Practical - 1

Title :- Random variable

Q1 Find the mean and variance for the following :

a]

x	-1	0	1	2
$P(x)$	0.1	0.2	0.3	0.4

x	$P(x)$	$x \cdot P(x)$	$E(x)^2$	$[E(x)]^2$
-1	0.1	-0.1	0.1	0.01
0	0.2	0	0	0
1	0.3	0.3	0.3	0.09
2	0.4	0.8	0.16	0.64
Total	$\Sigma=1$	$\Sigma=1$	$\Sigma E(x)^2 = 0.20$	$\Sigma [E(x)]^2 = 0.74$

$\therefore$ Mean $= E(x) = \Sigma x_i \cdot p(x) = 1$

$\therefore$ variance $= V(x) = \Sigma E(x)^2 - \Sigma [E(x)]^2$

$= 2 - 0.74$

$\therefore$ Mean $E(x) = 1$ $= 1.24$

and variance $V(x) = 1.24$

b)

x	-1	0	1	2
$p(x)$	$1/8$	$1/8$	$1/4$	$1/2$

solution :

x	$p(x)$	$x \cdot p(x)$	$E(x)^2$	$[E(x)]^2$
-1	$1/8$	$-1/8$	$1/8$	$1/64$
0	$1/8$	0	0	0
1	$1/4$	$1/4$	$1/4$	$1/16$
2	$1/2$	1	2	1
Total	$\Sigma = 1$	$\Sigma = 9/8$	$\Sigma = 19/8$	$\Sigma = 69/64$

$\therefore$ mean $= E(x) = \Sigma x \cdot p(x) = 9/8$

$\therefore$ variance $= V(x) = \Sigma E(x)^2 = \Sigma [E(x)]^2$

$$= \frac{19}{8} - \frac{64}{64}$$

$$= \frac{152 - 64}{64}$$

$$= \frac{83}{64}$$

$\therefore$ mean$(x) = 9/8$ and variance $V(x) = 83/64$

C

x	-3	10	15
$p(x)$	0.4	0.35	0.25

Solution

x	$p(x)$	$x \cdot p(x)$	$E(x)^2$	$\{E(x)\}^2$
-3	0.4	-1.2	3.6	1.44
10	0.35	3.5	3.5	12.25
15	0.25	3.75	56.25	14.0625
Total	$\Sigma=1$	$\Sigma=6.05$	$\Sigma 94.85$	$\Sigma=27.7525$

$\therefore$ mean $= E(x) = \Sigma x \cdot p(x) = 6.05$

$\therefore$ variance $= V(x) = \Sigma E(x)^2 - \Sigma[E(x)]^2$

$= 94.85 - 27.7525$

$= 67.0975$

$\therefore$ mean $E(x) = 6.05$ and variance $V(x) = 67.0975$

if $p(x)$ is pmf of a random variance x if $p(x)$ represent pmf for random variable x find value of k then evaluate mean and variance.

Solution : as $p(x_i)$ is a pmf it should satisfy the properties of pmf which are

a) $p(x_i) > 0$ for all sample space

b) $\Sigma p(x_i) = 1$

x	-1	0	1	2
$p(x)$	$k+1/13$	$k/13$	$1/13$	$k-4/13$

$\therefore \quad \Sigma P(x) = 1 = \frac{k+1}{13} + \frac{k}{13} + \frac{1}{13} + \frac{k-2}{13}$

$1 = \frac{k+1 + k+1 + k-2}{13}$

$13 = 3k - 2$

$15 = 3k$

$k = 5$

x	$h(x)$	$x \cdot h(x)$	$E(x)^2$	$[E(x)]^2$
-1	6/13	-6/13	6/13	36/189
0	5/13	0	0	0
1	1/13	1/13	1/13	1/189
2	1/13	2/13	4/13	4/189
Total	$\Sigma = 1$	$\Sigma = -3/13$	$\Sigma = 11/13$	$\Sigma = 41/189$

$\therefore$ mean $= E(x) = \Sigma x \cdot h(x) = \frac{-3}{13}$

$\therefore$ varience $= V(x) = \Sigma E(x)^2 - [E(x)]^2$

$= \frac{11}{13} - \frac{41}{169}$

$= \frac{143 - 41}{169}$

$= \frac{62}{169}$

$\therefore$ mean $= -3/13$ and varience $= 102/169$

Q3 The pmf of random variable x is given by

x	-3	-1	0	1	2	3	5	8
$p(x)$	0.1	0.2	0.15	0.2	0.1	0.15	0.05	

Obtain cdf. Find 1) $P(-1 \le x < 2)$ 2) $P(1 \le x \le 5)$ 3) $P(x \le 2)$ 4) $P(x \ge 0)$

solution

x	-3	-1	0	1	2	3	5	8
$p(x)$	0.1	0.2	0.15	0.2	0.1	0.15	0.05	0.05
$F(x)$	0.1	0.3	0.45	0.65	0.75	0.90	0.95	1.

1) $P(-1 \le x \le 2) = P(x \le 2) - P(x \le -1) + P(x = -1)$

$= F(x(b)) - F(x(a)) + p(a)$

$= F(2) - F(-1) + p(-1)$

$= 0.75 - 0.3 + 0.2$

$= 0.25$

2) $P(1 \le x \le 5) = F(x(b)) - F(x(a)) + p(a)$

$= F(5) - F(1) + f(1)$

$= 0.95 - 0.65 + 0.2$

$= 0.15$

3) $P(x \le 2) = P(x = -3) + p(x = -1) + p(x = 0) + p(x = 1) + p(x = 2)$

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

$= 0.75$

4) $P(x \ge 0) = 1 - F(0) + p(0)$

$= 1 - 0.45 + 0.15$

$= 0.70$

let f be contenious random variable with pdf

$\because f(x) = \frac{x+1}{2} \quad -1 < x < +1$

$= 0$ otherwise

obtain cdf of x find mean

solution : by defination of cdf we have

$f(x) = \int_{0-1}^{x+1} t\,dt$

$= \int_{-1}^{1} \frac{x+1}{2}\,dx$

$= \frac{1}{2}\left(\frac{1}{2}x^2 + x\right)$ for $-1 \le x \le 1$

hence the cdf is

$f(x) = 0$ for $x \le 0 - 1$

$= \frac{1}{4}x^2 + \frac{1}{2}x$ for $-1 \le x \le 1$

$= 0$ for $x \ge 1$

Q.5 Let of be continous Random variable with
$f(x) = \frac{x+2}{18}$ $\quad -2 \le x < 4$

$= 0$ Otherwise

calculate cdf

solution : by definition of cdf we have

$$F(x) = \int_{2}^{x} t \, dt$$

$$= \int_{2}^{x} \frac{x+2}{18} \, dx$$

$$= \frac{1}{18}\left(1 \frac{1}{2} x^2 + 2x\right)$$

for $-2 \le x \le 4$

hence cdf is

$$F(x) = 0 \quad \text{for } x \le 2$$

$$= \frac{1}{18}\left(\frac{1}{2} x^2 + 2x\right)$$

for $-2 \le x < 4$

$= 0$ for $x \ge 4$

practical no2

Title : Binomial distribution

1) an unbaised coin is tossed 8 times calculate the probability ks of obtaining no head, at least one head and more than one tail

No head

> d binom (0, 8, 0.5)

[1] 0.0625

atleast one head

> 1- d binom (0, 8, 0.5)

[1] 0.9375

more than one tail

> p binom (1, 8, 0.5 , lower tail = F)

[1] 0.9375

The probability that student is accepted to a prestigious College is 0.3 if 5 student supply whats the probability of almost 2 are accepted

> P binom (2, 5, 03)

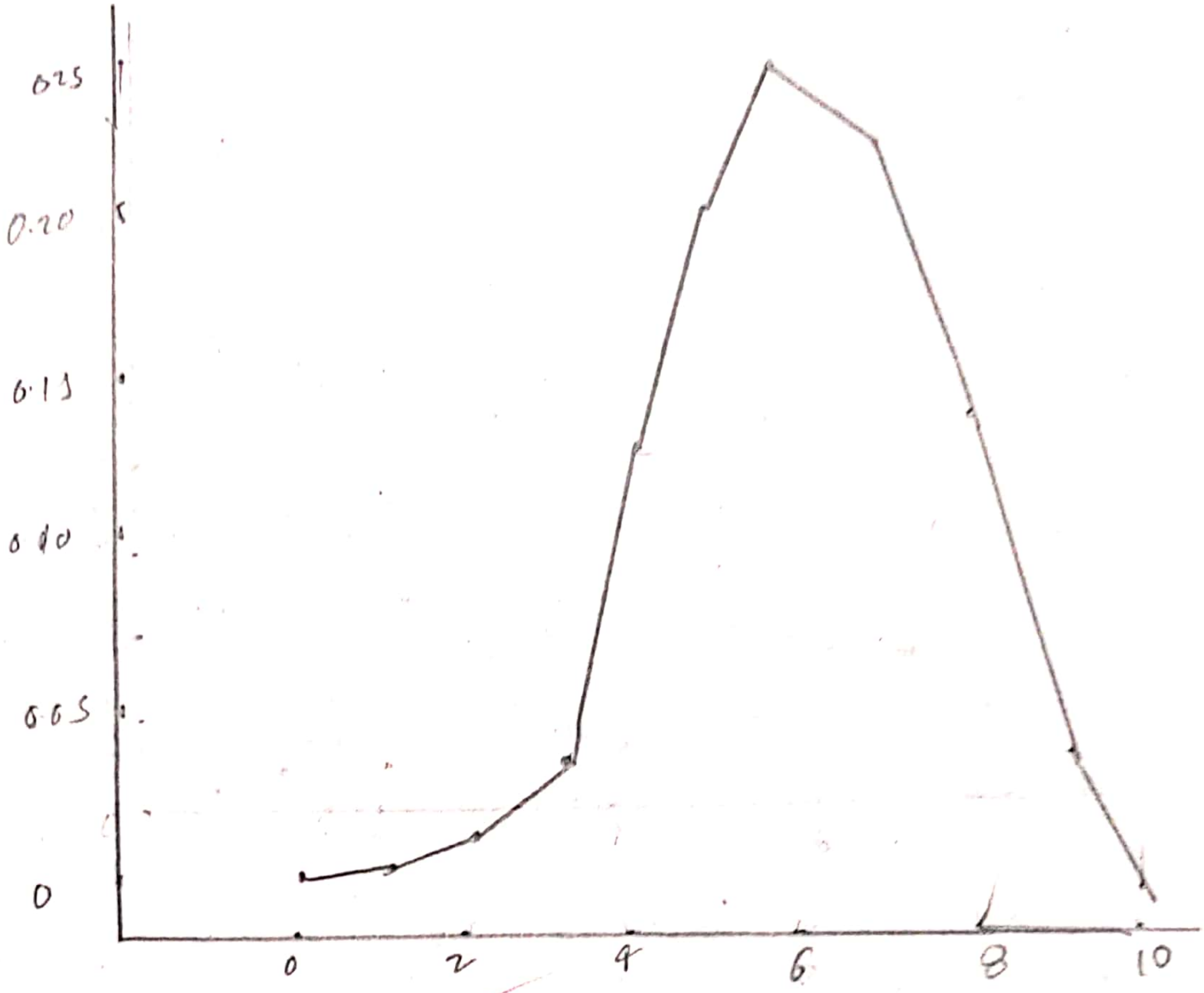
21

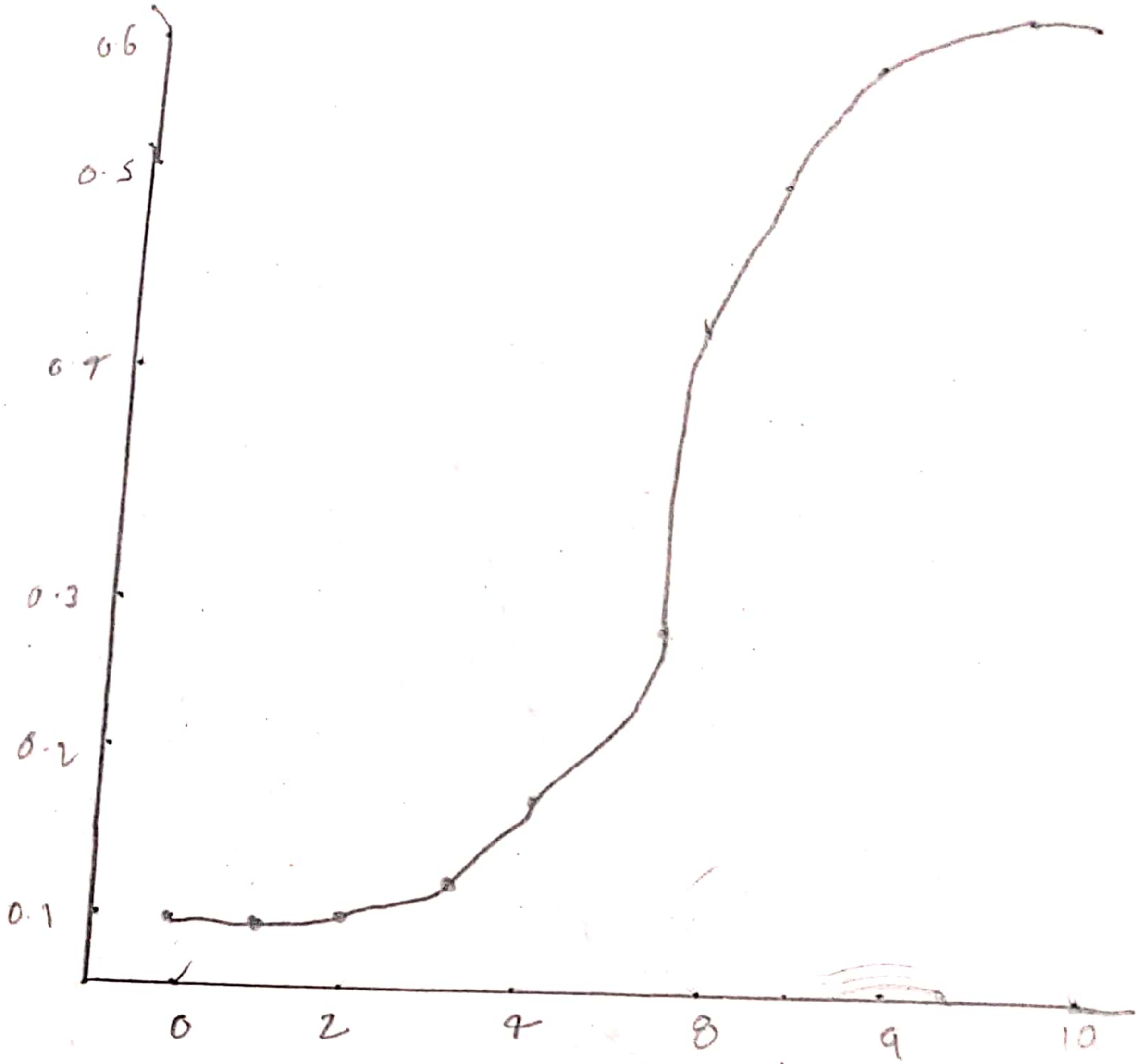
Q3 an unbiased coin is tossed 6 times the probability of head at any toss = 0·3 let x be no of head that comes up calculate $p(x=2)$ $p(x=3)$ $p(1<x<5)$

> d binom (2, 6, 0·3)
[1] 0·324135
> d binom (3, 6, 0·3)
0·18522
> d binom (2, 6, 0·3) + d binom (3, 6, 0·3) d binom(
0·74373

Q4 For n=10 p=0·6 evaluate binomial probabilities and plot the graph of pmf and cdf
> x = seq (0, 10)
> y = b.d binom (x, 10, 0·6)
> y
[1] 0·0001048576 0·0015728640 0·0106168321
0·0042467328 0·1107673600 0·2006581201
0·2508226560 0·2149908480 0·1209323827
0·0403107840 0·0060466176
> plot (x, y, xlab = "sequence", ylab = "probabilit
, "o", pch = 16).
> x = seq (0, 10)
> y = p binom (x, 10, 0·6)
> plot (x, y, xlab = "segence", ylab = "probabilities
, "o", pch = 16)

a random variable sample of size 10 for a b.d
→ b(8, 0·3) find the mean and the variance of the
sample


0.25
0.20
0.15
0.10
0.05
0
0
2
4
6
8
10


0.6
0.5
0.4
0.3
0.2
0.1
0
2
4
8
9
10

```
> x = rbinom (8, 10, 0.3)
[1] 2 2 3 4 3 4 2 3
> summary(x)
[1] 2.375
> var (x)
[1] 3.125
```

1) The probability of men hitting the target is 1/4 if he shoots 10 times what is the probability that he hits the target exactly 3 times probability that he hits target atleast one time

```
> dbinom (3, 10, 0.25)
[1] 0.2502823
> 1- dbinom (1, 10, 0.25)
[1] 0.8122882
```

bits are sent for communication channel in packet of 12. if the probability of bit being corrupted is 0.1 what is the probability of no more than 2 bits are corrupted in a packet

```
> pbinom (2, 12, 0.1 lower.tail = F) + dbinom (2, 12, 0.1
[1] 0.3409977
```

Mesh

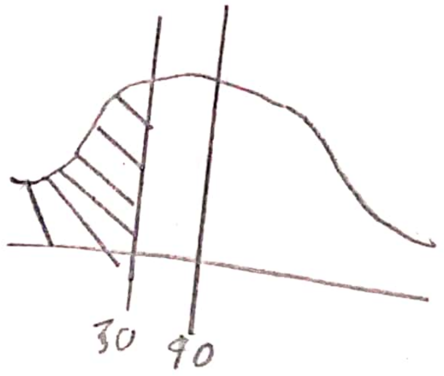
Pg: practical no 3

Title : normal distribution

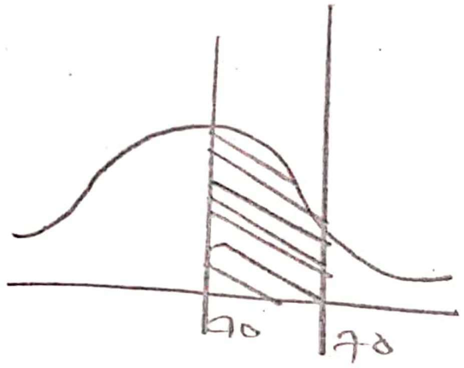
a normal distribution of 100 student with mean =40
sd =15
Find no of student whose marks are 1) p(x<30)
2) p(240 <x < 70) 3) p(25 <x < 35) 4) p (x > 60)

```
> pnorm( 30, 40,15)
[1] 0.2524925

> pnorm(70 40 15) - pnorm( 40, 40,15)
[1] 0.4772499

> pnorm(35 ,40, 25) - pnorm (25,40,15)
[1] 0.2107861

>1- pnorm(60,40;15)
[1] 0.09121122
```

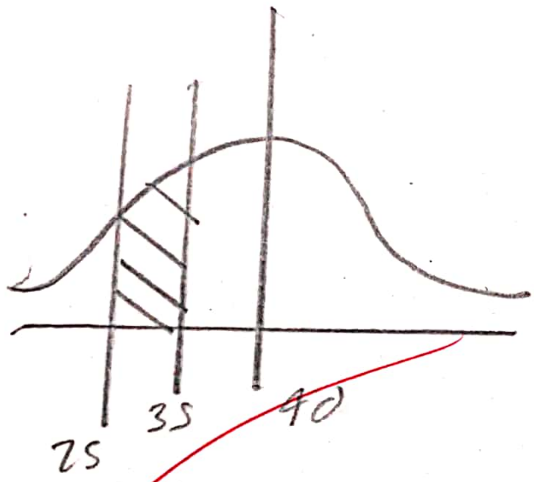
a)



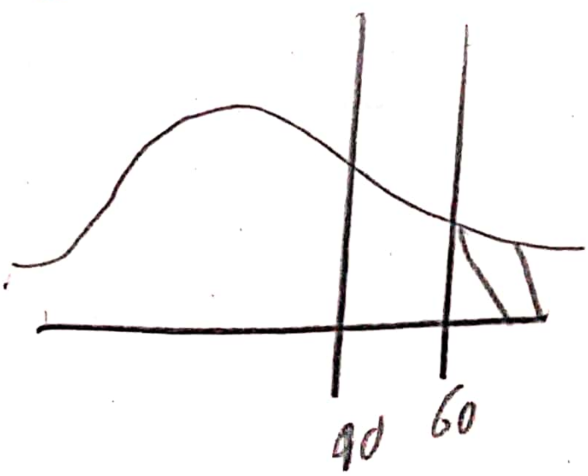
b)



c)

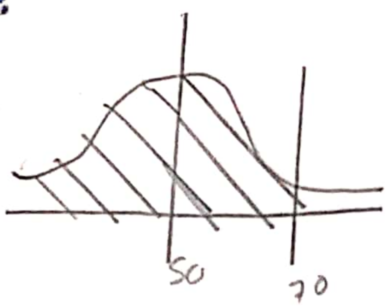


d)

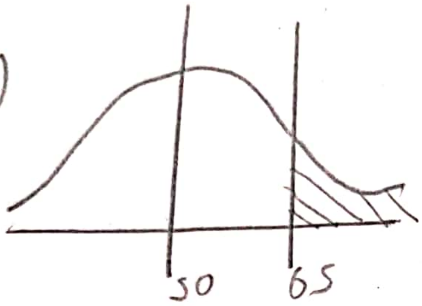


2

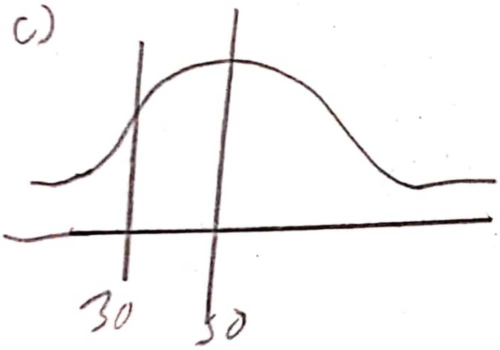
a)



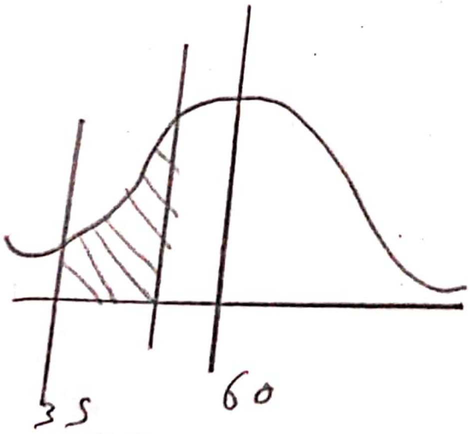
b)



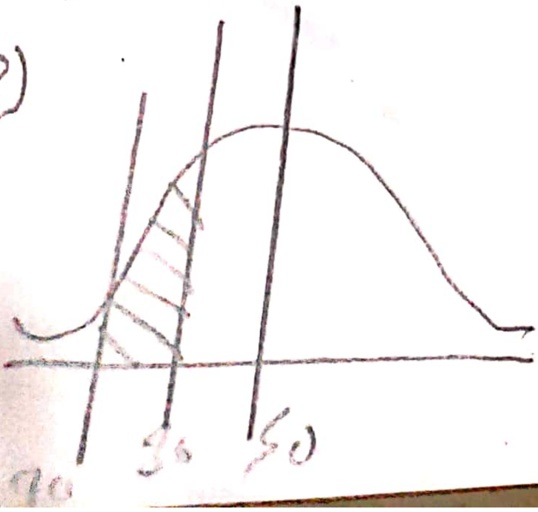
c)



d)



e)



If ... variable x follows normal distribution with mean = 50 V = 100 Find 1) p(x < 70) 2) p(x > 65) 3) p(x ≤ 32) 4) p(35 < x < 60) 5) p(20 < x < 30)

1) > pnorm(70, 50, 10)
[1] 0.9772499

> 1 - pnorm(65, 50, 10)
0.0668072

> pnorm(60, 50, 10) - pnorm(35, 50, 10)
0.7745375

> pnorm(30, 50, 10) - pnorm(20, 50, 10)
0.02140023

Let x ~ N(160, 400) find k_1 and k_2 such that
$p(x < k_1) = 0.6$ and $p(x > k_2) = 0.6$

> qnorm(0.6, 160, 20)
[1] 165.0669

> qnorm(0.8, 160, 20)
[1] 176.8320

Q4 a random variable x follows normal distribution with $\mu=10$ $\sigma 2$ generate 100 observation and evaluate its mean medium and variance

>x= rnorm(100, 10,2)
> summary (x)
[1] min 1st median mean 3rd max 5.713 8.778
9.7 23 9.914 11.325 14.298
>var(x)
[1] 3.6489 24

5 Q towrite a command to generate 10 random number for normally distribution with μ50 σ 4. Find the sample mean and median

>x= rnorm(10, 50,4)
>summary (x)
min 1Q median mean 3rd Q max
4 0.73 50.46 52.01 52.35 54.39 58.95

sample mean and deviation given single proportion

1) suppose the food level on the states that it has atmost 2 gms of saturated fat in a single contain in a sample of 55 cookie it was found that mean and of saturate fat per cookie it was assume that the sample std deviation is 0.3 at 5% level of significance can be rejected the food level

2) To check whether reject or accept level hypothesis at 95% level of confidence or 5% level of significance

$\sigma = 0.3 \quad n = 35 \quad \bar{x} = 2.1 \quad \mu = 2$

H_0 (null hypothesis) $= \mu < 2$

H_1 (alt. hypothesis) $= \mu > 2$

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$z = \frac{2.1 - 2}{\frac{0.3}{\sqrt{35}}} = 1.972027$$

p value $= 1 - \text{pnorm}(2)$

$= 0.0243$

$\therefore$ reject the null hypothesis $\therefore$ pvalue < 0.05

$\therefore$ accepted alternate hypothesis

72 A sample of 100 customer was randomly selected
set was found that average was 275 % the
SD = 30 using 0.05 level of significance would
your conclude that the amt spent by the
customer is more than 250 % whereas the
restaurant claim it is not > 250 %

$\bar{x} = 275 \quad u = 250 \quad \sigma = 30 \quad n = 100$

$x_0 = u < 250$

$x_1 - u > 210$

$$z = \frac{\frac{\bar{x} - u}{\sigma}}{\sqrt{n}}$$

$$= \frac{275 - 270}{\frac{30}{\sqrt{100}}} = 8.333$$

pt (z, 99 lower tail = F)

pvalue = 2.3057 36 e.13

reject the null hypotheses : p value < 0.05

a quality QC center of engineer find that sample
100 have average of 970 hours assuming population
whether the population mean < 980 hrs at 0.05

$n = 100 \quad \bar{x} = 970 \quad u_1 < 980 \quad \sigma = 25 \quad u = 980$

$$z = \frac{\bar{x} - u}{\sqrt{n}} = -4$$

p (z, 99 lower tail = T)

= 61 1125 760 - 0.5

reject the null

accept the alternate hypothesis $(\mu < 980)$

Q9 A principal at school claims that he is 100 of the student a random sample 30 student whose IQ was found to be the S.d of population is 15 test the claim of the principal

→ method I tail test

$H_0 = m = 100$

$H_1 = m = 100$

$x = 112$ SD $= 15$ $\mu = 100$ $n = 30$

$$z = \frac{x - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{112 - 100}{\frac{15}{\sqrt{30}}} = 4.38178$$

p value $= 5.886 \, 7e{-}06$

reject i2 tail test

$H_0 = \mu = 100$

$H_1 = \mu \neq 100$

pvalue $2 \times ((1 - \text{pnorm}(\text{abs}(z)))) = 1.1771\,97e{-}06$

reject the null hypothesis

p value < 0.05

single population portion

12) it is believed that coin is fair the coin is tossed 40 time 25 times head comes indicate whether the coin is fair or not 95% LOC

$$z = \frac{p - p_0}{\sqrt{\frac{p_0 q_0}{n}}} \quad \text{probability of population}$$

$p_0 = 0.5$

$q_0 = 1 - p_0 = 0.5$

$n = 40$

$$z = \frac{0.2 - 0.5}{\sqrt{\frac{0.05 \times 0.5}{40}}}$$

$H_0 = u = 0.5$ H_1 $u \neq 0.5$

pvalue $= 0.01149209$

Reject the null hypothesis

$\because P < 0.05$

accept the alternate hypothesis

Q2 in a hospital 480 female and 520 male as born in a week to confirm male and female are equal in 1-5

$$z = \frac{p - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

$p \to \frac{520}{100} = 0.5$

$q_0 = 0.5$ $n = 1000$

$h_0 = [p = p_0]$

$h_1 = [p \neq p_0]$

$z\,(p - p_0)$

$z = (p - p_0)$ (sqrt $(p_0 q_0 / n)$)

$z = 1.2695$

pvalue $= 2 \times (1 -$ pnorm (abs (z))

pvalue $= 0.2060506$

~~pvalue~~ $\therefore$ Reject the null hypotheses < 0.5

$\therefore$ accept the alternate hypothesis

ie $p = 100$

in a big city 325 value out of 600 men were formulate be found to be self employed conclusion is that maxim men is are self employed

$$z = \frac{p - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

$p \to \frac{325}{600} = 0.541607$ $p = 0.5$

$q_0 = 0.5$ $n = 600$

$h_0 = (p = p)$

$h_1 = [p = p_0]$

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.039 75 , sqrt (0.5 * 0.5/1000))

p value = 2 × (1 − pnorm (abs (2))

p value = 0.041552 84

∴ reject the null hypothesis

p value < 0.5

∴ accept the alternate hypothesis

i.e $p = p_0$

Experience shows that 20% of manufactured product are of top quality in 1 day production of 400 hypothesis that experience of 10% of manufactured product of wrong

$$Z = \frac{p - p_0}{\sqrt{\frac{p_0 q_0}{n}}}$$

$p = 0.125$ (50/400)

$p_0 = 0.2$ $q_0 = 0.8$

$n = 400$

$H_0 = [P = 0.2]$

$H_1 = [P \neq 0.2]$

Z = ((0.125 − 0.2)) sqrt (0.2 * 0.8/400)]

Z = 2.75

p value = 2 × (1 − pnorm (abs (2))

p value 0.0001768

Reject the null hypothesis ∵ pvalue < 0.2

∴ accept the alternate hypothesis

$p = 0.2$

formula

$$Z = \sqrt{pq\left(\frac{1}{n} + \frac{1}{m}\right)} \quad \text{where } p = \frac{p_1 n + p_2 m}{n + m}$$

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Q1 in an election campaign a telephone phone of 800 registered shows pvalue 460 second pole opinion 570 of 1000 registered voter found the condidate at 0.50 (0.01 level the confidence) is there sufficient evidence that populerity has decreased

$n = 800$ $\quad p_1 = 460/800 = 0.575$

$m = 100$ $\quad p_2 = 520/1000 = 0.52$

$p = (0.575 * 800 + 0.52 \times 1000) / (1800)$

$z = \text{sqrt}(0.54 * 0.46) * 1/8$

$z = 0.0112394$

$H_0 = p = 0.544$

$H_1 = p < 0.544$

pvalue $= 2 \times (1 - \text{pnorm}(\text{abs}(z)))$

$\therefore$ p value $= 0.9991053$

$\therefore$ accept the null hypothesis

pvalue > 0.5

accept $p = 0.5444$

from a consignment a 100 article are draw and 44 way format defective from assignment 200 sample are drawn of which 30 are defective test whether the propertis of defective item in 2 consinment are significant different

$H_0 = p_1 = p_2$

$H_1 = p_1 = p_2$

$p_1 = 44/200 = 0.22$

$n = 200 = m$

$p_2 = 30/200 = 0.15$

$$p = \frac{(p_1 n + p_2 m)}{n+m}$$

$p = (0.22 * 200 + 0.15 * 200) / 400$

$p = 0.1225$

z = (sqrt (0.1837 * 0.815) * (2/200)

z = 0.00388496

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

pvalue = 0.996 9018

pvalue > p

∴ accept the null hypothesis $p_1 = p_2$

lals

ga

practical - 5

title :- chi square root

a1) use the following data to test wheather the attribute condition of snow and child are independent

ans :- condition of how condition of child

dim dirty f. dim

70 50

80 20 dirty

35 45

ho = both are independent

h1 = both are dependent

>x = c(70, 80, 35)

y = c(50, 20, 45)

>z = data.from(x, y)

	x	y
1	70	50
2	80	20
3	35	45

> chisq test (z)

pearson chi square test

data : z

x - squared = 25.696 df = 2

p - value = 2.648 x

∴ both are independent

∴ reject the null hypothsis

1) a dice is tossed 120 times and full results were obtained

-> no of terms frequency

no of terms	frequency
1	30
2	25
3	18
4	10
5	22
6	15

test the hypothesis that dice is unbraised

∴ h_0 = dice is unbraised

h_1 = dice is braised

```
obs = c( 30, 25, 18, 10, 22, 15)
aor = sum( obs) / length(obs)
> aor
[1] 20
> z = sum ((obs - aor)^2 / aor))
> pchisq (z , df = length (obs -1)
(1) 0.95 6659
```

∴ a cept the null hypothesis

∴ dice is unbraised

an iq test was conducted and the student were observed before /and after training the result were full-

before	after
110	126
120	118
123	125
132	136
125	121

test wheather there is charge in the iq after the training

h_1 = no damage in iq

ho = iq increased efter training

a = c (120, 118, 125, 136, 121)

b = c (110, 120, 123, 132, 125)

z = sum ((b-a) ^2) /(a)

> pchisq (z, df = length (b) -1)

[1] 0.11 359 59

accept the null hypothsis

∴ there is no change in iq after training

Q8

	graduate	undergraduate
online	20	20
face to face	40	5

is there any associaton between student preference for type of education and method

∴ ho = independent

h_1 = dependent

> x = c (20, 40, 25, 5)

z = matrix (x, nrow = 2)

> chisq. test (2)

pearson chi squared test with yates confi continuity correction data = 7

x- squared = 18.08 df = 1

p- value = 2.157

∴ reject will null hypothesis

∴ both are dependent

5) a dice is tossed 180 times

no of terms	frequency
1	20
2	30
3	36
4	40
5	12
6	43

test the hypothesis that dice is unbaised

ho = dice is baised

h1 = dice is unbaised

> x = c(20, 30, 36, 40, 12, 43)

> chisq.test (x)

chi squared test for given probablity

data : x

x-squared = 28.483 df = 5

p-value = 0.0002236

∴ reject the null hypothesis

dice is unbaised

83 practical - 6

Q1 x = c(3366, 3337, 3361, 3410, 3316, 3357, 3348, 3356, 3376, 3382, 3377, 33..
3408, 3401, 3390, 3424, 3383, 3374, 3384, 3374)

test the hypothesis

1) Ho = μ = 3400, H1 = μ ≠ 3400
2) Ho = μ = 3400, H1 = μ > 3400
3 Ho = μ = 3400, H1 = μ < 3400
also check at 97% LOC

> shap (so = test(x))
p value = 0.987
t.test x, mu = 3400 alter = "two sided", conf level = 0.95)
p value = 0.000258
p value < 0.05
∴ reject the null hypothesis
t.test (x, mu = 3400, alter = "greater", conf level = 0.95
p value = 0.9999
t.test (x, mu = 3400, alter = ("less"), conf. level = 0.97)
p value = 0.05

Q2) below are the data of weight onto different diets A and B
diet A: (25, 32, 30, 43, 24, 14, 32, 24, 31, 31, 35, 25)
diet B: (44, 34, 22, 10, 47, 31, 40, 30, 32, 35, 18, 21)

Ho = a - b = 0
H1 = a - b ≠ 0

> a = c (25, 32, 30, 43, 24, 19, 32, 24, 31, 35, 18, 21)
> b = c(44, 34, 22, 10, 47, 31, 40, 30, 32, 35, 118, 21)

t.test (a, b, paired = T, alter = "two sided", conf level = 0.95
not paired t test
data a and b

t = 0.02787 u = 11 p value = 0.5429
alternative hypothesis these ath difference in mean not eq
0
95 percent confidence interval
-14.267330 7.933999

sample estimate
mean of the difference -3.166667
accept H0
there is no differerence in weight

Q3) 11 student gave the test after 1 month they gave their test after the tution do the main give evidence that student have benefited by coaching

E1 : 23, 20, 19, 21, 18, 20, 18, 17, 23, 16, 19

E2 : 24, 19, 22, 18, 20, 22, 20, 20, 23, 20, 17

test at 99 level of confidence

E1 <- 23, 20, 19, 21, 18, 20, 18, 17, 23, 16, 19

E2 24, 19, 22, 18, 20, 22, 20, 20, 23, 20, 17

$H_0 = E_1 = E_2$

$H_1 = E_1 < E_2$

> t.test (e1, e2 paired = T alter = "less", conf level = 0.99

paired t test

data e1 and e2

t = 1.782 n = 10 p-value = 0.0871

alternative hypothesis there difference in mean is less than 0

99% confidence method

0.86333

sample estimate

mean of the difference

-1

∴ accept H0

Q7 two days for u ~~to~~ was given and data was create

$D_1 = 0.7, -16, -0.2, -1.2, -0.1, 3.4, 3.7, 0.8, 0.2$

$D_2 = 1.9, 0.8, 1.1, 0.1, -0.1, 4.4, 5.5, 1.6, 4.6, 3.4$

the two days drugs have same effect check whether two ~~do~~ drugs have same effect on patient

$H_0 : d_1 = d_2$

$H_1 : d_1 \neq d_2$

> d1 = c (0.7, -1.6, 0.2, 1.2, -0.1, 3.4, 3.7, 0.8, 0.2)

> d2 = c(1.9, 0.8, 1.1, 0.1, -0.1, 4.4, 5.5, 1.6, 4.6, 3.4)

> t.test (d1, d2, alter = " two sided ", paired = T

conf level = 0.95)

paired t - test

data = d1 and d2

t = -4.0621 df = 1 p-value = 0.002833

alternative hypothesis true difference in mean not equal to 0

95% confidence interval

mean of the difference

-1.58

∴ Reject H0

∴ accept H1

if there is difference in salaries for the same in 2 different countries

CA : 53000, 49958, 41974, 44366, 40470, 36963

CB : 62490, 58810, 49495, 52203, 47670, 835..

$H_0 = S_1 = S_2$

$H_1 = S_1 \neq S_2$

> ca = c (53000, 44459, 41977, 19366, 109770, 36963)
> cb = c (62140, 58850, 14795, 52263, 17637, 13552)
> t.test (ca, cb, paired = T, alter = "two sided", conf level = 0.95)

paired t test

data ca and cb

t = -4.4564 df = 5 p value = 0.00666

alternative hypothesis true difference in means is not equal

95% confidence interval

-10408.821 -2747.296

sample estimate
mean of the difference

= 6548.843

∴ Reject H0
accept H1

meractical - 7 f. test

Q1 life expentancy in 10 region of indias in 1990 and 2000 we given below test whether two various at the 2 times are same

1990 : (48, 37, 39, 36, 42, 45, 48, 46, 49, 50, 51)

2000 : (47, 43, 47, 43, 42, 49, 50, 41, 48, 52, 42, 54)

var. test (S1, S2)

p value = 6.9176

accept h_0

Q2 I : 25, 28, 26, 22, 23, 29, 31, 31, 26, 31

II : 30, 25, 31, 32, 23, 23, 36, 26, 31, 32, 32, 27, 31, 38, 24

$H_0 = \sigma^2 = \sigma_2^2$

$H_1 = \sigma_1^2 = \sigma_2^2$

S1 = c(25, 28, 26, 22, 22, 29, 31, 31, 26, 31)

S2 = c(30, 25, 31, 32, 23, 23, 30, 26, 31, 32, 32, 22, 31, 27)

p-value = 0.5381

accept h_0

Q3 for the following data test the hypothesis for equality of 2 population mean proportion variance

$H_0 : \sigma_1^2 = \sigma_2^2$

$H_1 \; \sigma_1^2 \neq \sigma_2^2$

x = c(175, 168, 185, 190, 186, 185, 175, 200)

y = c(180, 170, 153, 180, 179, 183, 187, 205)

var.test (x, y)

p-value = 0.8216

accept h_0

Q) the full one the prices of commondity in the sample of shops selected at random from different a tic
city A = (74.10, 77.07, 75.35, 74, 73.80, 79.30, 75.30 76.80, 79.10, 76.00)
city B = (70.80, 74.90, 76.20, 72.80, 78.10, 74.70 69.80, 81.20)
x = c(70.10, 77.70, 75.35, 74, 73.80, 79.30, 75.80, 76.90 77.20, 76.00)
y = c(70.80, 74.90, 76.20, 72.80, 78.10, 74.70, 69.80, 81.20
> shapiro - test (x)
p value = 0.6559
> Shapiro test (y)
p value = 0.9304
∴ data is normal

$H_0 : \sigma_1^2 = \sigma_2^2$

$H_1 : \sigma_1^2 \neq \sigma_2^2$

p. value = 0.01284

2 variance are not equal ∴ reject ho = accept

$H_0 : \bar{x_1} = \bar{x_2}$

$H_1 : \bar{x_1} \neq \bar{x_2}$

> t.test (x, var equal = F)
p. value = 3.488
t. test (y, var. equal = F)
p. value = 1.46
accept Ho

Q5 Prepare csv file in excel import the file and apply the test to check the equality of variance of 2 data

$H_0 = \sigma_1^2 = \sigma_2^2$

$H_1: \sigma_1^2 \neq \sigma_2^2$

obs 1: 10, 15, 17, 11, 16, 20

obs 2: 15, 18, 16, 11, 12, 19

```
>Data = read.csv(file.choose(), header=T)
>Data
observation 1    observation 2
   10               15
   15               18
   17               16
   11               11
   16               12
   20               19
>attach(data)
>mean(observation 1)
   14.8333
>var.test(observation 1, observation 2)
   p-value = 0.51717
```

∴ accept H0

Rati

Marks

Non parametric test

66

1) the linear of failure in hour of 10 random select battries is given test the population test that population median is 63 against the population median is then 63

solution

H_0 = median = 63
H_1 = median < 63

x = c(28.9, 15.2, 28.9, 72.5, 48.5, 52.4, 37.6, 49.5, 62.1, 54.5)
sp = len(which (x < 63)
sn = len (which (x > 63)
n = sn + sp
q binom (0.05, n, 0.5)

sn

9

p binom (sn, n, 0.5)
0.9990205

Ho is accepted

2) date of weight of 40 student is random sample are
46, 44, 57, 64, 46, 67, 54, 48, 69, 61, 57, 54, 50, 48, 6
61, 66, 54, 50, 48, 49, 62, 47, 49, 47, 55, 59, 63, 53
56, 67, 44, 60, 64, 53, 50, 48, 51, 52, 54

use the sign test to test whether the mean weight of population is 50 kgs against the alternative that is greater 5

H_0 = 50
H_1 > 50

x = c(46, 49, 57, 64, 46, 67, 59, 48, 69, 61, 57, 59, 50, 48, 65, 61, 6
50, 58, 44, 62, 47, 49, 47, 56, 59, 63, 53, 56 6
60, 64, 53, 50, 48, 51, 52, 54)
sp = which (x > 50)
u = length (sp)
>d

22 >21
sn = which (x<50)
b = length (sn)
>b
>7
n = a+b
>n
>28
qbinom (0.05, n, 0.5)
>16
pbinom (a, n, 0.5)
>0.9981404
∵ p binom value is greater than 0.5
∴ accept the null hypothesis

Q3 the median age of tourist visiting a certain place is 41 years a random sample of 17 tourist have the age,
(25, 29, 52, 48, 57, 39, 45, 36, 30, 49, 28, 39, 44, 63, 32, 65, 42)

sn = which (x > 41)

x = c (25, 29, 52, 48, 57, 39, 45, 36, 30, 28, 39, 49, 63, 32, 65, 42)

sp = which (x>41)
a = length (sp)
> 9

sn = which (x<41)
b = length (sn)
b
>8

n = a+b

>n
17

q binom (0.05, n, 0.5)
> 5

∵ q binom value is less than sn value
∴ accept the null hypothesis

Q8 the weight in kgs of the person before and after sonshery are as follows
before :- 65, 75, 75, 62, 72 after 72, 82, 72, 66, 73

use the willcox test to check wheather the weight of the neerson increases after the storing of so smoking by 5% level of significance

x = c(c(65, 75, 75, 62, 72)
y = c(c(72, 82, 72, 66, 73)
n = x - y
n
> -7 -7 3 -4 -1
> willcox.test(n, mu = 0)
p value = 0.1756
p-value => 0.5
accept the null hypothesis

The time in min that a patient hess to wait for consultation is recorded as follows
is 17, 15, 24, 25, 20, 21, 32, 28, 12, , 25, 28, 28
Use willcox sign test wheather the median of waiting time is more than 20% level of ~~sig~~ significance

sa

x=c(15, 7, 28, 25, 20, 21, 32, 28, 12, 21, 28, 20)

$H_0 > 20$ $H_1 < 20$

willcox test (x) alternative = "less"

p value = 0.994

∴ p value > 0.5

∴ accept the null hypothesis.

Practical 7

1) the following the of three treatment

was a = 2, 3, 7, 2, 6
b = 10, 8, 7, 5, 10
c = 10, 13, 14, 13, 15

ans:-

```
a=c(2, 3, 7, 2, 6)
b=c(10, 8, 7, 5, 10)
c=c(10, 13, 14, 13, 15)
d= data frame (a, b, c)
>d
   a  b  c
1  2  10 10
2  3  8  13
3  7  7  14
4  2  5  15
5  6  10 13
>e=stack (d)
>e
1   values  ind
2    2      a
3    3      a
4    7      a
5    2      a
6    6      a
7    10     b
8    8      b
9    7      b
10   5      b
11   10     b
12   10     c
13   13     c
14   14     c
15   15     c
```

'89> oneway.test (values ~ ind, data=e)

one-way analysis of mean (not assuming equal variance)

data: values and ind

F= 21.537, num df=2.0, denom df= 7.9318, p-value=0.000

reject Ho

2) the following gives life of tyre of F brands

a= 20, 23, 18, 17, 22, 24

b= 19, 15, 17, 20, 16, 17

c= 21, 19, 22, 17, 20

d= 15, 14, 16, 18, 14, 16

ans:-

a=c(20, 23, 18, 17, 22, 24)

b=c(19, 15, 17, 20, 16, 17)

c=c(21, 19, 22, 17, 20)

d=c(15, 14, 16, 18, 14, 16)

>e=list(a1=a, b1=b, c1=c, d1=d)

>e

a1

[1] 20, 23, 18, 17, 22, 24

a2

[2] 19, 15, 17, 20, 16, 17

a3

[3] 21, 19, 22, 17, 20

a4

15, 14, 16, 18, 14, 16

f= stack(e)

>ef

	values	ind
1		
2	20	a1
3	23	a1
4	18	a1
5	17	a1
6	22	a1
7	24	a1
8	19	a2
9	15	a2
	17	a2
		a2
10	20	

11	16	92
12	17	42
13	21	93
14	19	93
15	22	93
16	17	93
17	20	93
18	15	94
19	14	04
20	16	94
21	18	94
22	14	94
23	16	94

> one way test (values in ind, data = f)

oneway analysis of means (not assuming equal variances)
data : values and ind
~~F = 7.453 , num df = 3.000 denom df = 10.207 p-value = 0.006291~~
reject ho

3 types of wax are applied for the protection of car and no of list of protection were noted test this are equally effective
a :- 44, 45, 46, 47, 48, 49
b :- 40, 42, 51, 52, 55
c :- 50, 53, 58, 59

ans a=c(44, 45, 46, 47, 48, 49)
b=c(40, 42, 51, 52, 55)
c=c(50, 53, 58, 59)
d= list (a1=a , b1=b, c1=c)
>d
a1
[1] 44 45 46 47 48 49

b1
[1] 40, 42, 51, 52, 55

c1
[1] 50, 53, 58, 59

>e=stack (d)
>e

	values	ind
1	44	a1
2	45	a1
3	46	a1
4	47	a1
5	48	a1
6	49	a1
7	40	b1
8	52	b1
9	51	b1
10	52	b1
11	55	b1
12	50	b1
13	53	c1
		c2

```
1 8     58     c1
1 5     59     c1
> oneway.test (values ~ ind, data = e)
   One-way analysis of means (not assuming equal variances)
data: values and ind
   F = 6.3398,   num df = 2.000, denom df = 5.4059, p-value = 0.038
                                  reject H0
```

Q) an experiment was conducted on 8 person the observation were noted they observe were three group not excersize 20 minutes 16 excersice.

a = 23, 26, 51, 48, 58, 37, 29, 48
b = 22, 27, 24, 39, 46, 48, 49, 65
c = c(54, 66, 38, 49, 56, 60, 56, 62)
> ~~d = data.frame~~

ans:-

```
a = c(23, 26, 51, 48, 58, 37, 29, 40)
b = c(22, 27, 29, 39, 46, 48, 49, 65)
c = c(59, 66, 38, 49, 56, 60, 56, 62)
> d = data.frame(a, b, c)
d

   a  b  c
1 23 22 59
2 26 27 66
3 51 29 38
4 48 39 49
5 58 46 56
6 37 48 60
7 29 49 56
8 40 65 62
> e = stack(d)
> e
```

Q5

	values	ind
1	23	a
2	26	a
3	51	a
4	48	a
5	58	a
6	37	a
7	29	a
8	48	a
9	22	b
10	27	b
11	29	b
12	39	b
13	46	b
14	48	b
15	49	b
16	65	b
17	59	b
18	66	c
19	38	c
20	49	c
21	56	c
22	60	c
23	56	c
24	62	c

oneway.test (values ~ ind , data = d)

oneway analysis of means (not assuming equal variances)

data : values and ind

F = 25.69 num df = 2.00 denom df = 13.3334

p-value = 0.01 8337

reject H0