = "graph" cdf ; "s")

Graph of cdf



PRACTICAL NO·4 - Binomial Distribution

1) Find the complete binomial distribution when n=5 and p=0·1

2) Find the probability of exactly 10 success · n=100 · trial · with p=0·1

3) 'x' follows binomial distribution with n=12, p=5, find

① p(x=5)

② p(x ≤ 5)

③ p(x > 7)

④ p(5 < x < 7)

4) The probability of salesman make a sell to a customer is 0·15 Find the probability.

① No sale for 10 customers, no more than 3 sale in 20 customers

5) A student write 5 MCQs, each question that 4 options out of which 1 correct calculate the probability atleast 3 correct answer.

NOTE - P(x = x) = dbinom (x, n, p)

P(x ≤ x) = pbinom (x, n, p)

P(x > x) = 1 − pbinom (x, n, p)

To find the value of 'x' for which the probability is p, command is qbinom (p, x, p)

1) n=5 p=0·1

dbinom (0:5, 5, 0·1)

[1] 0·59049 0·32805 0·07290 0·00810 0·00004 0·00001

2) dbinom (10, 100, 0·1) n = 100

[1] 0·1318653

3) n=12 p=0·25

dbinom (5, 12, 0·25) . P(x=5)

[1] 0·1032414.

ii. p(x≤5)
pbinom (5,12,0.25)
[1] 0.9455

iii. p(x>7) = 1-p(x≤7) = 1-pbinom (7,12,0.25)
[1] 0.00278151

iv. P(5<x<7)
dbinom (6,12,0.25)
0.04014945.

4) i. n=10 , p=0.15 , x=0
dbinom (0,10,0.15)
[1] 0.1980744

ii. n=20 , p=0.15
P(x>3) = 1-p(x≤3) = 1-pbinom (3,20,0.5)
[1] ~~0.1968744~~ 0.3522748

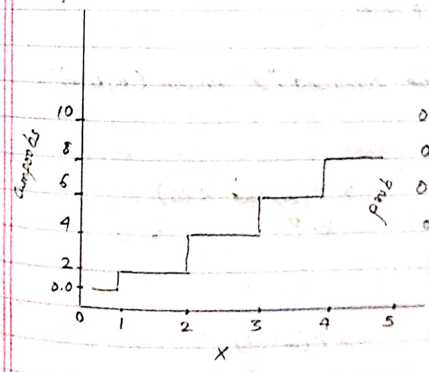
5) n=5 , p=0.25 , x=3
P(x≥3) = 1-p(x≤2)
= 1-pbinom (2,5,0.25)
[1] 0.1035156

Q.6) X follows binomial distribution n=10 , p=0.4 plot the graph of pdf and cdf.

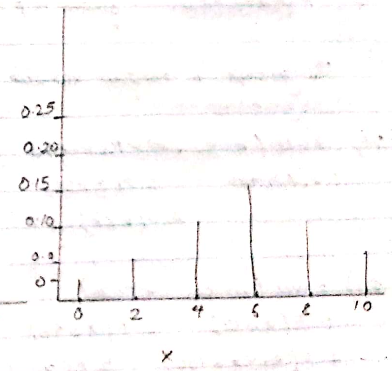
Sol^n
n=10 ; p=0.4 . x=0:n
prob = dbinom (x,n,p)
cumprob = pbinom (x,n,p)
d= dataframe ("x value"=x, "probability"=prob)
print (d)

x values	probability
0	0.006046 6176
1	0.040310 7840
2	0.12093 2520
3	0.2149908 480
4	0.2508226560
5	0.2006581248
6	0.1114767360
7	0.4246 73280
8	0.0106168320
9	0.00157 28640
10	0.00010 48576

plot (x, sum, prob, "s")



plot (x, prob, "h")



PRACTICAL No.5

Topic- Normal Distribution.

1) $P[z=x]$ = dnorm (x, μ, σ)

2) $P(X \leq x)$ = pnorm (x, μ, σ)

3) $P(X > x)$ = 1- pnorm (x, μ, σ)

4) $P(x_1 < x < x)$ = pnorm (x_2, μ, σ) - pnorm (x, μ, σ)

To find the value of 'k' as shown that

5) $P(X \leq k) = P_1$ qnorm (p, μ, σ)

To generate 'n' random variable command, 'x' rnorm (n, μ, σ)

Q.1) $x \sim N(\mu = 50, \sigma^2 = 100)$. find

1. $P(X \leq 40)$ 2. $P(x > 55)$ 3. $P(\mu_1 \leq x < 60)$

4. $P(X \leq k) = 0.7$ k=?

Q.2) $x \sim N(\mu = 100, \sigma^2 = 36)$

1. $P(x \leq 10)$ 2. $P(x \leq 95)$ 3. $P(x > 115)$

4. $P(95 < x \leq 105)$ 5. $P(x \leq 15) = 0.4$ k=?

Q.3) Generate 10 random numbers from a normal distributing with mean = 60 sd = 5. Also calculate sample mean, median, variance & sd.

4) Draw the graph of standard normal distribution

1) a= pnorm (40,50,10)
cat("p(x<40) ="a)
⇒ $p(x \leq 40)$ = 0.1586553.

2) b = 1-pnorm (55,50,10)
cat ("p(x>55) = "b")
$p(x>55)$ = 0.3085375

3) c = pnorm(60,50,10) - pnorm (42,50,10)
cat ("p(42≤x≤=60)=", c)
$p(42 \leq x \leq 60)$ = 0.6294893.

4) d= qnorm (0.7, 50,10)
cat ("p(x<k)=0.7 , k is =", d)
$p(x \leq k)$ = 0.7 k is = 55.24401

5) n= pnorm (110,100,6)
cat ("p(x≤110) =", a)
$p(x \leq 110$ = 0.9522096)

6) b= pnorm (95,100,6)
cat ("p(x<=95)=", b)
$p(x<=95)$ = 0.2023284

7) C= 1-pnorm (115,100,6)
cat("p(x>115) =", c)
$p(x>115)$ = 0.006209665

8) d= pnorm (105,100,6)
- pnorm (95,100,6)
cat ("p(95<=x<=105) =", b
$p(95<=x<=105)$ =
0.5953932

9) e= qnorm (0.4,100,6)
cat ("p(x<=k) = 0.4
k is 98.47992

a = rnorm (10, 60, 5)

n = 10

μ = 60

σ = 5

[1] 58.45543   55.02759   60.59413   58.66145   60.02250

60.54697   61.79573   51.97780   65.01164   68.01424

mean (a)

[1] 61.18175

n = 10

variance = (n-1) * (x) / n

[1] 23.22858

median (a)

[1] 60.27534

sd = sqrt (variance)

4.819604

101107322

sd (a)

5.080309

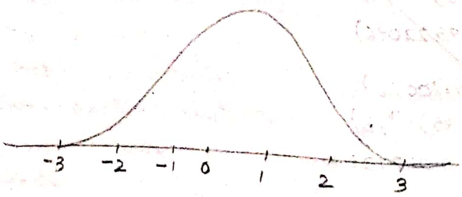
(sd (a)^2)

25.80954

4) x = seq (-3, 3, by = 0.1)

y = dnorm (x)

plot (x, y, xlab = "x value", ylab = "probability", main = "standard normal distribution", "l").



PRACTICAL No. 6

Topic -

Test the hypothesis (Ho).

1) Test Ho: μ = 10 against h₁: μ ≠ 10

A sample of size 400 is selected which gives mean 10.2 and sd. 2.25

Test the Ho @ 5% level of significance.

mo = mean of population

mx = mean of size

sd = standard deviation

zcal = (mx - mo) / (sd (sqrt (n)))

cat ("zcal is" = ", zcal)

zcal is 1.77778

pvalue = 2* (1-pnorm (abs (zcal)))

pvalue

[1] 0.07544036

Since 0.07544036 is more than 0.05 : we will accept the Ho.

2) Test the (Ho) μ = 75   H₁: μ ≠ 75.

A sample of size 100 is selected and sample mean = 80 with sd = 3

Test the (Ho) @ 5% level of significance.

zcal = (mx - mo) / (sd (sqrt (n)))

cat ("zcal is :", zcal)

zcal is = 16.6667

pvalue = 2* (1-pnorm(abs(zcal)))

pvalue

[1] 0.

3) Test the (Ho) μ= 25 against H1 : μ ≠ 25 @5% level of significance. The following of sample 30 is selected.

20, 24, 27, 35, 30, 46, 26, 27, 10, 20, 30, 37, 35, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 39, 27, 15, 19, 22, 20, 18

mx = mean(x)

mx

[1] 26.067

n= length (x)

n

[1] 30

variance = (30-1)* var(x) / 30

variance

[1] 7.279

pvalue = 2* (1-pnorm (abs (zcal)))

pvalue

[1] 0.42

zcal = (mx - 25) / (sd) (sqrt(n)))

cat ("zcal is =", zcal)

0.8025454

4) Experience has shown that 20% students of college smoke. A sample of 400 students reveal that out of 400 only 50 smoke. Test the (Ho) that experience gives the correct proportion or not.

zcal = (p-P)/(sqrt(P*Q/n))

cat ("zcal is =", zcal)

-3.75

pvalue = 2* (1-pnorm (abs(zcal)))

pvalue

[1] 0.0001768346

p

[1] 0.125

5) Test the (Ho): P= 0.5 against H1: P≠0.5 A sample of 200 is selected and sample proportion is calculated (p) = 0.56 Test (Ho) @ 1% of (Ho)

zcal = (p-P) / (sqrt (P*Q /n))

cat ("zcal is =", zcal)

= 1.697056

pvalue = 2* (1-pnorm (abs(zcal)))

pvalue

[1] 0.08968602

p

[1] 0.56

Value accepted.

AH 22.01.20

Pratical No.7

Topic - Large Sample Tests.

1) A Study of noise level into hospital is calculated below. test the hypothesis of noise level in two hospital are same or not

	Hos A	Hos B.
No of sample obs	84	34
Mean	61	59
sd	7	8

⇒ ho = Noise level ..

n1 = 84

mx = 61

my = 59

sdx = 7

sdy = 8

z = (mx-my) / sqrt ((sdx^2/n1) + (sdy^2/n2))

z

[1] 1.273682

cat ("z calculated is =", z ")

zcalculated is = 1.273682

pvalue = 2* (1- pnorm (abs(z)))

Pvalue

0.04550026 0.2027

Ho is at 5% level of significance.

2) Two random sample area of size 1000 and 2000 are drawn from two population with mean 67.5 and 68 respectively. sd of 2.5 test hypothesis the mean of population are equal.

⇒ ho = Two population

n1 = 1000

n2 = 2000

mx1 = 67.5

mx2 = 68

sdx = 2.5

sdy = 2.5

y = (mx1 - my1) / sqrt((sdx^2/n1) + (sdy^2/n2))

y

-5.163978

cat ("ycalculated is=" y)

ycalculated is = -5.163978

pvalue = 2* (1 - pnorm (abs (y))

pvalue.

2.415764.

we reject the ho of 5 level of significance

3) In a first year class 20% of random sample of 400 student had defect eye sight. in sy class 15.5% of 50 student is the difference of proportion is same?

ho = proportion of population

n1 = 400

n2 = 500

p1 = 0.2

p2 = 0.155

p = (n1*p1 + n2*p2)/(n1+n2)

q = 1-p

p

0.175

q

= 0.822225.

z = (p1-p2)/(sqrt(p*q*(1/n1+1/n2))

z

1.76547

pvalue = 2* (1- pnorm (abs(z)))

0.0774

we accept the ho of 5% level of significance.

4) From each of following boxes of apples a sample size of 200 is collective. It is found that there are 44 bad apples in first sample and 30 in second sample. test hypothesis that 2 boxes are equivalent in number of bad apples?

⇒ ho = Two boxes

p1 = 44/200

p2 = 30/200

n1 = 200

n2 = 200

p = (n1*p1 + n2*p2)/(n1+n2)

p

0.185.

q = 1-p

0.815

z = (p1-p2)/sqrt(p*q*(1/n1+1/n2))

z

14

1.802741

pvalue = 2* (1-pnorm (abs (3)))

0.07142

· pvalue < 0.05 accept the ho 5%.

level of significance

5) In MA class of sample 60 mean height is 63.5 inch with sd 2.5 in a

In mean m.com class out of 50 student mean height 69.5 inch with sd 2.5.

Test the hypothesis mean of MA & M.Com.

⇒ h₀ = mean of MA and M.com.

n1 = 60

n2 = 50

mx = 63.5

my = 69.5

sd1 = 2.5

sd2 = 2.5

y = (mx-my)/sqrt((sd1^2(n1) + (sd2^2/n2)

y

-12.53359

cat ('ycalculated is =",y)

ycalculated is = -12.53359

pvalue = 2* (1-pnorm (abs(y)))

pvalue

0

We reject the ho of 5%

level of significance.

Practical No. 8

Topic - Small Sample Test.

1) The flowers 10 selected and the height founded 63, 68, 69....71, 7..
Test the hypothesis that the mean weight 66cm or not at 1%.

⇒ Mean = 66cm

x = c(63, 63, 68, 69, 71, 71, 72)

t = test (x).

data = x

t = 47.94, df = 6

pvalue = 5.322.

alternative hypothesis

True mean is not equal to 0

Percent confidence level. interval:

64.66479 71.62092

Sample estimate:

Mean of x

68.14286

pvalue less than 0.01, reject Ho of 1% level of significance

2) 2 Random sample drawn from 2 different population sample - 8, 11, 16, 15, 18, 7

Sample 2 - 20, 15, 18, 9, 8, 10, 11, 12, 15, 18, 17, 16.

Test the hypothesis that there is no difference mean b/w the mean at 5%.

⇒ x=c(5,10,12,11,18,15,7)
y=c(20,15,18,9,10,11,12,8)
t.text(x,y).

data = x and y
t=0.36247
df = 13.387
p value = 0.7225
alternative hypothesis - True difference in means not equal to 0
percent confidence interval.
-5.192719
3.692719
Sample estimated:
Mean of x and y.
12.125 12.875.

p value greater than 0.05.
Accept Ho at 5% of level of significance.

3) Following are weight 10 people before and after diet program Text hypothesis that it effect or not.

Before 100, 125, 95, 96, 98, 112, 115, 104, 109, 110
After 95, 80, 95, 90, 100, 110, 85, 100, 101

x=c(100,125,95,96,98,112,115,104,109,110)
y=c(95,80,95,90,100,110,85,100,101)

data : x and y.
t= 2.6991
df= 18.801
pvalue = 0.985
95 percent confidence interval
. 18.72908
mean of difference
11

pvalue greater than 0.5.
Accept Ho at 5% level of significance.

Q.4) Mark before and after a training program as given below.
Before : 20, 25, 32, 28, 27, 36, 35, 25
After : 30, 35, 32, 37, 37, 40, 40, 23

⇒ x=c(20,25,32,28,27,36,35,25)
y=c(30,35,32,37,37,40,40,23)
t.text(x,y, paired = T, alternative ='greater').
paired t-text.
data : x and y
t= -3.3859
df = 7
p-value = 0.9942
Mean is greater than 0
Percent confidence interval:
-8.967399
Sample estimates.
Mean of difference
-5.75

We accept Ho at 5% level of significance

Q.5) 2 Random Sample were ~~drawn~~ drawn from 2 random population and the values are.

A: 66, 67, 65, 75, 76, 82, 84, 88, 90, 92

B: 64, 66, 74, 78, 82, 85, 87, 92, 93, 45, 97.

Test wheather the population hence some variance at 5%.

⇒ x=c (66, 67, 75, 76, 82, 84, 88, 90, 92)

y=c (64, 66, 74, 78, 82, 85, 87, 92, 93, 45, 97)

variance (x, y)

Compare 2 variance

data: x ordy.

F= 0.708660

num df = 8

denumdf: 10

p-value = 0.6354

ratio of variance.

0.7063 567

pvalue greater than 0.5

Accept H₀ at 5% level of significance.

Q.6) The arithematic mean of sample of 100 abservation is 52. if sd = 7 Test the hypothesis that the population mean = 55 as not at 5%.

⇒ μ_0 = population mean = 55

n = 100

mx = 52

mo = 55

sd = 7

z = (mx - x0)/(sd/sqrt(n))

pvalue = 2* (1- pnorm (abs (z)))

pvalue =

1.82153.

pvalue < 0.05

Reject the 5% level of significance.

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Practical No. 9.

Chi-Square Distribution and ANOVA Bar.

Q1) Use the following data to test wheather cleanly new home dependent upon other condition or not.

⇒ code of Home

code of child	Clean	clean	Dirty
	fairly Dirty	70	50
		80	20
		35	45

H°: colu of home and child are Independent.

x = c (70, 80, 35, 50, 20, 45)

m = 3

n = 2

y = matrix (x, nrow = m, ncol = n)

y

	[1]	[2]
[1]	70	50
[2]	80	20
[3]	35	45.

pv = chisq. hotly()

pv

pearson chi-square.

data: y

P value is less than 0.05 we reject Ho at 5%.

2) Table below show a relation between the performance of mathematics and computer of CS student

Math

Comp	HG	MG	LG
HG	56	71	12
MG	47	163	38
LG	14	42	85

Ho. performance b/w Maths and computer are independent.

x = c(56, 47, 14, 71, 163, 42, 12, 38, 85)

m = 3

y = matrix (x, nrow = m, ncol = 3

	[1]	[2]	[3]
[1]	56	71	12
[2]	47	163	38
[3]	14	42	85

pv = chisq. test (y)

pv

Pearson's chi = squared Test

data = y

x-square = 145.78, df = 4, p value < 2.2 e-16.

pvalue < 0.05 we reject Ho at 5% level

3) Perform ANOVA for following data.

Varities	observation
A	50, 52
B	53, 55
C	60, 58, 57, 56
D	52, 54, 54, 55

Ho : The mean of varity A, B, C, D are .

x1 - c(50, 52)

x2 - c (53, 55)

x3 - c (60, 58, 57, 56)

x4 - c(52, 54, 55, 55)

d= stock c list (b1 = x1 , b2 = x2 , b3 = x3 , b4 = x4)
names(d)
"values" "ind"
oneway test (values data =d, var = equal =T)
one way analysis of means
data values and ind
F= 11.735 , num df =3 , denom df =9 .. p-value = 0.00183
anova = aov [values ~ind , data =d]

summary (anova)

	Df	sumsq	Meansq	F.values	Pr (>F)
ind	3	71.06	23.687	11.73	0.00183 **
Residuals	9	13.17	2.019		

pr < 0.05 we reject H_0 at 5% los.

4)

type	observations
A	6,7,8
B	4,6,5
C	8,6,10
D	6,99

H_0 : The mean of variety A, B, C, D equal
x1 = c(6,7,8)
x2 = c(4,6,5)
x3 = c(8,6,10)
x4 = c(6,99)
d= stock (list .(b1 =x1 , b2=x2 , b3 = x3 , b4 = x4))
name (d)
"values" "ind"
one way . Test (value ~ind, data = d. var equal =3
one way analysis . of mean.
data = values and ind
F = 0.667 , num df = 3, denom df = 8 , pvalue = 0.1139.

annova = aov (values ~ ind , data = d
summary . (annova)

	Df sum	Sq mean	Sq F	values	Pr (>F)
ind	3	18	6.00	2.667	0.119
Residuals	8	18	2.25		

p.value > 0.05 we accept H_0 at 0.05 . at 5%
x= read csv(C :/users /Admin /Desktop
x.

Practical 10

Non - Parametric Test.

1) Following are the amount of sulphur oxide emited by factory.
data . 17, 15, 20, 23, 19, 18, 22, 25, 27, 9, 24, 20, 17, 6, 24, 14, 15, 23, 24, 26.
Apply sign test to ~~test~~ hypothesis that the population median is 21.5 . against algorithm it is less than 7 21.5

⇒ ho = population median equal to 21.5
. it is less than 21.5
x = c
m = 21.5
sp = length (x (x>m])
sn = length (x [x<m])
n = sp+sn
pv = pbinom (sp.n , 0.5)
pv = 0.411
pvalue > 0.05 we accept 5% leve of significance
NOTE - If alternative is greater than median.

2) For observation 12, 19, 31, 28, 23, 43, 40, 55, 42, 70, 63 apply sign test to population median is 25 against the alternative it is more than 25.
ho : population median equal to 23
h1 = It is more than 25
m = 25
x = c(12, 19, 31, 28, 43, 40, 55, 49, 70, 63)

sp = length (x [x>m])
sn = length (x [x<m])
n = sp+sn
pv = pbinom (sn, n, 0.5)
pv
[1] 0.0546875
pvalue is less than 0.05 we reject.

3) For following data
60, 65, 63, 89, 61, 71, 58, 51, 48, 66 Test the hypothesis using wilcoxon sign rank test for testing the hypothesis. The median is 60 against the alternative it is greater than 6

⇒ ho = median 60
h1 = greater than 60
x = c (60, 68, 65, 89, 61, 71, 58, 51, 48, 66)
mu = 60
wilcox = test (x, "greater", mu = 60)
wilcoxon signed test with continuity correction
data : x
V = 29 . p-value = 0.2386
alternative hypothesis : true locations is greater than 6
pvalue < 0.5 we reject ho
NOTE - If the alternative is less
wilcox.test (x, alter = "less", mu = 60)
if the alternative is not equal to
wilcox. test (x, alter = 2. sided)

4) Using wilcoxn test the hypothesis medox is 12 against the alternative is less than 12

12, 13, 10, 20, 15, 5, 1, 7, 6, 11, 3, 20

⇒ H_0 = Median is 12

h_1 = less than 12

x<-c (12, 13, 10, 20, 15, 5, 1, 7, 6, 11, 9, 20)

wilcox. test (x, alter = "less", mu=12)

wilcoxon signed rank test with continously correction

data: x

V=25 ; p-value = 0.2521

alternate hypothesis, true location is less than 12

pvalue value is 12.