TARGET MATHEMATICS
THE EXCELLENCE KEY
AGYAT GUPTA (M.Sc., M.Phil.)

21st YEAR OF QUALITY EDUCATION

CODE:- AG-TS-7-7936 REGNO:-TMC -D/79/89/36

GENERAL INSTRUCTIONS :

1. All question are compulsory.
2. The question paper consists of 29 questions divided into three sections A,B and C. Section – A comprises of 10 question of 1 mark each. Section – B comprises of 12 questions of 4 marks each and Section – C comprises of 7 questions of 6 marks each .
3. Question numbers 1 to 10 in Section – A are multiple choice questions where you are to select one correct option out of the given four.
4. There is no overall choice. However, internal choice has been provided in 4 question of four marks and 2 questions of six marks each. You have to attempt only one lf the alternatives in all such questions.
5. Use of calculator is not permitted.
6. Please check that this question paper contains 5 printed pages.
7. Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.

Pre-Board Examination 2012 -13

Time : 3 Hours	अधिकतम समय : 3
Maximum Marks : 100	अधिकतम अंक : 100
Total No. Of Pages :6	कुल पृष्ठों की संख्या : 6

CLASS – XII ***CBSE*** ***MATHEMATICS***

PART – A

Q.1	If * is a binary operation given by *: $R\times R \to R, a*b = a+b^2$, then (-2)*5 is (a) -52 (b) 23 (c) 64 (d) 13 ANS : B

Q.2	If $\sin^{-1} : [-1,1] \to \left[\frac{\pi}{2}, \frac{3\pi}{2}\right]$ is a function, then value of $\sin^{-1}\left(-\frac{1}{2}\right)$ is (a) $\frac{-\pi}{6}$ (b) $\frac{-\pi}{6}$ (c) $\frac{5\pi}{6}$ (d) $\frac{7\pi}{6}$ ANS : D
Q.3	Given that $\begin{pmatrix} 9 & 6 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} 2 & 3 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 3 & 0 \\ 1 & 2 \end{pmatrix}$.Applying elementary row transformation $R_1 \to R_1 - 2R_2$ on both sides, we get (a) $\begin{pmatrix} 3 & 6 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} 2 & 3 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 1 & -4 \\ 1 & 2 \end{pmatrix}$ (b) $\begin{pmatrix} 3 & 6 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} 0 & 3 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 3 & 0 \\ 1 & 2 \end{pmatrix}$ © $\begin{pmatrix} -3 & 6 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} 2 & 3 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 3 & 0 \\ -3 & 2 \end{pmatrix}$ (d) $\begin{pmatrix} -3 & 6 \\ 3 & 0 \end{pmatrix} = \begin{pmatrix} -4 & 3 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 3 & 0 \\ 1 & 2 \end{pmatrix}$ ANS : B
Q.4	If A and B are square matrices of order 3 such that lAl = –1 and lBl = 4, then what is the value of l3(AB)l ? ANS : - 108
Q.5	Write the number of all one – one function from the set A with Cartesian number 4 to itself . ANS : - 4! = 24
NOTE:	Fill in the blanks in each of the Questions 6 to 8 .
Q.6	The order & degree of the differential equation $\left(\frac{d^2y}{dx^2}\right)^5 + \frac{4\left(\frac{d^2y}{dx^2}\right)^3}{\left(\frac{d^3y}{dx^3}\right)} + \left(\frac{d^3y}{dx^3}\right) = x^2 - 1$ is….ANS : order 3 & degree 2
Q.7	The integrating factor for solving the linear differential equation $x\frac{dy}{dx} - y = x^2 is$.......... .... ANS : 1/ x
Q.8	Prove that a powerful bomb shot along the line $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ of fire will never hit a helicopter flying in the plane 2x + 4y – 4z +11 = 0 . ans

	: prove that line and plane are parallel to each other .
Q.9	A bird is located at the point A(3, 2, 8) in space. It wants to move to the plane whose equation is given by 3 x + 2y + 6 z +16 =0 in the shortest time. Find the distance she covered. Ans : 11 unit
Q.10	The confidence gained by playing x games of tennis at a trial function is given by $C(x) = 11 + 15x + 6x^2 - x^3$. Find the marginal confidence gained after playing 5 games. ans : 0
PART – B	
Q.11	Let n be a fixed positive integer and R be the relation in Z defined as a R b if and only if a – b is divisible by n, $\forall\ a,b \in Z$. Show that R is an equivalence relation Ans : (i) Since a R a, $\forall a \in$ Z, and because 0 is divisible by n, therefore R is reflexive. 1 (ii) a R $b \Rightarrow a - b$ is divisible by n, then $b - a$, is divisible by n, so b R a. Hence R is symmetric. 1 (iii) Let a R b and b R c, for $a,b,c, \in$ **Z**. Then $a - b = np$, $b - c = nq$, for some $p, q \in$ **Z** Therefore, $a - c = n(p + q)$ and so a R c. 1 Hence R is reflexive and so equivalence relation. 1
Q.12	Prove that $\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$. ans: $\text{LHS} = \tan^{-1}\frac{1}{7} + \tan^{-1}\frac{1}{8} + \tan^{-1}\frac{1}{18}$ $= \tan^{-1}\frac{\frac{1}{7}+\frac{1}{8}}{1-\frac{1}{7}\cdot\frac{1}{8}} + \tan^{-1}\frac{1}{18} = \tan^{-1}\left(\frac{15}{55}\right) + \tan^{-1}\frac{1}{18}$ $= \tan^{-1}\frac{3}{11} + \tan^{-1}\frac{1}{18} = \tan^{-1}\frac{\frac{3}{11}+\frac{1}{18}}{1-\frac{3}{11}\cdot\frac{1}{18}} = \tan^{-1}\frac{65}{195}$ $= \tan^{-1}\frac{1}{3} = \cot^{-1}3 = \text{RHS}$ **OR** Solve the equation $\tan^{-1}(2+x) + \tan^{-1}(2-x) = \tan^{-1}\frac{2}{3}, -\sqrt{3} > x > \sqrt{3}$. ans : Since $\tan^{-1}(2+x) + \tan^{-1}(2-x) = \tan^{-1}\frac{2}{3}$ Therefore, $\tan^{-1}\frac{(2+x)+(2-x)}{1-(2+x)(2-x)} = \tan^{-1}\frac{2}{3}$ Thus $\frac{4}{x^2-3} = \frac{2}{3}$ $\Rightarrow x^2 = 9 \Rightarrow x = \pm 3$
Q.13	There are 40 hardworking scholars in a class. Out of which 10 are sports-persons. Three scholars are selected at random out of them. Write the probability distribution for selected persons who are sports-persons. Find the mean of distribution. Explain the importance of sports

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in education. Ans :

Probability Distribution:

X	0	1	2	2
P(X)	406/988	435/988	135/988	12/988

Mean = 741/988 = 3/4.

Importance of sports in Education: It takes care of the mental and physical fitness of the body. It is helpful for the growth of student in the field of studies as well.

Q.14 Solve for x, $\begin{vmatrix} x+2 & x+6 & x-1 \\ x+6 & x-1 & x+2 \\ x-1 & x+2 & x+6 \end{vmatrix} = 0$ .ans

Given, $\begin{vmatrix} x+2 & x+6 & x-1 \\ x+6 & x-1 & x+2 \\ x-1 & x+2 & x+6 \end{vmatrix} = 0$

Using $\begin{matrix} R_2 \to R_2 - R_1 \\ R_3 \to R_3 - R_1 \end{matrix}$, we get $\begin{vmatrix} x+2 & x+6 & x-1 \\ 4 & -7 & 3 \\ -3 & -4 & 7 \end{vmatrix} = 0$

Using $\begin{matrix} C_2 \to C_2 - C_1 \\ C_3 \to C_3 - C_1 \end{matrix}$, we get $\begin{vmatrix} x+2 & 4 & -3 \\ 4 & -11 & -1 \\ -3 & -1 & 10 \end{vmatrix} = 0$

Therefore, $(x+2)(-111) - 4(37) - 3(-37) = 0$ $\quad x = -\frac{7}{3}$

Q.15 Determine the value of K so that the function :

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$$f(x) = \begin{cases} \dfrac{k.\cos 2x}{\pi - 4x} & if x \neq \dfrac{\pi}{4} \\ 5 & if x = \dfrac{\pi}{4} \end{cases}, \quad \text{is continuous at } x = \frac{\pi}{4}.$$

ans : Since f is continous at $x = \frac{\pi}{4}$, we have $\lim_{x \to \frac{\pi}{4}} f(x) = 5$.

3

Now $\lim_{x \to \frac{\pi}{4}} f(x) = \lim_{x \to \frac{\pi}{4}} \frac{k.\cos 2x}{\pi - 4x} = \lim_{y \to 0} \frac{k \cos 2(\frac{\pi}{4} - y)}{\pi - 4(\frac{\pi}{4} - y)}$, where $\frac{\pi}{4} - x = y$,

$= \lim_{y \to 0} \frac{k.\cos(\frac{\pi}{2} - 2y)}{\pi - \pi + 4y} = \lim_{y \to 0} \frac{(k \sin 2y)}{2.\,2y} = \frac{k}{2}$

Therefore, $\frac{k}{2} = 5 \Rightarrow k = 10.$

Q.16 If $x = \dfrac{1 + \log t}{t^2}$, $y = \dfrac{3 + 2\log t}{t}$ prove that $yy_1 - 2xy_1^2 = 1$.

OR

If $y = e^{a \cos^{-1} x}$, Show that $(1 - x^2)\dfrac{d^2 y}{d^2 x} - s\dfrac{dy}{dx} - a^2 y = 0.$

ans: $y = e^{a\cos^{-1} x} \Rightarrow \dfrac{dy}{dx} = e^{a\cos^{-1} x} \dfrac{(-a)}{\sqrt{1-x^2}}$ Therefore,

$\sqrt{1-x^2}\,\dfrac{dy}{dx} = -ay$.......(1) Differentiating again w.r.t. x, we get

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$$\sqrt{1-x^2}\,\frac{d^2y}{dx^2}-\frac{x}{\sqrt{1-x^2}}\frac{dy}{dx}=-\frac{a\,dy}{dx}$$

$$\Rightarrow(1-x^2)\frac{d^2y}{dx^2}-x\frac{dy}{dx}=-a\sqrt{1-x^2}\,\frac{dy}{dx}$$

$= -a(-ay)$ [from 1]

Hence $(1-x^2)\dfrac{d^2y}{dx^2}-x\dfrac{dy}{dx}-a^2y=0$.

Q.17 Find the equation of the tangent to the curve $x = \sin 3t$, $y = \cos 2t$ at $t=\dfrac{\pi}{4}$ .ans : $\dfrac{dx}{dt}=+3\cos 3t,\ \dfrac{dy}{dt}=-2\sin 2t$

Therefore, $\dfrac{dy}{dx}=-\dfrac{2\sin 2t}{3\cos 3t}$, and $\left(\dfrac{dy}{dx}\right)_{t=\frac{\pi}{4}}=\dfrac{-2\sin\frac{\pi}{2}}{3\cos 3\frac{\pi}{4}}=\dfrac{-2}{3.(-\frac{1}{\sqrt{2}})}=\dfrac{2\sqrt{2}}{3}$

Also $x=\sin 3t=\sin 3\dfrac{\pi}{4}=\dfrac{1}{\sqrt{2}}$ and $y=\cos 2t=\cos\dfrac{\pi}{2}=0$.

Therefore, Point is $\left(\dfrac{1}{\sqrt{2}},0\right)$

Hence, equation of tangent is $y-0=\dfrac{2\sqrt{2}}{3}\left(x-\dfrac{1}{\sqrt{2}}\right)$ Therefore,

$2\sqrt{2}\,x-3y-2=0$

OR

Find the intervals in which the function

$f(x)=\sin^4 x+\cos^4 x, 0<x<\dfrac{\pi}{2}$, is increasing or decreasing .ans :

$f'(x) = 4\sin^3x\ \cos x - 4\cos^3x\ \sin x$

$= -4\sin x\cos x\,(\cos^2x-\sin^2x)$

$= -\sin 4x$. Therefore,

$f'(x)=0\Rightarrow 4x=n\pi\Rightarrow x=n\dfrac{\pi}{4}$

Now, for $0<x<\dfrac{\pi}{4}$,

$f'(x)<0$ Therefore, f is strictly decreasing in $(0,\frac{\pi}{4})$ Similarly, we can show that f is strictly increasing in $(\frac{\pi}{4},\frac{\pi}{2})$.

Q.18 Evaluate $\displaystyle\int_0^{\frac{\pi}{6}}\sin^4 x\cos^3 x\,dx$. Ans $I=\int_0^{\frac{\pi}{6}}\sin^4 x\cos^3 x\,dx$

$=\int_0^{\frac{\pi}{6}}\sin^4 x(1-\sin^2 x)\cos x\,dx$ $=\int_0^{\frac{1}{2}}t^4(1-t^2)\,dt$, where $\sin x=t$

$=\int_0^{\frac{1}{2}}(t^4-t^6)\,dt=\left[\dfrac{t^5}{5}-\dfrac{t^7}{7}\right]_0^{\frac{1}{2}}$ $=\dfrac{1}{5}\left(\dfrac{1}{2}\right)^5-\dfrac{1}{7}\left(\dfrac{1}{2}\right)^7=\dfrac{1}{32}\left(\dfrac{1}{5}-\dfrac{1}{28}\right)=\dfrac{23}{4480}$

Q.19 Evaluate $\displaystyle\int\frac{3x+1}{2x^2-2x+3}dx$ Ans: $I=\displaystyle\int\frac{3x+1}{2x^2-2x+3}dx=\int\frac{\frac{3}{4}(4x-2)+\frac{5}{2}}{2x^2-2x+3}dx$

	$=\frac{3}{4}\int\frac{4x-2}{2x^2-2x+3}dx+\frac{5}{4}\int\frac{1}{x^2-x+\frac{3}{2}}dx$ $=\frac{3}{4}\log\|2x^2-2x+3\|+\frac{5}{4}\frac{2}{\sqrt5}\tan^{-1}\frac{2x-1}{\sqrt5}+c$ $=\frac{3}{4}\log\|2x^2-2x+3\|+\frac{\sqrt5}{2}\tan^{-1}\frac{2x-1}{\sqrt5}+c$ **OR** Evaluate : $\int x(\log x)^2\,dx$ .ans : $I=\int x(\log x)^2.dx=\int(\log x)^2\,x\,dx$ $=(\log x)^2\frac{x^2}{2}-\int 2\log x\frac{1}{x}\frac{x^2}{2}dx$ $=\frac{x^2}{2}(\log x)^2-\int\log x.\,x\,dx$ $=\frac{x^2}{2}(\log x)^2-\left[\log x.\frac{x^2}{2}-\int\frac{1}{x}.\frac{x^2}{2}dx\right]$ $=\frac{x^2}{2}(\log x)^2-\frac{x^2}{2}\log x+\frac{x^2}{4}+c$
Q.20	Find a particular solution of the differential equation: $2ye^{\frac{x}{y}}dx+(y-2xe^{\frac{x}{y}})dy=0$, given that x = 0 when y = 1.ans: Given differential equation can be written as $\frac{dx}{dy}=\frac{2xe^{\frac{x}{y}}-y}{2y.e^{\frac{x}{y}}}$ Putting $\frac{x}{y}=v\Rightarrow x=vy\Rightarrow\frac{dx}{dy}=v+y\frac{dv}{dy}$ Therefore, $v+y\frac{dv}{dy}=\frac{2vye^v-y}{2ye^v}=\frac{2ve^v-1}{2e^v}$

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	$y\frac{dv}{dy}=\frac{2ve^v-1}{2e^v}-v$ Hence $2e^v dv=-\frac{dy}{y}$ $\Rightarrow 2e^v=-\log\|y\|+c$ or $2e^{\frac{x}{y}}=-\log\|y\|+c$ when $x=0,\ y=1\Rightarrow$ C = 2 Therefore, the particular solution is $2e^{\frac{x}{y}}=-\log\|y\|+2$
Q.21	If $\vec a=2\hat i-2\hat j+\hat k,\vec b=\hat i+2\hat j-3\hat k$ and $\vec c=2\hat i-\hat j+4\hat k$, then find the projection of $\vec b+\vec c$ along $\vec a$. What are benefits of speaking truth?ans $\vec b+\vec c=(\hat i+2\hat j-3\hat k)+(2\hat i-\hat j+4\hat k)=3\hat i+\hat j+\hat k$ $\vec a=2\hat i-2\hat j+\hat k$ Projection of $(\vec b+\vec c)$ along $\vec a=\frac{(\vec b+\vec c).\vec a}{\|\vec a\|}$ is $\frac{6-2+1}{\sqrt{4+4+1}}=\frac{5}{3}$ units **Ans:** In case , you always speak the truth (a)People will always believe you. (b)There is no more stress on you. (c)You will have a good recognition. There can be multiple answers to the value based questions. Students may have their own opinion about answering them, there is no specific solution. Marks would be given for all sensible answers.
Q.22	Determine the vector equation of a line passing through (1, 2 ,-4) and perpendicular to the two lines $\vec r=(8\hat i-16\hat j+10\hat k)+\lambda(3\hat i-16\hat j+7\hat k)$ & $(15\hat i+29\hat j+5\hat k)+\mu(3i+8\hat j-5\hat k)$. ans: A vector perpendicular to the two lines is given as

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$(3\hat{i}-16\hat{j}+7\hat{k})\times(3\hat{i}+8\hat{j}-5\hat{k})=\begin{vmatrix}\hat{i}&\hat{j}&\hat{k}\\3&-16&7\\3&8&-5\end{vmatrix}$

$=24\hat{i}+36\hat{j}+72\hat{k}$ or $12(2\hat{i}+3\hat{j}+6\hat{k})$ Therefore, Equation of required line is $\vec{r}=(\hat{i}+2\hat{j}-4\hat{k})+\lambda(2\hat{i}+3\hat{j}+6\hat{k})$

PART – C

Q.23 State the condition for matrix A is invert able .Find A^{-1}, where A = $\begin{pmatrix}4&1&3\\2&1&1\\3&1&-2\end{pmatrix}$ .Hence solve the following system of equations : 4x+ 2y + 3z =2, x + y + z = 1, 3x + y - 2z = 5, ans: |A| = 4 (–3) –1 (–7) + 3 (–1) = –12 + 7 – 3 = –8 Therefore, $A^{-1}=-\frac{1}{8}\begin{pmatrix}-3&5&-2\\7&-17&2\\-1&-1&2\end{pmatrix}$ Given equations can be written as $\begin{pmatrix}4&2&3\\1&1&1\\3&1&-2\end{pmatrix}\begin{pmatrix}x\\y\\z\end{pmatrix}=\begin{pmatrix}2\\1\\5\end{pmatrix}$

$\Rightarrow A'.X=B\Rightarrow X=(A'^{-1})B$

$=(A^{-1})'B$ $\Rightarrow\begin{pmatrix}x\\y\\z\end{pmatrix}=\frac{-1}{8}\begin{pmatrix}-3&7&-1\\5&-17&-1\\-2&2&2\end{pmatrix}\begin{pmatrix}2\\1\\5\end{pmatrix}$

$=-\frac{1}{8}\begin{pmatrix}-6&+7&-5=&-4\\10&-17&-5=&-12\\-4&+2&+10=&8\end{pmatrix}=\begin{pmatrix}\frac{1}{2}\\\frac{3}{2}\\-1\end{pmatrix}$ Therefore, $x=\frac{1}{2},\ y=\frac{3}{2},\ z=-1$

OR

Discuss whether the matrix A is invert able or not if invert able then using elementary transformations, find A^{-1}, where

A = $\begin{pmatrix}1&2&-2\\-1&3&0\\0&-2&1\end{pmatrix}$. ans

Writing $A=\begin{pmatrix}1&2&-2\\-1&3&0\\0&-2&1\end{pmatrix}=\begin{pmatrix}1&0&0\\0&1&0\\0&0&1\end{pmatrix}A$;

$R_2\to R_2+R_1\Rightarrow\begin{pmatrix}1&2&-2\\0&5&-2\\0&-2&1\end{pmatrix}=\begin{pmatrix}1&0&0\\1&1&0\\0&0&1\end{pmatrix}A$

$R_2\to R_2+2R_3\Rightarrow\begin{pmatrix}1&2&-2\\0&1&0\\0&-2&1\end{pmatrix}=\begin{pmatrix}1&0&0\\1&1&2\\0&0&1\end{pmatrix}A$

$R_3\to R_3+2R_2\Rightarrow\begin{pmatrix}1&2&-2\\0&1&0\\0&0&1\end{pmatrix}=\begin{pmatrix}1&0&0\\1&1&2\\2&2&5\end{pmatrix}A$

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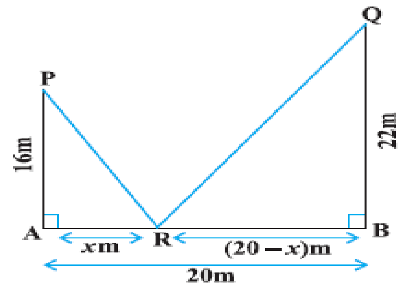
$$R_1 \to R_1 + 2R_3 \Rightarrow \begin{pmatrix} 1 & 2 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 5 & 4 & 10 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix} A$$

$$R_1 \to R_1 - 2R_2 \Rightarrow \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} = \begin{pmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix} A \Rightarrow A^{-1} = \begin{pmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix}$$

Q.24 Let AP and BQ be two vertical poles at points A and B, respectively. If AP = 16 m, BQ = 22 m and AB = 20 m, then find the distance of a point R on AB from the point A such that $RP^2 + RQ^2$



G.

Q.25 Evaluate $\int_1^3 (3x^2 + 2x + 5)\,dx$ by the method of limit of sum.ans :

$$I = \int_1^3 (3x^2 + 2x + 5)\,dx = \int_1^3 f(x)\,dx$$

$$= \lim_{h \to o} h\left[f(1) + f(1+h) + f(1+2h) + \ldots\ldots + f(1+(n-1)h)\right] \ldots\ldots \text{(i)}$$

where $h = \frac{3-1}{n} = \frac{2}{n}$

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$$f(1) = 3 + 2 + 5 = 10$$

$$f(1+h) = 3 + 3h^2 + 6h + 2 + 2h + 5 = 10 + 8h + 3h^2$$

$$f(1+2h) = 3 + 12h^2 + 12h + 2 + 4h + 5 = 10 + 8.2.h + 3.2^2.h^2$$

$$f(1+(n-1)h) = 10 + 8(n-1)\,h + 3(n-1)^2.h^2$$

$$I = \lim_{n \to \infty} h\left[10n + 8h\frac{n(n-1)}{2} + 3h^2\frac{n(n-1)(2n-1)}{6}\right]$$

$$= \lim_{n \to \infty} \frac{2}{n}\left[10n + \frac{16}{n}\frac{n(n-1)}{2} + \frac{12}{n^2}\frac{n(n-1)(2n-1)}{6}\right]$$

$$= \lim_{n \to \infty} \frac{2}{n}\left[10n + 8(n-1)\frac{2}{n}(n-1)\,(2n-1)\right]$$

$$= \lim_{n \to \infty} 2\left[10 + 8\left(1 - \frac{1}{n}\right) + 2\left(1 - \frac{1}{n}\right)\left(2 - \frac{1}{n}\right)\right]$$

$$= 2\,[10 + 8 + 4] = 44$$

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Q.26 Using integration, find the area of the triangle bounded by the lines y = 2x + 1, y = 3x +1 and x = 4. Ans Required Area $=\int_0^4 (3x+1)dx-\int_0^4 (2x+1)dx = 8unit^2$

Q.27 A line with direction numbers <2, 7, -5> is drawn to intersect the lines $\frac{x-5}{3}=\frac{y-7}{-1}=\frac{z+2}{1}$ and $\frac{x+3}{-3}=\frac{y-3}{2}=\frac{z-6}{4}$. Find the co – ordinates of the points of intersection and the length intercepted o it. ANS. (2, 8, -3), (0, 1, 2); $\sqrt{78}$.

OR

A bird at A(7, 14, 5) in space wants to reach a point P on the plane 2x + 4y – z = 2 when AP is least. Find the position of P and also the distance AP travelled by the bird. Ans : find foot of perpendicular . P(1, 2 ,8) . Also AP = $\sqrt{189} = 3\sqrt{21}$

Q.28 There is a group of 50 people who are patriotic out of which 20 believe in non violence. Two persons are selected at random out of them, write the probability distribution for the selected persons who are non violent. Also find the mean of the distribution. Explain the importance of Non violence in patriotism. ANS : Let x denote the number of non-violent persons out of selected two. X can take values 0, 1, 2 non-violent 20: Violent patriotism: 30 ; P(x = 0)=(30x29)/50x49 = 87/245 ; P(x = 1) = (30x20x2)/50x49 = 120/245 ; P(x = 2) = (20x19)/50x49 = 38/245 & Mean = 0x87/245 + 1x120/245 + 2x38/245 = 198/245 . **Importance:** In order to have a peaceful environment both the values are required patriotism and non-violence only patriotism with violence could be very dangerous . There can be multiple answers to the value based questions. Students may have their own opinion about answering them, there is no specific solution. Marks would be given for all sensible answers.

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Q.29 A furniture firm manufactures chairs and tables, each requiring the use of three machines A, B and C. Production of one chair requires 2 hours on machine A, 1 hour on machine B and 1 hour on machine C. Each table requires 1 hour each on machine A and B and 3 hours on machine C. The profit obtained by selling one chair is Rs 30 while by selling one table the profit is Rs 60. The total time available per week on machine A is 70 hours, on machine B is 40 hours and on machine C is 90 hours. How many chairs and tables should be made per week so as to maximize profit? Formulate the problems as a L.P.P. and solve it graphically. Keeping the rural background in mind justify the 'values' to be promoted for the selection of the manually operated machine. Ans :

Let number of chairs to be made per week be x and tables be y

Thus we have to maximise P = 30 x + 60 y

Subject to $2x + y \le 70$

$x + y \le 40$

$x + 3y \le 90$

$x \ge 0 y \ge 0$

Vertices of feasible region are

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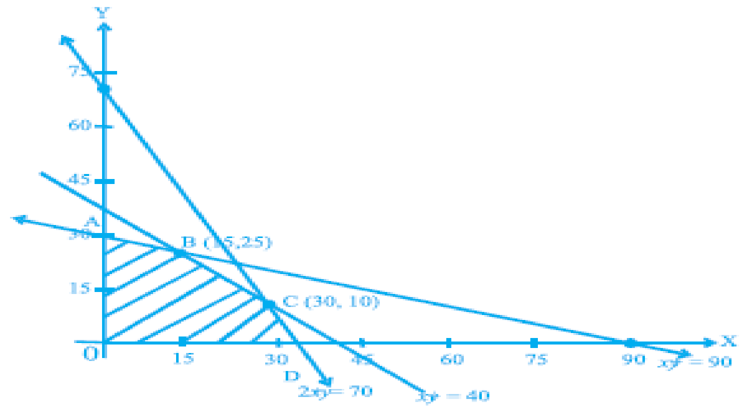

Fig. 2.4

A (0,30), B (15, 25), C (30,10), D (35, 0)

P (at A) = 30 (60) = 1800

P (at B) = 30 (15 + 50) = 1950

P (at C) = 30 (30 + 20) = 1500

P (at D) = 30 (35) = 1050

P is Maximum for 15 chairs and 25 tables.

ANS Keeping the 'save environment' factor in mind the manually operated machine should be promoted so that energy could be saved. There can be multiple answers to the value based questions. Students may have their own opinion about answering them, there is no specific solution. Marks would be given for all sensible answers.

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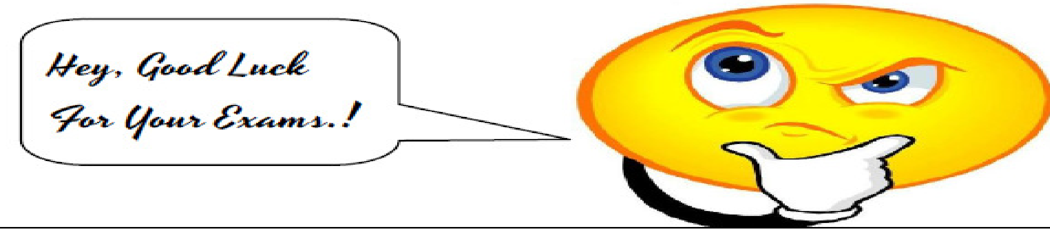

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