Sample Paper For CBSE Exam 2015

Class XII

By mathsNmethods

MATHEMATICS

Series : ORS/1

Code No. 65/1/1

Roll No. | | | | | | | |

Time allowed : 3 hours **Maximum marks :100**

General Instructions:

(i) **All** questions are compulsory.
(ii) The question paper consists of 26 questions divided into three sections A, B and C. Section A comprises of 06 questions of **one** mark each, Section B comprises of 13 questions of **four** marks each and Section C comprises of 7 questions of **six** marks each.
(iii) **All** questions in section A are to be answered in **one** word, **one** sentence or as per the exact requirement of the question.
(iv) There is no overall choice. However, internal choice has been provided in **5** questions of **four** marks each and 2 questions of **six** marks each. You have to attempt only **one** of the alternatives in all such questions.
(v) Use of calculators is not permitted.

Section A

Question numbers 1 to 6 carry 1 mark each.

1. If $\begin{vmatrix} sin\alpha & cos\beta \\ cos\alpha & sin\beta \end{vmatrix} = \frac{1}{2}$, where α, β are acute angles, then write the value of α+β.
2. If $\vec{a}$ and $\vec{b}$ are 2 unit vectors inclined to x- axis at angles 30^0 and 120^0 respectively, then write the value of $|\vec{a} + \vec{b}|$.
3. What is the value of α for which the lines
$\frac{x-1}{2} = \frac{y-3}{5} = \frac{1-z}{\alpha}$ and $\frac{x-2}{3} = \frac{y+1}{-2} = \frac{z}{2}$ are perpendicular.
4. Form differential equation for $y = mx + c$.
5. What is the degree of the following differential equation?

$$5x\left(\frac{dy}{dx}\right)^2 - \frac{d^2y}{d^2x} - 6y = logx$$

6. Find a unit vector parallel to the sum of the vectors $\hat{\imath} + \hat{\jmath} + \hat{k}$ and $2\hat{\imath} - 3\hat{\jmath} + 5\hat{k}$.

Section B

Question numbers 07 to 19 carry 4 marks each.

7. Using properties of determinants, prove the following :

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

8. If A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$. Show that $A^2 - 5A + 7I = 0$ and hence find A^{-1}.

Or

Find the inverse of A=$\begin{pmatrix} 3 & -1 \\ -4 & 1 \end{pmatrix}$ using elementary transformations.

9. To raise money for an orphanage, students of three schools A, B and C organized an exhibition in their locality, where they sold paper bags, scrap-books and pastel sheets made by them using recycled paper, at the rate of Rs. 20, Rs. 15 and Rs. 5 per unit respectively. School A sold 25 paper bag, 12 scrap-books and 34 pastel sheets. School B sold 22 paper bag 15 ,scrap-books and 28 pastel sheets while School C sold 26 paper bag, 18 scrap-books and 36 pastel sheets. Using matrices, find the total amount raised by each school.
   By such exhibition, which values are inculcated in the students?

10. If f(x)=$\begin{cases} \frac{1-cos4x}{x^2}, when\ x < 0 \\ a, when\ x = 0 \\ \frac{\sqrt{x}}{\sqrt{(16+\sqrt{x})-4}}, when\ x > 0 \end{cases}$ $and\ f\ is\ continuous\ at\ x = 0, find\ the\ value\ of\ a.$

11. Differentiate $\log(x^{sinx} + \cot^2 x)$ with respect to x.

12. Prove the following: $\tan[\frac{\pi}{4} + \frac{1}{2}\cos^{-1}(\frac{a}{b})] + \tan[\frac{\pi}{4} - \frac{1}{2}\cos^{-1}(\frac{a}{b})] = \frac{2b}{a}$.

Or

Solve for x : $\cos^{-1} x + \sin^{-1}\frac{x}{2} = \frac{\pi}{6}$.

13. Find the intervals in which the function f given by f(x)= sinx – cosx, 0≤ x ≤2π is strictly increasing.

Or

Find equation of normal on the curve $y = x^3 + 2x + 6$ which are parallel to x+ 14y + 4=0.

14. Evaluate : $\int e^x \left(\frac{sin4x-4}{1-cos4x}\right) dx$

15. Evaluate : $\int \frac{x^4}{(x-1)(x^2+1)} dx$

16. Find the value of **λ**, if the points with position vectors $3\hat{\imath} - 2\hat{\jmath} - \hat{k}$, $2\hat{\imath} + 3\hat{\jmath} - 4\hat{k}$, $-\hat{\imath} + \hat{\jmath} + 2\hat{k}$ and $4\hat{\imath} + 5\hat{\jmath} + \lambda\hat{k}$ are coplanar.
17. Find the equation of plane passing through the point (-1,-1,2) and perpendicular to each of the planes $\vec{r}.(2\hat{\imath}+3\hat{\jmath} - 3\hat{k})=2$ and $\vec{r}.(5\hat{\imath} - 4\hat{\jmath} + \hat{k})=6$
18. Out of a group of 8 highly qualified doctors in a hospital, 6 are very kind cooperative with patients and so are very popular, while the other 2 remain reserved. For a health camp, 3 doctors are selected at random. Find the probability distribution of the number of very popular doctors. What values are expected from the doctors?

Or

Consider the experiment of tossing a coin. If the coin shows tail, toss it again but if it shows head, then throw a die. Find the conditional probability of the event that 'the die shows a number greater than 3' given that 'there is at least one head'.

19. Evaluate: $\int(2sin2x - cosx)\sqrt{6 - \cos^2 x - 4sinx}\ dx$.

Or

Evaluate $\int_0^{\pi} \frac{x}{1+sinx} dx$

Section C

Question numbers 20 to 26 carry 6 marks each.

20. Let A be the set of real numbers except -1 and * be defined on A by a*b= a + b + ab, for all a, b ϵA. prove that:
    (a) * is binary on A.
    (b) * is commutative as well as associative.
    (c) show that identity element of * is 0.
    (d) every element of a has inverse $\frac{-a}{1+a}$
21. Given the sum of perimeter of a square and a circle. Show that the sum of their areas is least when the side of the square is equal to diameter of the circle.

Or

Show that the semi vertical angle of the cone of maximum volume and of given slant height is $\tan^{-1}\sqrt{2}$.

22. Using integration, find the area of the triangle whose vertices are (2,5),(4,7) and (6,2).

23. Find the distance of the point (1,-2,3) from the plane $x - y + z = 5$ $measered\ parallel\ to\ the\ line\ \frac{x-1}{2} = \frac{y-3}{3} = \frac{z+2}{-6}$.

Or

Find the equation of the plane passing through the intersection of the planes x+3y+6=0 and 3x-y-4z=0 and whose perpendicular distance from the origin is unity.

24. If a person drive his car at 25km/hr, he has to spend Rs 2/Km on petrol. If he drives it at a faster speed of 40Km/hr, the petrol cost increase to ₹5/Km. he has ₹ 100 to spend on petrol and wishes to find what is the maximum distance he can travel within one hour. Express this as a L.P.P and solve it.

25. 2 bags A and B contain 3 red 4 black balls, and 4 red and 5 black balls respectively. From bag A one ball is transferred to bag B and then a ball is drawn from bag B. The ball is found to be red in colour. Find the probability that the transferred ball is black?

26. For the differential equation $(\sin^{-1} y - x)dy = \sqrt{1-y^2}dx$, find the solution curve passing through the point (1,0).

Answer Key For Set 1

Section A

1. $\frac{2\pi}{3}$	2. $\sqrt{2}$	3. -2	4. $\frac{d^2y}{dx^2} = 0$	5. 1	6. $\frac{1}{7}(3\hat{i} - 2\hat{j} + 6\hat{k})$

Section B

8. $\begin{bmatrix} \frac{2}{7} & -\frac{1}{7} \\ \frac{1}{7} & \frac{3}{7} \end{bmatrix}$ 8(or). $\begin{bmatrix} -1 & -1 \\ -4 & -3 \end{bmatrix}$ 9. School A= Rs. 850, School B= Rs. 805, School C= Rs. 970 Values: Helping the orphans, use of recycled paper 10. 8 11. $\frac{x^{sinx}\left(\cos x \log x + \frac{\sin x}{x}\right) - 2\cot x\, cosec^2 x}{x^{sinx} + \cot^2 x}$

12(or). x=1,x≠ 1 13. (0, $\frac{3\pi}{4}$)∪ $\left(\frac{7\pi}{4}, 2\pi\right)$ 13. (or) x+14y-254=0, x+14y+86=0

14. $e^x \cot 2x + c$ 15. $\frac{x^2}{2} + x + \frac{1}{2}\log|x-1| - \frac{1}{4}\log(x^2+1) - \frac{1}{2}\tan^{-1} x + c$ 16. $[\overrightarrow{AB}, \overrightarrow{AC}, \overrightarrow{AD}]$=0 ⇒ $\lambda = -\frac{146}{17}$ 17. 9x +17y +23z - 20=0 18.

x	1	2	3
P(x)	3/28	15/28	10/28

18(or) $\frac{1}{3}$

19.$\left(\frac{4}{3}[\sin^2 x - 4\sin x + 5]^{\frac{3}{2}} + 7[\frac{\sin x - 2}{2}\sqrt{\sin^2 x - 4\sin x + 5} + \log|(\sin x - 2) + \sin 2x - 4\sin x + 5|] + c\right.$ 19(or) π

Section C

22. 7 sq. units 23. λ=1/7, SD=1 23(or) λ=$\pm 1, -x + 2y + 2z + 3 = 0$

24. Let distance travelled by the car at the speed of 25 km/hr and 40 km/he be x km and y km respectively. Max distance Z=x+y

Subject to constraints:

x$\geq 0, y \geq 0$, 2x+5y≤ 100 (Money constraints)

$\frac{x}{25} + \frac{y}{40} \leq 1$ (Time constraints) Final answer x = $\frac{50}{3}, y = \frac{40}{3}$ Max distance=30 km. 25. $\frac{16}{31}$

26. $x.e^{\sin^{-1} y} = e^{\sin^{-1} y}(\sin^{-1} y - 1) + 2$.