MATHEMATICS

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

General Instructions:

1. All questions are compulsory.

2. This question paper contains 29 questions.

3. Questions 1 – 4 in Section A are very short-answer type questions carrying 1 mark each.

4. Questions 5 – 12 in Section B are short-answer type questions carrying 2 marks each.

5. Questions 13 – 23 in Section C are long-answer I type questions carrying 4 marks each.

6. Questions 24 – 29 in Section D are long-answer II type questions carrying 6 marks each.

Section A

1. If A and B are invertible matrices of order 3, $|A| = 2$ and $|(AB)^{-1}| = -\dfrac{1}{6}$. Find $|B|$.

2. Differentiate $\sin^2(x^2)$ w.r.t x^2.

3. Write the order of the differential equation:

$$\log\left(\frac{d^2y}{dx^2}\right) = \left(\frac{dy}{dx}\right)^3 + x$$

4. Find the acute angle which the line with direction cosines $\dfrac{1}{\sqrt{3}}, \dfrac{1}{\sqrt{6}}, n$ makes with

positive direction of z-axis.

OR

Find the direction cosines of the line: $\dfrac{x-1}{2} = -y = \dfrac{z+1}{2}$

Section B

5. Let $A = Z \times Z$ and * be a binary operation on A defined by

$(a, b)*(c, d) = (ad + bc, bd)$.

Find the identity element for * in the set A.

6. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find k so that $A^2 = 5A + kI$.

7. Find : $\int \dfrac{(x^2 + \sin^2 x)\sec^2 x}{1 + x^2}\, dx$

8. Find: $\int \dfrac{e^x (x - 3)}{(x - 1)^3}\, dx$

<div align="center">OR</div>

Find: $\int \dfrac{(x^4 - x)^{\frac{1}{4}}}{x^5}\, dx$

9. Form the differential equation of all circles which touch the x-axis at the origin.

10. Find the area of the parallelogram whose diagonals are represented by the vectors

$\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ and $\vec{b} = 2\hat{i} - \hat{j} + 2\hat{k}$

<div align="center">OR</div>

Find the angle between the vectors

$\vec{a} = \hat{i} + \hat{j} - \hat{k}$ and $\vec{b} = \hat{i} - \hat{j} + \hat{k}$

11. If A and B are two independent events, prove that A′ and B are also independent.

12. One bag contains 3 red and 5 black balls. Another bag contains 6 red and 4 black balls. A ball is transferred from first bag to the second bag and then a ball is drawn from the second bag. Find the probability that the ball drawn is red.

<div align="center">OR</div>

If P(A) = 0.6, P(B) = 0.5 and P(A|B) = 0.3, then find P(A $\cup \cdot$ B).

<div align="center">

Section C

</div>

13. Prove that the function f:[0, ∞) → R given by $f(x) = 9x^2 + 6x - 5$ is not invertible. Modify the codomain of the function f to make it invertible, and hence find f^{-1}.

<div align="center">OR</div>

Check whether the relation R in the set **R** of real numbers, defined by

R = {(a, b) : 1 + ab > 0}, is reflexive, symmetric or transitive.

14. Find the value of : $\sin\left(2\tan^{-1}\dfrac{1}{4}\right) + \cos(\tan^{-1} 2\sqrt{2})$

CBSE Sample Papers for Class 12

Maths Sample Papers for Class 12 2019	Business Studies (BST) Sample Papers for Class 12 2019
Physics Sample Papers for Class 12 2019	Accountancy Sample Papers for Class 12 2019
Chemistry Sample Papers for Class 12 2019	Economics Sample Papers for Class 12 2019
Biology Sample Papers for Class 12 2019	Geography Sample Papers for Class 12 2019
English (Core and Elective) Sample Papers for Class 12 2019	History Sample Papers for Class 12 2019
Biotechnology Sample Papers for Class 12 2019	Home Science Sample Papers for Class 12 2019
Computer Science Sample Papers for Class 12 2019	Psychology Sample Papers for Class 12 2019
Hindi (Core and Elective) Sample Papers for Class 12 2019	Political Science Sample Papers for Class 12 2019
Engineering graphics Sample Papers for Class 12 2019	Sociology Sample Papers for Class 12 2019
	Human Right and Gender Studies Sample Papers for Class 12 2019
	Information Practices Sample Papers for Class 12 2019

CBSE Sample Papers for Class 12 Maths 2019

CBSE Sample Papers for Class 12 Maths Paper 1	CBSE Sample Papers for Class 12 Maths Paper 9
CBSE Sample Papers for Class 12 Maths Paper 2	CBSE Sample Papers for Class 12 Maths Paper 10
CBSE Sample Papers for Class 12 Maths Paper 3	CBSE Sample Papers for Class 12 Maths Paper 11
CBSE Sample Papers for Class 12 Maths Paper 4	CBSE Sample Papers for Class 12 Maths Paper 12
CBSE Sample Papers for Class 12 Maths Paper 5	CBSE Sample Papers for Class 12 Maths Paper 13
CBSE Sample Papers for Class 12 Maths Paper 6	CBSE Sample Papers for Class 12 Maths Paper 14
CBSE Sample Papers for Class 12 Maths Paper 7	CBSE Sample Papers for Class 12 Maths Paper 15
CBSE Sample Papers for Class 12 Maths Paper 8	Previous Year Question Papers for Class 12 Maths

LearnCBSE.in Class 12

15. Using properties of determinants, prove that:

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

16. If $y = x^{\sin x} + \sin(x^x)$, find $\dfrac{dy}{dx}$

OR

If $y = \log(1+2t^2+t^4), \ x = \tan^{-1}t$, find $\dfrac{d^2y}{dx^2}$

17. If $y = \cos(m\cos^{-1}x)$

Show that: $(1-x^2)\dfrac{d^2y}{dx^2} - x\dfrac{dy}{dx} + m^2y = 0$

18. Find the equations of the normal to the curve $y = 4x^3 - 3x + 5$ which are perpendicular to the line $9x - y + 5 = 0$.

19. Find: $\displaystyle\int \dfrac{x^4+1}{x(x^2+1)^2} dx$

20. Evaluate: $\displaystyle\int_{-1}^{1} \dfrac{x+|x|+1}{x^2+2|x|+1} dx$

21. Find the particular solution of the following differential equation.

$$\cos y \, dx + (1+2e^{-x})\sin y \, dy = 0; \ y(0) = \dfrac{\pi}{4}$$

OR

Find the general solution of the differential equation:

$$\dfrac{dx}{dy} = \dfrac{y\tan y - x\tan y - xy}{y\tan y}$$

22. If $\vec{p} = \hat{i} + \hat{j} + \hat{k}$ and $\vec{q} = \hat{i} - 2\hat{j} + \hat{k}$, find a vector of magnitude $5\sqrt{3}$ units perpendicular to the vector $\vec{q}$ and coplanar with vectors $\vec{p}$ and $\vec{q}$.

23. Find the vector equation of the line joining (1, 2, 3) and (−3, 4, 3) and show that it is perpendicular to the z-axis.

Section D

24. If $A = \begin{bmatrix} 3 & 1 & 2 \\ 3 & 2 & -3 \\ 2 & 0 & -1 \end{bmatrix}$, find A^{-1}.

Hence, solve the system of equations:

$$3x + 3y + 2z = 1$$
$$x + 2y = 4$$
$$2x - 3y - z = 5$$

OR

Find the inverse of the following matrix using elementary transformations.

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

25. A cuboidal shaped godown with square base is to be constructed. Three times as much cost per square meter is incurred for constructing the roof as compared to the walls. Find the dimensions of the godown if it is to enclose a given volume and minimize the cost of constructing the roof and the walls.

26. Find the area bounded by the curves $y = \sqrt{x}, 2y + 3 = x$ and $x - axis$.

OR

Find the area of the region.

$$\{(x, y) : x^2 + y^2 \leq 8, x^2 \leq 2y\}$$

27. Find the equation of the plane through the line $\dfrac{x-1}{3} = \dfrac{y-4}{2} = \dfrac{z-4}{-2}$ and parallel to the line $\dfrac{x+1}{2} = \dfrac{1-y}{4} = \dfrac{z+2}{1}$. Hence, find the shortest distance between the lines.

OR

Show that the line of intersection of the planes $x + 2y + 3z = 8$ and $2x + 3y + 4z = 11$ is coplanar with the line $\dfrac{x+1}{1} = \dfrac{y+1}{2} = \dfrac{z+1}{3}$. Also find the equation of the plane containing them.

Bookmark – **Learn**CBSE**.in**

Step 1: Open Chrome (or) Browser and Search LearnCBSE.in

Step 2: At the Top Right Click on 3 dots as shown

Step 3: To the Right of the address bar, click **star** ★
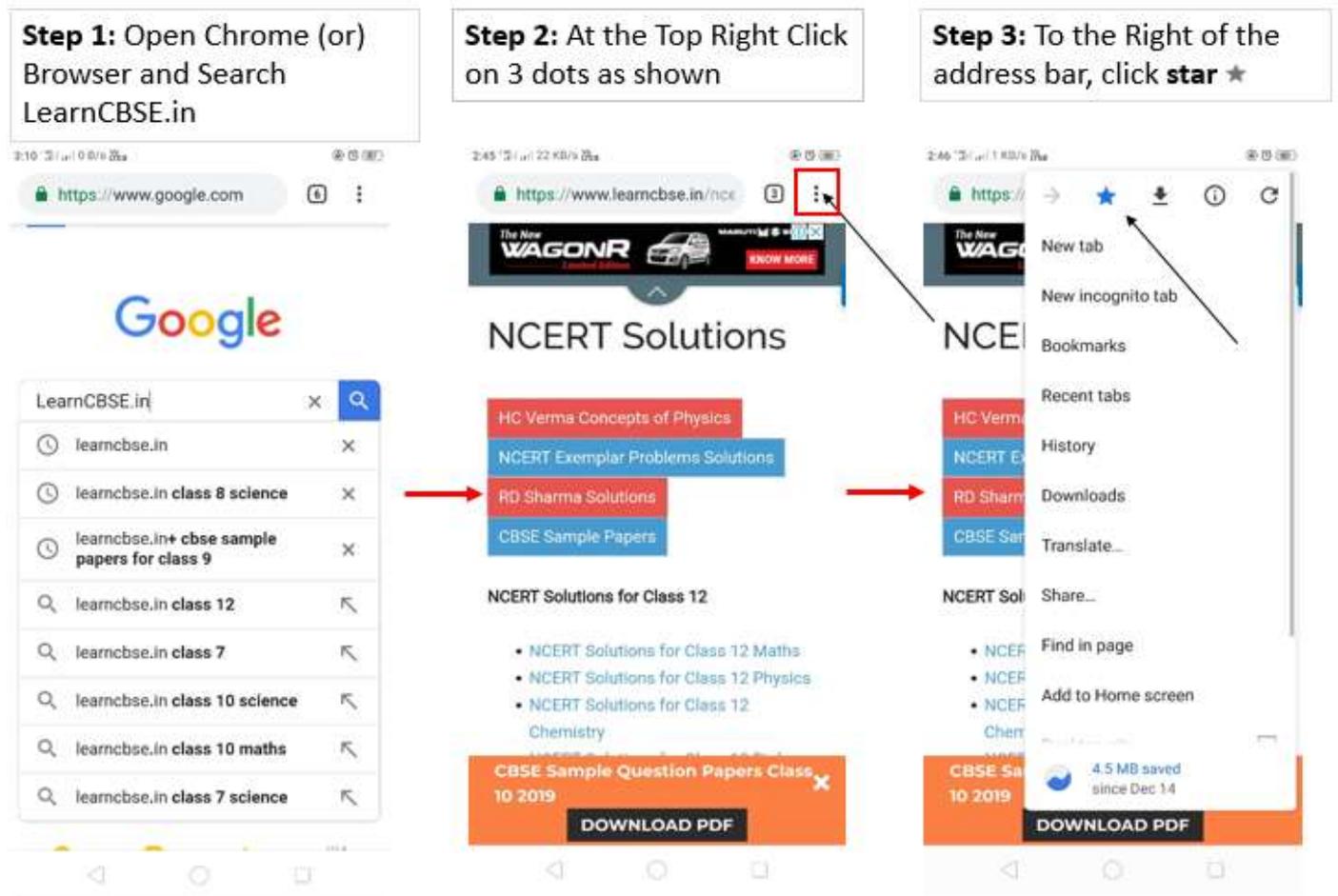
Open a Bookmark – LearnCBSE.in

1. On your computer, open Chrome.
2. At the top right, (3 dots) click More › Bookmarks.
3. Find and click on your favorite **LearnCBSE.in** Bookmark.

To open bookmarks faster, use the bookmarks bar. **Your bookmarks will show under the address bar**. Click a bookmark to open it. To turn the bookmarks bar on or off, click More › Bookmarks › Show Bookmarks Bar.

How to Search in Google, to access NCERT Solutions Faster.

- In Google Assistant **Voice Search LearnCBSE.in** to Get Best NCERT Solutions
- **Add to Favorites - Bookmark** in Google browser to Access Faster
- **In Google Search bar You can search**

  Ex: (i) LearnCBSE.in Class 12 Maths ch 1 Ex 1.1 Q1,

  (ii) LearnCBSE.in Class 12 Physics Important Questions,

  (iii) Any Question (LearnCBSE.in + Type your Question in Google Search bar)

Import Bookmarks – **Learn**CBSE**.in** Class 12

To import bookmarks from most browsers, like Google Chrome Firefox, Internet Explorer, and Safari:

1. On your computer, open Chrome.
2. At the top right, click more 3 dots and Click on Bookmarks.
3. Select Bookmarks ❯ Import Bookmarks and Settings.
4. Select the **downloaded** program (https://drive.google.com/open?id=1H9UTsvlPwihBa3kkVL0_Dw4Rcx6-TNeP - download) that contains the bookmarks you'd like to import.
5. Click Import.
6. Click Done.

> **Note:** Download Class 12 NCERT Solutions HTML File before Starting Import Bookmarks
> https://drive.google.com/open?id=1H9UTsvlPwihBa3kkVL0_Dw4Rcx6-TNeP - download)
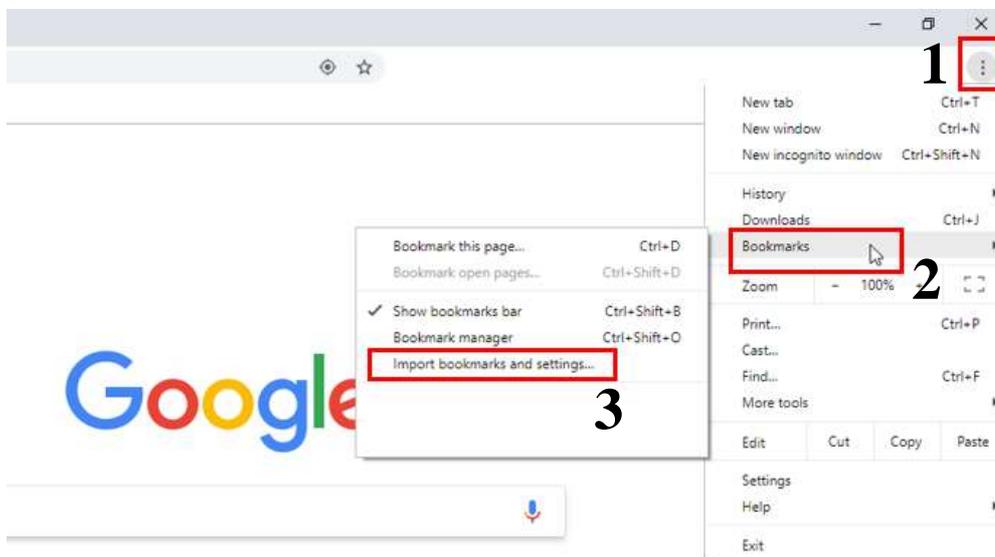
Import Bookmarks and Settings ➔ Bookmarks HTML File ➔ Choose file (Downloaded file)
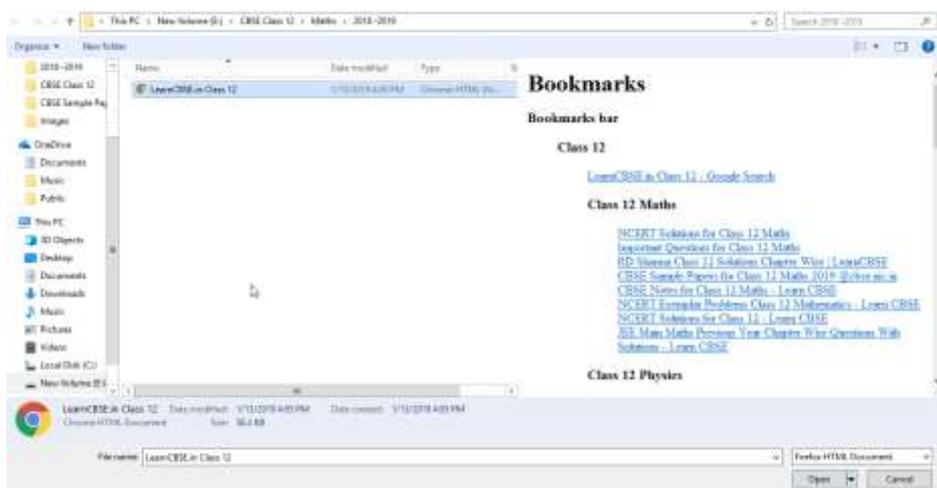
Click on Open and Import Bookmarks

Learn more: How to Export and Import Bookmarks in Chrome – Watch Now

28. A manufacturer makes two types of toys A and B. Three machine are needed for this purpose and the time (in minutes) required for each toy on the machines is given below:

Types of Toys	Machines		
	I	II	III
A	20	10	10
B	10	20	30

The machines I, II and III are available for a maximum of 3 hours, 2 hours and 2 hours 30 minutes respectively. The profit on each toy of type A is ₹ 50 and that of type B is ₹ 60. Formulate the above problem as a L.P.P and solve it graphically to maximize profit.

29. The members of a consulting firm rent cars from three rental agencies:
50% from agency X, 30% from agency Y and 20% from agency Z.
From past experience it is known that 9% of the cars from agency X need a service and tuning before renting, 12% of the cars from agency Y need a service and tuning before renting and 10% of the cars from agency Z need a service and tuning before renting. If the rental car delivered to the firm needs service and tuning, find the probability that agency Z is not to be blamed.

Class 12 Maths NCERT Solutions

RD Sharma Class 12 Solutions

JEE Main Maths Chapter wise Previous Year Questions

1. Relations, Functions and Reasoning
2. Complex Numbers
3. Quadratic Equations And Expressions
4. Matrices, Determinatnts and Solutions of Linear Equations
5. Permutations and Combinations
6. Binomial Theorem and Mathematical Induction
7. Sequences and Series
8. Limits,Continuity,Differentiability and Differentiation
9. Applications of Derivatives
10. Indefinite and Definite Integrals
11. Differential Equations and Areas
12. Cartesian System and Straight Lines
13. Circles and System of Circles
14. Conic Sections
15. Three Dimensional Geometry
16. Vectors
17. Statistics and Probability
18. Trignometry
19. Miscellaneous

NCERT Solutions for Class 12

- NCERT Solutions for Class 12 Maths
- NCERT Solutions for Class 12 Physics
- NCERT Solutions for Class 12 Chemistry
- NCERT Solutions for Class 12 Biology
- NCERT Solutions for Class 12 English
- NCERT Solutions for Class 12 English Vistas
- NCERT Solutions for Class 12 English Flamingo
- NCERT Solutions for Class 12 Hindi
- NCERT Solutions for Class 12 Hindi Aroh (आरोह भाग 2)
- NCERT Solutions for Class 12 Hindi Vitan (वितान भाग 2)
- NCERT Solutions for Class 12 Business Studies
- NCERT Solutions for Class 12 Accountancy
- NCERT Solutions for Class 12 Psychology
- NCERT Solutions for Class 12 Sociology
- NCERT Solutions for Class 12 History
- NCERT Solutions for Class 12 Entrepreneurship
- NCERT Solutions for Class 12 Political Science
- NCERT Solutions for Class 12 Economics
- NCERT Solutions for Class 12 Macro Economics
- NCERT Solutions for Class 12 Micro Economics
- NCERT Solutions for Class 12 Computer Science (C++)
- NCERT Solutions for Class 12 Computer Science (Python)