Total No. of Questions: 25 | Enrollment No : ____________

MEDICAPS UNIVERSITY

Faculty of Engineering / Science

End Semester Examination May 2025

CS3EL11 / IT3CO29 / BC3EL03 Statistical Analysis / Computational Statistic

Programme	:	B.Tech. / B. Sc.	**Branch/Specialisation**	:	CSE All / IT / CS
Duration	:	3 hours	**Maximum Marks**	:	60

Note: *All questions are compulsory. Internal choices, if any, are indicated. Assume suitable data if necessary. Notations and symbols have their usual meaning.*

Section 1 (Answer all question(s))

Marks CO BL

Q1. If Q1=25 and Q3 = 75 where Q1 and Q3 denotes first and third quartiles respectively then the Quartile deviation is- **1 1 2**

Rubric	Marks
25	1

- ○ 50
- ○ 15
- ● 25
- ○ None of these

Q2. The mode of the data 7, 12, 8, 5, 6, 4, 9, 10, 8, 9, 7, 9, 6, 5, 9 is: **1 1 2**

Rubric	Marks
9	1

- ○ 8
- ● 9
- ○ 12
- ○ None of these

Q3. If E is any event, then which of the following relation is always true: **1 1 1**

Rubric	Marks
$0 \le P(E) \le 1$	1

- ○ P(E)=0
- ○ P(E)=1
- ● $0 \le P(E) \le 1$
- ○ None of these

Q4. For two random variables x and y, which of the following relation is false: **1 1 1**

Rubric	Marks
E (x+y) < E(x) + E(y)	1

- ○ E(x+y) = E(x) + E(y)
- ○ E(x.y) = E(x).E(y)
- ● E (x+y) < E(x) + E(y)
- ○ None of these

Q5. Which one of the following distribution is used when the number of trial n is large and probability of success p is very small? **1 1 1**

Rubric	Marks
Poisson Distribution	1

- ○ Binomial distribution
- ● Poisson distribution
- ○ Exponential distribution
- ○ None of these

Q6. For Exponential Distribution $f(x) = \lambda e^{-\lambda x}, x > 0$ variance (σ^2) is- **1 1 1**

Rubric	Marks
option (b)	1

- ○ $1/\lambda$
- ● $1/\lambda^2$
- ○ λ^2
- ○ None of these

Q7. The coefficient of correlation is the __________ of the coefficient of regression. **1 1 1**

Rubric	Marks
Geometric mean	1

- ○ Harmonic mean
- ● Geometric mean
- ○ Arithmetic Mean
- ○ None of these

Q8. The normal equation for the straight line y=a+bx is- **1 1 1**

Rubric	Marks
Both (a) and (b)	1

- ○ $\Sigma y = na + b\Sigma x$
- ○ $\sum xy = a\sum x + b\sum x^2$
- ● Both (A) and (B)
- ○ None of these

Q9. If we reject null hypothesis, when it is correct then it is called- **1 1 1**

Rubric	Marks
Type I Error	1

- ● Type I Error
- ○ Type II Error
- ○ Degree of freedom
- ○ None of these

Q10. The degrees of freedom for the Chi-Square test statistic when testing for independence in a contingency table with 4 rows and 4 columns would be- **1 1 1**

Rubric	Marks
9	1

- ○ 7
- ○ 5
- ● 9
- ○ None of these

Section 2 (Answer any 2 question(s))

Marks CO BL

Q11. Calculate mean deviation from the mean for the following data : **5 3 3**

Marks	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Frequency	5	9	13	21	20	15	8	3

Rubric	Marks
proper formula, solution and answer	5

Q12. Find the standard deviation of following two series, which of these shows more variation: **5** **3** **3**

Series A	27	16	39	45	101	80	40	52
Series B	0	100	80	5	60	40	10	121

Rubric	Marks
standard deviation for both series, mean of both series, calculation	5

Q13. Calculate median both for the following frequency distribution of wages of 22 workers: **5** **3** **3**

Wages (Below)	10	20	30	40	50
No. of workers	3	8	17	20	22

Rubric	Marks
Table, formula, calculations	5

Section 3 (Answer all question(s))

Marks CO BL

Q14. Define probability mass function for discrete random variable. **2** **2** **2**

Rubric	Marks
Define pmf	2

Q15. Show that the function $f(x) = 6x(1-x), 0 \leq x \leq 1$ is a probability density function (p.d.f.). **3** **3** **3**

Rubric	Marks
formula and proof	3

Q16. **(a)** A can hit a target four times in five shots, B three times in four shots and C twice in three shots, calculate the probability: **5** **3** **3**

- A, B, C all may hit.
- B, C may hit and A may lose.
- C, A may hit and B may lose.

Rubric	Marks
individual probability, formula in case 1 and 2	5

(OR)

(b) Find $E(x), E(x^2), E\{(x-\bar{x})^2\}$ for the following probability distribution:

X	8	12	16	20	24
P(X)	1/8	1/6	3/8	1/4	1/12

Rubric	Marks
formula for E(x) and $E(x^2)$,$E(x\text{-xbar})^2$	5

Section 4 (Answer all question(s))

Marks CO BL

Q17. Comment on the following statement it is true or not 'the mean of binomial distribution is 5 and variance is 9'. **2** **2** **2**

Rubric	Marks
formula for mean and variance ,calculation answer	2

Q18. Write any three properties of normal distribution. **3** **2** **2**

Rubric	Marks
Each property 1 mark	3

Q19. (a) Prove that for Poisson distribution mean and variance are same. **5 3 3**

Rubric	Marks
mean , variance, mgf	5

(OR)

(b) Fit a Binomial distribution to the following data and calculate theoretical frequencies

x	0	1	2	3	4	5
f	2	14	20	34	22	8

Rubric	Marks
formula, theoretical frequencies	5

Section 5 (Answer any 2 question(s))

Marks CO BL

Q20. Calculate Karl Pearson's Correlation Coefficient from the following data: **5 4 5**

x	23	27	28	29	30	31	33	35	36	39
y	18	22	23	24	25	25	28	29	30	32

Rubric	Marks
formula, table, calculation , answer	5

Q21. Fit a second degree parabola to the following data regarding X as an independent variable: **5 4 5**

X	0	1	2	3	4
Y	1	5	10	22	38

Rubric	Marks
normal equations, table, values of a ,b, c and equation	5

Q22. Find mean value of x and y and correlation between them from the following regression lines. Also calculate the likely value of x when y = 10 and value of y when x = 20: **5 4 5**

$2y - x - 50 = 0$

$3y - 2x - 10 = 0$

Rubric	Marks
mean, value of x when y=1- and value of y when x=20	5

Section 6 (Answer any 2 question(s))

Marks CO BL

Q23. Define the following: **5 1 2**

- Type I Error and Type II Error
- Level of Significance
- Null hypothesis

Rubric	Marks
errors of I and II kind , level of significance, null hypothesis	5

Q24. 1600 families were selected at random in a city to test the belief that high income families usually send their children to public school and low income families often send their children to government schools. The following results were obtained in the study conducted: **5** **4** **4**

Income	Public School	Government School	Total
Low	494	506	1000
High	162	438	600
Total	656	944	1600

Examine by χ^2 Test to ascertain if the income of the families and type of schools are independent. (Given value of χ^2 at 5% and 1 degree of freedom is 3.84).

Rubric	Marks
hypothesis, expected frequencies, chi test, conclusion	5

Q25. 10 individuals are chosen at random from a population, and their heights are found to be 63, 63, 66, 67, 68, 69, 70, 70, 71, and 71 Inches. in light of the data, discuss the suggestion that the mean height in the population is 66 inches. (given value of t at 5% for 9 d.f. is 2.262) **5** **4** **1**

Rubric	Marks
hypothesis, formula for t test, table and calculations, decision	5

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Medicaps University ①

End Sem Exam May 2025

Solution Statistical Analysis (CS3EL11)

Computational Statistics (BC3EL03)

Q.1	C	25	+1
Q.2	B	9	+1
Q.3	C	$0 \le P(E) \le 1$	+1
Q.4	C	$E(x+y) \le E(x)+E(y)$	+1
Q.5	B	Poisson distribution	+1
Q.6	B	$1/d^2$	+1
Q.7	B	Geometric Mean	+1
Q.8	C	Both (A) & (B)	+1
Q.9	A	Type I Error	+1
Q.10	C	9	+1

Section 2

Q.11

Class	Mid value	frequency	$u=\frac{x-A}{i}$	fu	x-M	f|x-M|
10-20	15	5	-4	-20	-34.26	+171.3
20-30	25	9	-3	-27	-24.26	+218.34
30-40	35	13	-2	-26	-14.26	+185.38
40-50	45	21	-1	-21	-4.26	+89.46
50-60	55	20	0	0	5.74	114.8
60-70	65	15	1	15	15.74	236.1
70-80	75	8	2	16	25.74	205.92
80-90	85	3	3	9	35.74	107.22
n=8		N=Σf=94		Σfu=-54		Σf|x-M| = 1328.52

+2

$$\sigma_A = \sqrt{\frac{\Sigma(x-\bar{x}_A)^2}{n}} = \sqrt{\frac{5436}{8}}$$ 1

$$= \sqrt{679.5}$$

$$= 26.06$$

$$\therefore (C.V)_A = \frac{\sigma_A}{\bar{x}_A} \times 100$$

$$= \frac{26.06}{50} \times 100$$

$$= 52.12\%$$

Another formula

$$\sigma = \sqrt{\frac{\Sigma u^2}{n} - \left(\frac{\Sigma u}{n}\right)^2}$$

$u = x - A$ or $\frac{x-A}{i}$

$$M = A + \frac{\Sigma fu}{n}$$

$$\sigma_B = \sqrt{\frac{\Sigma(y-\bar{y}_B)^2}{n}} = \sqrt{\frac{14734}{8}}$$ 1

$$= \sqrt{1841.75} = 42.91$$

$$\therefore (C.V)_B = \frac{42.91}{52} \times 100$$

$$= 78.67\%$$

(i) Since $\bar{x}_A < \bar{y}_B$, A is better

(ii) Here $(C.V)_A \le (C.V)_B$, value of dispersion in the series B is greater i.e A is more consistent 1

Remark: Short cut method can also use for S.D

~~Q 13~~

Q.13

Wages (Below)	Mid value x	c.f	f	c.f
0-10	5	3	3	3
10-20	15	8	5	8
20-30	25	17	9	17
30-40	35	20	3	20
40-50	45	22	2	22

$\Sigma F = 22 = N$ +2

Here $N = 22$

Median class $= \frac{N}{2}$ th term

$= \frac{22}{2} = 11^{th}$ term +1

Clearly this term is situated in the class 20-30 Hence it is Median class

Here $l = 20$, $N = 22$ $F = 8$, $f = 9$

$i = 10$

Median

$$M_d = l + \frac{\frac{N}{2} - F}{f} \times i$$ +2

$$= 20 + \frac{11-8}{9} \times 10$$

$$= 20 + \frac{30}{9} = 23.33$$

Section 3

Q14 A Probability mass function (PMF) is a function that assigns a probability to each possible value of a discrete random variable +2

Formula for PMF is $f(x) = P(X = x)$

where $f(x)$ is the PMF and $P(X)$ is the

Probability that the random variable
X takes on the value x
PMF satisfy the following properties
1) $P(x) \geq 0$ for all x (non negativity)
2) $\sum P(x) = 1$ (normalisation)

Q.15 $f(x) = 6x(1-x), \; 0 \leq x \leq 1$

If f(x) is a probability density function
then it satisfies
1) $f(x) \geq 0$ 2) $\int_{-\infty}^{\infty} f(x)\,dx = 1$

$$\Rightarrow \int_0^1 f(x)\,dx = \int_0^1 6x(1-x)\,dx$$

$$= \int_0^1 6x - 6x^2\,dx$$

$$= \left[6\frac{x^2}{2} - 6\frac{x^3}{3}\right]_0^1 \quad +3$$

$$= (3x^2 - 2x^3)_0^1$$

$$= 3-2$$

$$= 1$$

Hence f(x) is a p.d.f

Q.16 (a) Chance of A's hitting = 4/5
Chance of B's hitting = 3/4 +2
Chance of C's hitting = 2/3

1) A, B, C all may hit = P(A) P(B) P(C) +1

$$= \frac{4}{5} \cdot \frac{3}{4} \cdot \frac{2}{3} = \frac{2}{5}$$

2) B, C may hit and A may lose +1

$$= P(B)\,P(C)\,(1-P(A))$$

$$= 3/4 \cdot 2/3\,(1-4/5) = \frac{3}{4}\cdot\frac{2}{3}\cdot\frac{1}{5} = \frac{1}{10}$$

3) C, A may hit and B may lose

$= P(C)\, P(A)\, (1 - P(B))$ +1

$= \frac{2}{3} \cdot \frac{4}{5} (1 - \frac{3}{4})$

$= \frac{2}{3} \cdot \frac{\cancel{4}}{5} \cdot \frac{1}{\cancel{4}} = \frac{2}{15}$

(b)

x:	8	12	16	20	24
$P(x)$:	1/8	1/6	3/8	1/4	1/12

Mean of Probability distribution +2

$E(x) = \Sigma x\, p(x)$

$= 8 \times \frac{1}{8} + 12 \times \frac{1}{6} + 16 \times \frac{3}{8} + 20 \times \frac{1}{4} + 24 \times \frac{1}{12}$

$\boxed{E(x) = 16}$

$E(x^2) = \Sigma x^2 p(x)$ +2

$= 64 \times \frac{1}{8} + 144 \times \frac{1}{6} + 256 \times \frac{3}{8} + 400 \times \frac{1}{4} + 576 \times \frac{1}{12}$

$\boxed{E(x^2) = 276}$ Second moment about origin

$\bar{x} = \frac{80}{5} = 16$

$E\{(x - \bar{x})^2\} = \Sigma (x - \bar{x})^2 p(x)$ +1

$= (8-16)^2 \times \frac{1}{8} + (12-16)^2 \times \frac{1}{6} + (16-16)^2 \times \frac{3}{8}$

$+ (20-16)^2 \times \frac{1}{4} + (24-16)^2 \times \frac{1}{12}$

$= 20$ = variance of the distribution

P17 given that

Mean $= np = 5$, Variance $= 9$

$SD = \sqrt{npq} = 3$ 1

$npq = 9 \Rightarrow 5q = 9$

$\Rightarrow q = \frac{9}{5} > 1$ 1

But q cannot be greater than 1, Since it is a Probability. Hence the given statement is False

P.18 Properties of normal distribution

1) The Curve is symmetric about y axis

2) The mean, Median and Mode Coincide at the origin 3

3) The Point of inflexion of the normal Curve are $x = \pm\sigma$

4) Moments of odd order about the origin vanish

* other properties can also be considered.

P19 (a) In Poisson distribution

$$P(X=r) = \frac{e^{-m} \cdot m^r}{r!}, \quad r = 0, 1, 2, 3 \ldots$$

$$\mu_1' = \sum_{r=0}^{\infty} e^{-m} \frac{m^r}{r!} r$$

$$= e^{-m} \sum_{r=0}^{\infty} \frac{m^r}{(r-1)!} = e^{-m}\left(m + \frac{m^2}{1!} + \frac{m^3}{2!} + \ldots\right)$$ 1.5

$$= m e^{-m}\left(1 + \frac{m}{1!} + \frac{m^2}{2!} + \ldots\right)$$

$$= m e^{-m} e^{m}$$

$$\boxed{\mu_1' = m}$$

$$\boxed{\text{Mean} = m}$$

$$\mu_2' = \sum_{r=0}^{\infty} e^{-m} \frac{m^r}{r!} r^2$$ +1.5

$$= \sum_{r=0}^{\infty} e^{-m} \frac{m^r}{r!} \{r(r-1)+r\}$$

$$= \sum_{r=0}^{\infty} \frac{e^{-m} m^r}{(r-2)!} + \sum_{r=0}^{\infty} \frac{e^{-m} m^r}{(r-1)!}$$

$$= m^2 \sum_{r=0}^{\infty} \frac{e^{-m} m^{r-2}}{(r-2)!} + m \sum_{r=0}^{\infty} \frac{e^{-m} m^{r-1}}{(r-1)!}$$

$$\boxed{\mu_2' = m^2 + m}$$

$$\mu_2 = \mu_2' - \mu_1'^2$$ +2

$$= m^2 + m - m^2$$

$$\boxed{\mu_2 = m = \text{variance}}$$

Clearly in Poisson distribution $\boxed{\text{Mean} = \text{Variance}}$

19 (b)

Here we have

$$n = 5, \quad \Sigma f = 100$$

$$A.M = \frac{\Sigma fx}{N} = \frac{0+14+40+102+88+40}{100}$$ +1

$$= \frac{284}{100} = 2.84$$

$np = m \qquad 5p = 2.84$

$\boxed{p = \cancel{0.284}}\ \boxed{0.568}$

$\therefore q = 1-p = 1-0.568 = \cancel{0.432}\ \boxed{0.432}$

Hence the binomial distribution to be fitted to the given data is $= 100(0.568 + 0.432)^5$ +1

using $N(p+q)^n$

From this expansion the successive frequencies 0, 1, 2, 3, 4, 5 successes are

$$P(X=x) = {}^nC_x\, p^x q^{n-x}; \quad x = 0, 1, 2 \cdots n$$

and expected frequency obtained from

$$f(x) = N\,P(x)$$

x	f	$P(x) = {}^nC_x\, p^x q^{n-x}$	$f(x) = N\,P(x)$ $= 100\,P(x)$
0	2	${}^5C_0 (0.57)^0 (0.43)^5 = (0.43)^5$	≈ 1
1	14	${}^5C_1 (0.57)^1 (0.43)^4 = 0.098$	≈ 10
2	26	${}^5C_2 (0.57)^2 (0.43)^3 = 0.260$	≈ 26
3	34	${}^5C_3 (0.57)^3 (0.43)^2 = 0.342$	≈ 34
4	22	${}^5C_4 (0.57)^4 (0.43) = 0.224$	≈ 22
5	2	${}^5C_5 (0.57)^5 (0.43)^0 = 0.059$	≈ 6

+3

Section 5

Q 20

x_i	y_i	$u_i = x_i - \bar{x}$	$v_i = y_i - \bar{y}$	$u_i v_i$	v_i^2	u_i^2
23	18	−8.1	−7.6	61.56	57.76	65.61
27	22	−4.1	−3.6	14.76	12.96	16.81
28	23	−3.1	−2.6	8.06	6.76	9.61
29	24	−2.1	−1.6	3.36	2.56	4.41
30	25	−1.1	−0.6	0.66	0.36	1.21
31	25	−0.1	−0.6	0.06	0.36	0.01
33	28	1.9	2.4	4.56	5.76	3.61
35	29	3.9	3.4	13.26	11.56	15.21
36	30	4.9	4.4	21.56	19.36	24.01
39	32	7.9	6.4	50.56	~~40.96~~	62.41
$\Sigma x_i = 311$	$\Sigma y_i = 256$	0	0	$\Sigma u_i v_i = 178.4$	$\Sigma v_i^2 = \cancel{179.85}$ $= 158.4$	$\Sigma u_i^2 = 202.9$

+3

$n = 10$

$$\bar{x} = \frac{\Sigma x_i}{n} = \frac{311}{10} = 31.1$$

$$\bar{y} = \frac{\Sigma y_i}{n} = \frac{256}{10} = 25.6$$

$$\therefore \rho(x,y) = \rho(u,v) = \frac{n\Sigma u_i v_i - \Sigma u_i \Sigma v_i}{\sqrt{n\Sigma u_i^2 - (\Sigma u_i)^2}\sqrt{n\Sigma v_i^2 - (\Sigma v_i)^2}}$$ +1

$$= \frac{10 \times 178.4 - 0}{\sqrt{10 \times 202.9 - 0}\sqrt{10 \times 158.4 - 0}}$$

$$= \frac{1784}{\sqrt{2029}\sqrt{1584}} = \frac{1784}{45.04 \times 39.79}$$

$$= \frac{1784}{1792.1} = 0.99$$ +1

OR Can use

$$\rho(x,y) = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{n\Sigma x^2 - (\Sigma x)^2}\sqrt{n\Sigma y^2 - (\Sigma y)^2}}$$

other formula can ~~be also~~ be considered

Q.21 Equation $y = a + bx + cx^2$

x	y	x^2	x^3	x^4	xy	x^2y
0	1	0	0	0	0	0
1	5	1	1	1	5	5
2	10	4	8	16	20	40
3	22	9	27	81	66	198
4	38	16	64	256	152	608
		$\Sigma x^2 = 30$	$\Sigma x^3 = 100$	$\Sigma x^4 = 354$	$\Sigma xy = 243$	$\Sigma x^2y = 851$

+2

~~Normal equations are~~

$$\Sigma y = na + b\Sigma x + c\Sigma x^2$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 + c\Sigma x^3$$ +1

$$\Sigma x^2 y = a\Sigma x^2 + b\Sigma x^3 + c\Sigma x^4$$

Putting the values

$$76 = 5a + 10b + 30c$$

$$243 = 10a + 30b + 100c$$ +2

$$851 = 30a + 100b + 354c$$

On solving these equations

$a = \underline{1.43}$ $\quad b = \underline{0.24}$ $\quad c = \underline{2.21}$

$\therefore$ Equation is $y = 1.43 + 0.24x + 2.21x^2$

Q22

let $\bar{x}$ & $\bar{y}$ be the mean of x & y then from given equations we have

$$-\bar{x} + 2\bar{y} - 50 = 0$$

$$-2\bar{x} + 3\bar{y} - 10 = 0$$

On solving we get

$$\bar{x} = 130 \quad \bar{y} = 90$$ +1

Now

$$x = 2y + 50$$

$$y = \frac{1}{2}x + 25, \quad x = \frac{3}{2}y - 5 \quad (1)$$

$$b_{yx} = \frac{1}{2} \quad b_{xy} = 3/2$$

Coefficient of Correlation

$$\rho = \sqrt{b_{yx} b_{xy}} = \sqrt{\frac{1}{2} \times 3/2}$$ +2

$$= \sqrt{3/4} = \underline{0.86}$$

from (1)

when $\underline{y = 10}$ ~~then~~ $\boxed{x = 10}$, $\underline{x = 20}$, $\boxed{y = 35}$ +2

Section 6

Q 23 Type I Error: When we reject the null Hypothesis H_0, though it is true then it is known as type I error

Type II Error: Accept the null Hypothesis H_0 though it is false then it is known as type II error. +2

Probability of occurence of type I & II errors denoted by α and β

$$\alpha = P(\text{reject } H_0 \text{ when it is true})$$
$$= P(\text{reject } H_0 / H_0)$$

$$\beta = P(\text{accept } H_0 \text{ when it is false})$$
$$= P(\text{accept } H_0 / H_1)$$

level of significance:

In testing a given Hypothesis the maximum Probability with which we would be willing to risk an error is called level of significance. The accepted levels of significance are 0.05 and 0.01. +1.5

Null Hypothesis:

A null hypothesis is a hypothesis which is tested for possible rejection under the assumption that it is true. The null Hypothesis is denoted by H_0 +1.5

Q 24 H_0: Income of families and type of school are independent +1

against H_1: Income of families and type of school are dependent

Now we find expected frequencies

$$E_{11} = \frac{(A_1)(B_1)}{N} = \frac{656 \times 1000}{1600} = 410$$

$$E_{12} = \frac{(A_1)(B_2)}{N} = \frac{656 \times 600}{1600} = 246$$

$$E_{21} = \frac{(A_2)(B_1)}{N} = \frac{944 \times 1000}{1600} = 590$$

$$E_{22} = \frac{(A_2)(B_2)}{N} = \frac{944 \times 600}{1600} = 354$$

Thus the contingency table for expected frequency given by

Income	Public School	Govt School	Total
low	410	590	1000
High	246	354	600
Total	656	944	1600

+2

Now χ^2 test statistic is given by

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

O	E	(O-E)	$(O-E)^2$	$(O-E)^2/E$
494	410	84	7056	17.2
162	246	-84	7056	26.68
506	590	-84	7056	11.96
438	944	84	7056	19.93
Total				75.77

+2

$$\chi^2 = 75.77$$

$$d.f = (2-1)(2-1) = 1$$ +1

From table $\chi^2_{(0.05)} = 3.84$ Since calculated

15

value of χ^2 statistic at 5% level of significance for 1 d.f is greater than the tabulated value of χ^2 so we reject our null hypothesis and conclude that the income of families and the type of school are dependent. +1

Q25

No of individuals	Heights x	Deviation of height from mean $x-\bar{x}$	$(x-\bar{x})^2$
1	63	-4.8	23.04
2	63	-4.8	23.04
3	66	-1.8	3.24
4	67	-0.8	0.64
5	68	0.2	0.04
6	69	1.2	1.44
7	70	2.2	4.84
8	70	2.2	4.84
9	71	3.2	10.24
10	71	3.2	10.24
$n=10$	$\Sigma x=678$		$\Sigma(x-\bar{x})^2=81.60$

+2

Here $\bar{x} = \frac{\Sigma x}{n} = \frac{678}{10} = 67.8$ inches

Population variance

$$s' = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n-1}} = \sqrt{\frac{81.60}{9}}$$

$= 3.011$ inches

Under null hypothesis H_0: mean of universe is 66 inches i.e $M=66$ +1

$$\therefore t = \frac{\bar{x}-M}{s'}\sqrt{n} = \frac{67.8-66}{3.011}\times\sqrt{10}$$ +1

$\boxed{t = 1.89 \text{ (approx)}}$

At 5% d.f = n−1 = 10−1 = 9

$t_{tabulate\,(5\%)} = 2.262$ for d.f = 9

Since $t_{calculated} < t_{tabulated}$

Conclude that null hypothesis will be true difference will be insignificant