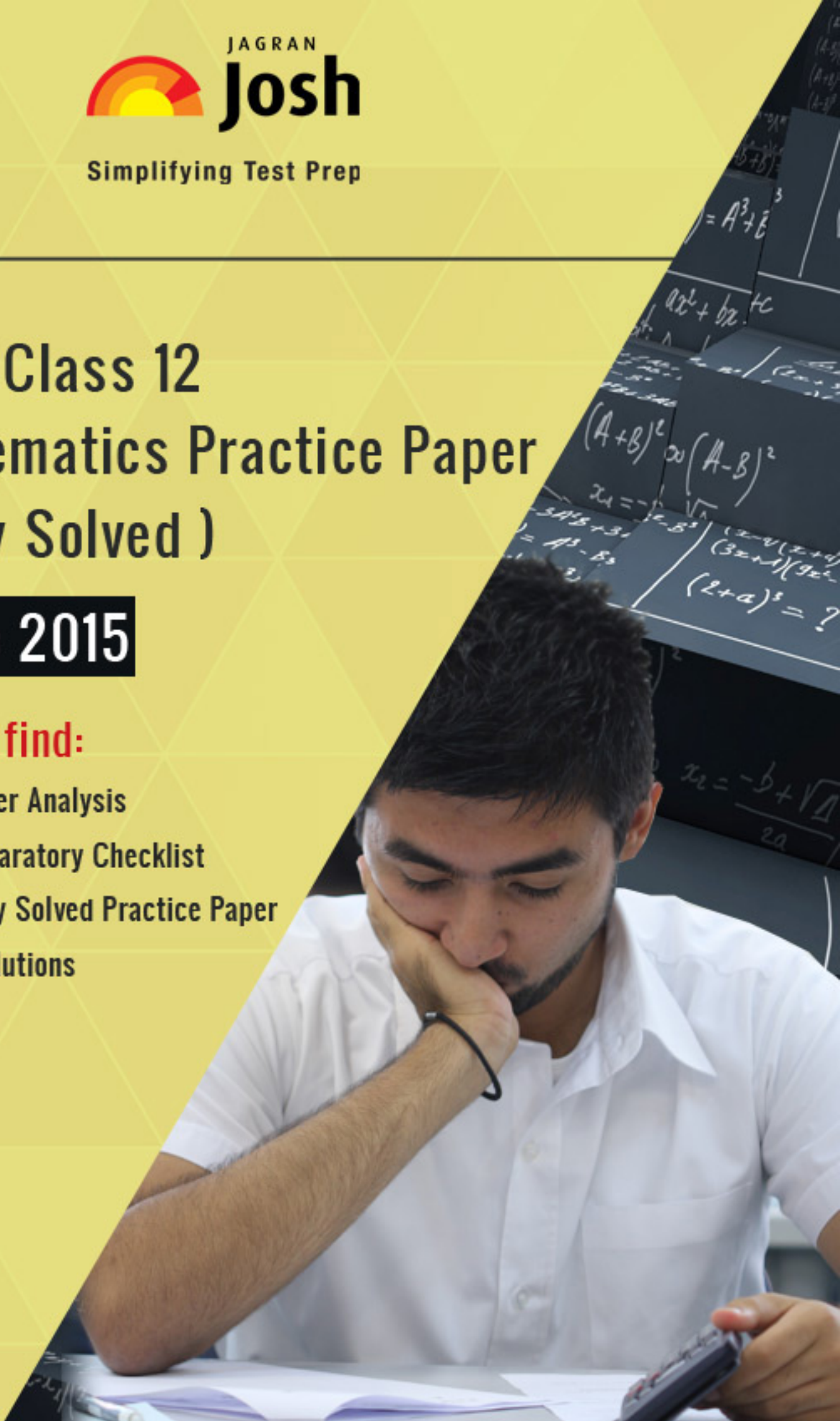
JAGRAN Josh

Simplifying Test Prep

CBSE Class 12 Mathematics Practice Paper (Fully Solved)

Set 2: 2015



You will find:

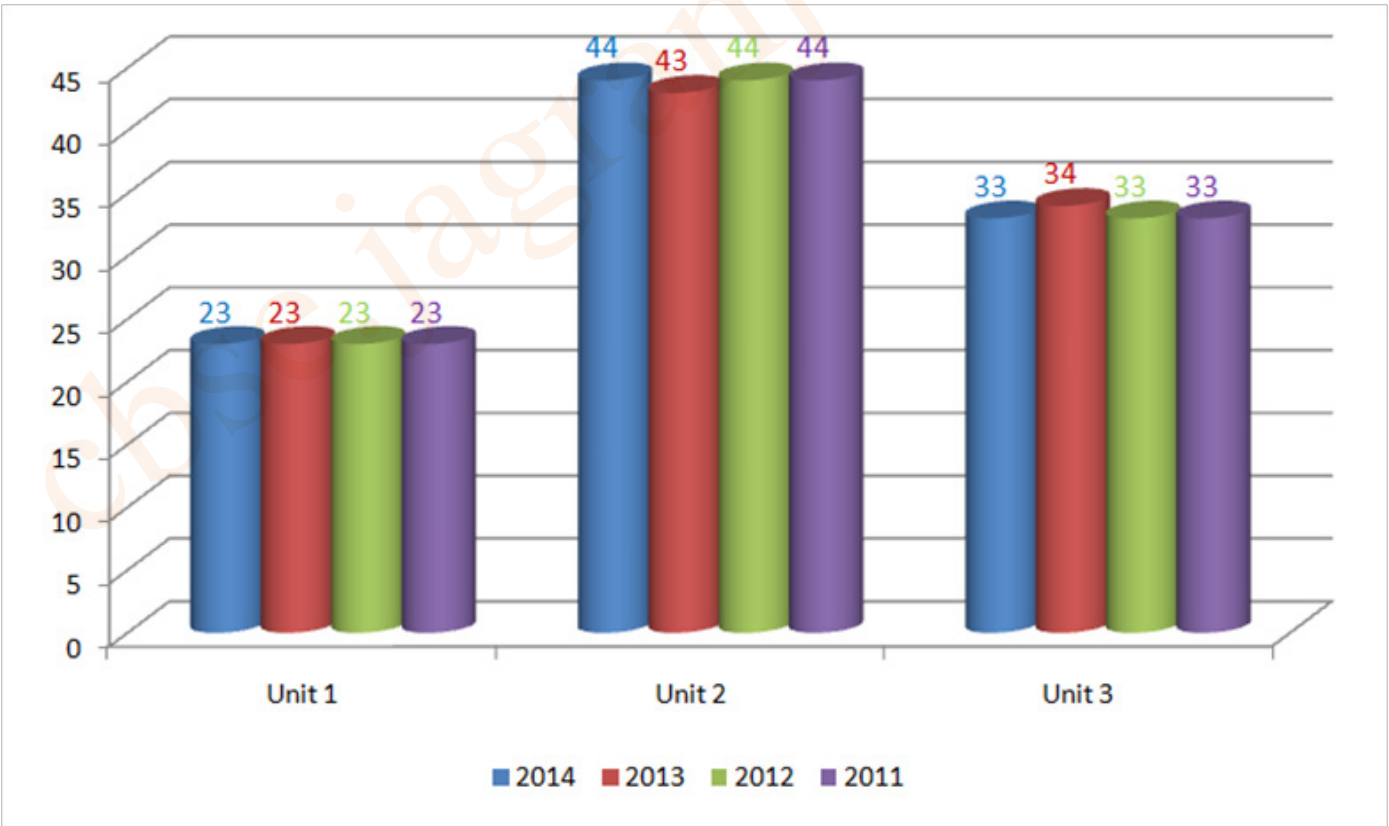
- Board Paper Analysis
- Exam Preparatory Checklist
- Completely Solved Practice Paper
- Unique Solutions

PREFACE

The Practice Paper is a product of CBSE Class 12th Board exam experts of jagranjosh.com, an online educational portal of Dainik Jagran.

After a round analysis for the previous four years of CBSE Class 12th Board Mathematics Question papers, the jagranjosh.com experts have set this Practice Paper for the 2015 CBSE Class 12th Boards.

An analysis of Previous Years Mathematics Question Papers has been mentioned here:



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Below are the Chapters covered under the entitled units:

Unit 1	➢ Relations & Functions ➢ Inverse trigonometric Functions ➢ Matrices ➢ Determinants
Unit 2	➢ Continuity & Differentiability ➢ Application of Derivatives ➢ Integrals ➢ Application of Integrals ➢ Differential Equations
Unit 3	➢ Vector Algebra ➢ Three Dimensional Geometry ➢ Linear Programming ➢ Probability

This conceptual Practice Paper along with guided solutions is a product exclusively for CBSE Class 12th students. The pattern of the Practice Paper is as per the Previous Year's CBSE Board Mathematics Question Papers, thus the students will find it easy and understandable in all its aspects.

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Free Checklist for the Year 2015 for Class 12th Mathematics:

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Solved Practice Paper
Class: XII (Boards)
Subject: Mathematics
Set -2

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

General Instructions:

(a) All questions are compulsory.

(b) The question paper consist of 26 questions divided into three sections A,B and C. Section A comprises of 6 questions of one mark each , Section B comprises of 13 questions of 4 marks each and section C comprises of 7 questions of 6 marks each.

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(c) All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.

(d) Use of calculator is not permitted.

"SECTION - A"

Q 1. Find X, if $Y = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $2X + Y = \begin{bmatrix} 1 & 0 \\ -3 & 2 \end{bmatrix}$

Q 2. Find the angle between two vectors $\vec{a}$ and $\vec{b}$ with magnitudes $\sqrt{3}$ and 2, respectively having $\vec{a} \cdot \vec{b} = \sqrt{6}$

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Q 3. If $A=\begin{bmatrix}1 & 0 & 1\\ 0 & 1 & 2\\ 0 & 0 & 4\end{bmatrix}$, then show that $|3A|=27|A|$.

Q 4. Let * be the binary operation on N given by a * b = L.C.M. of a and b. Find 5 * 7 and 20 * 16

Q 5. Find the values of $\tan\left(\sin^{-1}\frac{3}{5}+\cot^{-1}\frac{3}{2}\right)$

Q 6. Find values of k if area of triangle is 4 square units and vertices are (k, 0), (4, 0), (0, 2)

"SECTION - B"

Q 7. Using Properties of determinants, prove the following

$$\begin{vmatrix} a & -a+b & -a+c\\ -b+a & 3b & -b+c\\ -c+a & -c+b & c\end{vmatrix}=3(a+b+c)(ab+bc+ca)$$

Q 8. If $x\sqrt{1+y}+y\sqrt{1+x}=0$, for $-1<x<1$, prove that

$$\frac{dy}{dx}=\frac{1}{(1+x)^2}$$

Q 9. Evaluate integral $\int_{\pi/6}^{\pi/3}\frac{dx}{1+\sqrt{\tan x}}$

Q 10. Prove that $\tan\left(\frac{\pi}{4}+\frac{1}{2}\cos^{-1}\frac{a}{b}\right)+\tan\left(\frac{\pi}{4}-\frac{1}{2}\cos^{-1}\frac{a}{b}\right)=\frac{2b}{a}$

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Q 11. Prove that if a plane has the intercepts a, b and c is at a distance of p units from the origin then $\frac{1}{a^2}+\frac{1}{b^2}+\frac{1}{c^2}=\frac{1}{p^2}$

Q 12. Solve the following differential equation:

$$(xdy-ydx)\,y\sin\left(\frac{y}{x}\right)=(ydx+xdy)\,x\cos\left(\frac{y}{x}\right)$$

Q 13. Find the values of k so that the function f is continuous at the indicated point.

$$f(x)=\begin{cases}\dfrac{k\cos x}{\pi-2x}, & \text{if } x\neq\dfrac{\pi}{2}\\ 3, & \text{if } x=\dfrac{\pi}{2}\end{cases} \qquad \text{at } x=\frac{\pi}{2}$$

Q 14. In answering a question on a multiple choice test, a student either knows the answer or guesses. Let $\frac{3}{4}$ be the probability that he knows the answer and $\frac{1}{4}$ be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability $\frac{1}{4}$.What is the probability that the student knows the answer given that he answered it correctly?

Q 15. Given a non-empty set X, let *: P(X) × P(X) → P(X) be defined as A * B = (A − B) ∪ (B − A), " A, B ∈ P(X). Show that the empty set Φ is the identity for the operation * and all the elements A of P(X) are invertible with A−1 = A. (Hint: (A − Φ) ∪ (Φ − A) = A and (A − A) ∪ (A − A) = A * A = Φ).

Q 16. Let $\vec{a}=\hat{i}+4\hat{j}+2\hat{k},\vec{b}=3\hat{i}-2\hat{j}+7\hat{k}$ and $\vec{c}=2\hat{i}-\hat{j}+4\hat{k}$. Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$, and $\vec{c}\cdot\vec{d}=15$.

Q 17. Prove that $y=\frac{4\sin\theta}{(2+\cos\theta)}-\theta$ is an increasing function of θ in $\left[0,\frac{\pi}{2}\right]$.

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Q 18. Find the equation of the plane through the line of intersection of the planes $2x+3y+4z=5$ and $2x+3y+4z=5$ which is perpendicular to the plane $x-y+z=0$

Q 19. If the points (1, 1, p) and (−3, 0, 1) be equidistant from the plane $\vec{r}\cdot\left(3\hat{i}+4\hat{j}-12\hat{k}\right)+13=0$, then find the value of p.

"SECTION - C"

Q 20. The sum of three no. is 6. Of we multiply third no. by 3 and add second no. to it, we get II. By adding first and third no. we get double of ht second no. represent it algebraically and find the no. using matrix method.

Q 21. An open box with a square base is to be made out of a given quantity of card board of area c^2 square units. Show that the maximum volume of the box is $c^3/ 6\sqrt{3}$ cubic units.

OR

A point on the hypotenuse of a triangle is at distance a and b from the sides of the triangle. Show that the minimum length of the hypotenuse is $\left(a^{\frac{2}{3}}+b^{\frac{2}{3}}\right)^{\frac{3}{2}}$

Q 22. Using the method of integration find the area of the region bounded by lines:

2x + y = 4, 3x – 2y = 6 and x – 3y + 5 = 0

Q 23. Find $\int_0^{\frac{x}{4}}\frac{\sin x+\cos x}{9+16\sin 2x}dx$

OR

Evaluate the following as limit of sums: $\int_{-1}^{1}e^x dx$

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Q 24. (i) Find $\frac{dy}{dx}$ for $y = \sin^{-1}\left(\frac{5x + 12\sqrt{1-x^2}}{13}\right)$

(ii) If $y = \log\tan\left(\frac{\pi}{4} + \frac{x}{2}\right)$ Show that $\frac{dy}{dx} - \sec x = 0$

Or

Find a particular solution of the differential equation $(x+1)\frac{dy}{dx} = 2e^{-y} - 1$, given that y = 0 when x = 0

Q 25. A farmer mixes two brands P and Q of cattle feed. Brand P, costing Rs 250 per bag contains 3 units of nutritional element A, 2.5 units of element B and 2 units of element C. Brand Q costing Rs 200 per bag contains 1.5 units of nutritional elements A, 11.25 units of element B, and 3 units of element C. The minimum requirements of nutrients A, B and C are 18 units, 45 units and 24 units respectively. Determine the number of bags of each brand which should be mixed in order to produce a mixture having a minimum cost per bag? What is the minimum cost of the mixture per bag?

Q 26. In a game, a man wins a rupee for a six and loses a rupee for any other number when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a six. Find the expected value of the amount he wins/loses.

OR

Assume that the chances of the patient having a heart attack are 40%. It is also assumed that a meditation and yoga course reduce the risk of heart attack by 30% and prescription of certain drug reduces its chances by 25%. At a time a patient can choose any one of the two options with equal probabilities. It is given that after going through one of the two options the patient selected at random suffers a heart attack. Find the probability that the patient followed a course of meditation and yoga?

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Solutions

"SECTION - A"

Solution 1:

$$2X+Y=\begin{bmatrix}1 & 0\\ -3 & 2\end{bmatrix}$$

$$\Rightarrow 2X+\begin{bmatrix}3 & 2\\ 1 & 4\end{bmatrix}=\begin{bmatrix}1 & 0\\ -3 & 2\end{bmatrix}$$

$$\Rightarrow 2X=\begin{bmatrix}1 & 0\\ -3 & 2\end{bmatrix}-\begin{bmatrix}3 & 2\\ 1 & 4\end{bmatrix}=\begin{bmatrix}1-3 & 0-2\\ -3-1 & 2-4\end{bmatrix}$$

$$\Rightarrow 2X=\begin{bmatrix}-2 & -2\\ -4 & -2\end{bmatrix}$$

$$\therefore X=\frac{1}{2}\begin{bmatrix}-2 & -2\\ -4 & -2\end{bmatrix}=\begin{bmatrix}-1 & -1\\ -2 & -1\end{bmatrix}$$

Solution 2:

It is given that,

$|\vec{a}|=\sqrt{3}$, $|\vec{b}|=2$ and, $\vec{a}\cdot\vec{b}=\sqrt{6}$

Now, we know that $\vec{a}\cdot\vec{b}=|\vec{a}||\vec{b}|\cos\theta$.

$$\therefore \sqrt{6}=\sqrt{3}\times 2\times\cos\theta$$

$$\Rightarrow \cos\theta=\frac{\sqrt{6}}{\sqrt{3}\times 2}$$

$$\Rightarrow \cos\theta=\frac{1}{\sqrt{2}}$$

$$\Rightarrow \theta=\frac{\pi}{4}$$

Hence, the angle between the given vectors $|\vec{a}|$ and $|\vec{b}|$ is $\frac{\pi}{4}$.

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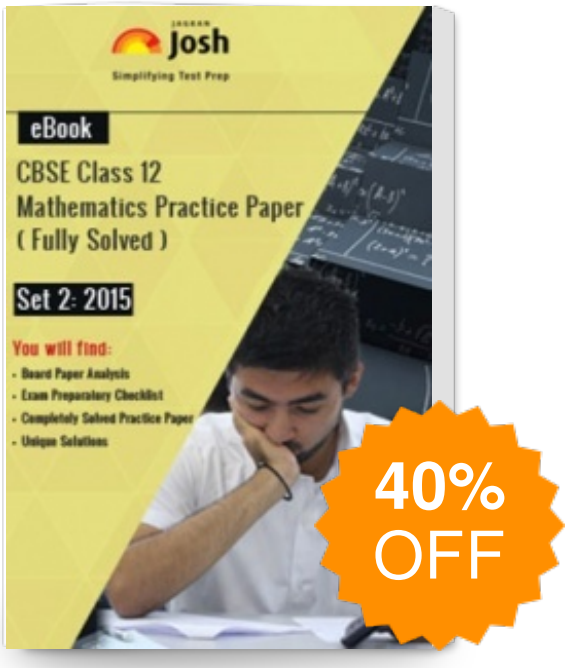

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