## 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 2015
# CLASS – XII CBSE
# MATHEMATICS

**Time: 3 Hours** **Maximum Marks: 100**

## PART-A

**Q.1** For the determinant $\begin{bmatrix} A_{12} & A_{12} & A_{13} \\ A_{21} & A_{22} & A_{23} \\ A_{31} & A_{32} & A_{33} \end{bmatrix}$, find the value of $a_{23}\,A_{33} + a_{22}\,A_{12} + a_{23}\,A_{23}$ $A_{ij}$ is cofactor of element aij.Ans.= 0

**Q.2** If the binary operation *, defined on Q, is defined as a * b = 2a + b – ab, for all a, b $\in$ Q, find the value of 3 * 4. Ans. – 2

**Q.3** If $A=\begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$, and $B = [-2\ -1\ -4]$, Find $(AB)^T$.

**Q.4** If $\left|\underset{a}{\rightarrow}\right| = \sqrt{3}$, $\left|\underset{b}{\rightarrow}\right| = 2$ and $\underset{a}{\rightarrow} \underset{b}{\rightarrow} = \sqrt{3}$ find $\left|\underset{a}{\rightarrow} X \underset{b}{\rightarrow}\right|$ Ans : 3

**Q.5** Is sine function onto in the set of real numbers ? Give reasons.

**Q.6** Prove that: $\sin(2\cos^{-1}\left(-\frac{3}{5}\right)) = -\frac{24}{25}$

**Q.7** If $\underset{a}{\rightarrow}$ is a unit vector and $(\underset{x}{\rightarrow} - \underset{a}{\rightarrow}).(\underset{x}{\rightarrow} + \underset{a}{\rightarrow}) = 8$, find $\left|\underset{x}{\rightarrow}\right|$ Ans. =3

**Q.8** Evaluate: $\int \frac{e^{5\log e^x} - e^{4\log e^x}}{e^{3\log e^x} - e^{2\log e^x}}\,dx$ Ans.=$\frac{x^3}{3}$

**Q.9**It is given that at *x* = 1, the function $x^4 - 62x^2$+ax+9 attains itsmaximum value, on the interval [0, 2]. Find the value of *a*. Ans. f '(x) =0 Then a=120.

**Q.10**Let A = $\begin{bmatrix} 3 & 2 & 3 \\ 4 & 5 & 3 \\ 2 & 4 & 5 \end{bmatrix}$. Express A as sum of two matrices such that one issymmetric and the other is skew symmetric.

## PART – B

**Q.11**Evaluate :$\int \frac{\sin^{-1}\sqrt{x-\cos^{-1}\sqrt{x}}}{\sin^{-1}\sqrt{x+\cos^{-1}\sqrt{x}}}dx$ Ans. $\frac{2}{\pi}\{\sqrt{x}\sqrt{1-x-(1-2x)\sin^{-1}\sqrt{x}\}-x=}$ $\frac{4}{\pi}\{\sin^{-1}\sqrt{xdx-x\&t=\int \sin^{-1}\sqrt{xdx=}}-\frac{1}{2}\sin^{-1}\sqrt{x}(1-2x)+\frac{1}{2}\sqrt{x}\sqrt{1-x}$

**Q.12** Write in the simplest form:$\tan^{-1}\left[\frac{\sqrt{1+sinx}-\sqrt{1-sinx}}{\sqrt{1+sinx}+\sqrt{1-sinx}}\right]$ Ans=$\frac{x}{2}$

**Q.13** A pair of dice is thrown. Find the probability of getting 7 as a sum, if it isknown that second dice always exhibits a prime number Ans.$\frac{\frac{3}{36}}{\frac{18}{36}} = \frac{1}{6}$

**Q.14** Find the foot of the perpendicular drawn from the point A (1,0,3) to thejoin of the pints B(4,7,1) and C(3,5,3). Ans. *foot*$\left(\frac{5}{3},\frac{7}{3},\frac{17}{3}\right)$

**Q.15**If *i*^+ *j*^+ *k*^,2*i*^+ 5*j*^,3*i*^+2*j*^- 3*k*^and *i*^- 6*j*^–*k*^are the position vectors ofthe pints A,B,C and D respectively, find the angle between *AB*and *CD.* Deduce that *AB*and *CD*are collinear. Ans. $\theta = \pi$ &*AB*=λ*CD*

Or

Points L, M,N divide the sides BC,CA and AB of triangle ABC in theratio 1:4, 3:2 and 3:7 respectively. Prove that *AL* + *BM* + *CN*is a vectorparallel to *CK*,where K divides AB in the ratio 1:3.

Ans. AL+BM+CN=$\frac{3a+b-4c}{10}$, $CK^2 = \frac{4}{10}\left(\frac{b+3a-4c}{4}\right)$

**Q.16**Solve the following differential equation :*ydx* – (*x* + 2$y^2$)*dy*= 0.

Or

Solve the following differential equation: =*(*$x^3 + x^2$+*x*+*1)*$\frac{dy}{dx}$=*2*$x^2$+*x*

*Ans.* $\int dy = \int \frac{2x^2+x}{(x+1)(x^2+1)}dx \rightarrow y = \frac{1}{2}\log(x+1) + \frac{3}{4}\log(x^2+1) - \frac{1}{2}\tan^{-1}x$

**Q.17** Let *f* :{2, 3, 4,5}→{3, 4,5,9}and *g* :{3, 4,5,9}→{7,11,15} be functions defined as f(2)=3,f(3)= 4,f(4)= 5, f(5) = 5 and g(3) = g(4) = 7 and g(5) =g(9) = 11. Find gof. Also find the domain and the range of gof.

Ans. *gof* : {(2,7), (3,7), (4,11), (5,11)},*domain* = {2,3,4,5}, *range* = {7,11}

**Q.18** Find the intervals in which the function *f* given by f(x )= 2 log(x- 2)-$x^2$+ 4x+1 is (i) increasing, (ii) decreasing . Ans:f ( x) is increasing on ( 2 , 3 ) and decreasing on $(3,\infty)$

**Q.19**Form the differential equation corresponding to *y e* (*a x b x*) *x* = cos + sin ,where *a* and *b* are arbitrary constants. Ans : Required differential Equation$\left(\frac{d^2y}{dx^2}\right) - 2\left(\frac{dy}{dx}\right) + 2y = 0$

**Q.20**The function f is given by f(x)=$\begin{cases} \frac{x-4}{|x-4|} + a & x(4 \\ a + b & x = 4 \\ \frac{x-4}{|x-4|} + b & x)4 \end{cases}$ .Ans. a=1; b=-1

**Q.21** Using properties of determinants, prove : $\begin{vmatrix} (b+c)^2 & a^2 & bc \\ (c+a)^2 & b^2 & ca \\ (a+b)^2 & c^2 & ab \end{vmatrix} = (a-b)(b-c)(c-a)(a+b+c)(a^2+b^2+c^2)$

Or

If *A*=$\begin{bmatrix} \cos n^\theta & i\,sinn^\theta \\ i\,sin\,n^\theta & \cos n^\theta \end{bmatrix}$., then prove by the principle ofmathematical induction that:
*A*=$\begin{bmatrix} \cos n^\theta & i\,sinn^\theta \\ i\,sin\,n^\theta & \cos n^\theta \end{bmatrix}$

**Q.22** Evaluate: $\int_0^{\pi/2}(\sqrt{\tan x} + \sqrt{\cot x})dx.\ Ans.\pi\sqrt{2}$

Or

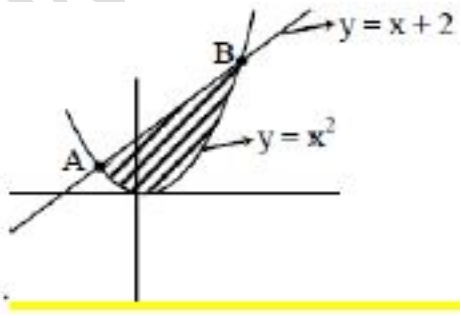
Evaluate: $\int_{-\pi}^{\pi} \frac{2x(1+sin\ x)}{1+cos^2\ x}dx\ .Ans.\pi^2$

## PART – C

**Q.23** Evaluate: $\int_1^3(5x^2 - e^{2x-5} + 4)dx$ , as limit of sums.Ans.=$\frac{154}{3} - \frac{e}{2} + \frac{e^{-3}}{2}$

**Q.24**Use the product$\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$to solve the followingsystem of equations : x - y + 2 z = 1 ; 2 y – 3 z = 1 ; 3 x – 2 y + 4 z = 2 ., : x - y + 2 z = 1 ; 2 y – 3 z = 1 ; 3 x – 2 y + 4 z = 2 . A Ans AB=I &$A^{-1}$=$\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ ;x = 0,y = 5,z = 3

**Q.25**Find the area of the region enclosed by the parabola $x^2$= *y* the line y = x + 2 and the x- axis .




axis . .

For A&B

$x^2$=x+2

$\rightarrow x^2 - x - 2 = 0$ So A=(-1,1) and B=(2,4)

→(x+1)(x-2)=0 So Required Area= $f^2(x + 2 - x^2)dt$

→x= -1,2

=$\left[\frac{x^2}{2} + 2x - \frac{x^3}{3}\right]^2_{-1} = \left[2 + 4 - \frac{8}{3} - \frac{1}{2} + 2 - \frac{1}{3}\right] = \frac{9}{2} sq.units$

**OR**

Using integration find the area of the region bounded by the parabola

$y^2 \leq 4x$ and the circle $4x^2+4y^2 \leq 9$.Ans. Required Area$2\{\int_0^{\pi/2} 2\sqrt{xdx} + \frac{1}{2}\int_2^{3/2} \sqrt{9 - 4x^2}\, dx\} = 2\left(\frac{4}{3}\frac{1}{2\sqrt{2}} + 1492X\pi 2 - 2 - 92\sin -113 = 2\{212 + 9\pi 16 - 98\sin -113\right.$

**Q.26** The sum of the perimeter of a circle and a square is k, where k is some constant .prove that the sum of their areas is least when the side of square is double the radius of the circle.

**OR**

An open topped box is to be constructed by removing equal squares from each corner of a 3 metre by 8 metre rectangular sheet of aluminium and folding up the sides. Find the volume of the largest such box. A Ans. Length = 3 – 2x ; breadth = 8- 2x & height = x $f(x) = (3-2x)(8-2x)x \therefore f'(x) = 0$ x= $3\frac{2}{3}, x \neq 3\ volume = \frac{200}{27} m^3$

**Q.27** The probability that a student entering a college will graduate is 0.6. find the probability that out of a group of 6 students (i) None (ii) At least one (iii) At most 3 will graduate.

Ans.$(i)\frac{64}{15625}, (ii)\frac{15561}{15625}, (iii)\frac{1424}{3125}$

**Q.28** Find the vector equation in the scalar product form, of the plane passing through the pints (1, 0, –1), (3, 2, 2) and parallel to the line $\rightarrow r = i + j + \lambda(i - 2j + 3k)$.A Ans $r \cdot (4i - j - 2k) = 6$

**Q.29** A farmer decides to plant upto 10 hectares with cabbages and potatoes. He decides to grow at least 2 but not more than 8 hectares of cabbages and at least 1 but not more than 6 hectares of potatoes. If he can make a profit of 1500 per hectare on cabbages and 2000 per hectare on potatoes, how should he plan his farming so as to get the maximum profit? From an LPP and solve it graphically. Ans. X+y≤10,2≤x≤8,1≤y≤6,z=1500x+2000y∴ $z^{nm}$ at(4,6)=18000max

**DIAGRAM NO.1 IN 7855 WITH ANSWER DIAGRAM OR PHOTOS FOLDER**