	class	Freq.	Rel. f.
1	35-39	01	0.02
2	40-44	02	0.04
3	45-49	01	0.02
4	50-54	04	0.08
5	55-59	04	0.08
6	60-64	05	0.1
7	65-69	11	0.22
8	70-74	05	0.1
9	75-79	05	0.1
10	80-84	6	0.12
11	85-89	02	0.04
12	90-94	0.2	0.04
13	95-99	0.2	0.04
	Total	50.	

Relative freq^{n} $= \frac{\text{freq}^{n}}{\text{Total freq.}}$

$= \frac{01}{50}$

$= 0.02$

2) $\frac{02}{50} = 0.04$

Q The mean expenditure per customer at a tire store is $ 75.00, with a standard deviation of $8.00. If a random sample of 30 customers is taken, What is the prob that the sample average expenditure per customer for this sample will be $77.00 or more?

→ Soln:-

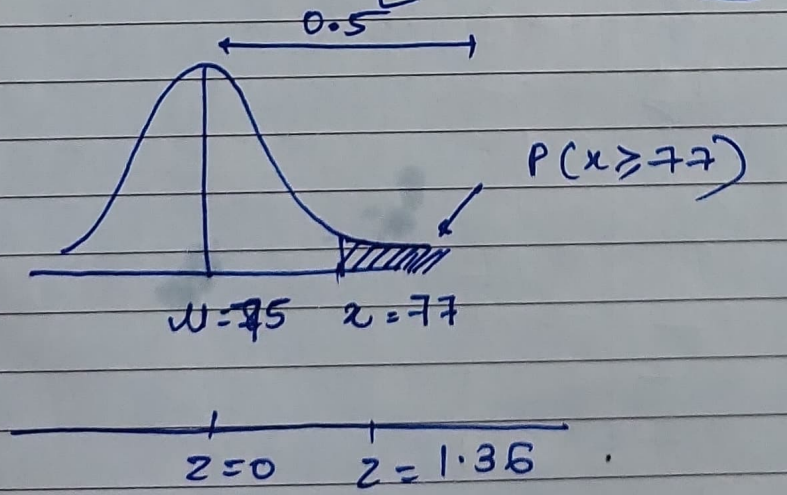
$\mu = \$75.00$ $\quad n = 30$

$\sigma = \$8.00$

$\bar{x} = \$77.00$

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{77 - 75}{\frac{8}{\sqrt{30}}}$$

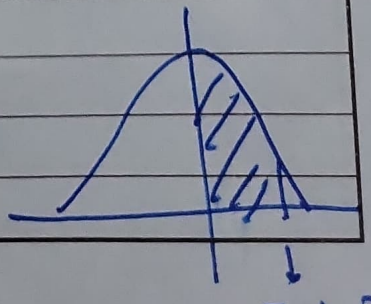
$$[z = 1.36]$$



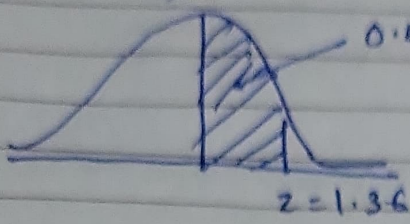
To find: $P(x \geq 77.00)$

using z table find $P(z)$

$R = 1.3 \quad C = 0.06$



$(0.4131) \Rightarrow z = 1.36$



$\therefore P(x \geq 77) = 0.5 - 0.4131$

$= 0.0869 \times 100$

$= 8.69$

i.e 8.69% of the time, a random sample of 36 customers from this population will yield a sample mean expenditure of $77.00 or more.

Q) Find Linear regression equation for the following two sets of data.

x	y	xy	x^2
2	4	8	4
8	5	15	9
5	7	35	25
7	10	70	49
9	15	135	81
3	12	36	9
11	4	44	121
13	5	65	169
8	10	80	64
5	9	45	25
Sum 6.6	8.1	53.3	55.6

$\Sigma x = 6.6$ $\quad \Sigma x^2 = 55.6$

$\Sigma y = 8.1$

$\Sigma xy = 53.3$

Q The mean expenditure per customer at a tire store is $ 75.00, with a standard deviation of $8.00. If a random sample of 30 customers is taken, what is the prob that the sample average expenditure per customer for this sample will be $77.00 or more?

→ Soln:-

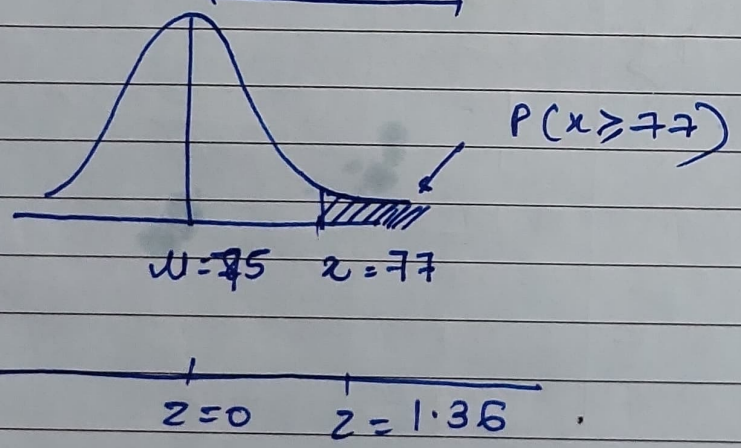
$\mu = \$75.00$ $\quad n = 30$

$\sigma = \$8.00$

$\bar{x} = \$77.00$

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{77 - 75}{\frac{8}{\sqrt{30}}}$$

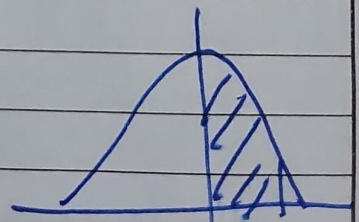
$$[Z = 1.36]$$



To find: $P(x \geq 77.00)$

using z table find $P(z)$

$R = 1.3 \quad C = 0.06$



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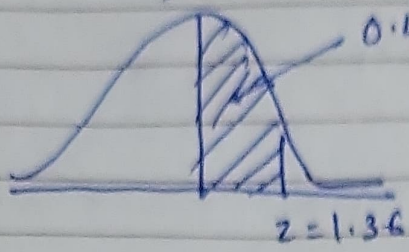

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5	9	45	25
Sum 6.6	8.1	53.3	55.6

$\Sigma x = 6.6$ $\quad \Sigma x^2 = 55.6$

$\Sigma y = 8.1$

$\Sigma xy = 53.3$

N = 10

$$m = \frac{N\,\Sigma(xy) - \Sigma x\,\Sigma y}{N\,\Sigma(x^2) - (\Sigma x)^2}$$

$$= \frac{(10 \times 53.3) - (6.6 \times 8.1)}{(10 \times 55.6) - (43.56)}$$

$$[m = 0.935]$$

$$b = \frac{\Sigma y - m\Sigma x}{N}$$

$$= \frac{8.1 - 0.935 \times 6.6}{10}$$

$$(b = 0.1929)$$

$$y = mx + b$$

$$[y = 0.935x + 0.1929]$$

predict value for (2,5) & (6,11)

(2,5)

i) $y_1 = 2 \times 0.935 + 0.1929$

$y_1 = 2.0629$

error = $5 - 2.0629$

$[e = 2.9371]$

ii) (6,11)

$y_2 = 6 \times 0.935 + 0.1929$

$y_2 = 5.8029$

error = $11 - 5.8029$

$[e = 5.1971]$

Q. Time series data.

Week	Time series value	forecast	Forecast error (18−20)	Absolute value of Forecast error
1	20			
2	18	20	−2	2
3	14	18	−4	4
4	16	14	2	2
5	11	16	−5	5
6	13	11	2	2
			Total	15

a) Mean absolute error is

$$MAE = \frac{\Sigma |e_r|}{n-K}$$

$$= \frac{22}{6-1} = 4.4$$

b) mean squared error

$$MSE = \frac{\Sigma |e_r|^2}{n-K}$$

$$= \frac{|22|^2}{6-1} = 96.8$$

a) Mean absolute error is

$$MAE = \frac{\Sigma |e_r|}{n-K} = \frac{15}{5} = 3$$

b) mean squared error

$$MSE = \frac{\Sigma |e_r|^2}{n-k} = \frac{9}{3}$$

$$= \frac{(2)^2 + (4)^2 + (2)^2 + (5)^2 + (2)^2}{5}$$

$$= \frac{4 + 16 + 4 + 25 + 4}{5}$$

$$= \underline{10.6}$$

c) mean absolute % error.

$$MAPE = \frac{\sum_{n=K+1}^{n} \left| \frac{e_i}{y_i} \right| \times 100}{n-K}$$

No	Time series value (y_i) (Actual value)	forecast	forecast error e_i	% error $\frac{e_i}{y_i}$	absolute % error $\lvert e_i/y_i \rvert$
1	18	20			
2	18	18	20	−2	−11.11	11.11
3	16	14	18	−4	−28.57	28.57
4	11	16	14	2	+12.5	12.5
5	17	11	16	−5	−45.45	45.45
	14	13	11	2	15.38.	15.38.

$\Sigma \Rightarrow 113.01$

% error

$$\Rightarrow \left| \frac{-2}{18} \right| \times 100 = -11.11$$

$$\left(\frac{-4}{14} \right) \times 100 = -28.57$$

$$\therefore MAPE = \frac{\sum \left| e_i/y_i \right|}{n-K} = \underline{22.602} \text{ //}$$

$$= \frac{113.01}{5}$$

d) what is the forecast for week 7.

is 13