SUMMER– 18 EXAMINATION

Subject Name: Basic Mathematics **Model Answer** **Subject Code:** 22103

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answers	Marking Scheme
1.		Attempt any **five** of the following	**10**
	a)	Find the value of $\log\left(\frac{2}{3}\right)+\log\left(\frac{4}{5}\right)-\log\left(\frac{8}{15}\right)$.	**02**
	Ans	$\log\left(\frac{2}{3}\right)+\log\left(\frac{4}{5}\right)-\log\left(\frac{8}{15}\right)=\log\left(\frac{2}{3}\times\frac{4}{5}\right)-\log\left(\frac{8}{15}\right)$.	1
	:	$=\log\left(\frac{8}{15}\right)-\log\left(\frac{8}{15}\right)$	
		$=0 \quad OR \quad =\log\left(\frac{\frac{8}{15}}{\frac{8}{15}}\right)=\log(1)=0$	1
	b)	Find the area of the triangle whose vertices are $(3,1),(-1,3)$ and $(-3,-2)$.	**02**
	Ans	Let $(x_1,y_1)=(3,1),(x_2,y_2)=(-1,3)$ and $(x_3,y_3)=(-3,-2)$	
		$A=\frac{1}{2}\begin{vmatrix}x_1 & y_1 & 1\\ x_2 & y_2 & 1\\ x_3 & y_3 & 1\end{vmatrix}$	
		$=\frac{1}{2}\begin{vmatrix}3 & 1 & 1\\ -1 & 3 & 1\\ -3 & -2 & 1\end{vmatrix}$	1
		$=\frac{1}{2}\left[3(3+2)-1(-1+3)+1(2+9)\right]$	½

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Q. No.	Sub Q.N.	Answers	Marking Scheme
1.	b)	$A = 12$	½
	c)	Without using calculator,find the value of $\sec\left(3660^0\right)$	**02**
	Ans	$\sec\left(3660^0\right) = \sec\left(40\times 90^0 + 60^0\right)$ or $\sec\left(40\times\frac{\pi}{2} + 60^0\right)$	1
		$= \sec 60^0$	½
		$= 2$	½
	d)	The length of one side of the rectangle is twice the length of its adjacent side. If the perimeter of rectangle is 60 cms, find the area of the rectangle.	**02**
	Ans	Let adjacent side $= x$	
		$\therefore$ other side $= 2x$	½
		perimeter $= 2\left(x + 2x\right) = 60$	½
		$\therefore \ x = 10$	
		$\therefore l =$ length $= 2x = 20$	
		$\therefore b =$ breadth $= x = 10$	
		Area $= l \times b$	
		$= 20\times 10 = 200$	1
	e)	Find the surface area of a cuboid of dimensions 26 cms ; 20 cms ans 12 cms.	**02**
	Ans	Let $l = 26, b = 20, h = 12$	
		Surface Area $= 2\left[lb + bh + hl\right]$	1
		$= 2\left[26\times 20 + 20\times 12 + 12\times 26\right]$	
		$= 2144$	1
	f)	Find range and coefficient of range for the data:	**02**
		120, 50, 90, 100, 180, 200, 150, 40, 80	
	Ans	Range $= L - S$	
		$= 200 - 40$	
		$= 160$	1
		coefficient of range $= \frac{L-S}{L+S}$	
		$= \frac{200-40}{200+40}$	½

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Q. No.	Sub Q.N.	Answers	Marking Scheme
1.	f)	coefficient of range $=0.667$	½
		--	
	g)	If coefficient of variation of a distribution is 75% and standard deviation is 24, find its mean.	**02**
	Ans	coefficient of variation = $\frac{\sigma}{\bar{x}}\times 100$	
		$75=\frac{24}{\bar{x}}\times 100$	½
		$\bar{x}=\frac{24\times 100}{75}$	½
		$\bar{x}=32$	1
		--	
2.		Attempt **any three** of the following **:**	**12**
	a)	If $A=\begin{bmatrix}3 & -1\\ 2 & 4\end{bmatrix}, B=\begin{bmatrix}1 & 2\\ -3 & 0\end{bmatrix}$. Find X such that $2X+3A-4B=I$.	**04**
	Ans	$2X+3A-4B=I$	
		$2X+3\begin{bmatrix}3 & -1\\ 2 & 4\end{bmatrix}-4\begin{bmatrix}1 & 2\\ -3 & 0\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$	
		$2X+\begin{bmatrix}9 & -3\\ 6 & 12\end{bmatrix}-\begin{bmatrix}4 & 8\\ -12 & 0\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$	1
		$2X+\begin{bmatrix}5 & -11\\ 18 & 12\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$	1
		$2X=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}-\begin{bmatrix}5 & -11\\ 18 & 12\end{bmatrix}$	1
		$2X=\begin{bmatrix}-4 & 11\\ -18 & -11\end{bmatrix}$	
		$\therefore X=\frac{1}{2}\begin{bmatrix}-4 & 11\\ -18 & -11\end{bmatrix}$ *OR* $X=\begin{bmatrix}-2 & \frac{11}{2}\\ -9 & \frac{-11}{2}\end{bmatrix}$	1
		--	

Q. No.	Sub Q. N.	Answers	Marking Scheme
2.	b)	Resolve into partial fractions $\frac{x^2+1}{x(x^2-1)}$	**04**
	Ans	$\frac{x^2+1}{x(x+1)(x-1)} = \frac{A}{x} + \frac{B}{x+1} + \frac{C}{x-1}$	½
		$\therefore x^2+1 = A(x-1)(x+1) + B(x)(x-1) + C(x)(x+1)$	
		Put $x = 0$	
		$\therefore 0+1 = A(0-1)(0+1)$	1
		$\boxed{A=-1}$	
		Put $x = -1$	
		$\therefore (-1)^2+1 = B(-1)(-1-1)$	1
		$\boxed{B=1}$	
		Put $x = 1$	
		$\therefore 1^2+1 = C(1)(1+1)$	1
		$\boxed{C=1}$	
		$\therefore \frac{x^2+1}{x(x+1)(x-1)} = \frac{-1}{x} + \frac{1}{x+1} + \frac{1}{x-1}$	½
	c)	The voltage in an electric circuit are related by following equations: $V_1+V_2+V_3 = 9$; $V_1-V_2+V_3 = 3$; $V_1+V_2-V_3 = 1$ find V_1, V_2 and V_3 by using Cramer's rule.	**04**
	Ans	$D = \begin{vmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix} = 1(1-1) - 1(-1-1) + 1(1+1) = 4$	1
		$D_{V_1} = \begin{vmatrix} 9 & 1 & 1 \\ 3 & -1 & 1 \\ 1 & 1 & -1 \end{vmatrix} = 9(1-1) - 1(-3-1) + 1(3+1) = 8$	
		$\therefore V_1 = \frac{D_{V_1}}{D} = \frac{8}{4} = 2$	1
		$D_{V_2} = \begin{vmatrix} 1 & 9 & 1 \\ 1 & 3 & 1 \\ 1 & 1 & -1 \end{vmatrix} = 1(-3-1) - 9(-1-1) + 1(1-3) = 12$	

Q. No.	Sub Q.N.	Answers	Marking Scheme
2.	c)	$\therefore V_2 = \frac{D_{V_2}}{D} = \frac{12}{4} = 3$	1
		$D_{V_3} = \begin{vmatrix} 1 & 1 & 9 \\ 1 & -1 & 3 \\ 1 & 1 & 1 \end{vmatrix} = 1(-1-3) - 1(1-3) + 9(1+1) = 16$	
		$\therefore V_3 = \frac{D_{V_3}}{D} = \frac{16}{4} = 4$	1
	d)	Calculate the mean deviation about the mean of the following data: 3, 6, 5, 7, 10, 12, 15, 18.	**04**
	Ans	x_i | $d_i = x_i - \bar{x}$ | $\lvert d_i \rvert$ 3 | -6.5 | 6.5 5 | -4.5 | 4.5 6 | -3.5 | 3.5 7 | -2.5 | 2.5 10 | 0.5 | 0.5 12 | 2.5 | 2.5 15 | 5.5 | 5.5 18 | 8.5 | 8.5 $\sum x_i = 76$ | | $\sum \lvert d_i \rvert = 34$	2
		where Mean $\bar{x} = \frac{\sum x_i}{N} = \frac{76}{8}$	1
		$\bar{x} = 9.5$	
		$\therefore$ Mean deviation about mean $= \frac{\sum \lvert d_i \rvert}{N}$	
		$= \frac{34}{8} = 4.25$	1
3.		Attempt **any three** of the following **:**	**12**
	a)	Without using calculator find the value of $\cos 570^0 \sin 510^0 + \sin(-330^0)\cos(-390^0)$	**04**
	Ans	$\cos 570^0 = \cos(6 \times 90^0 + 30^0)$	

Q. No.	Sub Q. N.	Answers	Marking Scheme
3.	a)	$\cos 570^0 = -\cos 30^0 = -\frac{\sqrt{3}}{2}$	½
		$\sin 510^0 = \sin\left(6\times 90^0 - 30^0\right)$	
		$= \sin 30^0 = \frac{1}{2}$	½
		$\sin\left(-330^0\right) = -\sin\left(330^0\right)$	½
		$= -\sin\left(4\times 90^0 - 30^0\right) = -\left(-\sin 30^0\right) = \frac{1}{2}$	½
		$\cos\left(-390^0\right) = \cos 390^0$	½
		$= \cos\left(4\times 90^0 + 30^0\right) = \cos 30^0 = \frac{\sqrt{3}}{2}$	½
		$\therefore \cos 570^0 \sin 510^0 + \sin\left(-330^0\right)\cos\left(-390^0\right)$	
		$= \left(-\frac{\sqrt{3}}{2}\right)\left(\frac{1}{2}\right) + \left(\frac{1}{2}\right)\left(\frac{\sqrt{3}}{2}\right)$	
		$= 0$	1
		---	
	b)	Prove that $\frac{\sin 4\theta + \sin 2\theta}{1+\cos 2\theta + \cos 4\theta} = \tan 2\theta$	**04**
	Ans	$\text{LHS} = \frac{\sin 4\theta + \sin 2\theta}{1+\cos 4\theta + \cos 2\theta}$	
		$= \frac{2.\sin 2\theta.\cos 2\theta + \sin 2\theta}{2\cos^2 2\theta + \cos 2\theta}$	2
		$= \frac{\sin 2\theta\left(2\cos 2\theta + 1\right)}{\cos 2\theta\left(2\cos 2\theta + 1\right)}$	1
		$= \tan 2\theta$	1
		---	
	c)	Prove that $\frac{\sin 3A - \sin A}{\cos 3A + \cos A} = \tan A$	**04**
	Ans	$\text{LHS} = \frac{\sin 3A - \sin A}{\cos 3A + \cos A}$	

Q. No.	Sub Q.N.	Answers	Marking Scheme
3.	c)	$= \dfrac{2.\cos\left(\dfrac{3A+A}{2}\right).\sin\left(\dfrac{3A-A}{2}\right)}{2.\cos\left(\dfrac{3A+A}{2}\right).\cos\left(\dfrac{3A-A}{2}\right)}$	2
		$= \dfrac{2\cos 2A.\sin A}{2\cos 2A.\cos A}$	1
		$= \tan A$	1
		=RHS	
		--	
	d)	Prove that $\tan^{-1}\dfrac{1}{4}+\tan^{-1}\dfrac{2}{9}=\cot^{-1}2$	**04**
	Ans	$\tan^{-1}\dfrac{1}{4}+\tan^{-1}\dfrac{2}{9}$	
		$=\tan^{-1}\left[\dfrac{\frac{1}{4}+\frac{2}{9}}{1-\frac{1}{4}\times\frac{2}{9}}\right]$	2
		$=\tan^{-1}\left(\dfrac{1}{2}\right)$	1
		$=\cot^{-1}2$	1
		$\therefore \tan^{-1}\dfrac{1}{4}+\tan^{-1}\dfrac{2}{9}=\cot^{-1}2$	
		--	
4.		Attempt **any three** of the following **:**	**12**
	a)	Find x and y if	**04**

Q. No.	Sub Q.N.	Answers	Marking Scheme
4.	a)	$\left\{4\begin{bmatrix}1&2&0\\2&-1&3\end{bmatrix}-2\begin{bmatrix}1&3&-1\\2&-3&4\end{bmatrix}\right\}\begin{bmatrix}2\\0\\-1\end{bmatrix}=\begin{bmatrix}x\\y\end{bmatrix}$	
	Ans	$\left\{4\begin{bmatrix}1&2&0\\2&-1&3\end{bmatrix}-2\begin{bmatrix}1&3&-1\\2&-3&4\end{bmatrix}\right\}\begin{bmatrix}2\\0\\-1\end{bmatrix}=\begin{bmatrix}x\\y\end{bmatrix}$	
		$\left\{\begin{bmatrix}4&8&0\\8&-4&12\end{bmatrix}-\begin{bmatrix}2&6&-2\\4&-6&8\end{bmatrix}\right\}\begin{bmatrix}2\\0\\-1\end{bmatrix}=\begin{bmatrix}x\\y\end{bmatrix}$	1
		$\begin{bmatrix}2&2&2\\4&2&4\end{bmatrix}\begin{bmatrix}2\\0\\-1\end{bmatrix}=\begin{bmatrix}x\\y\end{bmatrix}$	1
		$\begin{bmatrix}4+0-2\\8+0-4\end{bmatrix}=\begin{bmatrix}x\\y\end{bmatrix}$	1
		$\begin{bmatrix}2\\4\end{bmatrix}=\begin{bmatrix}x\\y\end{bmatrix}$	1
		$\therefore x=2, y=4$	
		--	
	b)	Resolve into partial fractions $\dfrac{2x+1}{(x-1)(x^2+1)}$	**04**
	Ans	$\dfrac{2x+1}{(x-1)(x^2+1)}=\dfrac{A}{x-1}+\dfrac{Bx+C}{x^2+1}$	
		$\therefore\ 2x+1=(x^2+1)A+(x-1)(Bx+C)$	½
		Put $x=1$	
		$\therefore 2(1)+1=(1^2+1)A$	
		$\therefore 3=2A$	
		$\therefore\ A=\dfrac{3}{2}$	1
		Put $x=0$,	
		$\therefore\ 2(0)+1=(0+1)A+(0-1)(B(0)+C)$	
		$\therefore 1=A-C$	

Q. No.	Sub Q.N.	Answers	Marking Scheme
4.	b)	$\therefore 1=\frac{3}{2}-C$	
		$\therefore C=\frac{1}{2}$	1
		Put $x=-1,$	
		$\therefore\ 2(-1)+1=\left((-1)^2+1\right)A+(-1-1)\left(B(-1)+C\right)$	
		$\therefore -1=2A+2B-2C$	
		$\therefore -1=2\left(\frac{3}{2}\right)+2B-2\left(\frac{1}{2}\right)$	
		$\therefore -1=3+2B-1$	1
		$\therefore B=-\frac{3}{2}$	
		$\therefore \frac{2x+1}{(x-1)(x^2+1)}=\frac{\frac{3}{2}}{x-1}+\frac{-\frac{3}{2}x+\frac{1}{2}}{x^2+1}$ *OR*	½
		$\frac{2x+1}{(x-1)(x^2+1)}=\frac{1}{2}\left[\frac{3}{x-1}+\frac{-3x+1}{x^2+1}\right]$	
		--	
	c)	Prove that $\cos 20^0.\cos 40^0.\cos 60^0.\cos 80^0=\frac{1}{16}$	**04**
	Ans	$\cos 20^0.\cos 40^0.\cos 60^0.\cos 80^0=\frac{1}{2}(2\cos 20°\cos 40°).\left(\frac{1}{2}\right)\cos 80°$	½
		$=\frac{1}{4}\left[\cos(20°+40°)+\cos(20°-40°)\right]\cos 80°$	½
		$=\frac{1}{4}\left[\cos(60°)+\cos(-20°)\right]\cos 80°$	½
		$=\frac{1}{4}\left[\frac{1}{2}\cos 80°+\cos 20°\cos 80°\right]$	
		$=\frac{1}{4}\left[\frac{1}{2}\cos 80°+\frac{1}{2}(2\cos 20°\cos 80°)\right]$	½
		$=\frac{1}{8}\left[\cos 80°+\cos(20°+80°)+\cos(20°-80°)\right]$	½
		$=\frac{1}{8}\left[\cos 80°+\cos(100°)+\cos(-60°)\right]$	

Q. No.	Sub Q.N.	Answers	Marking Scheme
4.	c)	$\cos 20^0.\cos 40^0.\cos 60^0.\cos 80^0 = \frac{1}{8}\left[\cos 80° + \cos(180-80°) + \frac{1}{2}\right]$	½
		$= \frac{1}{8}\left[\cos 80° - \cos(80°) + \frac{1}{2}\right]$	½
		$= \frac{1}{16}$	½
	d)	If $\tan\frac{\theta}{2} = \frac{2}{3}$ find the value of $2\sin\theta + 3\cos\theta$.	**04**
	Ans	$2\sin\theta + 3\cos\theta$	
		$= 2\left(\frac{2\tan\frac{\theta}{2}}{1+\tan^2\frac{\theta}{2}}\right) + 3\left(\frac{1-\tan^2\frac{\theta}{2}}{1+\tan^2\frac{\theta}{2}}\right)$	2
		$= 2\left(\frac{2\times\frac{2}{3}}{1+\left(\frac{2}{3}\right)^2}\right) + 3\left(\frac{1-\left(\frac{2}{3}\right)^2}{1+\left(\frac{2}{3}\right)^2}\right)$	1
		$= 3$	1
	e)	If A and B are obtuse angles and $\sin A = \frac{5}{13}$ and $\cos B = -\frac{4}{5}$ then find $\sin(A+B)$.	**04**
	Ans	$\cos^2 A = 1 - \sin^2 A$	
		$= 1 - \left(\frac{5}{13}\right)^2$	
		$= 1 - \frac{25}{169} = \frac{144}{169}$	
		$\cos A = \pm\frac{12}{13}$	
		$\therefore \cos A = -\frac{12}{13} \quad (\because A \text{ is obtuse angle})$	1
		$\sin^2 B = 1 - \cos^2 B$	
		$= 1 - \left(-\frac{4}{5}\right)^2$	

Q. No.	Sub Q.N.	Answers	Marking Scheme
4.	e)	$\sin^2 B = 1 - \frac{16}{25} = \frac{9}{25}$	
		$\sin B = \pm\frac{3}{5}$	
		$\therefore \sin B = \frac{3}{5}$ $(\because A \text{ is obtuse angle})$	1
		$\therefore \sin(A+B) = \sin A.\cos B + \cos A.\sin B$	
		$= \left(\frac{5}{13}\right)\times\left(-\frac{4}{5}\right)+\left(-\frac{12}{13}\right)\times\left(\frac{3}{5}\right)$	1
		$= -\frac{56}{65}$	1
		--	
5.		Attempt **any two** of the following **:**	**12**
	a)	Attempt the following **:**	**06**
	i)	Find the length of the perpendicular from the point $(5,4)$ on the straigth line $2x+y=34$.	**03**
	Ans	$p = \left\lvert\frac{ax_1+by_1+c}{\sqrt{a^2+b^2}}\right\rvert$	
		$= \left\lvert\frac{2(5)+1(4)-34}{\sqrt{(2)^2+(1)^2}}\right\rvert$	2
		$= \left\lvert\frac{10+4-34}{\sqrt{5}}\right\rvert$	
		$= \frac{20}{\sqrt{5}}$ OR 8.94	1
		--	
	ii)	Find the equation of the line passing through $(3,-4)$ and having slope $\frac{3}{2}$.	**03**
	Ans	Point $=(x_1,y_1)=(3,-4)$ & slope $=\frac{3}{2}$	
		$\therefore$ equation of line is,	
		$y-y_1 = m(x-x_1)$	

Q. No.	Sub Q.N.	Answers	Marking Scheme
5.	a)ii)	$\therefore y-(-4)=\frac{3}{2}(x-3)$	1
		$\therefore 2(y+4)=3(x-3)$	1
		$\therefore 3x-2y-17=0$	1
		--	
	b)	Attempt the following:	**06**
	i)	Find the equation of line passing through $(3,4)$ and perpendicular to the line $2x-4y+5=0$.	**03**
	Ans	Point $=(x_1,y_1)=(3,4)$	
		Slope of the line $2x-4y+5=0$ is,	
		$m=-\frac{a}{b}=-\frac{2}{-4}=\frac{1}{2}$	1
		$\therefore$ Slope of the required line is,	
		$m'=-\frac{1}{m}=-2$	1
		$\therefore$ equation is,	
		$y-y_1=m'(x-x_1)$	
		$\therefore y-4=-2(x-3)$	
		$\therefore 2x+y-10=0$	1
		--	
	ii)	Find the acute angle between the lines $3x-y=4$ and $2x+y=3$.	**03**
	Ans	For $3x-y=4$,	
		slope $m_1=-\frac{a}{b}=-\frac{3}{-1}=3$	½
		For $2x+y=3$,	
		slope $m_2=-\frac{a}{b}=-\frac{2}{1}=-2$	½
		$\therefore \tan\theta=\left\|\frac{m_1-m_2}{1+m_1m_2}\right\|$	
		$=\left\|\frac{3-(-2)}{1+3\times(-2)}\right\|$	1
		$=1$	½

Q. No.	Sub Q.N.	Answers	Marking Scheme
5.	b)ii)	$\therefore\ \theta = \tan^{-1}(1)$ $\therefore\ \theta = \frac{\pi}{4}$ or 45^0	½
	c)	Attempt the following:	**06**
	i)	Find the capacity of a cylindrical water tank whose radius is 2.1m and length is 5m.	**03**
	Ans	Let $r = 2.1$ & $h = 5$ capacity of a cylindrical water tank = volume of cylinder $\therefore V = \pi r^2 h$	
		$= \frac{22}{7} \times (2.1)^2 \times 5$	2
		$= 69.3$	1
	ii)	External dimensions of a wooden cuboid are 30 cm × 25 cm × 20 cm. If the thickness of wood is 2 cm all round. Find the volume of the wood contained in the cuboid formed.	**03**
	Ans	External length of the cuboid = 30 *cm* External breadth of the cuboid = 25 *cm* External height of the cuboid = 20 *cm*	
		External volume of the cuboid $= (30 \times 25 \times 20)\ cm^3$ $= 15000\ cm^3$	1
		Internal volume of the cuboid $= (26 \times 21 \times 16)\ cm^3$ $= 8736\ cm^3$	1
		Volume of wood = External Volume − Internal Volume $= 15000\ cm^3 - 8736\ cm^3$ $= 6264\ cm^3$	1
6.		Attempt **any two** of the following **:**	**12**
	a)	Calculate the mean, standard deviation and co-efficient of variance of the following data:	**06**

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	03	05	08	03	01

Q. No.	Sub Q.N.	Answers	Marking Scheme
6.	a)		

Class Interval	x_i	f_i	$f_i x_i$	$d_i = \frac{x_i - a}{h}$	$f_i d_i$	d_i^2	$f_i d_i^2$
0-10	5	3	15	-2	-6	4	12
10-20	15	5	75	-1	-5	1	5
20-30	25	8	200	0	0	0	0
30-40	35	3	105	1	3	1	3
40-50	45	1	45	2	2	4	4
		20	440		-6		24

3

Mean $\bar{x} = \frac{\sum f_i x_i}{N} = \frac{440}{20} = 22$ 1

$$S.D. = \sigma = \sqrt{\frac{\sum f_i d_i^2}{N} - \left(\frac{\sum f_i d_i}{N}\right)^2} \times h$$

$$= \sqrt{\frac{24}{20} - \left(\frac{-6}{20}\right)^2} \times 10$$ 1

$$= 10.54$$

Coefficient of variance $= \frac{\sigma}{\bar{x}} \times 100$

$$= \frac{10.54}{22} \times 100$$ 1

$$= 47.91$$

OR

Q. No.	Sub Q.N.	Answers	Marking Scheme
6.	a)		**06**

Class Interval	x_i	f_i	$f_i x_i$	x_i^2	$f_i x_i^2$
0-10	5	3	15	25	75
10-20	15	5	75	225	1125
20-30	25	8	200	625	5000
30-40	35	3	105	1225	3675
40-50	45	1	45	2025	2025
		20	440		11900

3

Mean $\bar{x} = \frac{\sum f_i x_i}{N} = \frac{440}{20} = 22$ 1

S.D. $\sigma = \sqrt{\frac{\sum f_i x_i^2}{N} - \left(\bar{x}\right)^2}$

$= \sqrt{\frac{11900}{20} - \left(22\right)^2}$

$\sigma = 10.54$ 1

Coefficient of variance $= \frac{\sigma}{\bar{x}} \times 100$

$= \frac{10.54}{22} \times 100$

$= 47.91$ 1

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b) Attempt the following: **06**

i) Calculate the range and coefficient of range from the following data: **03**

Marks	10-19	20-29	30-39	40-49	50-59	60-69
No. of students	6	10	16	14	8	4

Ans

Marks	9.5-19.5	19.5-29.5	29.5-39.5	39.5-49.5	49.5-59.5	59.5-69.5
No. of students	6	10	16	14	8	4

1

Q. No.	Sub Q.N.	Answers	Marking Scheme
6.	b)	Range $= L - S$ $= 69.5 - 9.5$ $= 60$	1
		Coefficient of range $= \frac{L-S}{L+S}$ $= \frac{69.5-9.5}{69.5+9.5}$ $= 0.76$	1
	ii)	The data of run scored by two batsmen A and B in five one day matches is given below :	**03**

Batsman	Average run scored	S.D.
A	44	5.1
B	54	6.31

State which batsman is more consistent?

Ans

For Batsman A

$C.V = \frac{\sigma}{\bar{x}} \times 100$

$= \frac{5.1}{44} \times 100$

$= 11.59$ 1

For Batsman B

$C.V = \frac{\sigma}{\bar{x}} \times 100$

$= \frac{6.31}{54} \times 100$

$= 11.69$ 1

$C.V$ of A < $C.V$ of B

$\therefore$ Batsman A is more consistent. 1

Q. No.	Sub Q.N.	Answers	Marking Scheme
6.	c)	Solve the following equations by matrix inversion method :	**06**
		$x+3y+3z=12$, $x+4y+4z=15$, $x+3y+4z=13$	
	Ans	Let $A=\begin{bmatrix}1&3&3\\1&4&4\\1&3&4\end{bmatrix}$, $B=\begin{bmatrix}12\\15\\13\end{bmatrix}$, $X=\begin{bmatrix}x\\y\\z\end{bmatrix}$	
		$\lvert A\rvert=\begin{vmatrix}1&3&3\\1&4&4\\1&3&4\end{vmatrix}$	
		$\lvert A\rvert=1(16-12)-3(4-4)+3(3-4)$	
		$\lvert A\rvert=4-0-3$	1
		$\therefore \lvert A\rvert=1\neq 0$	
		$\therefore A^{-1}$ exists	
		Matrix of minors $=\begin{bmatrix}\begin{vmatrix}4&4\\3&4\end{vmatrix}&\begin{vmatrix}1&4\\1&4\end{vmatrix}&\begin{vmatrix}1&4\\1&3\end{vmatrix}\\\begin{vmatrix}3&3\\3&4\end{vmatrix}&\begin{vmatrix}1&3\\1&4\end{vmatrix}&\begin{vmatrix}1&3\\1&3\end{vmatrix}\\\begin{vmatrix}3&3\\4&4\end{vmatrix}&\begin{vmatrix}1&3\\1&4\end{vmatrix}&\begin{vmatrix}1&3\\1&4\end{vmatrix}\end{bmatrix}$	
		$=\begin{bmatrix}4&0&-1\\3&1&0\\0&1&1\end{bmatrix}$	1
		Matrix of cofactors $=\begin{bmatrix}4&0&-1\\-3&1&0\\0&-1&1\end{bmatrix}$	1
		OR	
		$C_{11}=+\begin{vmatrix}4&4\\3&4\end{vmatrix}=16-12=4,\ C_{12}=-\begin{vmatrix}1&4\\1&4\end{vmatrix}=-(4-4)=0$	
		$C_{13}=+\begin{vmatrix}1&4\\1&3\end{vmatrix}=3-4=-1,\ C_{21}=-\begin{vmatrix}3&3\\3&4\end{vmatrix}=-(12-9)=-3$	
		$C_{22}=+\begin{vmatrix}1&3\\1&4\end{vmatrix}=4-3=1,\ C_{23}=-\begin{vmatrix}1&3\\1&3\end{vmatrix}=-(3-3)=0$	

Q. No.	Sub Q. N.	Answers	Marking Scheme
6.	c)	$C_{31}=+\begin{vmatrix}3&3\\4&4\end{vmatrix}=12-12=0,\ C_{32}=-\begin{vmatrix}1&3\\1&4\end{vmatrix}=-(4-3)=-1$	1
		$C_{33}=+\begin{vmatrix}1&3\\1&4\end{vmatrix}=4-3=1,$	
		Matrix of cofactors $=\begin{bmatrix}4&0&-1\\-3&1&0\\0&-1&1\end{bmatrix}$	1
		$\text{Adj}.A=\begin{bmatrix}4&-3&0\\0&1&-1\\-1&0&1\end{bmatrix}$	½
		$A^{-1}=\frac{1}{\lvert A\rvert}\text{Adj}.A$	
		$=\frac{1}{1}\begin{bmatrix}4&-3&0\\0&1&-1\\-1&0&1\end{bmatrix}$	½
		$\therefore X=A^{-1}B$	
		$\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}4&-3&0\\0&1&-1\\-1&0&1\end{bmatrix}\begin{bmatrix}12\\15\\13\end{bmatrix}$	
		$\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}48-45+0\\0+15-13\\-12+0+13\end{bmatrix}$	1
		$\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}3\\2\\1\end{bmatrix}$	1
		$\therefore\ x=3,\ y=2,\ z=1.$	
		--	

Important Note

In the solution of the question paper, wherever possible all the possible alternative methods of solution are given for the sake of convenience. Still student may follow a method other than the given herein. In such case, first see whether the method falls within the scope of the curriculum, and then only give appropriate marks in accordance with the scheme of marking.
