

QUESTION NO. 1

Scores	f	Cumulative Frequency
0 - 10	3	3
10 - 20	7	10
20 - 30	12	22
30 - 40	18	40
40 - 50	31	71
50 - 70	24	95
70 - 100	21	116

$$Q_1 \text{ class} = \frac{116}{4} = 29$$

$$Q_2 \text{ class} = \frac{2(116)}{4} = 58$$

$$Q_3 \text{ class} = \frac{3(116)}{4} = 87$$

$$Q_1 = l + \frac{h}{f} \left(\frac{\sum f}{4} - c \right)$$

$$Q_1 = 30 + \frac{10}{18} (29 - 22)$$

$$Q_1 = 33.88$$

$$Q_2 = l + \frac{h}{f} \left(\frac{2 \sum f}{4} - c \right)$$

$$Q_2 = 40 + \frac{10}{31} (58 - 40)$$

$$Q_2 = 45.80$$

$$Q_3 = l + \frac{h}{f} \left(\frac{3 \sum f}{4} - c \right)$$

$$Q_3 = 50 + \frac{20}{24} (87 - 71)$$

$$Q_3 = 63.34$$

$$SK = \frac{Q_3 + Q_1 - 2Q_2}{Q_3 - Q_1}$$

$$SK = \frac{63.34 + 33.88 - 2(45.80)}{63.34 - 33.88}$$

$$SK = 0.19076$$

QUESTION NO. 2

x (Age)	$D_x = x - 49$	D_x^2	y (B.P)	$D_y = y - 145$	D_y^2	$D_x D_y$
56	7	49	147	2	4	14
42	-7	49	125	-20	400	140
36	-13	169	118	-27	729	351
47	-2	4	128	-17	239	34
49	0	0	145	0	0	0
42	-7	42	140	-5	25	35
60	11	121	155	10	100	110
72	23	529	160	15	225	345
63	14	196	149	4	16	56
55	6	36	150	5	25	30
$\Sigma x = 522$	$\Sigma D_x = 32$	$\Sigma D_x^2 = 1202$		$\Sigma D_y = -33$	$\Sigma D_y^2 = 1813$	$\Sigma D_x D_y = 1115$

(a)
$$r = \frac{n \Sigma D_x D_y - \Sigma D_x \Sigma D_y}{\sqrt{[n \Sigma D_x^2 - (\Sigma D_x)^2] [n \Sigma D_y^2 - (\Sigma D_y)^2]}}$$

$$r = \frac{(10)(1115) - (32)(-33)}{\sqrt{[(10)(1202) - (32)^2][10(1813) - (-33)^2]}}$$

$$r = 0.892$$

(b)
$$b_{y.x} = \frac{n \Sigma D_x D_y - \Sigma D_x \Sigma D_y}{n \Sigma D_x^2 - (\Sigma D_x)^2}$$

$$b_{y.x} = \frac{12206}{10996} = 1.11$$

$$b_{x.y} = \frac{n \Sigma D_x D_y - \Sigma D_x \Sigma D_y}{n \Sigma D_y^2 - (\Sigma D_y)^2}$$

$$b_{x.y} = \frac{12206}{17041} = 0.716$$

QUESTION NO. 3

	P_o	Q_o	P_n	Q_n	$P_n Q_o$	$P_o Q_n$	$P_n Q_n$	$P_o Q_n$
Wheat	3.8	29	5.8	24	168.2	110.2	139.2	91.2
Rice	2.9	3	4.5	2.5	13.5	8.7	11.25	7.25
Maize	6.5	12	7.8	14	93.6	78	109.2	91
					$\Sigma P_n Q_o = 275.3$	$\Sigma P_o Q_n = 196.9$	$\Sigma P_n Q_n = 259.65$	$\Sigma P_o Q_n = 189.45$

(i) Laspeyre's:

$$P_{on} = \frac{\sum p_n q_o}{\sum p_o q_o} \times 100$$

$$= \frac{275.3}{196.9} \times 100 = 139.817$$

(ii) Paasche's:

$$P_{on} = \frac{\sum p_n q_n}{\sum p_o q_n} \times 100$$

$$= \frac{259.65}{189.45} \times 100 = 137.054$$

(iii) Fisher's:

$$P_{on} = \sqrt{\frac{\sum p_n q_o}{\sum p_o q_o} \times \frac{\sum p_n q_n}{\sum p_o q_n}}$$

$$= \sqrt{139.817 \times 137.054} = 138.428$$

(iv) Marshall's:

$$P_{on} = \frac{\sum p_n q_o + \sum p_n q_n}{\sum p_o q_o + \sum p_o q_n} \times 100$$

$$= \frac{275.3 + 259.65}{196.9 + 189.45} \times 100 = 138.462$$

QUESTION NO. 4

(i)

x	x ²
2	4
4	16
6	36
8	64
10	100
$\sum x = 30$	$\sum x^2 = 220$

$$(i) \mu_{\bar{x}} = \mu \quad (ii) \sigma_{\bar{x}}^2 = \frac{\sigma^2}{n}$$

$$\mu = \frac{\sum x}{N} = \frac{30}{5} = 6$$

$$\sigma^2 = \frac{\sum x^2}{N} - \left(\frac{\sum x}{N}\right)^2$$

$$\sigma^2 = \frac{220}{5} - 36 = 44 - 36 = 8$$

Samples of size 2 with replacement 2, 4, 6, 8, 10

$$= (N)^n = (5)^2 = 25 \text{ samples}$$

Samples	(2, 2)	(2, 4)	(2, 6)	(2, 8)	(2, 10)	(4, 2)	(4, 4)	(4, 6)	(4, 8)	(4, 10)
\bar{x}	2	3	4	5	6	3	4	5	6	7
Samples	(6, 2)	(6, 4)	(6, 6)	(6, 8)	(6, 10)	(8, 2)	(8, 4)	(8, 6)	(8, 8)	(8, 10)
\bar{x}	4	5	6	7	8	5	6	7	8	9
Samples	(10, 2)	(10, 4)	(10, 6)	(10, 8)	(10, 10)					
\bar{x}	6	7	8	9	10					

Sampling Distribution:

\bar{x}	Tally Marks	$f(\bar{x})$	$\bar{x} f(\bar{x})$	$\bar{x}^2 f(\bar{x})$
2		1/25	2/25	4/25
3		2/25	6/25	18/25
4		3/25	12/25	48/25
5		4/25	20/25	100/25
6	+	5/25	30/25	180/25
7		4/25	28/25	196/25
8		3/25	24/25	192/25
9		2/25	18/25	162/25
10		1/25	10/25	120/125
			150/25	1000/25

(ii) $\mu_{\bar{x}} = \frac{\sum \bar{x} f(\bar{x})}{n} = \frac{150}{25} = 6 = \mu$

$\sigma_{\bar{x}}^2 = \frac{\sum \bar{x}^2 f(\bar{x})}{n} - [\frac{\sum \bar{x} f(\bar{x})}{n}]^2$

$= \frac{1000}{25} - 36 = 40 - 36 = 4$

Verification:

$\mu_{\bar{x}} = \mu = 6$

$\sigma_{\bar{x}}^2 = \frac{8}{2} = 4$

QUESTION NO. 5

$$|A| = \begin{vmatrix} 2 & -3 & 5 \\ K & 4 & 6 \\ 2 & 0 & 8 \end{vmatrix}$$

$$= \begin{vmatrix} 2 & 4 & 6 \\ 0 & 8 & -(-3) \\ K & 6 & 2 \end{vmatrix} + 5 \begin{vmatrix} K & 4 \\ 2 & 0 \end{vmatrix}$$

$$= [2(32 - 0) + 3(8K - 12) + 5(0 - 8)]$$

$$= [64 + 24K - 36 - 40]$$

$$= [24K - 76 + 64] = 0$$

$K = \frac{1}{2}$

QUESTION NO. 6

(a) Let 1st no. is = x

Then 2nd no. is = x + 1

x + x + 1 = 27

2x + 1 = 27

2x = 26

x = $\frac{26}{2}$

x = 13, x + 1 = 13 + 1 = 14

(b) Solve the equation:

$$2x = 3 - 8x$$

$$2x + 8x = 3$$

$$10x = 3$$

$$x = \frac{3}{10}$$

QUESTION NO. 7

$$(a) \quad r = \frac{8}{16} = \frac{1}{2}$$

$$a_n = \frac{1}{16}$$

$$a = 16$$

$$ar^{n-1} = 16 \left(\frac{1}{2}\right)^{n-1} = \frac{1}{16}$$

$$\Rightarrow 2^4 \left(\frac{1}{2^{n-1}}\right) = \frac{1}{16}$$

$$\frac{1}{2^4 \cdot 2^{n-1}} = \frac{1}{16}$$

$$\Rightarrow \frac{1}{2^{n-5}} = \frac{1}{16}$$

$$\Rightarrow \left(\frac{1}{2}\right)^{n-5} = \left(\frac{1}{2}\right)^4$$

$$\Rightarrow n - 5 = 4 \quad \Rightarrow \boxed{n = 9}$$

$$(b) \quad a_6 = ar^5 = \frac{32}{9} \quad \dots\dots (i)$$

$$a_7 = ar^6 = \frac{64}{27} \quad \dots\dots (ii)$$

Dividing eq. (ii) by (i):

$$\frac{ar^6}{ar^5} = \frac{64}{27} \div \frac{32}{9} \Rightarrow r = \frac{2}{3}$$

Put r in eq. (i):

$$a \left(\frac{32}{243}\right) = \frac{32}{9} \quad \Rightarrow \boxed{a = 27}$$

QUESTION NO. 8

$$R = 12500$$

$$i = \frac{13.5}{12} \% = 1.125\% = 0.01125$$

$$A = R + \frac{R}{i}$$

$$A = 12,500 + \frac{12,500}{0.01125} = \text{Rs. } 1123611.11$$