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# QUESTION BANK

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### MATHEMATICS
## CLASS 12

FOR
**MARCH
2017
EXAM**

**Chapter wise / Topic wise Introduction** to enable quick revision

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**Flowcharts** for concepts clarification

# QUESTION BANK
## with Complete Solutions

### CLASS 12

## Mathematics

Strictly Based on the Latest Syllabus issued by CBSE Board

**For**
**MARCH**
**2017**
**Exam**

### Includes CBSE Solved Paper
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# CONTENTS

# PREFACE

CBSE always believes in Global Trends of Educational Transformation. The CBSE curriculum gets its lead from National Curriculum Framework – 2005 and Right to Free and Compulsory Education Act – 2009. The aim of CBSE Curriculum is not just to let learners obtain basic knowledge but to make them life-long learners. CBSE always updates and reviews the syllabus to make it more relevant with educational transformation and in last few years the chapters and topics which CBSE has added are very interesting and increase practical knowledge.

Oswaal Question banks are designed to nurture individuality and thus enhance one's innate potentials which helps in increasing the self-study mode for students. This book strengthens knowledge and attitude related to subject. It is designed in such a way that students can set their own goals and can improve their problem solving and thinking skills.

The Journey of this book is never ending as this book is reviewed every year and new questions, previous year's examination questions, new HOTS or any change in syllabus is updated time to time. Also regular review and reader's feedback increases the efficiency of this book gradually.

Moreover every Question Bank strictly follows the latest syllabus and pattern, and contains more than sufficient questions and brief description of chapters, which help students in practicing and completing the syllabus. Higher Order Thinking Skills (HOTS) questions, Value Based Question, Previous Year Questions and Important Questions from NCERT makes this book complete and very efficient. Solutions are always checked twice and tried to make precise as per marking scheme. Practically, this book provides students everything they need to learn.

At last we would like to thank our authors, editors, reviewers and specially students who regularly send us suggestions which helps in continuous improvement of this book and makes this book stand in the category of "One of the Best". Wish you all Happy Learning.

*–Publisher*

# Latest Syllabus for Academic Year 2016-17
# Mathematics (Code–041)
# Class-XII

**One Paper**                    **Time : Three Hours**                    **Marks : 100**

| Units | | No. of Periods | Marks |
|---|---|---|---|
| I. | Relations and Functions | 30 | 10 |
| II. | Algebra | 50 | 13 |
| III. | Calculus | 80 | 44 |
| IV. | Vectors And Three - Dimensional Geometry | 30 | 17 |
| V. | Linear Programming | 20 | 06 |
| VI. | Probability | 30 | 10 |
| | **Total** | **240** | **100** |

## Unit I : Relations and Functions

1. **Relations and Functions :**                    **(15 Periods)**

   Types of relations : reflexive, symmetric, transitive and equivalence relations. One to one and onto functions, composite functions, inverse of a function. Binary operations.

2. **Inverse Trigonometric Functions :**                    **(15 Periods)**

   Definition, range, domain, principal value branch. Graphs of inverse trigonometric functions. Elementary properties of inverse trigonometric functions.

## Unit II : Algebra

1. **Matrices :**                    **(25 Periods)**

   Concept, notation, order, equality, types of matrices, zero and identify matrix, transpose of a matrix, symmetric and skew symmetric matrices. Operation on matrices; Addition and multiplication and multiplication with a scalar, simple properties of addition, multiplication and scalar multiplication. Non-commutativity of multiplication of matrices and existence of non-zero matrices whose product is the zero matrix (restrict to square matrices of order 2). Concept of elementary row and column operations. Invertible matrices and proof of the uniqueness of inverse, if it exists; (Here all matricecs will have real entries).

2. **Determinants :**                    **(25 Periods)**

   Determinant of a square matrix (up to $3 \times 3$ matrices), porperties of determinants, minors, co-factors and applications of determinants in finding the area of a triangle. Adjoint and inverse of a square matrix. Consistency, inconsistency and number of solutions of system of linear equations by examples, solving system of linear equations in two or three variables (having unique solution) using inverse of a matrix.

## Unit III : Calculus

1. **Continuity and Differentiability :**                    **(20 Periods)**

   Continuity and differentiability, derivative of composite functions, chain rule, derivatives of inverse trigonometric functions, derivative of implicit function. Concept of exponential and logarithmic functions.

   Derivatives of logarithmic and exponential functions. Logarithmic differentiation, Derivative of functions expressed in parametric forms. Second order derivatives. Rolle's and Lagrange's Mean Value Theorems (without proof) and their geometric interpretations.

2. **Applications of Derivatives :** (10 Periods)

Applications of derivatives : rate of change bodies, increasing/decreasing functions, tangents and normals, use of derivatives in approximation, maxima and minima (first derivative test motivated geometrically and second derivative test given as a provable tool). Simple problems (that illustrate basic principles and understanding of the subject as well as real-life situations).

3. **Integrals :** (20 Periods)

Integration as inverse process of differentiation. Integration of a variety of functions by substitution, by partial fractions and by parts, Evaluation of simple integrals of the following types and problems based on them :

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c}, \int \frac{dx}{\sqrt{ax^2 + bx + c}}$$

$$\int \frac{px + q}{ax^2 + bx + c} dx, \int \frac{px + q}{\sqrt{ax^2 + bx + c}} dx, \int \sqrt{a^2 \pm x^2} dx \text{ and } \int \sqrt{x^2 - a^2} dx$$

$$\int \sqrt{ax^2 + bx + c} \ dx, \ \int (px + q)\sqrt{ax^2 + bx + c} \ dx$$

Definite integrals as a limit of a sum, Fundamental Theorem of Calculus (without proof). Basic properties of definite integrals and evaluation of definite integrals.

4. **Applications of the Integrals :** (15 Periods)

Applications in finding the area under simple curves, especially lines, circles/parabolas/ellipses (in standard form only), Area between any of the two above said curves (the region should be clearly indentifiable).

5. **Differential Equations :** (15 Periods)

Definition, order and degree, general and particular solutions of a differential equation. Formation of differential equation whose general solution is given. Solution of differential equation by method of separation of variables solutions of homogeneous differential equations of first order and first degree. Solutions of linear differential equation of the type :

$\frac{dy}{dx} + py = q$ where $p$ and $q$ are functions of $x$ or constant.

$\frac{dx}{dy} + px = q$, where $p$ and $q$ are functions of $y$ or constant.

## Unit IV : Vectors and Three-Dimensional Geometry

1. **Vectors :** (15 Periods)

Vectors and scalars, magnitude and direction of a vector. Direction cosines and direction ratios of a vector. Types of vectors (equal, unit, zero, parallel and collinear vectors), position vector of a point, negative of a vector, components of a vector, addition of vectors, multiplication of a vector by a scalar, position vector of a point dividing a line segment in a given ratio. Definition, Geometrical Interpretation, properties and application of scalar (dot) product of vectors, vector (cross) product of vectors, scalar triple product of vectors.

2. **Three-Dimensional Geometry :** (15 Periods)

Direction cosines and direction ratios of a line joining two points. Cartesian equation and vector equation of a line, coplanar and skew lines, shortest distance between two lines. Cartesian and vector equation of a plane. Angle between (i) two lines, (ii) two planes. (iii) a line and a plane. Distance of a point from a plane.

## Unit V : Linear Programming

1. **Linear Programming :** (20 Periods)

Introduction, related terminology such as constraints, objective function, optimization, different types of linear programming (L.P.) problems, mathematical formulation of L.P. problems, graphical method of solution for problems in two variables, feasible and infeasible regions (bounded or unbounded), feasible and infeasible solutions, optimal feasible solutions (up to three non-trivial constraints).

1. **Probability :** (30 Periods)

   Conditional probability, Multiplication theorem on probability. independent events, total probability, Bayes' theorem, Random variable and its probability distribution, mean and variance of random variable. Repeated independent (Bernoulli) trials and Binomial distribution.

**Prescribed Textbooks :**

1. Mathematics Text book for Class 11, NCERT Publication
2. Mathematics Part I – Textbook for Class XII, NCERT Publication
3. Mathematics Part II – Textbook for Class XII, NCERT Publication
4. Mathematics Exempler Problem for Class 11, Published by NCERT
5. Mathematics Exempler Problem for Class 12, Published by NCERT.

# MATHEMATICS (Code No. 041)
# QUESTION PAPER DESIGN
# CLASS – XII (2016-17)

**Time 3 Hours**                                          **Max. Marks : 100**

| S. No. | Typology of Questions | Very Short Answer (1 mark) | Long Answer I (4 marks) | Long Answer II (6 marks) | Marks | % Weightage |
|---|---|---|---|---|---|---|
| 1. | **Remembering-** (Knowledge based Simple recall questions to know specific facts, terms, concepts, principles, or theories, Identify, define, or recite, information) | 2 | 3 | 1 | 20 | 20% |
| 2. | **Understanding-** (Comprehension - to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase information | 2 | 2 | 2 | 22 | 22% |
| 3. | **Application-** (Use abstract information in in concrete situation, to apply knowledge to new situations. Use given content to interpret a situation, provide an example, or solve a problem) | 1 | 4 | 2 | 29 | 29% |
| 4. | **High Order Thinking Skills -** (Analysis & Synthesis- Classify, compare, contrast, or differentiate between different pieces of information, Organize and/or integrate unique pieces of information from a variety of sources) | 1 | 2 | 1 | 15 | 15% |
| 5. | **Evaluation -** (Appraise, judge, and/or justify the value or worth of a decision or outcome or to predict outcomes based on values) | | 1+1 (value based) | 1 | 14 | 14% |
| | **Total** | 6×1=6 | 13×4=42 | 7×6=42 | 100 | 100% |

# QUESTION WISE BREAK UP

| Type of Question | Marks per Question | Total No. of Questions | Total Marks |
|---|---|---|---|
| VSA | 1 | 6 | 06 |
| LA-I | 4 | 13 | 52 |
| LA-II | 6 | 7 | 42 |
| **Total** | | **26** | **100** |

1.  *No Chapter wise weightage. Care to be taken to cover all the chapters.*
2.  *The above template is only a sample, Suitable internal variations may be made for generating similar templates keeping the overall weightage to different form of questions and typology of questions same.*

●●

| SOLVED PAPER | C.B.S.E. 2016 Class–XII Outside Delhi & Delhi | Mathematics |
| --- | --- | --- |

**Time : 3 Hrs.**                                                   **M.M. : 100**

### Instructions :

1. *All questions are compulsory.*
2. *Please check that this question paper contains 26 questions.*
3. *Question 1 to 6 in Section A are very short – answer type questions carrying 1 mark each.*
4. *Questions 7 to 19 in Section B are long – answer I type question carrying 4 marks each.*
5. *Questions 20 to 26 in Section C are long – answer II type question carrying 6 marks each.*
6. *Please write down the serial number of the question before attempting it.*

## SECTION A

**Questions numbers 1 to 6 carry 1 mark each.**

1. If $A = \begin{pmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{pmatrix}$, find $\alpha$ satisfying $0 < \alpha < \dfrac{\pi}{2}$ when $A + A^T = \sqrt{2}I_2$; where $A^T$ is transpose of $A$.

2. If $A$ is a $3 \times 3$ matrix $|3A| = k|A|$, then write the value of $k$.

3. For what values of $k$, the system of linear equations

$$x + y + z = 2$$
$$2x + y - z = 3$$
$$3x + 2y + kz = 4$$

has a unique solution?

4. Write the sum of intercepts cut off by the plane $\vec{r}.(2\hat{i} + \hat{j} - k) - 5 = 0$ on the three axes.

5. Find $\lambda$ and $\mu$ if $(\hat{i} + 3\hat{j} + 9k) \times (3\hat{i} - \lambda\hat{j} + \mu k) = 0$.

6. If $\vec{a} = 4\hat{i} - \hat{j} + k$ and $\vec{c} = 2\hat{i} - 2\hat{j} + k$, then find a unit vector parallel to the vector $\vec{a} + \vec{b}$.
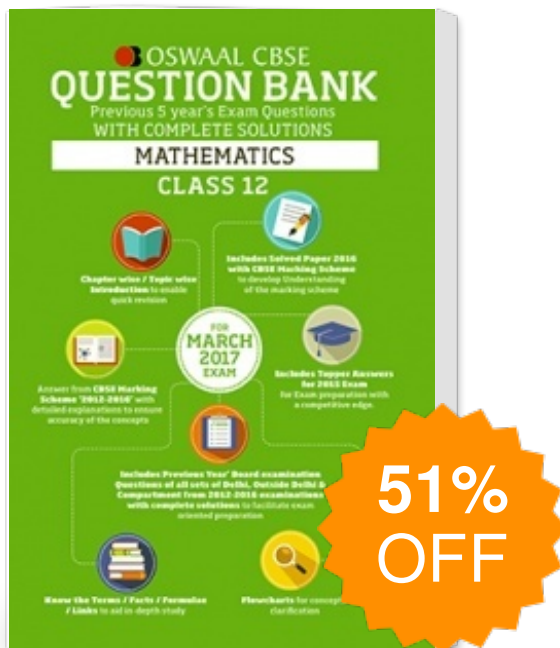
## SECTION B

7. Solve for $x$ : $\tan^{-1}(x-1) + \tan^{-1}x + \tan^{-1}(x+1) = \tan^{-1}3x$.

**OR**

Prove that $\tan^{-1}\left(\dfrac{6x - 8x^3}{1 - 12x^2}\right) - \tan^{-1}\left(\dfrac{4x}{1 - 4x^2}\right) = \tan^{-1}2x$; $|2x| < \dfrac{1}{\sqrt{3}}$.

8. A typist charges ₹ 145 for typing 10 English and 3 Hindi pages, while charges for typing 3 English and 10 Hindi pages are ₹ 180. Using matrices, find the charges of typing one English and one Hindi page separately. However typist charged only ₹ 2 per page from a poor student Shyam for 5 Hindi pages. How much less was charged from this poor boy? Which values are reflected in this problem?

# Oswaal CBSE Question Bank With Complete Solutions for Class 12 Mathematics (For 2017 Exams)



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