Brain International School
Vikas Puri, New Delhi

REVISION SHEET

SUBJECT:MATHEMATICS **CLASS-XII** **TERM 1**

SECTION A MCQ

Q1 Let A = {1, 2, 3} and consider the relation R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)}
Then R is
(a) reflexive but not symmetric (b) reflexive but not transitive
(c) symmetric and transitive (d) neither symmetric, nor transitive

Q 2 The relation R is defined on the set of natural numbers as R = {(a, b) : a = 2b}. Then R^{-1} is given by
(a) {(2, 1), (4, 2), (6, 3), …} (b) {(1, 2), (2, 4), (3, 6), …}
(c) R^{-1} is not defined (d) None

Q 3 For real numbers x and y, we write $xRy \Leftrightarrow x-y$ is an integer. Then the relation R is
(a) Equivalence (b) Symmetric but not reflexive
(c)Transitive but not symmetric (d) Reflexive but not transitive

Q 4 Let S be the set of all real numbers. Then the relation R = {(a, b) : 1 + ab > 0} on S is
(a) Reflexive and symmetric but not transitive
(b) Reflexive and transitive but not symmetric
(c) Symmetric and transitive but not reflexive
(d) Reflexive and transitive but not symmetric

Q5 Let A = {1, 2, 3, ..n} and B = {a, b}. Then the number of surjections from A to B is

a) nP_2 b) 2^n-2 c) 2^n-1 d) None of these q 59 b

Q 6 Let $f:R\to R$ be defined by $f(x)=\frac{1}{x}$ $\forall\ x \in R$. Then f is q 60 d

a) One-one b) onto c) Bijective d) f is not defined

Q 7 Let $f=[2,\infty)\to R$ be the function defined as $f(x)=x^2-4x+5$, then the range of f is

a) R b) $[1,\infty)$ c) $[4,\infty)$ d) $[5,\infty)$ q 61 b

Q 8 Which of the following is the principal value of $cosec^{-1}x$?

a) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ b) $[0,\pi]-\frac{\pi}{2}$ c) $\left\{\frac{\pi}{2}\right\}\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ d) $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]-\{0\}$

Q 9 The domain of $sin^{-1}2x$ is

a) [0, 1] b) [−1, 1] c) $\left[-\frac{1}{2},\frac{1}{2}\right]$ d) [−2, 2]

Q 10 The domain of the function $cos^{-1}(2x-1)$ is

a) [0, 1] b) [−1,1] c) (−1,1) d) $[0,\pi]$

Q 11 The value of $\sin\left(2\ sin^{-1}(.6)\right)$ is

a) .48 b) .96 c) 1.2 d) 1.48

Q 12 If $sin^{-1}x+sin^{-1}y=\frac{\pi}{2}$, then value of $cos^{-1}x+cos^{-1}y$ is

a) $\frac{\pi}{2}$ b) π c) 0 d) $\frac{2\pi}{3}$

Q 13 The value of the expression $\sin[cot^{-1}(\cos(tan^{-1}1))]$ is

a) 0 b) 1 c) $\frac{1}{\sqrt{3}}$ d) $\sqrt{\frac{2}{3}}$

Q 14 The equation $tan^{-1}x - cot^{-1}x = tan^{-1}(\frac{1}{\sqrt{3}})$ has

a) no solution b) unique solution c) Infinite number of solutions d) Two solutions

Q 15 The matrix $\begin{bmatrix} 0 & -5 & 8 \\ 5 & 0 & 12 \\ -8 & -12 & 0 \end{bmatrix}$ is a

a) Diagonal matrix b) Symmetric matrix c) Skew symmetric matrix d)Scalar matrix

Q 16 If A is matrix of order m x n and B is a matrix such that AB' and $B'A$ are both defined, then order of matrix B is

a) m x m *b)* n x n *c)* n x m *d)* m x n

Q 17 If A is a square matrix such that $A^2 = I$, then $(A-I)^3 + (A+I)^3 - 7A$ is equal to

a) A b) I – A c) I + A d) 3A

Q 18 Which of the following is correct?

a) determinant is a square matrix (b) Determinant is a number associated to a matrix

© Determinant is a number associated to a Square matrix (d) None

Q 19 If A is a 3×3 matrix and |3A| = k|A|, then k is equal to:

a) 3 (b) 9 (c) 27 (d) None

Q 20 If the points (2, -5), (-4, 5) and (x, 15) are collinear then value of x is

a) 10 (b) -10 (c) 0 (d) 1

Q 21 If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, then value of x is:

a) 3 (b) ±6 (c) ±3 (d) -6

Q 22 The maximum value of $\Delta = \begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+sin\theta & 1 \\ 1+cos\theta & 1 & 1 \end{vmatrix}$ is (θ is real number)

a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\sqrt{2}$ (d) $\frac{2\sqrt{3}}{4}$

Q 23 If $A = \begin{bmatrix} 2 & \gamma & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{bmatrix}$, then A^{-1} exists if

(a $\gamma = 2$ (b) $\gamma \neq 2$ (c) $\gamma \neq -2$ (d) None of these

Q 24. $(sin^{-1}2x + cos^{-1}2x), |x| \leq \frac{1}{2}$, *then* $\frac{dy}{dx}$ is

(a) 1 (b) 0 (c) 2 (d) x

Q25. The value of 'k' for which the following function is continuous at x = 3: $f(x) = \begin{cases} \frac{(x+3)^2-36}{x-3}, & x \neq 3 \\ k, & x = 3 \end{cases}$ is

(a) 12 (b) 3 (c) 14 (d) 9

Q 26. The function $f(x) = \frac{4-x^2}{4x-x^3}$ is

(a) discontinuous at only one point
(b) discontinuous at exactly at two points
(c) discontinuous at exactly at three points
(d) None

Q 27. Differential coefficient of $sec(tan^{-1}x)$ w. r. t is

(a) $\frac{x}{\sqrt{1+x^2}}$ (b) $\frac{x}{1+x^2}$ (c) $x\sqrt{1+x^2}$ (d) $\frac{1}{\sqrt{1+x^2}}$

Q 28. If $x=t^2$ and $y=t^3$, then $\frac{d^2y}{dx^2}$ is:

(a) $\frac{3}{2}$ (b) $\frac{3}{2t}$ (c) $\frac{3}{4t}$ (d) $\frac{4}{3t}$

Q 29 The function $f(x)=\begin{cases}\frac{sinx}{x}+cosx, & if\ x\neq 0\\ k, & if\ x=0\end{cases}$ is continuous at $x=0$, then value of k is

a) 3 b) 2 c) 1 d) 1.5

Q 30 The function $f(x)=[x]$, where $[x]$ denotes the greater integer function, is continuous at

a) 4 b) -2 c) 1 d) 1.5

Q31 The number of points at which the function $f(x)=\frac{1}{x-[x]}$ is not continuous at

a) 1 b) 2 c) 3 d) None of these

Q 32 If f(x) = |x|, then $\frac{d}{dx}[f(x)]$ at x = 0 is

(a) -1 (b) 1

(c) $\pm\frac{|x|}{x}$ (d) Doesn't exist

Q33. The function $f(x)=x^3-3x^2-9x-7$ has a stationary point at:

(a) -1 only (b) 3 only (c) -1 and 3 (d) None

Q 34. The sides of an equilateral triangle are increasing at the rate of 2cm/s. The rate at which the area increases, when side i 10cm is:

(a) 10 cm^2/s (b) $\sqrt{3}\ cm^2/s$ (c) $10\sqrt{3}\ cm^2/s$ (d) $\frac{10}{3}\ cm^2/s$

Q 35 The rate of change of the area of a circle with respect to its radius r at r = 4cm is

(a) 8π cm (b) 10π cm (c) 4π cm (d) 12π cm

Q 36 The function $f(x)=tan^{-1}(cosx+sinx)$ is an increasing function in the interval:

(a) $\left(0,\frac{\pi}{4}\right)$ (b) $\left(\frac{\pi}{4},\frac{\pi}{2}\right)$ (c) $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ (d) $\left(0,\frac{\pi}{2}\right)$

Q 37. $\int_0^1 sin(sin^{-1}x+cos^{-1}x)dx$ **is equal to**

(a) 2 **(b) 0** **(c) 1** **(d) None**

Q38. $\int\frac{dx}{x^2+6x+13}$**=?**

(a) $log\left(x^2+6x+13\right)+C$ **(b)** $\frac{1}{x^2+6x+13}+C$

(c) $\frac{1}{2}tan^{-1}\left(\frac{x+3}{2}\right)+C$ **(d)** $\frac{1}{2}sec^{-1}\left(\frac{x+3}{2}\right)+C$

Q39 . Find the area enclosed between the curve $y=x^{\frac{1}{3}}$, x-axis and the lines x = 2 and x = 6 is given by

(a) $\int_2^6 x^{\frac{1}{3}}dx$ **(b)** $\int_0^2 x^{\frac{1}{3}}dx+\int_2^6 x^{\frac{1}{3}}dx$ **(c)** $\int_0^6 x^{\frac{1}{3}}dx$ **(d)** $\int_6^2 x^{\frac{1}{3}}dx$

Q 40 Find the area of region bounded by parabola $y=x^2$ and $y=|x|$ is

a) 3 b) ½ c) 1/3 d) 2

Q 41 assertion : $\mathbf{A}=\begin{bmatrix}3&0&0\\0&5&0\\0&0&7\end{bmatrix}$ then Det of A = 105

Reasoning The determinant of a diagonal matrix is equal to product of its diagonal elements.

Q 42 Assertion : Determinant of a skew symmetric matrix of order 3 is always zero

REASON *For any matrix A, Det (A) = Det (A^T) and Det (− A) = − Det (A) where Det (B) denotes the determinant of matrix B. Then,*

Q 43 **Assertion (A) :** The relation $R=\{(a,b):a\leq b^2\}$ on the set R of real nos. is not reflexive.

Reason (R) : A relation on a set A is reflexive if $(a,a)\in R\ \forall\ a\in A$.

Q 44 **Assertion (A) :** Let $f:R\to R$ defined as $f(x)=[x]$, here $[\ .\ ]$ represents the greatest integer function. Then f is not one-one.

Q45 **Reason (R) :** A function is one-one if $f(\alpha)=f(\beta)$ implies $\alpha=\beta$.

Assertion (A) : $f(x)=\log|x|$ is always continuous for all real values of x.

Reason (R) : A function is always continuous at all the points of its domain.

Q 46 **Assertion (A) :** If $y = x e^x$, then $\frac{dy}{dx} = x e^x + e^x$. **Reason (R) :** $\frac{d}{dx}(u\,v) = u\frac{dv}{dx} + v\frac{du}{dx}$.

Section B 2 MARKERS

Q47 Show that the relation R in the sets of Z of integers given by R = {(a, b): 2 divides a – b} is an equivalence relation.

Q 48 Let R be a relation on the set A of ordered pairs of positive integers defined by (x, y) R (u, v) if and only if xv = yu. Show that R is an equivalence relation.

Q 49 Show that the Signum functions F: R → R, given by $f(x) = \begin{cases} 1, & if\ x>0 \\ 0, & if\ x=0 \\ -1, & if\ x<0 \end{cases}$ is neither one -one nor onto

Q 50 Let A and B be sets. Show that f: A × B → B × A such that $f(a, b) = (b, a)$ is bijective function.

Q 51 Let f: N→N be defined $f(n) = \begin{cases} \frac{n+1}{2}, & if\ n\ is\ odd \\ \frac{n}{2}, & if\ n\ is\ even \end{cases}$

State whether the function f is bijective. Justify your answer

Q 52 If R_1 and R_2 are equivalence relations on set A. show that $R_1 \cap R_2$ is also an equivalence relation.

Q53 Let A = {1, 2, 3,…, 9} and R be the relation in A x A defined by (a, b) R (c, d) if a + d = b + c for (a, b), (c, d) in A x A. Prove that R is an equivalence relation & also obtain the equivalent class [(2, 5)].

Q 54 Let f: R → R be the function defined by $f(x) = \frac{1}{2-\cos x}\ \forall\ x \in R$ .Then, find range of f.

Q 55 Let R be the relation on N x N defined by, $(a, b)R(c, d) \Leftrightarrow ad(c+b) = bc(a+d)$.SHOW EQ

Q 56 Prove that the relation R on the set Z of all integers defined by x R y ⇔ $x^y = y^x$

Q 57 Evaluate the following:

d) $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ **e)** $\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$ **f)** $\sin^{-1}\left(\sin\left(\frac{3\pi}{5}\right)\right)$ **g)** $\tan^{-1}\left(\tan\frac{7\pi}{6}\right)$

h) $\sin(\tan^{-1} x)$ **i)** $\sec^2\left(\tan^{-1} 2\right)$ **j)** $\cos\left(\operatorname{cosec}^{-1}\frac{13}{12}\right)$ **k)** $\cos\left(2\sin^{-1}\frac{1}{2}\right)$

l) $\sin(2\sin^{-1} 0.6)$ **m)** $\tan\left(2\tan^{-1}\frac{1}{5}\right)$

Q 58 Find the values of x, y, z if matrix $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfy the equation $A'A = I$.

Q 59 For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$, verify that (A - A') is a skew symmetric matrix

Q 60 If A and B are symmetric matrices of the same order, then show that AB is symmetric if and only if A and B commute, that is AB = BA.

Q 61 If A and B are symmetric matrices, prove that AB – BA is a skew symmetric matrix

SECTION C 3 MARKERS

Q 62 Show that the matrix B′AB is symmetric or skew symmetric according as A is symmetric or skew symmetric.

Q 63 If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ and $A^{-1} = A'$, find the value of α.

Q 64 Let $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$. Then show that $A^2 - 4A + 7I = 0$. Using this result calculate A^5 also

Q 65 Find the Matrix A such that

$$\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$$

Q66 Examine the continuity of f, where f is defined b $f(x) = \begin{cases} \sin x - \cos x, & if\ x \neq 0 \\ -1 & , \ x = 0 \end{cases}$

Q 67 Find the value o k if f $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, & x \neq \frac{\pi}{2} \\ 3 & , \ x = \frac{\pi}{2} \end{cases}$ Is a continuous function $at\ x = \frac{\pi}{2}$

Q 68 Direct Derivative

a) $\frac{8^x}{x^8}$ **b)** $\text{Sin}\sqrt{x}+\cos^2\sqrt{x}$ **c)** $\sin x^2+\sin^2 x+\sin^2(x^2)$ **d)** $\sin^{-1}\left(\frac{1}{\sqrt{x+!}}\right)$

Q 69 A particle moves along the curve $6y = x^3 + 2$. Find the points on the curve at which the y-coordinate is changing 8 times as fast as the x-coordinate.

Q 70 A balloon, which always remains spherical, has a variable diameter $\frac{3}{2}(2x+1)$. Find the rate of change of its volume with respect to x.

Q 71 Show that the function f given by $f(x) = x^3 - 3x^2 + 4x$, $x \in \mathbf{R}$ is strictly increasing on R.

Q72 Show that the function given by $f(x) = e^{2x}$ is strictly increasing on **R**.

Q 73 Show that $y = \log(1+x) - \frac{2x}{2+x}$, $x > -1$, is an increasing function of x throughout its domain.

Q 74 Find the following integrals

i) $\int \frac{\cos x - \sin x}{1+\sin 2x}\,dx$ ii) $\int (\sin^3 x.\cos^3 x)\,dx$ *iii)* $\int \frac{e^x(1+x)}{\cos^2(e^x x)}\,dx$ iv) $\int \frac{dx}{2x-x^2}$ v) $\int \frac{dx}{3x^2+13x-10}$ vi) $\int \frac{dx}{\sqrt{5x^2-2x}}$

Q 75 Find the area of the region bounded by the parabola $y=x^2$ & $y=|x|$

Q 76 Find the area bounded by the curve $x^2 = 4y$ & the line $x=4y-2$

Q 77 Find the area bounded by the curve $y = x^3$, the x—axis and the ordinates $x = -2$ and $x = 1$

Q 78 Find the area bounded by the curve $y^2 = 4ax$ & the line $y = mx$

Q 79 Integrate following

1. 3^{x+2} **2.** $e^{x\log a}+e^{a\log x}+e^{a\log a}$ **3.** $\sqrt{1-\sin 2x}$ **4.** $\frac{\cos 2x}{\sin^2 x\cos^2 x}$ **5.** $\frac{(a^x+b^x)^2}{a^x b^x}$ **6.** $\int (x^4+x^2+1)\,(dx^2)$

Q80 Prove that the function f(x) = tanx — 4x is strictly decreasing on $\left(-\frac{\pi}{3}, \frac{\pi}{3}\right)$

Q 81 Show that $f(x) = 2x+\cot^{-1} x + \log(\sqrt{1+x^2}-x)$ is increasing in R.

Q 82 Water is dripping out at a steady rate of 1 cu cm/sec through a tiny hole at the vertex of the conical vessel, whose axis is vertical. When the slant height of water in the vessel is 4 cm, find the rate of decrease of slant height, where the vertical angle of the conical vessel is $\frac{\pi}{6}$

Q 83 Given that: $\text{Cos}\frac{x}{2}.\cos\frac{x}{4}.\cos\frac{x}{8}\ldots = \frac{\sin x}{x}$, prove that: $\frac{1}{2^2}\sec^2\frac{x}{2}+\frac{1}{2^4}\sec^2\frac{x}{4}+\ldots = \text{cosec}^2 x - \frac{1}{x^2}$

Q 84 If $x = a(\cos\theta + \theta\sin\theta)$, $y = a(\sin\theta - \theta\cos\theta)$, prove that $\frac{d^2y}{dx^2} = \frac{\sec^3\theta}{a\theta}$

Q 85. If $\sqrt{1-x^2}+\sqrt{1-y^2} = a(x-y)$, prove that $\frac{dy}{dx} = \sqrt{\frac{1-y^2}{1-x^2}}$

Q 86 Determine the product $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ and use it to solve the system of equations: $x-y+z=4$; $x-2y-2z=9$, $2x+y+3z=1$.

SECTION D 5 MARKERS

Q 87 A school wants to award its students for regularity and hard work with a total cash award of Rs 6,000. If three times the award money for hard work added to that given for regularity amount to Rs 11,000, represent the above situation algebraically and find the award money for each value, using matrix method. Suggest two more values, which the school must include for award.

Q 88 If $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$, find A^{-1}. Use it to solve the system of equations

$2x - 3y + 5z = 11$; $3x + 2y - 4z = -5$; $x + y - 2z = -3$

Q 89 Find the value of λ so that the points (λ, 2-2λ), (- λ+1, 2λ) and (-4-λ, 6-2λ) are collinear?

Q 90 If $A^{-1} = \frac{1}{5}\begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 3 \\ 1 & 4 \end{bmatrix}$, then find $(AB)^{-1}$

Q 91 Show that $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ satisfies the equation $x^2 - 3x - 7 = 0$. Thus, find A^{-1}.

Q 92 Three schools A, B and C organised a mela for collecting funds for helping the rehabilitation of flood victims. They sold handmade fans, mats and plates from recycled material at a cost of Rs 25, Rs 100 and Rs 50 each. The

number of articles sold are given below:

	A	B	C
Hand-fans	40	25	35
Mats	50	40	50
Plates	20	30	40

Find the funds collected by each school separately by selling the above articles. Also find the total funds collected for the purpose. Write one value generated by the above situation

Q 93 To promote the making of toilets for women, an organisation tried to generate awareness through (i) house calls; (ii) letters, and (iii) announcements. The cost for each mode per attempt is given below:

(i) Rs 50 (ii) Rs 20 (iii) Rs 40

The number of attempts made in three villages X, Y and Z are given below:

	(i)	(ii)	(iii)
X	400	300	100
Y	300	250	75
Z	500	400	150

Find the total cost incurred by the organisation for the three villages separately, using matrices.
Write one value generated by the organisation in the society.

Q 94 Prove that the function F: N $\rightarrow$ N, $f(x) = x^2 + x + 1$ is one – one but not onto.

Q 95 If $A=\begin{bmatrix} 0 & -\tan\frac{\alpha}{2} \\ \tan\frac{\alpha}{2} & 0 \end{bmatrix}$ and I is the identity matrix of order 2, show that

$I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

Q 96 Two farmers Ramakrishan and Gurucharan Singh cultivates only three varieties of rice namely Basmati, Permal and Naura. The sale (in Rs) of these varieties of rice by both the farmers in the month of September and October are given by the following matrices A and B.September Sales (in Rs)

Basmati Permal Naura

$$A = \begin{bmatrix} 10{,}000 & 20{,}000 & 30{,}000 \\ 50{,}000 & 30{,}000 & 10{,}000 \end{bmatrix} \begin{matrix} \textit{Ramakrishan} \\ \textit{Gurucharan Singh} \end{matrix}$$

October Sales (in Rs)

Basmati Permal Naura

$$B = \begin{bmatrix} 5{,}000 & 10{,}000 & 6{,}000 \\ 20{,}000 & 10{,}000 & 10{,}000 \end{bmatrix} \begin{matrix} \textit{Ramakrishan} \\ \textit{Gurucharan} \end{matrix}$$

(i) Find the combined sales in September & October for each farmer in each variety.
(ii) Find the decrease in sales from September to October.
(iii) If both farmers receive 2% profit on gross sales, compute the profit for each farmer and for each variety sold in October.

Q 97 Find the matrix A satisfying the matrix equation:

$$\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Q 98 The sum of three numbers is 6. If we multiply third number by 3 and add second number to it, we get 11. By adding first and third numbers, we get double of the second number. Represent it algebraically and find the numbers using matrix method.

Q 99 Given $A=\begin{bmatrix}2 & 2 & -4\\ -4 & 2 & -4\\ 2 & -1 & 5\end{bmatrix}$, $B=\begin{bmatrix}1 & -1 & 0\\ 2 & 3 & 4\\ 0 & 1 & 2\end{bmatrix}$, find BA and use this to solve the system of equation y + 2z = 7, x - y = 3, 2x + 3y + 4z = 17

Q 100 State True or False:

a) If $A=\begin{bmatrix}x & 5 & 2\\ 2 & y & 3\\ 1 & 1 & z\end{bmatrix}$, xyz = 80, 3x + 2y + 10z = 20 then verify that $A.adj.A=\begin{bmatrix}79 & 0 & 0\\ 0 & 79 & 0\\ 0 & 0 & 79\end{bmatrix}$

Q 101 The area of a rectangle gets reduced by 9 square units, if its length is reduced by 5 units and breadth is increased by 3 units. If we increase the length by 3 units and the breadth by 2 units, the area increases by 67 square units. Find the dimensions of the rectangle.

Q 102 An amount of Rs 5000 is put into three investments at the rate of 6%, 7% and 8% p.a. and the total income is Rs 358. If the combined income from the first two investments is Rs 70 more than the income from third. Find amount of each investment by matrix method.

Q103 Using matrix method, solve the following system of equations:

$\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4;\ \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1;\ \frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2;\ x,y,z\neq 0$ **(2011 DELHI)**

Q 104 Show that $f(x)=\begin{cases}\frac{\sin 3x}{\tan 2x}, & if x<0\\ \frac{3}{2}, & if x=0\\ \frac{\log_{10}(1+3x)}{e^{2x}-1}, & if x>0\end{cases}$ is continuous at x = 0

Q 105 Show that function $f(x)=\begin{cases}\frac{e^{\frac{1}{x}}-1}{e^{\frac{1}{x}}+1}, & x\neq 0\\ 1, & x=0\end{cases}$ is discontinuous at x = 0

Q 106 If $f(x)=\begin{cases}\frac{\log(1+ax)-\log(1-bx)}{x}, & x\neq 0\\ k, & x=0\end{cases}$ is continuos at $x=0$, find the value of k.

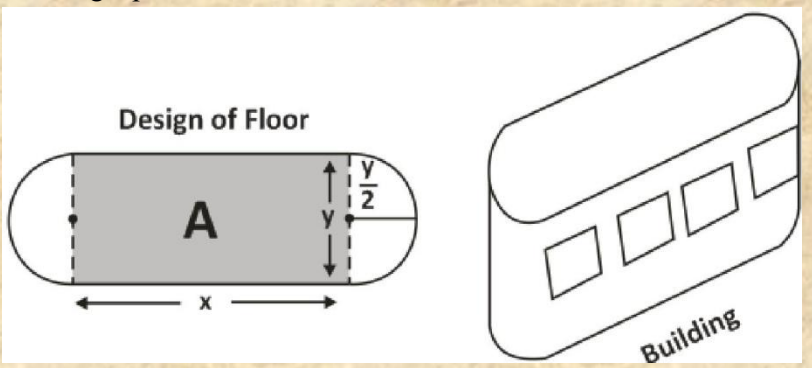
Q 107 Find the area of the region $\{(x, y): 0\leq y\leq x^2+1, 0\leq y\leq x+1, 0\leq x\leq 2\}$

Q 108 Using integration find the area of the region bounded by lines:
2x + y = 4, 3x – 2y = 6 and x – 3y + 5 = 0

Q109 Find area of smaller region bounded by ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ & the line ellipse $\frac{x}{a}+\frac{y}{b}=1$

SECTION E CASE STUDY

Q 110 An architect designs a building for a multi-national company. The floor consists of a rectangular region with semicircular ends having a perimeter of 200 m as shown below.



Based on the above information, answer the following.

(i) If x and y represents the length and breadth of the rectangular region, then determine the relation between the variables.

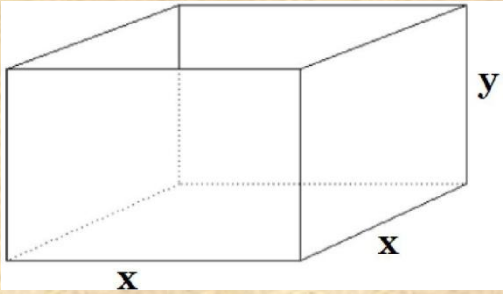
(ii) Write the area of the rectangular region(A),expressing it as a function of x.

(iii) Find the maximum value of area A.

(iv) The CEO of the multi-national company is interested in maximizing the area of the whole floor including the semi-circular ends. For this to happen, what should be the value of x?

(v) Find the extra area generated ,if the area of the whole floor is maximized.

Q111 Shashank wants to make a project for state level science exhibition. For this he wants to make metal box with square base and vertical sides to contain 1024 cm^3 of water. Material for top and bottom costs ₹5 per cm^2 and material for sides costs ₹2.50 per cm^2.



Length x cm
Breadth x cm
Height y cm

Based on the information above,answer the following.

(i) What will be the relation between x and y?

(ii) What will be the total cost© of the material used to construct the box?

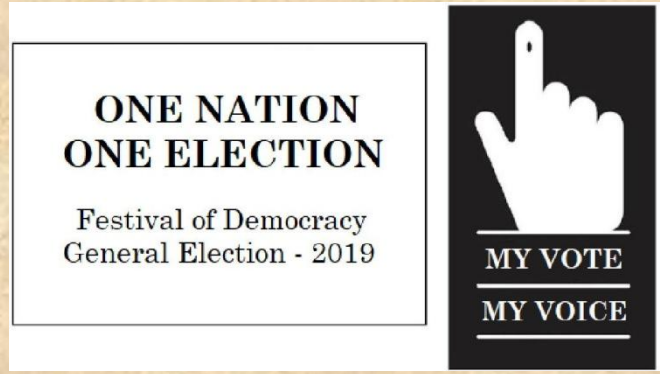
(iii) What will be the total cost© of the box in terms of x?

(iv) What should be the dimensions of the box to minimize the cost?

(v) What is the leas tcost of the box

Q112Following is the pictorial description for a particular page, selected by a school administration.

A General Election of Lok Sabha is a gigantic exercise. About 911 million people were eligible to vote and voter turnout was about 67%, the highest ever in the GeneralElection-2019.



Let I be the set of all citizens of India who were eligible to exercise their voting right in General Elections held in 2019. A relation 'R' is defined on I as follows :

R $(V_1,V_2):V_1,V_2$ IandbothusetheirvotingrightinGeneralElection-2019 . Using the information given above, answer the following.

(i) Let two friends X and Y I. X and Y both exercised their voting right in the General Election-2019.Is(X,Y) R ıe?Justify.

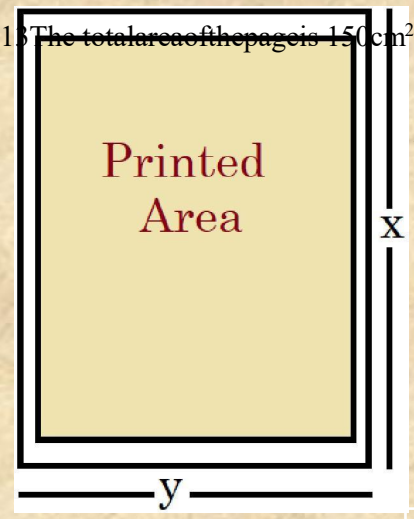
(ii) Mr. 'X 'and his wife' W'both exercised their voting right in GeneralElection-2019. Is the statement "both(X,W)and(W,X) R" true? Justify.

(iii) Three brothersB_1,B_2 and exercised their voting right in GeneralElection-2019. Then is the statement"(B_1,B_2) R,(B_2,B_3) Rand(B_1,B_3) R"true? Justify.

(iv) Mr.GhanshyamexercisedhisvotingrightinGeneralElection-2019. Then is he related to"allthose eligible voters who cast their votes"?Justify.

(v) The relation R $(V_1,V_2):V_1,V_2$ I and both use their voting right in General Election-2019 ymmetricandtransitivebutnotreflexive.Justify.

Q11 The total area of the page is 150 cm^2.



The combined width of the margin at the top and bottom is 3 cm and the side 2 cm.

Using the information given above , answer the following.

I Find the relation between x and y.

2 Find the area of page where printing can be done.

3 Find the area of the printable region of the page, in terms of x.

4 For what value of 'x', the printable area of the page is maximum? Use derivatives.

5 What should be dimension of the page so that it has maximum area to be printed?