

CLASS XII SAMPLE PAPER MATHS

Time Allowed : 3 hours

Maximum Marks: 100

General Instructions : -

- ✤ All questions are compulsory.
- The question paper consists of 29 questions divided in to three sections A, B and C. Section A comprises of 10 questions 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.
- All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- There is no over all choice. However, internal choice has been provided in 4 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.
- ✤ Use of calculators is not permitted

<u>Section – A</u> (Q1- Q10 each carry one mark.)

- 1. Evaluate : $\int \frac{\sin \sqrt{x} \, dx}{\sqrt{x}}$
- 2. Find the value of x, if

$$\begin{pmatrix} 3x+y & -y \\ 2y-x & 3 \end{pmatrix} = \begin{pmatrix} 1 & 2 \\ -5 & 3 \end{pmatrix}$$

3. Find the principle

4.

value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$

Find the value of p if $(2\hat{i} + 6\hat{j} + 27\hat{k}) \times (\hat{i} + 3\hat{j} + p\hat{k}) = \vec{0}$.

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- 5. Write the direction cosines of a line equally inclined to the three coordinate axes.
- If \vec{p} is a unit vector and $(\vec{x} \vec{p}) \cdot (\vec{x} + \vec{p}) = 80$, then find $|\vec{x}|$. 6.
- Find the value of x if 7.

$$\begin{vmatrix} x & -4 \\ 8 & -2x \end{vmatrix} = 0$$

- Write the value of the following determinant : 8.
 - a-b b-c Find $\overrightarrow{a} \cdot \overrightarrow{c}$, if $|\overrightarrow{a}| = 5$, $|\overrightarrow{c}| = 4$ and $\overrightarrow{a} \times \overrightarrow{c} = 8$.
- 9.
- 10. Find $\frac{dy}{dx}$, if $y = e^{a^x}$,

<u>Section – B</u> (Q11- Q22 each carry 4- marks.)

11. If $\sin y = x \sin (a + y)$, prove that $\frac{dy}{dx} = \frac{\sin^2 (a + y)}{\sin a}$.

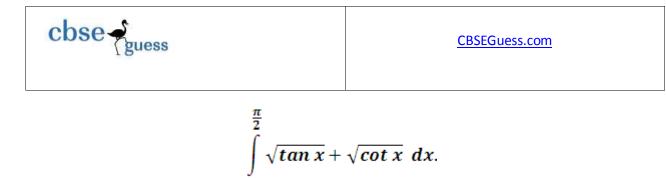
OR

If
$$(\cos x)^y = (\sin y)^x$$
, find $\frac{dy}{dx}$.

12. Evaluate :

$$\int x \sin^{-1} x \, dx$$

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- 13. On a multiple choice examination with three possible answers (out of which only one is correct) for each of the five questions, what is the probability that a candidate would get four or more correct answers just by guessing ?
- 14. Evaluate:

$$\int \frac{2x^2 + 3 \, dx}{(x^2 - 1)(x^2 + 4)}$$

15. Find the shortest distance between the following two lines :

$$\vec{r} = (1+\lambda)\hat{i} + (2-\lambda)\hat{j} + (\lambda+1)\hat{k}; \vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + \mu(2\hat{i} + \hat{j} + 2\hat{k}).$$

16. Prove the following :

$$\cot^{-1}\left(\frac{\sqrt{1+\sin x} + \sqrt{1-\sin x}}{\sqrt{1+\sin x} - \sqrt{1-\sin x}}\right) = \frac{x}{2}, \quad x \in \left(0, \frac{\pi}{4}\right)$$
OR

Solve for x : $2 \tan^{-1} (\cos x) = \tan^{-1} (2 \operatorname{cosec} x)$

17. The scalar product of the vector $\hat{i} + \hat{j} + \hat{k}$ with the unit vector along the sum of vectors $2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\lambda\hat{i} + 2\hat{j} + 3\hat{k}$ is equal to one. Find the value of λ .

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18. Find the equation of the tangent and normal to the curve $x = a \sin^3 t$, $y = b \cos^3 t$ at the point $t = \pi/4$.

OR
If x= a(cos t +t sin t), y= b(sin t - t cos t). find
$$\frac{d^2y}{dx^2}$$

19. Prove that :
$$\begin{vmatrix} x & x^2 & 1 + px^3 \\ y & y^2 & 1 + py^3 \\ z & z^2 & 1 + pz^3 \end{vmatrix} = (1 + pxyz)(x-y)(y-z)(z-x).$$

20. Solve the following differential equation : $x \frac{dy}{dx} = y - x \tan\left(\frac{y}{x}\right)$

21. Solve the following differential equation :

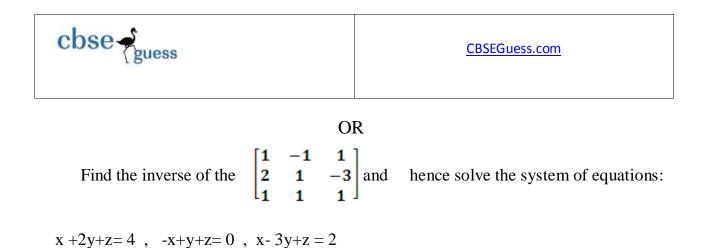
$$(1+y^2)dx = (\tan^{-1} y - x) dy$$
, given $y(0) = 0$

22. If $y = \frac{\sin^{-1} x}{\sqrt{1 - x^2}}$, show that $(1 - x^2) \frac{d^2 y}{dx^2} - 3x \frac{dy}{dx} - y = 0$ Section - C (Q23- Q29 each carry 6- marks.)

23. Obtain the inverse of the following matrix using elementary operations :

	٦ 3	0	-1]
A =	2	3	0
	lo	4	1

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- 24. Find the equation of the plane which is perpendicular to the plane 5x + 3y + 6z + 8 = 0 and which contains the line of intersection of the planes x + 2y + 3z 4 = 0 & 2x + y z + 5 = 0
- 25. Draw the rough sketch of $\{(x,y) : |x-1| \le y \le \sqrt{5-x^2}\}$. Using Integration find the area of the region enclosed.
- 26. Evaluate:

$$\int_0^\pi \frac{x \, dx}{a^2 \cos^2 x + b^2 \sin^2 x}$$

27. Show that the volume of the greatest cylinder which can be inscribed in a cone of height h and semi-vertical angle 30^0 is $\frac{4}{81}\pi h^3$.

OR

A manufacturer can sell x items at a price of Rs. $\left(5 - \frac{x}{100}\right)$ each. The cost price of x items is Rs. $\left(\frac{x}{5} + 500\right)$. Find the number of items he should sell to earn maximum profit.

28. A farmer has a supply of chemical fertilizer of type I which contains 10% Nitrogen and 5% Phosphoric acid and type II which contains 6% Nitrogen and 10% Phosphoric acid. After soil testing it was found that at least 14kg of Nitrogen and 14kg of Phosphoric acid is required for a good crop. The type I costs Rs. 2/kg and the type II cost Rs. 3/kg. How

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many kilograms of each fertilizer should be used to meet the requirement so that the cost be minimum?

29. A lot of 100 bulbs is known to contain 10 defective and 90 non-defective bulbs. If

8 bulbs are selected at random, what is the probability that

- (i) there will be 3 defective and 5 non-defective bulbs
- (ii) there will be atleast one defective bulb.
