THE INSTITUTE OF CHARTERED ACCOUNTANTS OF SRI LANKA

SUGGESTED SOLUTIONS

02104 – Business Mathematics and Statistics

Certificate in Accounting and Business I Examination
March 2014

THE INSTITUTE OF CHARTERED ACCOUNTANTS OF SRI LANKA

PAPER 'A'

ANSWERS FOR MULTIPLE CHOICE QUESTIONS

1.	**3**	11.	**2**
2.	**4**	12.	**3**
3.	**2**	13.	**2**
4.	**1**	14.	**4**
5.	**2**	15.	**2**
6.	**4**	16.	**3**
7.	**3**	17.	**1**
8.	**4**	18.	**4**
9.	**3**	19.	**2**
10.	**2**	20.	**2**

Answer No. 01

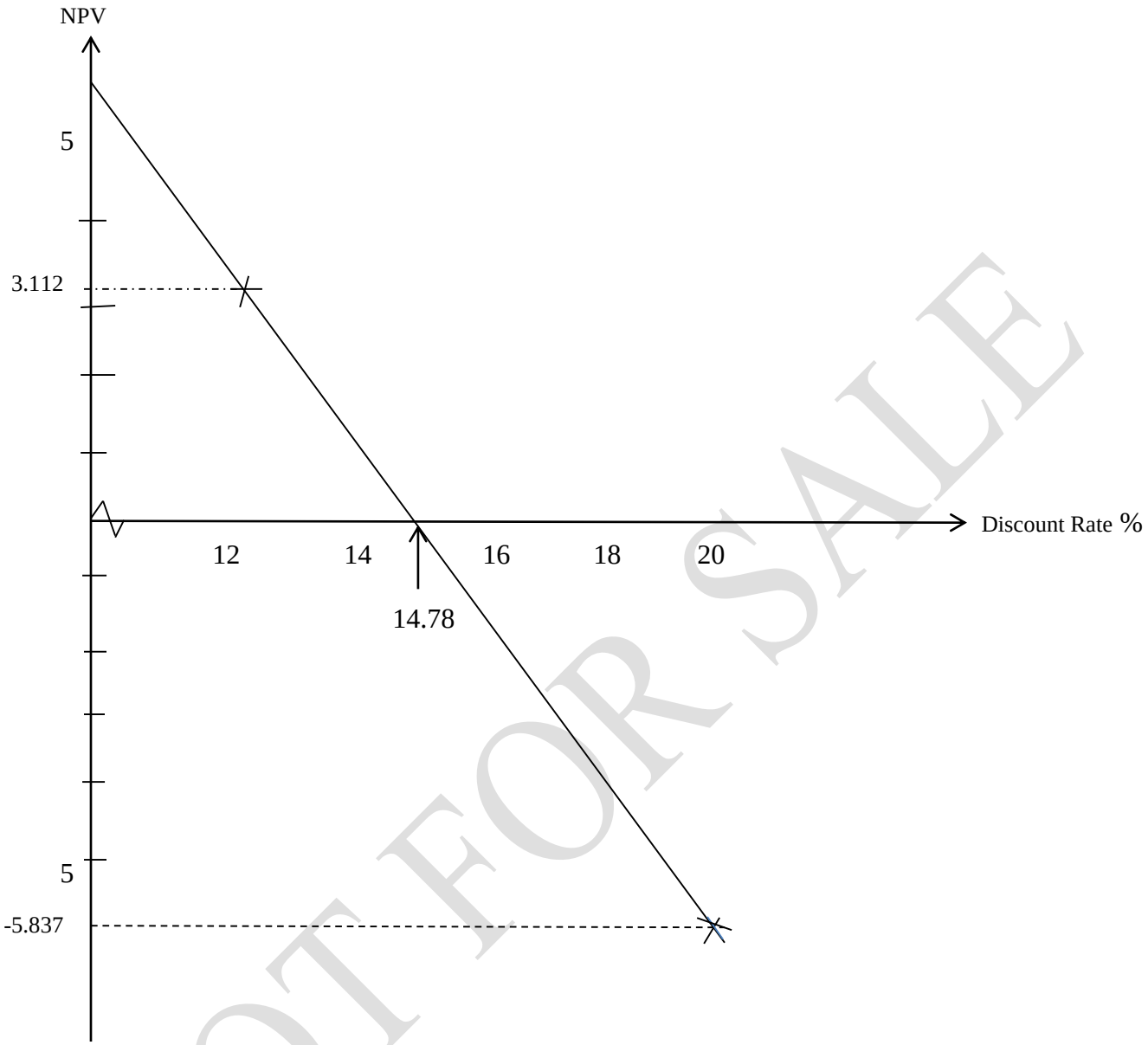
(a) Internal Rate of Return (IRR) is the rate at which Net Present Value (NPV) becomes zero.

(b)

(i)		Y0	Y1	Y2	Y3	Y4	Y5
	Capital Cost (Rs. m)	(40.0)			(5.0)		
	Cash Inflow (Rs. m)		5.0	12.0	23.0	25.5	16.0
	Operating Cost (Rs. m)		(2.5)	(2.5)	(2.5)	(2.5)	(2.5)
		-40	2.5	9.5	15.5	23	13.5
	Discount rate (12%)	1	0.893	0.797	0.712	0.636	0.567
	DCF	-40	2.2325	7.5715	11.036	14.628	7.6545
	NPV						3.1225

(ii)	Discount rate (20%)	1	0.833	0.694	0.579	0.482	0.402
	DCF	-40	2.0825	6.593	8.9745	11.086	5.427
	NPV						-5.837

(iii)	Rate	NPV
	12%	3.112
	20%	-5.837



From the graph: $\frac{3.1225 - 0}{12 - x} = \frac{3.1225 - (-5.837)}{12 - 20}$

$x = 2.78 + 12$

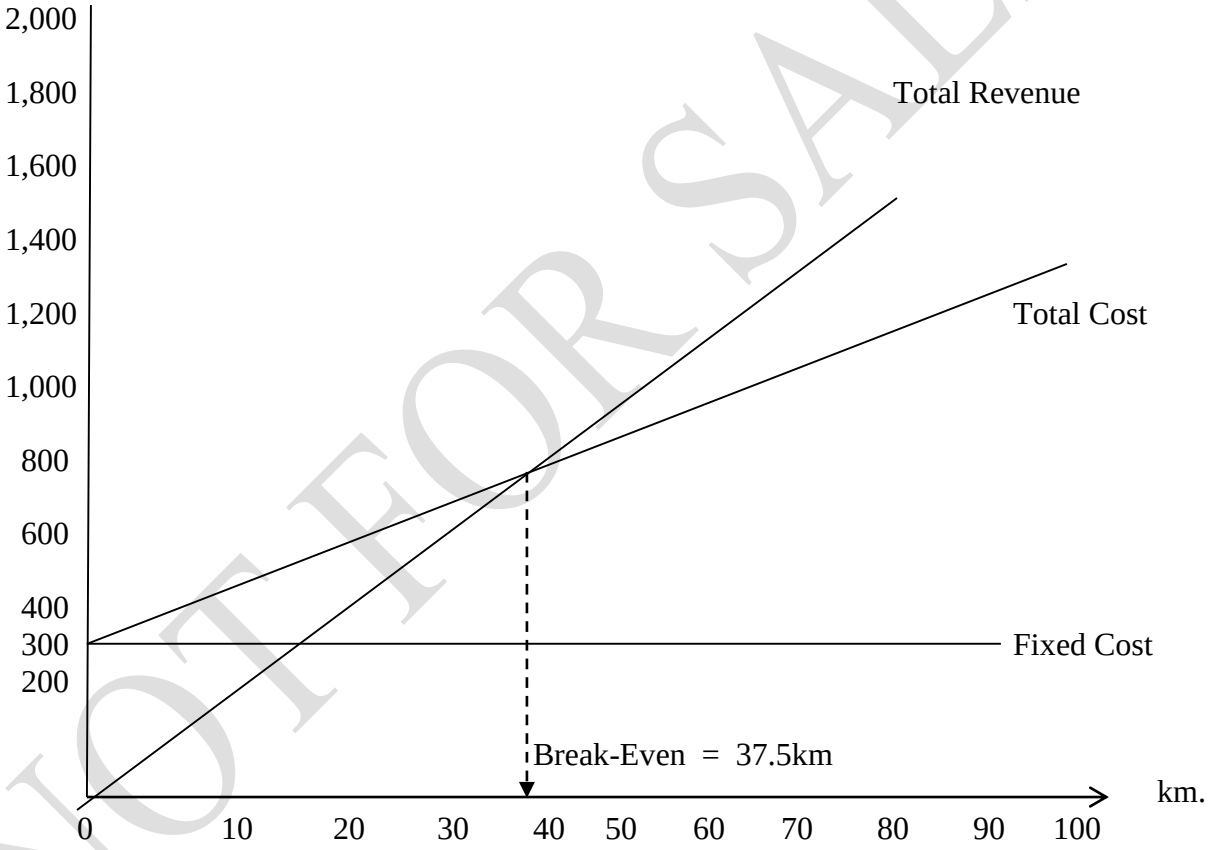
IRR = 14.78%

Answer No. 02

(i)

Total fixed cost	=	Rs. 150m + Rs. 150m
	=	Rs. 300m
Total variable cost	=	Rs. 10m x 100
	=	Rs. 1,000m
Total cost (for 100 km)	=	Rs. 1,300m
Cost per km	=	Rs. 13m

(ii) Rs. million



(iii) From the graph to break-even, at least 37.5 km needs to be constructed

Alternate method

TR = TC

x = distance to the break-even point

$18x = 10x + 300$

$8x = 300$

$x = \frac{300}{8}$

$x = 37.5$ km

(iv)

km	10	20	30	40	50	60	70	80	90	100
Total Fixed Cost	300	300	300	300	300	300	300	300	300	300
Variable cost	100	200	300	400	500	600	700	800	900	1,000
Total Cost	400	500	600	700	800	900	1,000	1,100	1,200	1,300
Income	180	360	540	720	900	1,080	1,260	1,440	1,620	1,800
Profit for 62km										
Total revenue	1,192 (i.e. 18 x 62 + 2 x 38)									
FC	300									
VC	620									
TC	920									

Total Revenue = 18 x 62 + 2 x 38 = Rs. 1,192 million

Total Cost = 150 + 150 + 10 x 62 = Rs. 920 million

∴ Profit = Rs. 272 million

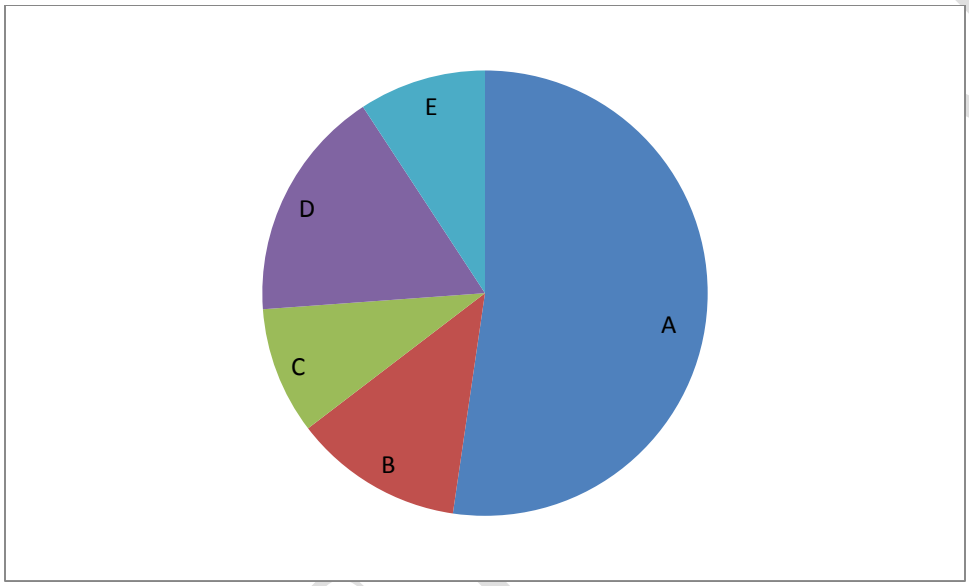
Answer No. 03

(a) If the data collection consists of qualitative categories where there is an order, then this type of data is referred to as ordinal.

E.g. Data on service quality on an ordinal scale:

Superior: .....
Good: .....
Average: .....
Poor: .....

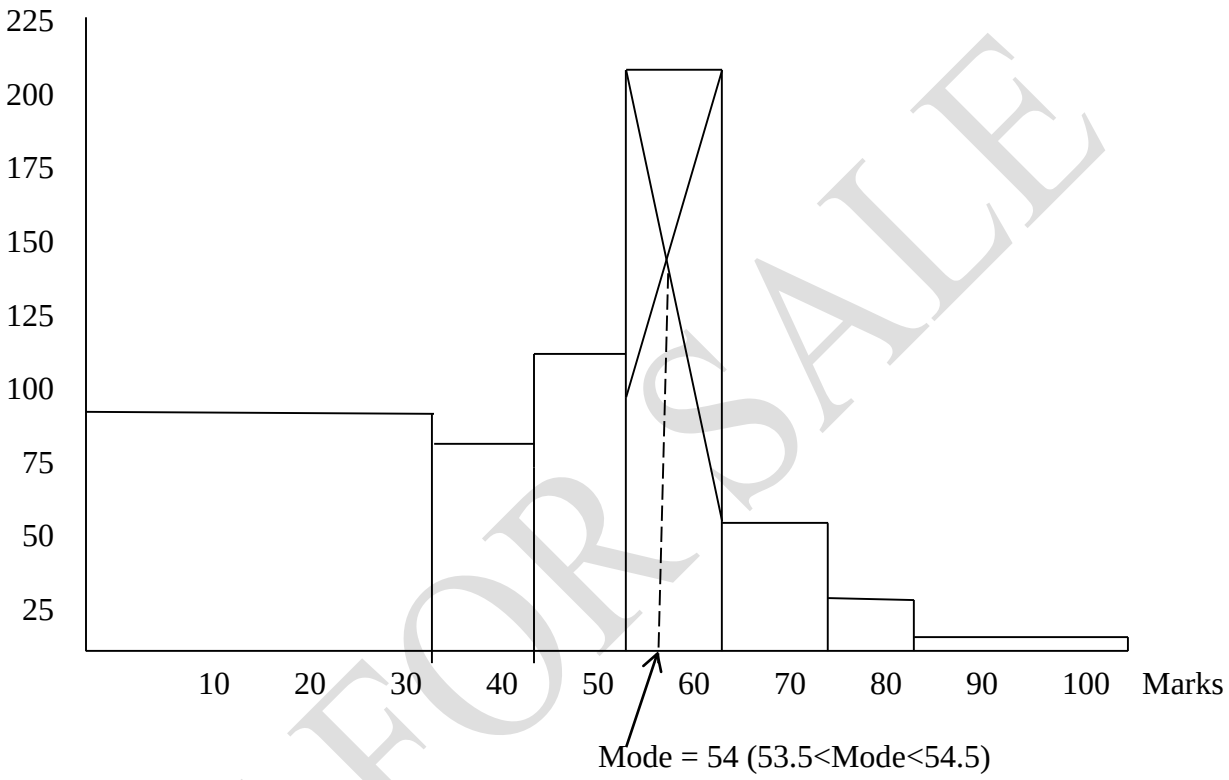
(b)



Overhead allocated to department A = 3.4 million

Department A	3.44	53%	190.8^{o}
Department B	0.78	12%	43.2^{o}
Department C	0.59	9%	32.4^{o}
Department D	1.10	17%	61.2^{o}
Department E	0.59	9%	32.4^{o}
	6.5	100%	360 ^{o}

(c)



Answer No. 04

(a) Harmonic Mean $\quad \frac{1}{\overline{H}} \Rightarrow \frac{1}{H} = \frac{\sum \frac{1}{x_1}}{n}$

$$\frac{1}{H} = \left(\frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} + \frac{1}{10} \right) \Big/ 5$$

$$= 4.38$$

(b)

						A=22.5						
	X	**f**	**fx**	**x^2**	**fx^2**	**d=x-A**	**fd**	**d^2**	**fd^2**	**u =x-A/c**	**fu**	**fu^2**
0 ≤x <5.0	2.5	9	22.5	6.25	56.25	-20	-180	400	3600	-5	-45	225
5≤x <10.0	7.5	19	142.5	56.25	1068.75	-15	-285	225	4275	-4	-76	304
10.0 ≤x <15.0	12.5	37	462.5	156.25	5781.25	-10	-370	100	3700	-3	-111	333
15.0 ≤x <20.0	17.5	13	227.5	306.25	3981.25	-5	-65	25	325	-2	-26	52
20.0≤x <25.0	22.5	10	225	506.25	5062.5	0	0	0	0	-1	-10	10
25.0 ≤x <30.0	27.5	6	165	756.25	4537.5	5	30	25	150	0	0	0
30.0≤x <35.0	32.5	5	162.5	1056.25	5281.25	10	50	100	500	1	5	5
35.0≤x <40.0	37.5	1	37.5	1406.25	1406.25	15	15	225	225	2	2	4
		100	1445	4250	27175	-20	-805	1100	12775	-12	-261	933
			Mean	=	14.45		14.45					14.45
			SD		7.93		7.93					7.93

(i) Mean $\bar{x} = \frac{\sum fx}{\sum f} = A + \frac{\sum fd}{\sum f} = 22.5 + \frac{-805}{100}$

$$= 14.45$$

$$\text{S.D } \sigma = \sqrt{\frac{\sum fd^2}{\sum f} - \left(\frac{\sum fd}{\sum f}\right)^2}$$

$$= \sqrt{\frac{12,775}{100} - \left(\frac{805}{100}\right)^2}$$

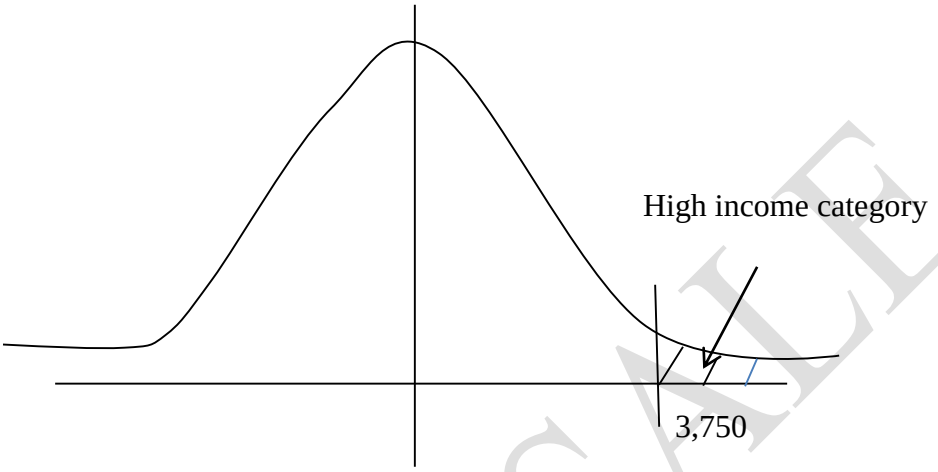
$$= 7.93$$

(ii) $P(x < 15,000) = \frac{65}{100} = 65\%$

Answer No. 05

(a) In cluster sampling, populations are divided into groups consisting of clusters. Once the group or the cluster have been randomly selected, each item in the group is included in the sample

(b) (i)



μ = 1,963

σ = 563

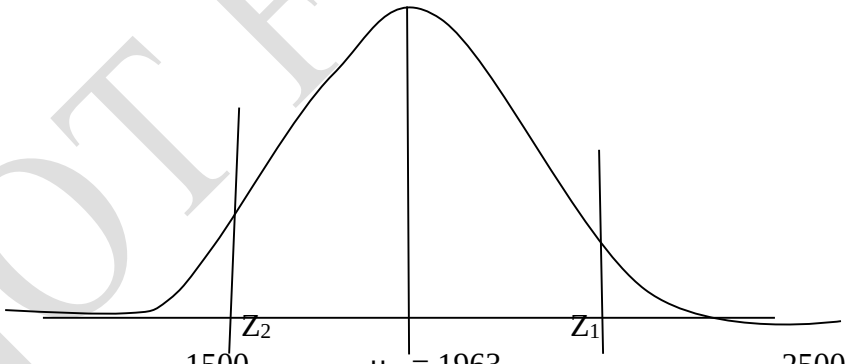
$$Z = \frac{3,750 - 1,963}{563}$$

$$= 3.174$$

Area $\wedge$ 0.4992

% of population in high income category = (0.5 – 0.4992) = 0.08%

(ii)



σ = 563

$$Z_1 = \frac{2,500 - 1,963}{563} = 0.954$$

$$Z_2 = \frac{1,500 - 1,963}{563} = -0.822$$

Area Z_1 = 0.3289

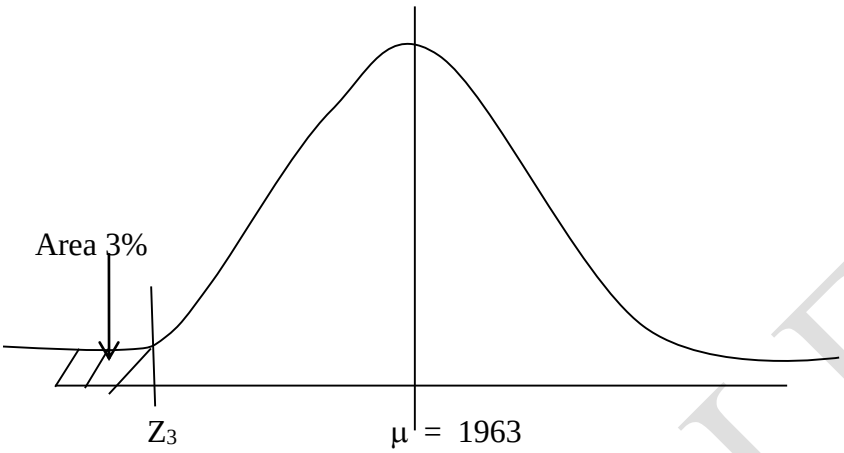
Area Z_2 = 0.2939

Total $Z_1 + Z_2$ = 0.6228

% of population in middle income category = 62.28%

(10)

(iii)



Corresponding area for Z_3 = 0.47

Therfore, Z_3 = -1.88

$$Z_3 = \frac{x - \mu}{\sigma}$$

$$-1.88 = \frac{x - 1{,}963}{563}$$

$$x = -563 \times 1.88 + 1{,}963$$

$$= \text{Rs. } 904.56$$

People with a daily income of Rs. 905 or less will eligible for the government assistance scheme.

Answer No. 06

(a) Power of test is the probability that a false hypothesis is correctly rejected

(b) (i) This is similar to type I error of hypothesis testing.

(ii) The impact of a type I error is more significant than the impact of a type II error

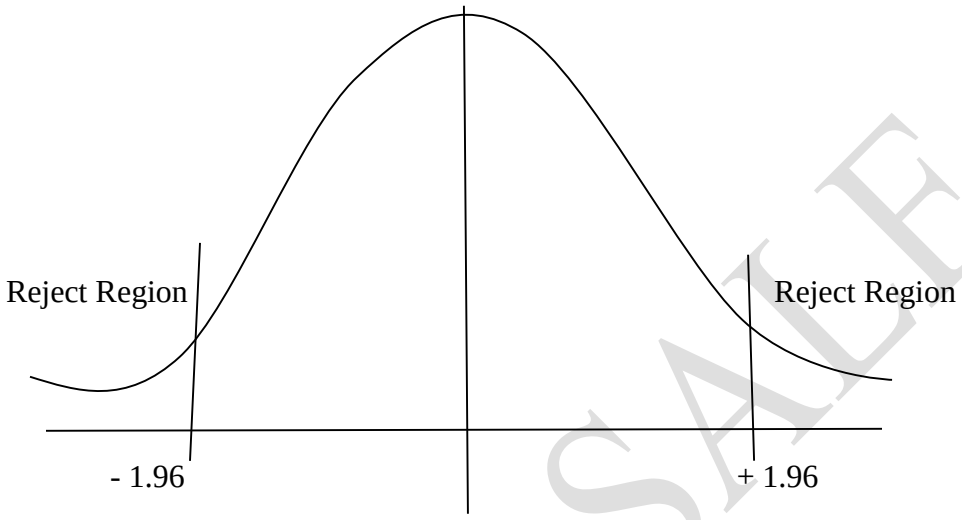
i.e. It recommends that the aircraft is in good condition though the condition is bad. Based on that, it recommends the aircraft for the next journey, which is risky.

This is more risky than an aircraft in good condition undergoing the detailed test (type II error)

(iii) $H_o : \mu = 15$ $\quad \sigma = 5$ $\quad n = 100$

$H_1 : \mu \neq 15$ $\quad \bar{x} = 17$

Level of significance $\alpha = 0.05$



$$Z_1 = \frac{\bar{x} - \mu}{\left(\frac{\sigma}{\sqrt{n}}\right)} = \frac{17 - 15}{\left(\frac{5}{\sqrt{100}}\right)} = \frac{2}{0.5} = 4$$

The value of Z exceeds 1.96 and falls in the rejection region.

$\therefore$ Null hypothesis H_o is rejected

Answer No. 07

(a) (i) $T = 48.2 + 7.2t$

2011: $Q_1 \Rightarrow t = 1$

2014: $Q_2 \Rightarrow t = 14$

Substituting $t = 14$

$T_{2014\ Q2} = 48.2 + 7.2 \times 14$

$= 149.0$

(ii) 2013 $Q_1 \Rightarrow t = 9$

2013 $Q_2 \Rightarrow t = 10$

$T_{2013Q2} = 48.2 + 7.2 \times 10$

$= 48.2 + 72$

$= 120.2$

$T = \frac{Y}{S}$

$S = \frac{Y}{T} = \frac{125.3}{120.2}$

Seasonal index $Q_2 = 1.04$

(iii) $T_{2014\ Q2} = 149$

Seasonal index $= 1.03$

Forecasted sales $Y = T \times S$

$= 1.04 \times 149$

$= 154.96$

$=$ Rs. 155 million

(b) (i) Laspeyre's index $= \frac{\sum_i^N P_{it} \times q_{i0}}{\sum_i^N P_{i0} \times q_{i0}} \times 100 = \frac{181500}{96000} \times 100 = 189$

$$\sum_i^N P_{it} \times q_{i0} = (200)(200) + (400)(200) + (70)(450) + (30)(1000) = 181500$$

$$\sum_i^N P_{i0} \times q_{i0} = (200)(100) + (400)(100) + (70)(300) + (30)(500) = 96000$$

(ii) Total sales for 2005 and 2010 were \$600,000 and \$1,200,000 respectively.

Year 2005 sales (adjusted for price increase between 2005 1nd 2010)

$= \text{Total sales (in 2005)} \times \frac{index}{100}$

$= 600{,}000 \times \frac{189}{100} = 1{,}134{,}000$

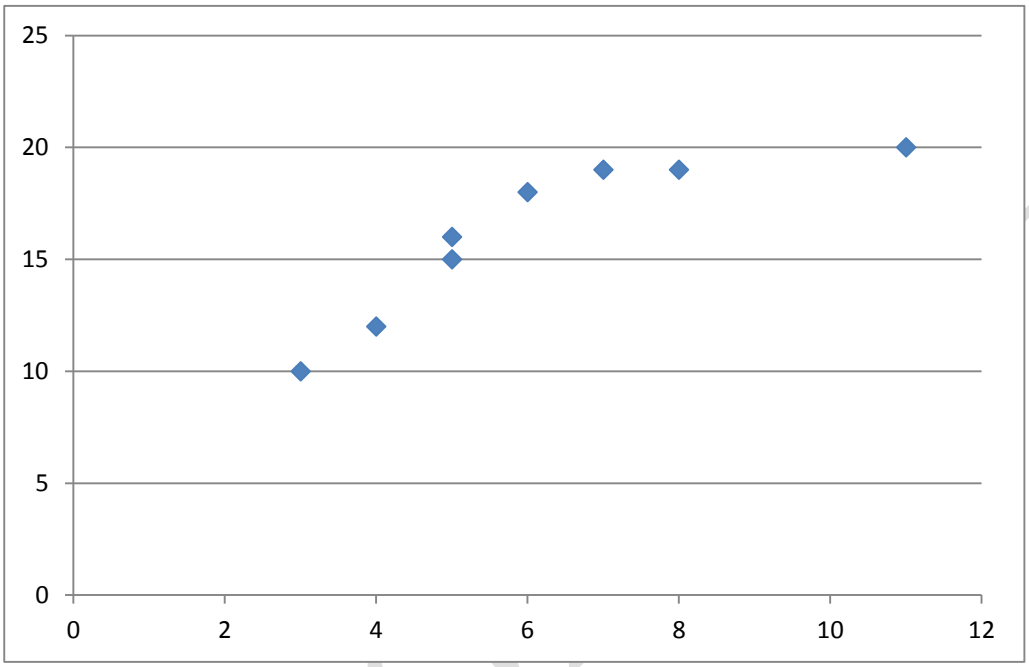
Real increase in sales = \$ 1,200,000 - \$ 1,134,000 = \$ 66,000

Answer No. 08

(a) If the dependent variable y has two independent variables x1 and x2, the regression equation can b considered as;

$$Y = a + b_1x_1 + b_2x_2$$

(b)



The two variables have a strong positive correlation

(c)

x	y	xy	x2	Y2
4	12	48	16	144
6	18	108	36	324
5	15	75	25	225
7	19	133	49	361
8	19	152	64	361
3	10	30	9	100
5	16	80	25	256
11	20	220	121	400
49	**129**	**846**	**345**	**2171**

(14)

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\left(n\sum x^2 - (\sum x)^2 (n\sum y^2 - (\sum y)^2) \right)}}$$

$$r = \frac{8 \times 846 - 49 \times 129}{\sqrt{\left[(8 \times 345 - 49^2) \right] \left[(8 \times 2171 - 129^2) \right]}}$$

$$r = 0.87$$

$$r^2 = 0.756$$

75. 6% of the variation of the share price of XYZ can be accounted for by a liner relationship with the share price of ABC

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