Practical No. 1

Aim :- Basics of R Software

1) R is a software for statical analysis and data computing
2) It is an effective data handling software and outcome storage is possibele
3) It is capalete of graphical display
4) It is a free software

Q.1 Solve the followings

1) $4+6+8\div2-5$

```
> 4+6+8/2-5
[1] 9
```

2) $2^2+|-3|+\sqrt{45}$

```
> 2^2 + abs(-3) + sqrt(45)
[1] 13.7082
```

3) $5^3+7\times5\times8+46/5$

```
> 5^3+7*5*8+46/5
[1] 414.2
```

```
> c(2,3,5,7) * 2
[1] 4 6 10 14

> c(2,3,5,7) * c(2,3,6,2)
[1] 4 9 30 14

> c(2,3,5,7) ^ 2
[1] 4 9 25 49

> c(6,2,7,5) / c(4,5)
[1] 1.50 0.40 1.75 1.00

> c(2,3,5,7) * c(2,3)
[1] 4 9 10 21

> c(1,6,2,3) * c(-2,-3,-4,-1)
[1] -2 -18 -8 -3

> c(4,6,8,9,4,5) ^ c(1,2,3)
[1] 4 36 512 9 16
```

Q.3)

```
> x = 20  > y = 30  > z = 2
> x^2 + y^3 + z
[1] 27402
> sqrt (x^2 + y)
[1] 20.73644
> x^z + y^z
[1] 1300
```

Q.4)

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

> x          [,1]   [,2]
[1] [1,]      1      5
    [2,]      2      6
    [3,]      3      7
    [4,]      4      8
```

Scanned with CamScanner

Q.5 Find x+y and 2x+3y where $x = \begin{bmatrix} 4 & -2 & 6 \\ 7 & 0 & 7 \\ 9 & -5 & 3 \end{bmatrix}$

$y = \begin{bmatrix} 10 & -5 & 7 \\ 12 & -4 & 9 \\ 15 & -6 & 5 \end{bmatrix}$

> x <- matrix (nrow=3 ,ncol=3 ,data = c(10,12,15, -5, -4, -6, ...

> y	[,1]	[,2]	[,3]
[1,]	10	-5	7
[2,]	12	-4	9
[3,]	15	6	5

> x+y

	[,1]	[,2]	[,3]
[1,]	10	-7	13
[2,]	12	-4	16
[3,]	24	-11	8

> 2 - x + 3 * y

	[,1]	[,2]	[,3]
[1,]	38	-19	33
[2,]	50	-12	41
[3,]	63	-28	21

Q.6 Marks of statistics of CS Batch B

x = c (58, 20, 35, 24, 46, 56, 55, 45, 27, 22, 47, 58, 54, 40, 50, 32, 36, 29, 35, 39)

> x = c (data)
breaks = Seq(20, 60, 5)
a = Cut (x, breaks, right = FALSE)

Scanned with CamScanner

```
> b = table(a)
> c = transform(b)
> c
```

	a	Freq
1	[20, 25]	3
2	[25, 30]	2
3	[30, 35]	1
4	[35, 40]	4
5	[40, 45]	1
6	[45, 50]	3
7	[50, 55]	2
8	[55, 60]	4

PRACTICAL - 2

Topic :- probebility distribution

1) check whether the following are p.m.f or not

x	$p(x)$
0	0.1
1	0.2
2	-0.5
3	0.4
4	0.3
5	0.5

If the given data is p.m.f. than
$\Sigma p(x) = 1$

$p(0) + p(1) + p(2) + p(3) + p(4) + p(5) = p(x)$

$\therefore 0.1 + 0.2 - 0.5 + 0.4 + 0.3 + 0.5$

$= 1.0$

$\therefore p(2) = -0.5$, it cant the

$\therefore$ probality mass function

$\therefore p(x) \geq \quad \forall, x$

2)

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

The Condition for p.m.f is $\Sigma p(x) = 1$

So,

$\Sigma p(x) = p(1) + p(2) + p(3) + p(4) + p(5)$

$= 0.2 + 0.2 + 0.3 + 0.2 + 0.2$

$= 1.1$

$\therefore$ The given data is not a pmf because the $p(x) \neq 1$

3)

x	$p(x)$
10	0.2
20	0.2
30	0.35
40	0.15
50	0.1

The ~~Condition~~ for p.m.f is

i) $p(x) \geq 0 \; \forall x$ satisfy

2) $p(x) = 1$

$\Sigma p(x) = p(10) + p(20) + p(30) + p(40) + p(50)$

$= 0.2 + 0.2 + 0.35 + 0.15 + 0.1$

$= 1$

The given data is p.m.f

Code :

```
> prob = c (0.2, 0.2, 0.35, 0.15, 0.1)
> Sum (prob)
[1] 1
```

38

Q.2 find the c.d.f for the following p.m.f and sketch the graph.

x	10	20	30	40	50
$p(x)$	0.2	0.2	0.35	0.15	0.1

$P(x) = 0 \qquad x < 10$

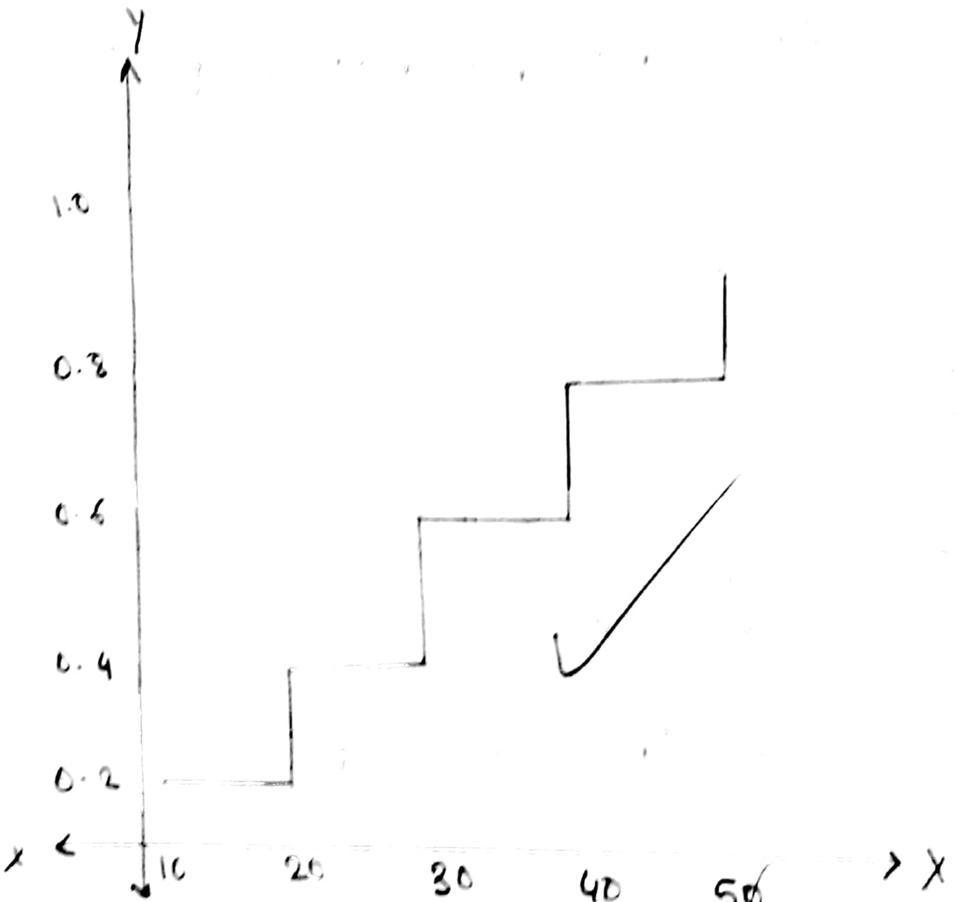
$0.2 \qquad 10 \leq x < 20$

$0.4 \qquad 20 \leq x < 30$

$0.75 \qquad 30 \leq x < 40$

$0.90 \qquad 40 \leq x < 50$

$1.0 \qquad x \geq 50$




```
> x=c(10,20,30,40,50)
> plot(x, cumsum(cap), "s")
```

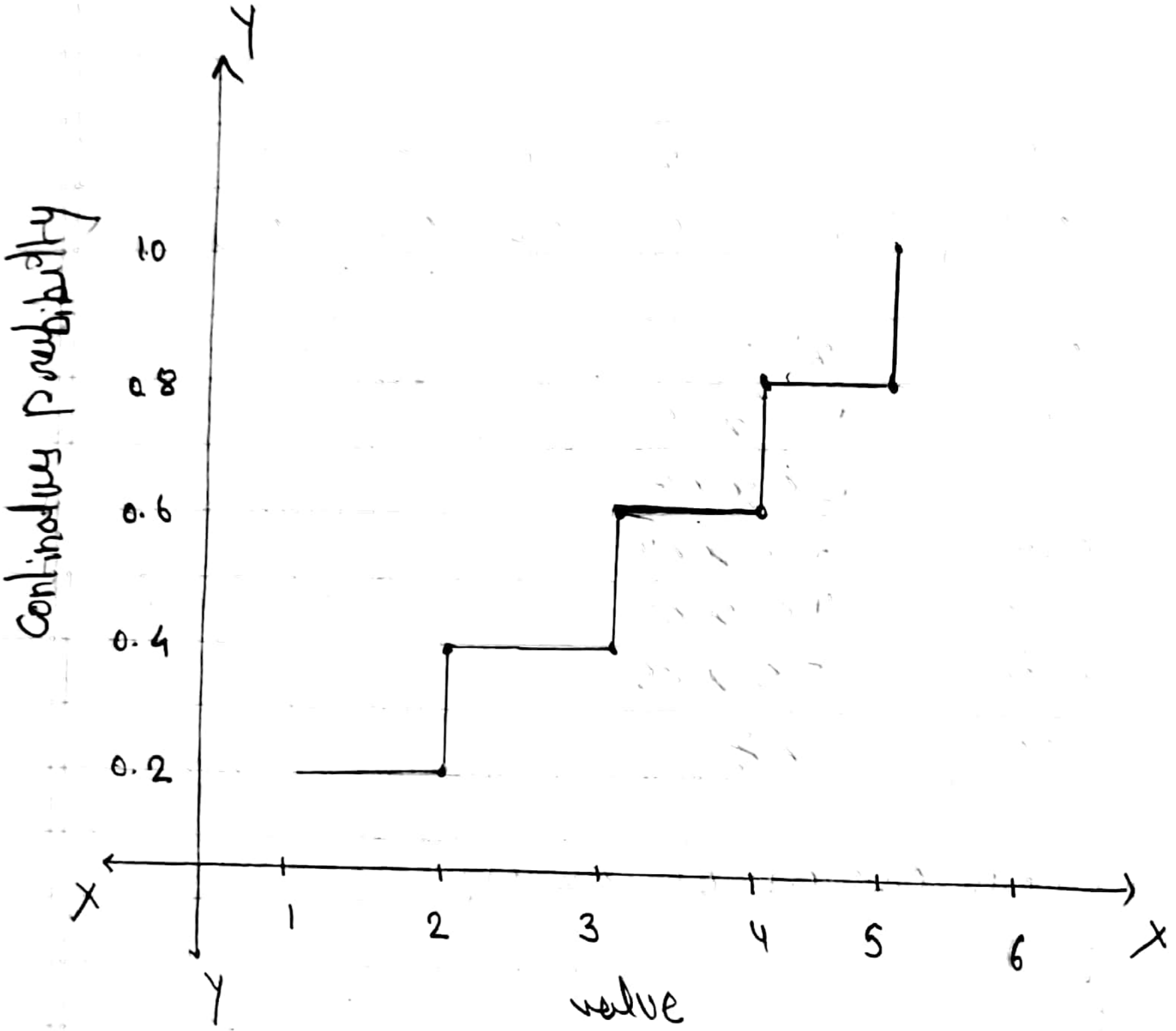
Scanned with CamScanner

Q. Find

x	1	2	3	4	5	6
$p(x)$	0.15	0.25	0.1	0.2	0.2	0.1

$$
f(x) = \begin{cases} 0 & x < 1 \\ 0.15 & 1 \le x < 2 \\ 0.40 & 2 \le x < 3 \\ 0.50 & 3 \le x < 4 \\ 0.70 & 4 \le x < 5 \\ 0.90 & 5 \le x < 6 \\ 1.00 & x \ge 6 \end{cases}
$$

```
> prob = c(0.15, 0.25, 0.1, 0.2, 0.2, 0.1)
> sum(prob)
 [1] 1
> cumsum(prob)
[1]  0.15, 0.40, 0.50, 0.70, 0.90, 1.00
> x = c(1,2, 3, 4, 5, 6,)
> plot(x, cumsum(prob), "s" xlab = "value",
      ylab = "Cumulative probility"
      main = " CDF graph ," col = "brown")
```



3, check that whether the following is p.d.f or not

i) $f(x) = 3 - 2x \; ; \; 0 \le x \le 1$

ii) $f(x) = 3x^2 \; ; \; 0 < x < 1$

i) $f(x) = 3 - 2x$

$= \int_0^1 f(x)$

$= \int_0^1 (3 - 2x)\,dx$

$= \int_0^1 3\,dx - \int_0^1 2x\,dx$

$= [3x - x^2]_0^1 = 2$

$\therefore$ The $\int_0^1 f(x) \neq 1$ $\therefore$ It is not a pdf

2) $f(x) = 3x^2$; $0 < x < 1$

$\int_0^1 f(x)$

$= \int_0^1 3x^2$

$= 3\int_0^1 x^2$

$= 3\left[\frac{x^3}{3}\right]_0^1$ $\therefore$ $x^n = \frac{x^{n+1}}{n+1}$

$= x^3$

$= 1$

The $\int_0^1 f(x) = 1$ $\therefore$ It is a pdf

PRACTICAL : 3

1.
```
> x = dbinom (10, 100, 0.1)
> x
[1] 0.1318653
```

2.
i)
```
x = dbinom (4,12,0.2)
[1] 0.1328756
```
ii)
```
pbinom (4,12,0.2)
[1] 0.9274445
```
iii)
```
1 - pbinom (3,12,0.2)
[1] 0.01940528
```

3 dbinom (0:5 , 5 , 0.1)

0 - 0.59049
1 - 0.32805
2 - 0.07290
3 - 0.00810
4 - 0.00045
5 - 0.00001

4 i) dbinom (5, 12, 0.25)

[1] 0.1032414

2) pbinom (5, 12, 0.25)

[1] 0.9455978

3) 1-pbinom (7, 12, 0.25)

[1] 0.0027815

~~4) dbinom (6, 12, 0.25)~~

~~[1] 0.04114445~~

4) i) dbinom (5, 12 , 0.25)

[1] 0.1032414

ii) dbinom (5, 12, 0.25)

[1] 0.9455978

iii) 1 - pbinom (7, 12, 0.25)

[1] 0.0027815

iv) dbinom (6, 12, 0.25)

[1] 0.04014945

PRACTICAL NO. 3

Topic :- Binomial distribution

$p(x=x)$ = dbinom (x, n, p)
$p(x \le x)$ = pbinom (x, n, p)
$p(x > x)$ = 1- pbinom (x, n, p)
if x is unknown
$p_1 = p(x \le x)$ = qbinom (p_1, n, p)

1) find the probablity of exactly 10 sucess in hundred trial with $p=0.1$

2) Suppose there are 12 mcq, each quation has 5 option out of which 1 is correct. find the probility of having
i) exactly 4 correct answers.
ii) Atmost 4 correct answer
iii) more than 5 correctly answere

3) find the complete distribution when $n=5$ and $p=0.1$

4) probabilities $n=12$ $p=0.25$
i) $p(x=5)$
ii) $p(x \le 5)$
iii) $p(x>7)$
iv) $p(5<x<7)$

Scanned with CamScanner

5) The probility of sales making a sale to customer is 0.15 find probility
i) No sales out of 10 customer
ii) More than 3 sales out of 20 customer.

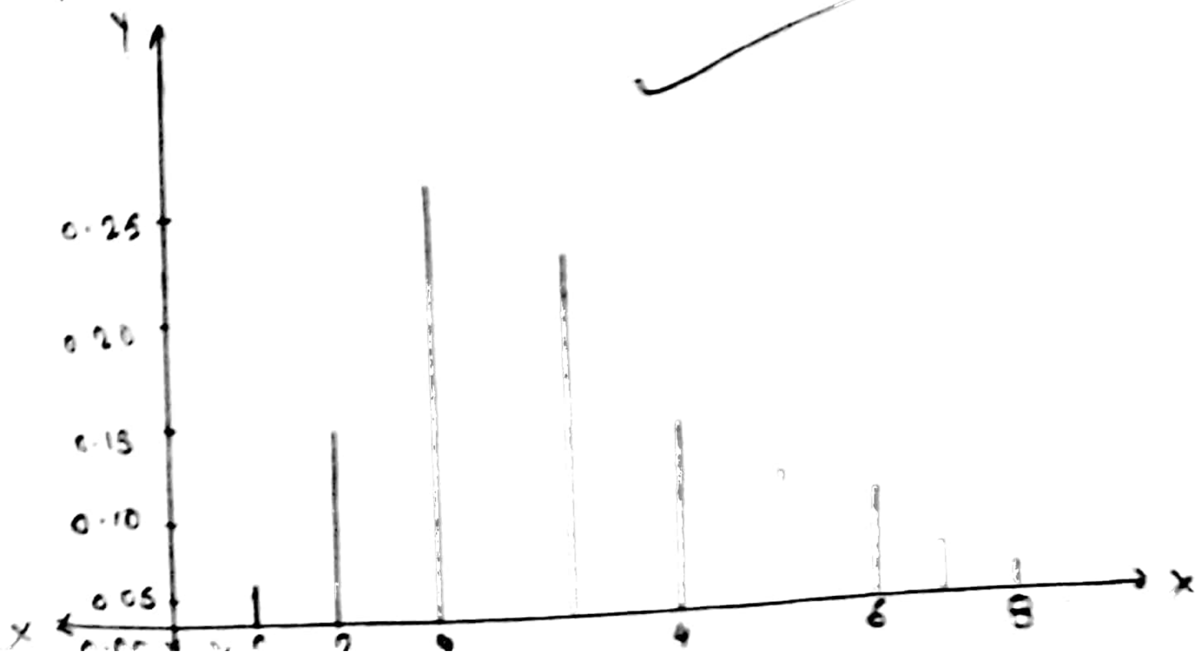
6) A salesman has 20% probility of making a sale to customer out of 30 customer, what is minimum no. of sales he can make with 88% of probility.

7) x follow binomial distribution with n=10, p=0.3 plot the graph p.m.f of c.d.f.

5) dbinom (0,10,0.15)
[1] 0.196874
1- pbinom (3,20,0.15)
[1] 0.352274
6) qbinom (0.88, 30, 0.2)
[1] 9
7) n = 10
> p = 0.3
> x = 0:n
> prob = dbinom (x, n, p)
> Cumprob = pbinom(x, n, p)
> d = data.frame("x value" = x, "probability" = prob
> print(d)

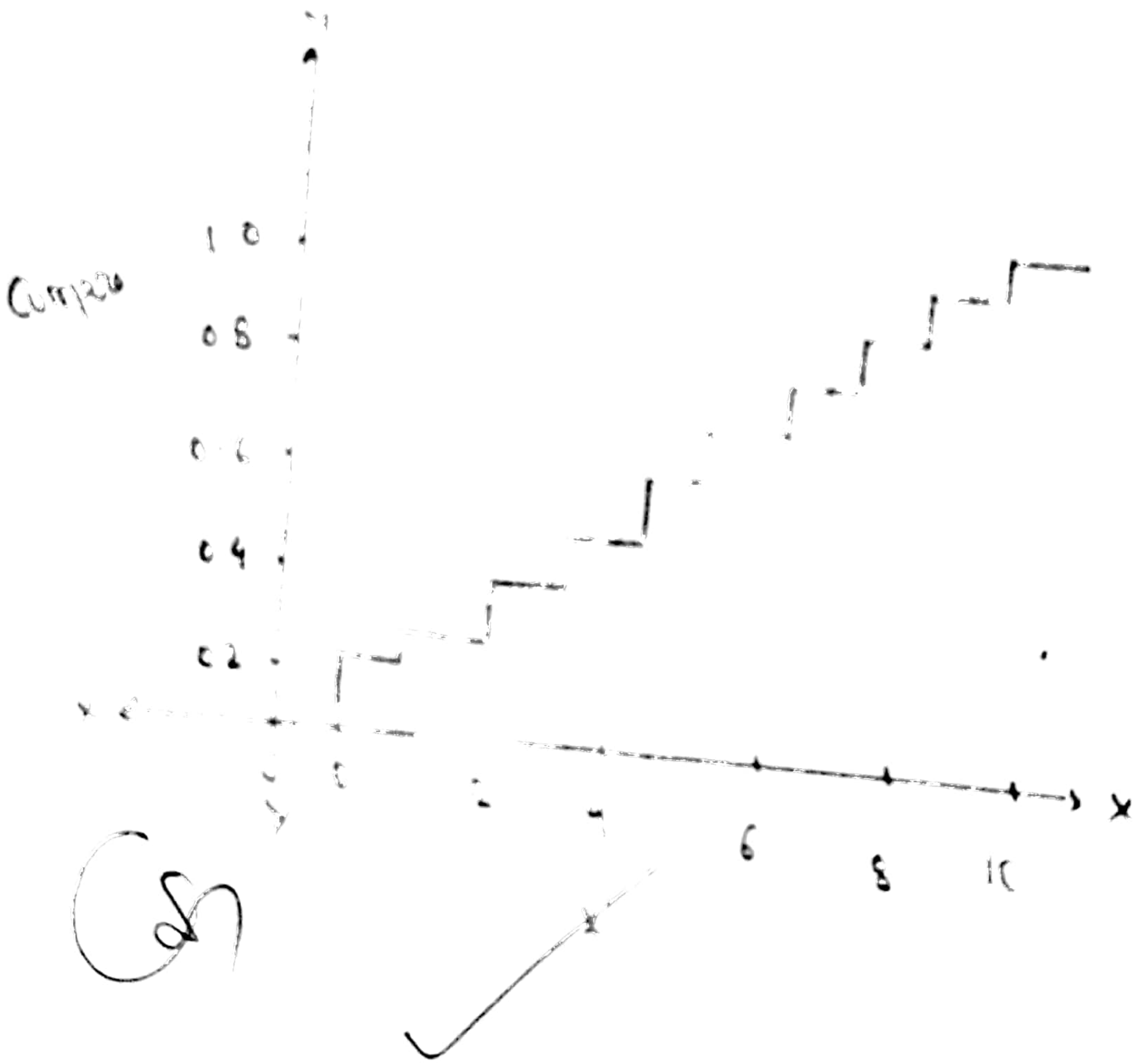
x value	probility
0	0.0282
1	0.1210
2	0.2334
3	0.2668
4	0.2001
5	0.1029
6	0.0367
7	0.0090
8	0.0017
9	0.0001
10	0.0000

> plot(x, prob, "h")



Scanned with CamScanner

> plot (x Compare, "s")



PRACTICAL 4

Topic :- Normal Distribution

i) $p(x = x) = \text{dnorm}(x, \mu, \sigma)$
ii) $p(x \le x) = \text{pnorm}(x, \mu, \sigma)$
iii) $p(x > x) = 1 - \text{pnorm}(x, \mu, \sigma)$
iv) To generate random number from a normal distribution (n random number) the R code is
rnorm (n, μ, σ)

Q.1. A random variable x follows normal distribution with mean = 12

CODE :-

```
> p1 = pnorm (15,12, 3)
> p1
[1] 0.8413447
> p2 = pnorm ( 13,12, 3)- pnorm (10,12,13)
p2
[1] 0.3780661
> p3 = 1- pnorm (14,12,3)
p3
[1] 0.2524925
> p4 = rnorm (5,12, 3)
p4
[1] 15.254723     16.548505 . 11.280515 6.419444
12.2460
```

2) x follows normal distribution with $\mu = 10$, $\sigma : 2$. find i) $p(x \leq 7)$ ii) $p(5 < x < 12)$ iii) $p(x > 12)$ iv) 10 observation
Also find k such that $p(x < k) = 0.4$

52

CODE :-

```
>p1 = pnorm (4,10,2)
 p1
[1] 0.668072
> p2 = pnorm (5, 10,2) - pnorm (12,10,2)
 p2
 [1] 0.835181
 p3 = 1- pnorm (12,10,2)
 p3
 [1] = 0.1586
 p4 = rnorm (10 , 10,2)
 p4
[1] 17.608981  9.920414  12.637741  8.078354
    8.721380  9.143725  0.366824  11.707106
    9.537584  12.715006
 p5 = qnorm (0.4, 10,2)
 p5
 [1] 9.493306
```

3. Generate 5 random number from a normal distribution $\mu = 15$, $\sigma = 4$. find Sample mean, midian, S.D and print it.

Code :-

```
> rnorm (15,15,4)
[1] 10.7649   7.793249   9.963444   13.345904   17.50966
> am = mean (x)
  am
[1] 11.87345
> cat (" Sample mean is = ", am)
  Sample mean = 11.87345
> me = median
> me
[1] 10.76499
> Cat (" Semple median = ", me)
  Sample median = 10.76494
> n= 5
> v= (n-1)* var (x)/n
> v
  [1] 11.09965
> S.D= sqrt(v)
> S.D
  [1] 3.33163
> Cat ("SD= ", S.D)
> SD = 3.33169
```

53

Q.4. $X \sim N(30, 100)$, $\sigma = 10$

i) $p(x \leq 40)$; ii) $p(x > 35)$ iii) $p(25 < x < 35)$

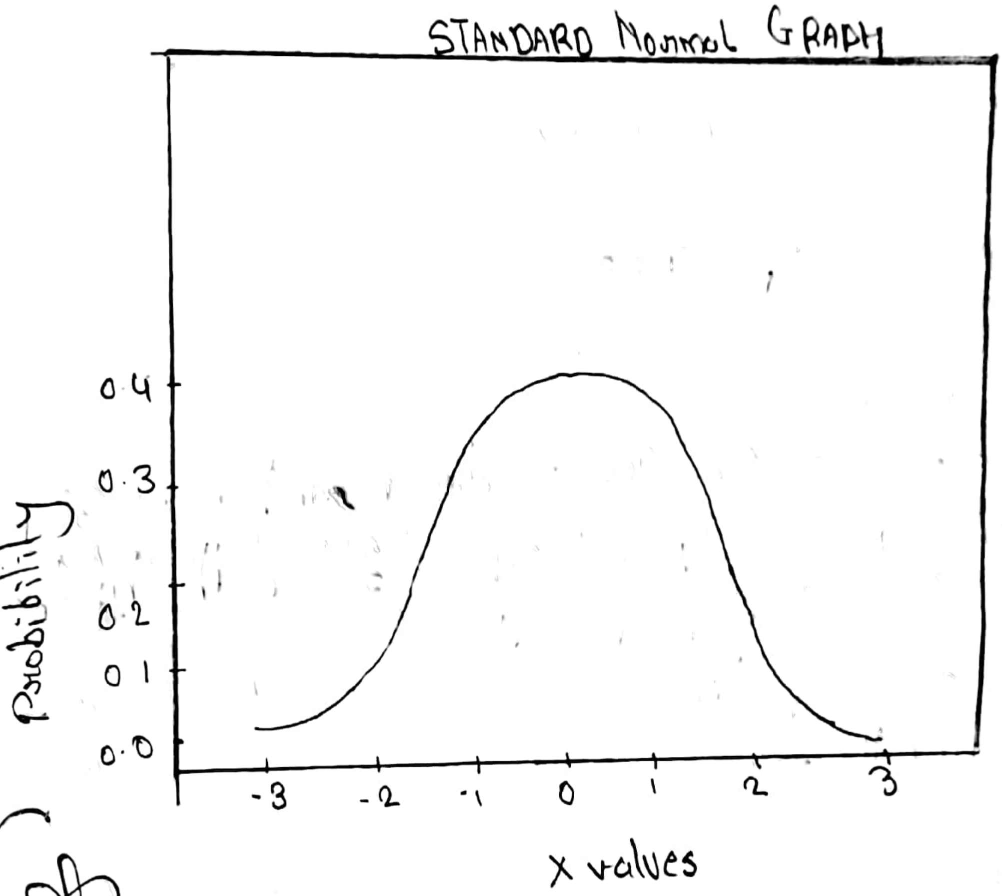
iv) find k such that $p(x < k) = 0.6$

Code :-

```
> f1 = pnorm(40, 30, 10)
> f1
[1] 0.8413447
> f2 = 1 - pnorm(35, 30, 10)
> f2
[1] 0.3085375
> f3 = pnorm(25, 30, 10) - pnorm(35, 30, 10)
f3
[1] 0.3829249
> f4 = qnorm(0.6, 30, 10)
> f4
[1] 32.53347
```

Q.5 plot standard normal graph

```
> x = seq(-3, 3, by = 0.1)
> y = dnorm(x)
> plot(x, y xlab = "x values", ylab = "probabity",
    main = "standard normal graph")
```


STANDARD Normal GRAPH
Probability
0.4
0.3
0.2
0.1
0.0
-3
-2
-1
0
1
2
3
X values

PRACTICAL - 5

Topic : Normal and t. Test

i) $H_0 : \mu = 15$ $H_1 : \mu \neq 15$

Test the hypothesis
Random Sample of size 400 is drawn and it is Given
The Sample mean is 14 and S.D is 3 test the hypothesis
at 5% level of significance at .5%

0.05 > accept the value
0.05 < less the value

```
> m0 = 15
> mx = 14
> n = 400
> sd = 3
> zcal = (mx - m0) / (sd / (sqrt(n)))
> zcal
[1] -6.6667
> cat ("Calculated values of z is:" zcal)
Calculated values z is: -6.666
> pvalue = 2* (1- pnorm (abs(zcal)))
> pvalue
[1] 2.616796
```

∴ The value is less than 0.05 we will rejected the value of $H_0 : \mu = 15$

2) Test the hypothesis $H_0 : \mu = 10$ against $H_1 : \mu \neq 10$
A random sample size of 400 is drawn with sample mean = 10.2 and s.d = 2.25 Test the hypothesis at.

```
> mo =10
> n = 400
> mx = 10.2
> sd = 2.25
> zcal = (mx - mo) / [sd / (sqrt(n))]
> zcal
 [1] 1.7778
> pvalues = 2 * (1- pnorm (abs (zcal)))
> pvalue
> 0.07544036
```

∴ The values pvalue is greater then 0.05 ∴ The value is accepted.

3) Test the hypothesis Ho : proportinal of smokers is college is 0.2. A sample is collected and calculated the sample as 0.125 test the hypothesis at 5% level of significans [sample size is 400]

```
> p = 0.2
> P = 0.125
> n = 400
> Q = 1-p
> zcal = (p - P) (sqrt (p* Q(n)))
> cat (" calculated value of z is = ", zcal
```

[1] Calculated value of z is = - 3.75

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

pvalue

[1] 0.0001768346 (Reject)

4) last Year farmer's lost 20% of their Crops. A random Sample of 60 fields are Collected and it is test hypothesis at 1% levels of significance -

> p= 0.2

> P= 9/60

> n=60

>zcal = (p-P) / [sqrt (p* q/n)]

> zcal

> [1] -0.96824

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

pvalue

> [1] 0.332916

5) Test the hypotesis $H_0 : \mu = 12.5$ from the followed Sample at 5% level of significance.

> x = c (12.25, 11,97 , 12.25, 12,0.8, 12.31, 12.28, 11.94, 11.84, 12.16, 12.04)

n= length(x)

n

[1] 10

mx = mean[x]

Scanned with CamScanner

```
> mx
[1] 12.107
> variance = (n-1) * var(x) /n
variance
[1] 0.019521
> sd = sqrt (variance)
> sd
> [1] 0.1397176
> t = (mx - mo) / (sd / sqrt (n))
t
[1] -8.894909
> pvalue = 2* (1- pnorm (abs(t)))
> pvalue
[1] 0
```

∴ This values is less than 0.05 the values is accepted.

PRACTICA - 06

Topic : Large Sample test

1) Let the population mean (the amount spent per customer in a restaurant) is 250. A Sample of 100 customer selected the Sample mean is Customer of 275 and SD 30 test the hypothesis that the population mean is 250 or not on 5% level of significants

2) In a random Sample of 100 students it is found that 250 use value pen blue test the hypothesis that the population proportion is 0.8 at 1% level of significance.

→ Soln:

1)

> m0 = 250

> mx = 275

> sd = 30

> n = 100

zcal = (mx-m0)/(sd/(sqrt(n)))

> cat ("calculated value of is z = ", zcal)

[1] calculated values is z is = 8.333

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

pvalue.

[1] 0

∴ The value is less that 0.05 we will reject of H0: μ=250

Sol^n:

2) p = 0.8
Q = 1-p
p = 750/1000
n = 1000
zcal = (p - P) /[sqrt (p * Q/n)]
cat ("Calculator value is z is:", zcal)
[1] Calculated value of z: -3.9528
pvalue = 2* (1 - pnorm (abs(zcal)))
pvale
[1] 7.77 628. J2
∴ The value is less 0.01 we reject !

3) A study sample of size 1000 & 2000 are drawn from two population with same sd 2.5 the sample mean are 67.5 and 6.8 test hypothesis $\mu_1 = \mu_2$ at 5 < of significance

4) A study of noise level in 2 hospital given below test the clamin that 2 hospital have same level of noise at 1% level of significance.

Hos. A	Hos. B
84	84
61.2	59.4
7.9	7.5

5) In a Sample to 600 Students is dg 400 used a Blue ink. In another dg from a Sample of 900 Students 450 use blue ink. Test the hypothesis ~~tat~~ that the propartion of students using blue ink in two collegues conve equal or not at 1% level of significance

Solution :-

3) n1 = 1000
n2 = 2000
mx1 = 67.5
mx2 = 68
Sd1 = 2.5
Sd2 = 2.5
> zCal = (mx1 - mx2) / sqrt ((sd1^2 /n1) + (sd2^2 /n2))
zCal
[1] -5.163975
> pvalue = 2 * (1- pnorm (abs (zcal)))
pvalue
> [1] 2.417564e-07 < (Rejected.

4) n1 = 84
n2 = 34
mx1 = ~~59.4~~ 61.2
mx2 = 59.4
Sd1 = 7.9
Sd2 = 7.5

Scanned with CamScanner

58

> z col = (mx1 - mx2) / sqrt (sd1^2/n1 + sd2^2/n2))
zcol
[1] 1.162528
> pvalue = 2* (1- pnorm (abs (zcol)))
pvalue
[1] 0.2450211
∴ The value is greater than 0.01 we accept the value

5) $H_0 = p_1 = p_2$ against $H_1 : p_1 \neq p_2$
> n1 = 600
> n2 = 900
> p1 = 400/600
> p2 = 450/900
> p = (n1 * p1 + n2 * p2) (n1 + n2)
> p
[1] 0.4333
> zcal = (p1 - p2) / sqrt (p * q * (1/n1 + 1/n2))
> zcal
[1] 6.381534
> pvalue = 2* (1- pnorm (abs (zcal)))
pvalue
[1] 1.7532e-10
∴ value is less than 0.01 the value is rejected.

PRACTICAL - 7

Topic : Small Sample test

The marks of 10 students are given by 63, 63, 66, 67, 68, 69, 70, 71, 72 test the hypothsis that the sample from the population with average 66.

$H_0 : \mu = 66$

> x = c (66, 63, 66, 67, 68, 69, 70, 71, 72)

> t. test (x)

one Sample t-test

data : x

t = 68.319 , df = 9 , pvalue = $1.558e^{-13}$

alternative hypothsis

True mean is not equal to 0

95 percent Confidence interval

65.63171 70.14829

Sample estimates

mean of x

67.9

∴ The p value is less than 0.05 we reject the hypothesis at 5% Level of Significance.

2) Two groups of students Scoured the following marks Test the hypothesis that there is no significant difference. between the 2 group.

GR1 :- 18, 22, 21, 17, 20, 17, 23, 20, 22, 21
GR2 :- 16, 20, 14, 21, 20, 18, 13, 15, 17, 21

Ho : There is not difference b/w the 2 group.

```
> x = c (18 ,22, 21, 17 ,20 ,17, 23, 20, 22, 21)
> y = c( 16, 20, 14, 21, 20, 18, 13, 15, 17, 21)
> t. test (x,y)
          welch Two Sample t-test
data : x and y
  t = 2.2573    df = 16.376    p-value = 0.03798
  alternative hypothesis
         True different in means is not equal
to 0    95 percent Confindence interval
      0.1628205      5.0371795
   Sample estimates:
         mean of x   mean of y.
         20.1        17.5

> p. value = 0.03798
> if (pvalue > 0.05) {cat ("accept Ho")}
  else {cat ("reject Ho")}
  reject Ho.
```

(PAIRED : T. test)

3) The Sales data of $6 shops before & after a speial Campaign are given below

Before :- 53, 28, 31, 48, 50, 42

after :- 58, 29, 30, 55, 56, 45

Test the hypothesis different of Sales before.

Ho :- There is no Significen differenc of Sales before & after Campaign

> x = c (Before)

> y = c (After)

> t.test (x, y, paired = T, alternative = "greater")

paired t-test

data : x & y

t = -2.7815, df = 5, pvalue = 0.9806

alternative hypothesis :

True difference in means is greater than 0

95 percent Confidence interval :

-6.035547 inf.

Sample estimates

mean of the difference

-3.5

∴ pvalue is greater than 0.05. we accept the hypothesis at 5% Level of Significance.

Scanned with CamScanner

b) Following are the weights before & after the diet program. Is the diet program effective:

Before : 120, 125, 115, 130, 123, 119

After : 100, 114, 95, 90, 115, 99

Solution :

H_0 : There is no significance difference

> x = c(Before)

> y = c(after)

t.test (x, y, paired = T, alternative = "less")

paired t-test

data : x & y

t = 4.3498, df = 5, pvalue = 0.9963

alternative hypothesis : true difference in means is

Confidence interval

-Inf 29.0295

sample estimates :

mean of the difference

19.8333

∴ pvalue is greater than 0.05 we accept the hypothesis at 5% level of significance.

Q) 2 medianis are applied to two group of patient respectively.

grp1 :- 10, 12, 13, 11, 14
grp2 : 8, 9, 12, 14, 15, 10, 9

Is there any Significance difference b/w 2 medicines

Ho : There is no Significance difference

```
> x = c(grp1)
> y = c(grp2)
> t.test(x, y)
data : x & y
t = 0.80384 , df = 9.7594 pvalue = 0.4406
alternative hypothesis : true difference in mean
is not equal to 0
95 percent Confidence interval
  -0.9698553    4.2981886
  Sample estimates
  mean of x   mean of y
  12.0000     10.333
```

∴ pvalue is greater than 0.05 is accept the hypothesis at 5% level of Significance.

:ə

PRACTICA - 8

Topic: Larges and Small test.

Q.1) The arithmetic mean of a Sample of 100 items frome a large population is 52. if the standard is 7 test the hypothesis that the population mean is 55 against the alternative is more than 55 at 5% Los

→

Q.2) In a big city 350 out 700 males are found to be Smoke. Does the information supports that exactly half of the males in the city are Smokers? Test at 1% Los.

→

Q.3) Thousand articles from the factory: A are found of have 2% defective, 15000 articals from a 2nd factory: B are found have 1% defective. Test at 5% Los that the two factory are similar are not.

→

Q.4) A Sample of Size 400 was draw at a Sample mean is 99. Test at 5% Los that the sample comes form a population with the mean 100 and variance 64.

Q.5. The flower stems are Selected and the height are the height are found to be (cm) 63,63,68,69,71,71,72 test the hypothesis that the mean ~~100~~ 66 and variance 64. not to 1% LoS.

Solution :-

1) $H_0 : \mu = 55$, $H_1 : \mu \neq 55$

```
> n = 100
> mx = 52
> m0 = 55
> sd = 7
> zCal = (mx - m0) / (sd / (sqrt(n)))
> zCal
[1] : -4.285714
> pvalue = 2 * (1 - pnorm (abs (zCal)))
> pvalue
[1] 1.82153e-05
```

2) $H_0 : p = 0.5$ agains $H_0 = p \neq 0.5$

```
> p = 0.5
> q = 1-p
> n = 700
> zCal = (p - p) / (sqrt (p*q / n))
> zCal
[1] 0
> pvalue = 2 * (1 - pnorm (abs (zCal)))
> pvalue
```

sa.

[1] 1

3) $H_0 = p_1 = p_2$ again $H_1 : p_1 \neq p_2$

> n1 = 1000

> n2 = 1500

> p1 = 2/1000

> p2 = 1/1500

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

> p

[1] 0.~~9988~~0012

> q = 1-p

[1] 0.9988

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

> zcal

[1] 0.943375

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

> pvalue

[1] 0.345489

∴ pvalues is gerater than 0.05 we accept Ho and 5% level of singnipicants.

4) $H_0 = \mu = 100$ against $H_2 : \mu \neq 100$

> var = 64

> n = 400

> m0 = 100

> mx = 99

> sd = sqrt(var)

> sd

[1] 8

```
> zcal = (mx - m0) / (sd / (sqrt(n)))
> zcal
[1] -2.5
> pvalue = 2 * (1- pnorm (abs (zcal)))
> pvalue
[1] 0.01241933
```

5) $H_0 : \mu = 66$ against $H_1 : \mu \neq 66$

```
> x = c(63 ,63 ,68 ,69, 71 ,71, 72)
> t.test (x)
      One Sample t. test
data x:
t = 47.94.   df = 6.   p value = 5.522e-09
    64.66479    71.62092
   sample estimates
    mean x
    68.14286
```

Since p value is less than 0.05 we rejects Ho at 1% level of significance.

PRACTICAL · 9

Topic :- Non parametric tests

* Sign test :-

Q.1.) The following data present earnings (in dollar) for a random sample of five Common stocks listed on the New York Exchange. Test whether median earning 4 dollars (1.68, 3.35, 2.50, 6.23, 3.24)

```
># Sign test.
>   x <- c(1.68, 3.35, 2.50, 6.23, 3.24)
>   n <- length (x); p0 <- 0.5;
>   x>4
[1]   FALSE  FALSE  FALSE  TRUE  FALSE
>   s <- sum (x > 4); s;
    x > 4
[1] 1
> binom.test (s, n, p=0.5, alternative = "greater");

    Exact binomial test
  data: s and n
  number of Successes = 1, number of trials = 5, p-value
  = 0.9688
alternative hypothesis : true probability of success is than
0.5   95 % Confidence interval :
```

0.01020622 1.00000

Sample estimates

probability of Seccess.

wilcoxon test :.

Q.2) The Scores of 8 Students in reading before and after lesson are as follows: Test whether there is effect of reading.

Student No :	1	2	3	4	5	6	7	8
Score before	10	15	16	12	09	07	11	12
Score After	13	16	15	13	09	10	13	10

```
> b <- c(10,15,16,12 ,09, 07, 11 ,12);
> a <- c(13 ,16, 15, 13, 09, 10 ,13,10);
> D <- b-a;
> wilcox. test (D , alternative = "greater");
```

data : D

V = 10.5 , p. values = 0.8722

alternative hypothesis : true location is greater than 0

warning message :

In wilcox . test . default (D, alternative = "greater"):

Cannot computer exect p. value with ties.

Mann - whitney - wilcoxon's test .

Q.3) The diameter of a ball bearings was measured by 6 inspe... each using two different kinds of Calipers . The result were Test whether average ball bearing for .

Inspector	1	2	3	4	5	6
Caliper 1	0.265	0.268	0.266	0.267	0.269	0.264
Caliper 2	0.263	0.262	0.270	0.261	0.271	0.260

```
> # Given
> x <- c(0.265, 0.268 , 0.266 , 0.267, 0.269, 0264);
> y <-c(0.263 . 0.262 , 0.270 ,0.261, 0.271, 0.260 );
> wilcox. test (x,y ,alternative = "greater")
        wilcoxon rank Sum test
   data : x and y
   w = 24, p. value = 0.197
   alternative hypothesis : true location shift is greater
   than 0 .
```

PRACTICAL NO - 10

AIM : chi square tests and ANOVA (Analysis of variance)

use the following data to test whether the Condition of home & Condition of child are independent or not.

Cond child	Cond Home clean	Dirty
clean	70	50
fairly clean	80	20
Dirty	35	45

Ho : Condition of Home & 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
```

> pvalue = chisq : test (y)
> p value
pearson's chi - squared test
data : y
x - Squared = 25.646
df = 2
p - value = 2.648e - 06
They are dependent
∴ pvalue is less than 0.05 we reject the hypothsis at 5% level of Significance.

Q.2. Test the hypothesis that vaccation and diecase are independent or Not

Disease	vaccine Affected	Not. Affected
Affect	70	46
Non. affected	35	37

Ho : Disease and vaccine are independent

```
> x = c(70, 35, 46, 37)
> m = 2
> n = 2
> Y = materix (x, nrow = m, ncol = n)
> Y
      [,1]  [,2]
[1,]   70    46
[2,]   35    37
```

> pv = chisq . test (y)

> pv

pearson's chi squared test with
yates' Continuity Connection
data : y
x - Square = 2.0275
df = 1
p - value = 0.1545

∴ p - value is more than 0.05 we accepted the hypothesis at 5% level of significance.

// They are INDEPENDENT.