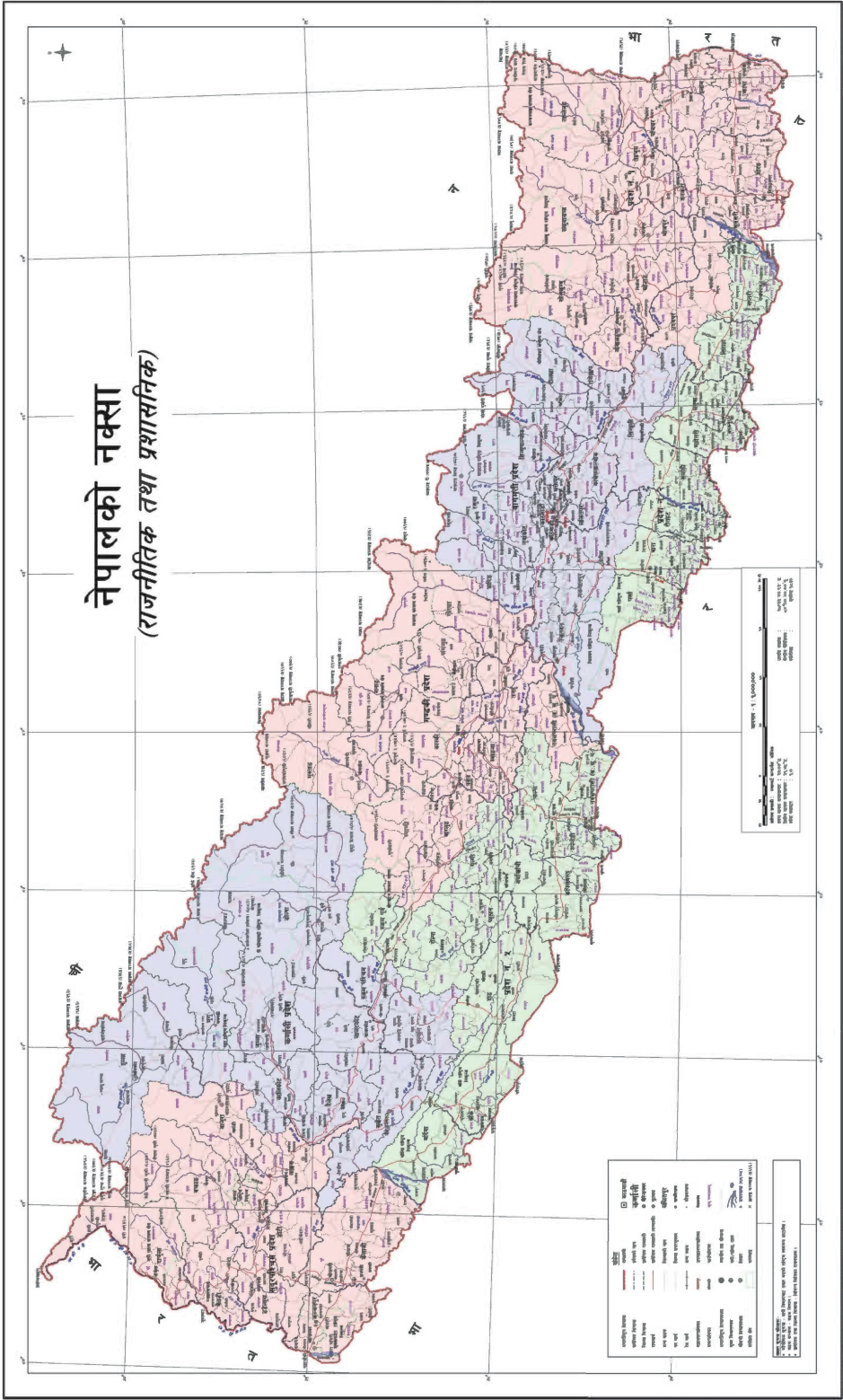


# Fundamentals of MATHEMATICS

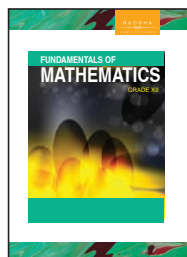
GRADE XII



# नेपालको नक्सा (राजनीतिक तथा प्रशासनिक)

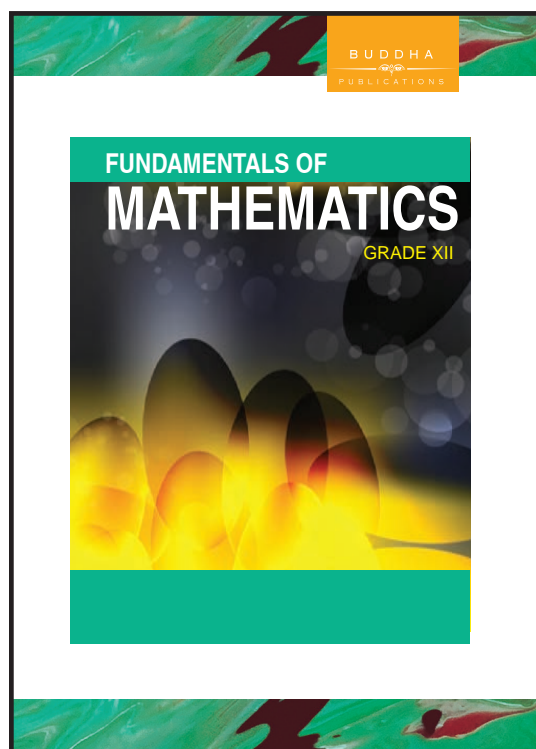


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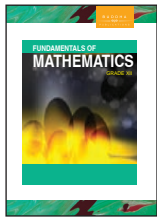


# Fundamentals of MATHEMATICS

GRADE XII



**Prof. Dr. Prakash Muni Bajracharya**  
**Krishna C. Poudel**  
**Keshab Raj Phulara**  
**Mukunda Raj Acharya**



# Fundamentals of MATHEMATICS

## GRADE XII

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श्री बुद्ध पब्लिकेसन्स प्रा.लि.

काठमाण्डौं ।

प्रस्तुत विषयमा त्यस प्रकाशनबाट मूल्याङ्कन र स्वीकृतिका लागि तोकिएको अवधिभित्र पेस हुन आएका तपसिलबमोजिमका पाठ्यसामग्री आवश्यक निर्णयार्थ पाठ्यसामग्री व्यवस्थापन तथा मूल्याङ्कन समितिमा पेस हुँदा विद्यालय शिक्षाको राष्ट्रिय पाठ्यक्रम प्रारूप २०७६, माध्यमिक शिक्षा पाठ्यक्रम (कक्षा ११ र १२), पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान, ऐन, कानून, निर्देशिका, कार्यविधि, प्रकाशन शैलीका प्रावधान, पठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका र पाठ्यसामग्री सुधार/परिमार्जन/पुनर्लेखनका लागि दिइएका सुझाव र निर्देशनको परिपालना गरी स्वीकृति दिन सिफारिस भएअनुसार यस केन्द्रको मिति २०७८/०५/०२ गतेको निर्णयानुसार तपसिलमा उल्लिखित निर्देशनको पूर्ण परिपालना गरी शैक्षिक वर्ष २०७८, २०७९ र २०८० गरी तीन शैक्षिक वर्षका लागि गुणस्तरीय एवम् त्रुटिरहित पाठ्यसामग्री विकास गरी प्रकाशन गर्न स्वीकृति प्रदान गरिएको छ । विद्यमान संवैधानिक व्यवस्था, ऐन, कानून, निर्देशिका, कार्यविधि, पाठ्यक्रम विकास केन्द्रले विभिन्न समयमा जारी गरेका निर्देशनलगायतका प्रावधानहरूको पूर्ण परिपालना नगरी गुणस्तरहीन पाठ्यसामग्रीको विकास, प्रकाशन र बिक्रीवितरण गरेको पाइएमा, पाठ्यक्रम परिवर्तन भएमा वा यस केन्द्रबाट अन्य निर्णय भएमा यो स्वीकृति जुनसुकै बेला रद्द हुने छ ।

तपसिल :

(क) पाठ्यसामग्रीको नाम :

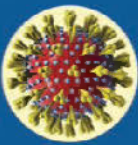
क्र.सं.	पाठ्यसामग्रीको नाम	माध्यमिक तह/ कक्षा १२
१	Fundamentals of Mathematics	

(ख) निर्देशन :

- आवरण पृष्ठको अघिल्लो (Front) भागको बायाँ (Verso) पृष्ठमा नेपालको आधिकारिक नक्सा र आवरण पृष्ठको पछिल्लो (Back) भागको दायाँ (Recto) पृष्ठमा कोभिड १९ सङ्क्रमण रोकथामसम्बन्धी सूचना यस केन्द्रको वेबसाइटबाट डाउनलोड गरी समावेश गर्ने । विषयवस्तुको प्रकृति र आवश्यकताका आधारमा पाठ्यसामग्री भित्रका विषयवस्तुमा समावेश गरिने नक्सा आधिकारिक र प्रामाणिक हुनुपर्ने ।
- स्वीकृति पत्र स्व्यान गरी पाठ्यसामग्रीको शीर्षक पृष्ठभन्दा पछि दायाँ (Recto) पृष्ठमा समावेश गर्ने । पाठ्यसामग्रीको प्रत्येक पृष्ठको पुच्छर (Footer) मा पाठ्यक्रम विकास केन्द्रबाट स्वीकृत भन्ने व्यहोरा उल्लेख गरी प्रकाशन गरेको पाठ्यसामग्रीको तीन प्रति यस केन्द्रमा पेस गरेपछि मात्र बिक्रीवितरण गर्ने । शिक्षा, विज्ञान तथा प्रविधि मन्त्रालयको निर्णयअनुसारको मूल्य कायम गर्ने र मूल्य सर्वाधिकार पृष्ठमा राख्नुपर्ने । प्रतिनिधि अधिकार (Copy right) को सम्बन्धमा लेखक र प्रकाशक स्वयम् जिम्मेवार हुने ।
- पाठ्यसामग्री विकाससम्बन्धी विद्यमान प्रावधान तथा पाठ्यसामग्री सुधार र परिमार्जनका लागि यस अघि दिइएका सुझाव र निर्देशनको पूर्ण परिपालना गर्ने । माध्यमिक शिक्षा पाठ्यक्रम (कक्षा ११ र १२) २०७६ का तहगत सक्षमता, कक्षागत सिकाइ उपनिबन्ध हासिल गर्न सहयोग पुऱ्नेगरी विषयवस्तुको क्षेत्र र क्रम, प्रयोगात्मक तथा परियोजना कार्यअन्तर्गतका सम्भाव्य क्रियाकलापका उदाहरण, क्षेत्र वा एकाइगत कार्यघण्टा, सिकाइ सहजीकरण विधि र प्रक्रिया, विद्यार्थी मूल्याङ्कन विधि तथा प्रक्रिया आदि समेतलाई ध्यानमा राखी पाठ्यसामग्रीलाई पूर्णरूप दिने ।
- विद्यार्थीलाई थप आर पार्ने गरी पाठ्यक्रममा समावेश नगरिएका विषयवस्तु, अभ्यास तथा सिकाइ क्रियाकलाप पाठ्यसामग्रीमा समावेश नगर्ने ।
- प्रत्येक एकाइ/पाठमा अभ्यासका लागि प्रश्नहरू समावेश गर्दा सरलदेखि जटिल हुनेगरी समावेश गर्ने । विभिन्न एकाइ/पाठमा अभ्यासका लागि समावेश गरिएका प्रश्नहरूको उत्तर समावेश नगर्ने । प्रश्नोत्तरको शैलीमा समावेश गरिएका अभ्यास हटाउने ।
- राष्ट्र, राष्ट्रिय एकता, सार्वभौमिकता, भौगोलिक अखण्डता, स्वाधीनता, राष्ट्रिय हित, पहिचान, सम्मान र समृद्धिमा आँच आउने तथा विभिन्न जातजाति, भाषा, धर्म, संस्कृति, सामाजिक सहिष्णुता, सद्भाव, सांस्कृतिक मूल्यमान्यता, रहनसहन आदिमा प्रतिकूल प्रभाव पार्ने कुनै पनि विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।
- जातजाति, भाषा, धर्म, संस्कृति, वर्ण, क्षेत्र, लैङ्गिकता, अपाङ्गता, पेसा, व्यवसाय, सामाजिक सांस्कृतिक अवस्थाका आधारमा भावनात्मक रूपमा चोट पुऱ्नाउने, आक्षेप लाग्ने, होम्प्याउने र विभेदीकरण गर्ने किसिमका विषयवस्तु, उदाहरण, चित्र, अभ्यास, सिकाइ क्रियाकलाप समावेश नगर्ने ।

मीनबहादुर थापा  
पाठ्यक्रम अधिकृत

पुनर्रच : यो स्वीकृति शैक्षिक वर्ष २०७८, २०७९ र २०८० का लागि प्रदान गरिएकाले सोहीबमोजिम प्रकाशन, बिक्री वितरण र प्रयोग गर्नु गराउनहुन सम्बन्धित सरोकारवाला सधैँमा अनुरोध छ ।



# कोरोना भाइरस रोग (कोभिड-१९)

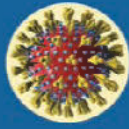
हाल विश्वभरी कोरोना भाइरसको प्रकोपबाट बच्नका लागि स्वास्थ्यकर्मीहरूले "कोभिड-१९" को नाम दिएका छन् र यसलाई विश्वभरी प्रसारणको रूपमा संक्षेपमा परिचालन गरेका छन् ।

कोरोना भाइरस संक्रमणको माध्यमबाट सँगै रोग फैलिन्छ । यो संक्रमण व्यक्तिगत रूपमा वा हावाबाट फैलिन सक्छ ।

## कोरोना भाइरस रोगको मुख्य लक्षणहरू



यसमा लक्षणहरू देखा परेमा नजिकको स्वास्थ्य केन्द्रमा सहायता लिनु । यस रोगको संक्रमणको जोखिमबाट बच्नका लागि निम्न उपायहरू अपनाउनुपर्छ ।

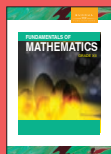


# कोरोना भाइरस रोगबाट बच्नै उपायहरू



जस्तो आएमा, साँघो लागेमा वा स्वास फेर्न गाह्रो भएमा नजिकको स्वास्थ्य केन्द्रमा सम्पर्क गर्ने





# PREFACE

This book “**Fundamentals of Mathematics**” has been prepared in accordance with the syllabus prescribed by Curriculum Development Centre (CDC) under the Ministry of Education, Science and Technology, Nepal for grade XII.

The book has been written keeping in mind the following objectives:

- To create an interest for Mathematics in those students who show a promise for higher study in Mathematics,
- To create confidence in others for equipping themselves with the Mathematics needed for the areas in natural and social sciences.

These objectives were achieved by focusing on


- presentation of materials,
- motivation and development of concepts,
- logical reasoning with rigor and precision,
- problems sets.

To make the book effective from practical as well as theoretical point of view, an attempt has been made to provide a thorough explanation of many mathematical terms for their proper use. One of the main features of this book is the attention given to motivating the concepts under discussion. The authors have tried to make clear the intuitive meaning of what is taking place and diagrams are provided, whenever it seems feasible to help the reader develop skill in using his/her imagination to visualize new concepts. We have avoided use of “or” in the sense of equivalence and use of “log” in the sense of natural logarithm.

Neglecting rigor and precision in logical reasoning, Mathematics is not really a serious affair and its aim may get out of sight. Therefore, the book provides every logical reasoning with rigor and precision.

The book is full of worked out examples presented in a very systematic way, sometimes they motivate the concept.

The success of any text book depends upon the strength of its problems sets. We have devoted an extraordinary amount of effort to organizing the problems for this text. The problems are graded and divided into groups arranging problems in each group to the level of difficulty as far as possible, in order that the student can have sufficient practice.



Considerable amount of graphing techniques have been included, because the authors are convinced that the only way to understand the nature and behaviour of functions is to have graphs of standard functions in mind.

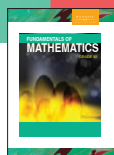
We expect comments and suggestions for the improvement of the book.

We would like to thank Mr. Nabaraj Bajgain of Buddha Publications Pvt. Ltd. for encouragement and publication of the book. We would also like to express our appreciation to Mr. Dipendra Shrestha and Ms. Rajani Shrestha for typing and layout.

Every effort has been made to find and correct errors in this book. Experience leads us to believe, however, that the occasional mistake will have slipped through. The authors assume responsibility of all errors. Any suggestions for correction of errors and for further improvement will be highly appreciated.

**Authors**

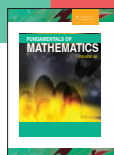




# SYLLABUS

Content Area	Contents	LH
<b>1 Algebra</b>	<b>1.1 Permutation and combination:</b> Basic principle of counting, Permutation of (a) set of objects all different (b) set of objects not all different (c) circular arrangement (d) repeated use of the same objects, Combination of things all different, Properties of combination.	31 hrs
	<b>1.2 Binomial Theorem:</b> Binomial theorem for a positive integral index, general term, Binomial coefficient, Binomial theorem for any index (without proof), application to approximation, Euler's number, Expansion of $e^x$ , $a^x$ and $\log(1+x)$ (without proof).	
	<b>1.3 Elementary Group Theory:</b> Binary operation, Binary operation on sets of integers and their properties, Definition of a group, finite and infinite groups. Uniqueness of identity, Uniqueness of inverse, Cancellation law, Abelian group.)	
	<b>1.4 Complex numbers:</b> De Moivre's theorem and its application in finding the roots of a complex number, properties of cube roots of unity. Euler's formula.)	
	<b>1.5 Quadratic equation:</b> Nature and roots of a quadratic equation, Relation between roots and coefficient. Formation of a quadratic equation, Symmetric roots, one or both roots common.	
	<b>1.6 Sequence and series:</b> Sum of finite natural numbers, sum of squares of first n-natural numbers, Sum of cubes of first n- natural numbers, principle of mathematical induction.	
	<b>1.6 Sequence and series:</b> Sum of finite natural numbers, sum of squares of first n-natural numbers, Sum of cubes of first n- natural numbers, principle of mathematical induction. <b>1.7 Matrix based system of linear equation:</b> Solution of a system of linear equations by Cramer's rule and matrix method (row- equivalent and inverse) up to three variables.	
<b>2 Trigonometry</b>	2.1 Inverse circular functions.	8 hrs
	2.2 Trigonometric equations and general values	
<b>3 Analytic Geometry</b>	<b>3.1 Conic section:</b> Standard equations of Ellipse and hyperbola.	13 hrs
	<b>3.2 Coordinates in space:</b> direction cosines and ratios of a line, general equation of a plane, equation of a plane in intercept and normal form, plane through 3 given points, plane through the intersection of two given planes, parallel and perpendicular planes, angle between two planes, distance of a point from a plane.	
<b>4 Vectors</b>	<b>4.1 Product of Vectors:</b> vector product of two vectors, geometrical interpretation of vector product, properties of vector product, application of vector product in geometry and trigonometry.	7 hrs

<b>5 Statistics &amp; Probability</b>	<b>5.1 Correlation and Regression:</b> correlation, nature of correlation, correlation coefficient by Karl Pearson's method, interpretation of correlation coefficient, properties of correlation coefficient (without proof), rank correlation by Spearman, regression equation, regression line of y on x and x on y.	9 hrs
	<b>5.2 Probability:</b> Dependent cases, conditional probability (without proof), binomial distribution, mean and standard deviation of binomial distribution (without proof).	
<b>6 Calculus</b>	<b>6.1 Derivatives:</b> derivative of inverse trigonometric, exponential and logarithmic function by definition, relationship between continuity and differentiability, rules for differentiating hyperbolic function and inverse hyperbolic function, L'Hospital's rule ( $0/0$ , $\infty/\infty$ ), differentials, tangent and normal, geometrical interpretation and application of Rolle's theorem and mean value theorem.	31 hrs
	<b>6.2 Anti-derivatives:</b> anti-derivatives of standard integrals, integrals reducible to standard forms, integrals of rational function.	
	<b>6.3 Differential equations:</b> differential equation and its order, degree, differential equations of first order and first degree, differential equations with separable variables, homogenous, linear and exact differential equations.	
<b>7 Computational Methods</b>	<b>7.1 Linear programming problems (LPP):</b> simplex method (maximization problems only).	10 hrs
	<b>7.2 System of linear equations:</b> Gauss Elimination method	
<b>8 Mechanics Or Mathematics for Economics and Finance</b>	<b>8.1 Statics:</b> Resultant of like and unlike parallel forces.	11 hrs
	<b>8.2 Dynamics:</b> Newton's laws of motion and projectile.	
	<b>8.3 Mathematics for economics and finance:</b> Consumer and Producer Surplus, Quadratic functions in Economics, Input-Output analysis, Dynamics of market price, Difference equations, The Cobweb model, Lagged Keynesian macroeconomic model.	



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