Bhutan Council for School Examinations and Assessment

Business Mathematics

Assessment Syllabus

Key Stage 5 (Classes XI and XII)

2026 - 2030

Contact Us
Bhutan Council for School Examinations and Assessment
Kawajangsa, Thimphu
Post Box No. 156
Email: bcsea@bcsea.bt

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1. Why choose this syllabus?

In Bhutan, education is designed to foster seven essential competencies, balancing the preservation of cultural identity with readiness for global engagement. Mathematics plays a vital role in supporting the development of these competencies. Studying mathematics contributes significantly to achieving these competencies in the following ways.

- **Spirituality & Values:** Mathematics connects logic with ethics and mindfulness, helping learners appreciate beauty, patterns, and universal truths. Examples such as the Knot of Infinity, auspicious dates, and the Golden Ratio show how mathematical ideas link to spirituality, responsibility, and ethical reasoning.
- **Language:** Mathematics is a universal language with its own grammar, vocabulary, and syntax. It bridges disciplines and cultures, from symmetry in Bhutanese art to calculus in hydropower, empowering students to innovate and communicate complex ideas.
- **Transversal Competencies:** Mathematics fosters analytical, critical, and problem-solving skills used across sciences, business, arts, and global challenges, preparing students for lifelong learning and contribution to society.
- **Enterprising & Industrious:** By applying math to real-world contexts—like engineering, sustainable energy, and infrastructure—students build discipline, creativity, and entrepreneurial thinking while supporting Bhutan's development goals.
- **Sustainable Living:** Concepts like estimation, measurement, and statistics enable informed decisions about resource use and environmental stewardship.
- **Health & Wellbeing:** Structured reasoning, perseverance, and the beauty of patterns promote resilience, mindfulness, confidence, and emotional balance, enriching both academic and personal growth.
- **Digital Competence:** Integrating technology in math enhances reasoning, visualization, and communication. Tools such as coding, statistical software, and graphing utilities deepen understanding and prepare students for academic, professional, and everyday applications.

Key benefits

Bhutan Assessment prepares students for life, helping them develop an informed curiosity and a lasting passion for learning. Our Education gives students a clear path for educational success from age 6 to 19.

Mathematics helps learners to develop the following qualities:

- **Confidence:** using and sharing information and ideas, and applying mathematical techniques to solve problems. These skills enhance self-assurance and support learning in mathematics as well as in other subjects.
- **Responsibility:** acquiring and applying skills that prepare them for further academic studies and enable them to become numerate, informed members of society.
- **Reflection:** making connections across different areas of mathematics and thoughtfully considering the outcomes of mathematical problems and models.

- **Innovation:** approaching both familiar and unfamiliar problems in creative ways, choosing from a variety of mathematical and problem-solving strategies.
- **Engagement:** appreciating the beauty, patterns, and structure of mathematics, and recognizing its wide range of real-life applications.

Key Concept

Business Mathematics is grounded in three main strands: Numbers and Operations, Patterns and Algebra, and Data Management and Probability. These elements build essential skills such as number sense, calculation, generalization, modelling, and data interpretation relevant to business and economics. By linking abstract principles to practical applications—like design and decision-making—they provide a coherent foundation that supports progression from basic learning to advanced topics and mathematical thinking.

Skills

Business Mathematics instruction aims to develop knowledge and equip learners with transferable skills for lifelong success. Through active, reflective, and collaborative learning, students grow in confidence and learn to apply mathematical understanding in diverse contexts.

Key Mathematical Skills

- **Abstract conceptualization:** Understand and work with symbolic and abstract ideas.
- **Fluency and accuracy:** Execute calculations and procedures with speed and precision.
- **Generalization:** Detect patterns and establish overarching rules.
- **Mathematical reasoning:** Form sound arguments, draw conclusions, and justify solutions.
- **Modelling:** Represent real-world situations mathematically and interpret results in context.
- **Problem solving:** Tackle new and complex challenges by selecting appropriate strategies.
- **Spatial understanding:** Visualize and analyse geometric forms, graphs, and transformations.
- **Statistical literacy:** Gather, interpret, and evaluate data effectively.
- **Technical communication:** Present ideas clearly through symbols, diagrams, graphs, and precise language.
- **Use of tools and technology:** Apply measurement instruments and digital tools accurately to support mathematical work.

Recognition and Support

National and International Recognition

BCSEA qualifications are designed to meet high academic standards and prepare learners for success both within Bhutan and globally. Our Business Mathematics curriculum equips students with skills and knowledge that are valued by universities and employers worldwide.

Students who complete Business Mathematics syllabus can confidently pursue higher education locally or internationally, as our programmes align with global expectations for analytical thinking, problem-solving, and ethical decision-making. Graduates are well-

prepared to continue studies in mathematics, or related fields, and are equally equipped for careers that demand practical and transferable skills.

Supporting Teachers

Effective education depends on the alignment of curriculum, teaching, learning, and assessment**.** BCSEA provides teachers with the guidance, resources, and professional development opportunities needed to deliver the mathematics curriculum effectively.

Teachers have access to:

- **Planning and preparation resources**: assessment framework, schemes of assessment, specimen papers, and teacher guides.
- **Learning and revision tools**: mark schemes, past papers, and exemplars to support students' understanding and performance.
- **Results analysis and reporting**: insights from assessments to inform teaching strategies and improve student outcomes.

Professional Development in Assessment

As an awarding body, BCSEA offers targeted professional development focused on assessment**.** This ensures teachers and examiners:

- Understand assessment objectives and criteria**.**
- Can accurately interpret and apply mark schemes**.**
- Are skilled in providing feedback that supports learner improvement**.**
- Stay up-to-date with changes in assessment standards and processes**.**

Through this approach, BCSEA ensures high-quality assessment, fairness, and reliability**,** supporting both learners and educators in achieving excellence.

2. Syllabus Overview

Aims

The aims describe the purposes of a course based on this syllabus.
The aims are to enable students to:

- build mathematical knowledge and skills in ways that foster confidence, satisfaction, and enjoyment in applying mathematics to business contexts.
- understand mathematical principles and appreciate business mathematics as a logical, coherent discipline relevant to commerce and economics.
- develop a broad range of mathematical skills, particularly those that support real-life applications and connections with other subjects such as economics, accounting, and finance.
- strengthen their ability to analyse problems logically and systematically.
- recognise when and how situations can be represented mathematically, identify and interpret key elements, and choose appropriate methods for solving problems.
- use mathematics as a clear and effective means of communicating business, with emphasis on accuracy and precise interpretation.
- gain the mathematical foundation needed for further studies in business, economics, finance, or other related fields.

Content Overview

Assessment Component	Strand	Class XI	Class XII
Business Mathematics 1	Patterns and Algebra	1: Equations, Inequalities and Graphs	8: Algebra
		2: Simultaneous Equations	9: Differentiation
		3: Quadratics	10: Integration
		4: Functions	11: Application of Calculus in Commerce and Economics
		5: Series	
		6: Differentiation	
		7: Integration	
Business Mathematics 2	Number and Operation	1: Matrices	3: Matrices
		2: Taxation	4: Logarithmic and exponential functions
			5: Annuities
	Data Management and Probability	1: Representation of Data	3: Correlation
		2: Probability	4: Regression
			5: Permutations and Combinations
			6: Probability

Assessment Overview

Key Stage 5 Business Mathematics Components:

Paper 1
Business Mathematics 1 1 hour 45 minutes
70 marks
Business Mathematics 1 subject content of Classes XI and XII
Approximately 25% from Class XI
10 MCQ and 8 to 10 structured questions
Written examination
Externally assessed
40% of the total marks

Paper 2
Business Mathematics 2 1 hour 45 minutes
70 marks
Business Mathematics 2 subject content of Classes XI and XII
Approximately 25% from Class XI
10 MCQ and 8 to 10 structured questions
Written Examination
Externally assessed
40% of the total marks

Coursework
School Based Assignment 1 year
40 marks
Assignment topics: Business Mathematics subject content of Classes XI and XII
Internally assessed
Externally verified
20% to the total marks

Assessment Objectives

The assessment objectives (AOs) are:

AO1: Knowledge and Understanding
- Show understanding of relevant mathematical concepts, terminology and notation
- Recall accurately and use appropriate mathematical manipulative techniques

AO2: Application and communication
- Recognize the appropriate mathematical procedure for a given situation
- Apply appropriate combinations of mathematical skills and techniques in solving problems
- Present relevant mathematical work, and communicate corresponding conclusions, in a clear and logical way

Weighting for assessment objectives

The weightings allocated to each of the assessment objectives (AOs) are summarised below.

Assessment objective	Weighting in Key Stage 5 %
AO1 Knowledge and understanding	50
AO2 Application and communication	50
Total	**100**

Assessment objectives as a percentage of each component.

Assessment objective	Weighting in components %		
	Paper 1	**Paper 2**	**Coursework**
AO1 Knowledge and understanding	50	50	50
AO2 Application and communication	50	50	50
Total	**100**	**100**	**100**

3. Subject content

This syllabus offers flexibility to design a course that is engaging, challenging, and relevant to your learners.

Where appropriate, teachers are responsible for selecting subject contexts, resources, and examples that support learners' understanding. These choices should be suitable for the learners' age, cultural background, and learning environment, and must align with school policies and local legal requirements.

The mathematical content for each component is detailed below.

Prior Knowledge

To successfully take up Key Stage 5 Business Mathematics, learners are expected to have completed Key Stage 4 Mathematics or an equivalent standard of study. This ensures they possess the foundational knowledge and skills necessary to engage with the more advanced concepts introduced at KS5.

Specifically, students should have a solid understanding of the following areas from KS4:

- **Strand A** - includes knowledge of number operations, ratio, proportion, rates, exponents, set theory, matrices, and commercial math concepts like profit, loss, and interest. Proficiency in calculator use and interpreting data using scientific notation also supports advanced business applications.
- **Strand B** - familiar with linear and non-linear functions, solving linear and quadratic equations, interpreting graphs, and working with polynomial expressions. Prior knowledge of sequences, linear inequalities, and basic differentiation supports modeling and solving real-world business problems effectively.
- **Strand D** - able to collect, organize, and interpret data, including data involving two variables, using appropriate graphical methods. Familiarity with basic probability concepts helps in analyzing risk and making informed business decisions.

Class XI Subject content

Business Mathematics 1

Candidates should be able to:

B	**Patterns and Algebra**
B1	Equations, Inequalities and Graphs Series
B1.1	Understand linear equations and Inequalities in one variable.
B1.2	Understand the meaning of $\|x\|$ and sketch graphs of the form $\|y = \|ax + b\|$.
B1.3	Solve the equations and inequalities using the properties such as $\|a\| = \|b\| \Leftrightarrow a^2 = b^2$ and $\|x - a\| < b \Leftrightarrow a - b < x < a + b$.
B1.4	Solve the following linear equations algebraically and graphically: • $ax + b = 0$ • $\|x\| = 0$ • $\|ax + b\| = c\ (c \geq 0)$ • $\|ax + b\| = cx + d$ • $\|ax + b\| = \|cx + d\|$
B1.5	Using the substitution method, form and solve a quadratic equation. For example: $x^{\frac{2}{3}} + x^{\frac{1}{3}} - 12 = 0$.
B1.6	Draw the graph of a cubic polynomial when given as a product of three linear factors.
B2	Simultaneous equations
B2.1	Use the elimination, substitution, comparison and graphical methods to solve two linear equations in two unknowns.

B2.2	Solve a linear and a quadratic equation simultaneously using graphing and substitution methods.
B3	Quadratics
B3.1	Use the squaring method (rewriting in vertex form) to graph quadratic polynomials and solve quadratic equations of the form $ax^2 + bx + c = 0$.
B3.2	Solve quadratic equation $ax^2 + bx + c = 0$ using factorising, quadratic formula and graphical method.
B3.3	Draw the graph of a quadratic equation ax^2 + bx _+c = 0.
B3.4	Find the discriminant of a quadratic polynomial $ax^2 + bx + c = 0$ and use the discriminant to identify the nature of roots of quadratic equations.
B3.5	Solve quadratic equation of type: $\lvert ax^2 + bx + c\rvert = d$.
B3.6	Solve quadratic inequalities of type: • $\lvert ax^2 + bx + c\rvert > d$ • $\lvert ax^2 + bx + c\rvert \leq d$ algebraically and graphically.
B4	Functions
B4.1	Define the terms function, domain, range, one-one function, inverse function and composition of functions.
B4.2	Identify the domain and range of a simple algebraic function.
B4.3	Find the composition of two given functions.
B4.4	Determine whether or not a given function is one-one, and find the inverse of a one-one function in simple cases.
B4.5	Illustrate graphically the relationship between a one-one function and its inverse.
B5	Series
B5.1	Understand the concepts of the Binomial Theorem using Pascal's Triangle.
B5.2	Expand $(a + b)^n$ for positive integer values of *n* using the binomial expansion.
B5.3	Identify and evaluate the general term and the middle term(s) in the expansion of $(a + b)^n$.
B5.4	Find the nth term and the sum of the nth terms of arithmetic and geometric progressions.
B5.5	Find the sum to infinity of a geometric progression and understanding the condition required for its convergence.
B6	Differentiation
B6.1	Understand the meaning of derivatives and their geometrical interpretation by linking with the slope of linear graphs.
B6.2	Find the gradient of a tangent as a limit (Differentiation using the first principle) and find the gradient of a function at a given point.

B6.3	Apply the derivative of power functions x^n, where n is any rational number, other functions involving constant multiples, sums, and differences of functions, and of composite functions using the chain rule.
B6.4	Differentiate functions involving the product and quotient of two or more functions using the product rule and quotient rule.
B7	Integration
B7.1	Understand integration as the reverse process of differentiation.
B7.2	Integrate functions x^n and $(ax+b)^n$ for $n \neq -1$ and apply these techniques to find integrals of algebraic functions.
B7.3	Evaluate definite integrals for basic algebraic functions.

Business Mathematics 2

Candidates should be able to:

A	**Numbers and Operations**
A1	Matrices
A1.1	Understand the classification, operations, and properties of matrices (up to order 3).
A1.2	Find the transpose, adjoint and inverse of matrices up to order 3.
A2	Taxation
A2.1	Understand the terminologies (income and expenditure) of household finances.
A2.2	Estimate and calculate deductions from income.
A2.3	Estimate and calculate taxes on income using the tax slab (as per the government of Bhutan) for PIT.
D	**Data Management and Probability**
D1	Data Representation
D1.1	Represent raw statistical data into stem and leaf plot, histogram, cumulative frequency graphs and explain advantages and disadvantages of each representation.
D1.2	Determine central tendencies (mean, median and mode) for simple, discrete, grouped, and ungrouped data.
D1.3	Determine measures of variation (range, interquartile range, mean and standard deviation) for grouped and ungrouped data.

D2	Probability
D2.1	Define basic probability terms (like random experiment, sample space, and events) and classify different types of events (such as mutually exclusive, complementary, or impossible events).
D2.2	Solve simple probability problems by drawing sample space diagrams, outcome charts or sets.
D2.3	Differentiate between dependent and independent events, and calculate probabilities using the addition (OR) rule and multiplication (AND) rule.

Class XII Subject content

Business Mathematics 1

Candidates should be able to:

B	**Patterns and Algebra**
B8	Algebra
B8.1	Solve the following types of inequalities algebraically and graphically: • $k\|ax+b\| > c\ (c \geq 0)$ • $k\|ax+b\| \leq c\ (c > 0)$ • $k\|ax+b\| \leq \|cx+d\|$, where $k > 0$ • $\|ax+b\| \leq cx+d$
B8.2	Using graphs solve cubic inequalities of the form • $f(x) = 0$ • $f(x) \geq d$ • $f(x) > d$ • $f(x) \leq d$, Where $f(x)$ is a cubic function.
B8.3	Understand the concept of the remainder theorem, and evaluate the remainder when a polynomial (not exceeding degree 4) is divided by a polynomial.
B4.4	Understand the factor theorem and factorise a polynomial using the factor theorem (not exceeding degree 4).
B9	Differentiation
B9.1	Find the derivatives of rational, logarithmic $(log\ x, log(ax+b))$ and exponential (exclude a^x) functions.
B9.2	Differentiate implicit functions and parametric functions (first-order derivatives only).
B9.3	Find the higher-order (up to second-order) derivatives of basic algebraic functions.

B9.4	Define and determine the maxima, minima, and points of inflexion of a function, along with the conditions of their existence.
B9.5	Apply maxima and minima to solve practical problems involving only numbers (Exclude geometrical figures and mensuration problems).
B10	Integration
B10.1	Integrate x^n and $(ax+b)^n$ (for any rational of $n \neq -1$) including constant multiples, sums, and differences and integrate functions like: • $e^{(ax+b)}$ • $\frac{1}{(ax+b)}$
B10.2	Apply substitution techniques to evaluate integrals including those of the form $\frac{kf'(x)}{f(x)}$.
B10.3	Evaluate integrals of rational functions through partial fraction decomposition (excluding improper fractions and denominators with more than three factors).
B10.4	Evaluate integrals of products of functions using the integration by parts (only basic functions of algebra, logarithmic, and exponential functions).
B10.5	Use definite integration to find the area of a region bounded by a line, a curve, and the coordinate axes.
B11	Application of Calculus in Commerce and Economics
B11.1	Define, and write the cost function, demand function, revenue function, profit function, Average and Marginal Costs, Average and Marginal Revenues.
B11.2	Find the break-even points, average cost and average revenue.
B11.3	Find the marginal cost and marginal revenue by applying the idea of differentiation.
B11.4	Determine the functions that maximise profits and revenues, and minimise costs, using the concept of maxima and minima.
B11.5	Determine the total cost and total revenue function using the concept of integration.

Business Mathematics 2

Candidates should be able to:

A	**Numbers and Operations**
A3	Matrices
A3.1	Solve a system of equations with two or three unknowns using Martin's rule.
A3.2	Determine whether a system of two or three linear equations is consistent or inconsistent.
A4	Logarithmic and exponential functions
A4.1	Apply exponential laws to simplify expressions and convert between exponential and logarithmic forms.
A4.2	Apply the Laws of logarithms and apply them to solve the problems involving the unknown in indices (excluding change of base).

A4.3	Understand and interpret the inverse relationship between e^x and $logx$, including their properties and graphical representations.
A5	Annuities
A5.1	Define types of annuities, classes of annuity, certain, future value, and present value of an annuity.
A5.2	Apply the understanding of future value to find the amount, instalment, and the term of annuities.
A5.3	Differentiate between the present and future value of annuities, and calculate the future value, present value, and Equated Monthly Instalments (EMI) using relevant formulas to solve problem**s.**
A5.4	Comprehend and solve problems related to annuity and perpetuity.
D	**Data Management and Probability**
D3	Correlation
D3.1	Calculate and interpret Karl Pearson's coefficient of correlation for ungrouped data collected from real-life experiments.
D3.2	Calculate and interpret Spearman's Rank correlation coefficient (including tied ranks) for ungrouped data.
D4	Regression
D4.1	Interpret the meaning of regression coefficients and understand the significance of the regression line.
D4.2	Determine regression coefficients and equations.
D4.3	Apply knowledge of regression lines to interpret data distribution.
D5	Permutations and combinations
D5.1	Discuss the meanings of the terms permutation and combination.
D5.2	Differentiate between permutations and combinations through illustrative examples.
D5.3	Solve permutation problems in a line involving repetition and restrictions. (Exclude circular permutation)
D5.4	Solve combination problems involving restriction.
D6	Probability
D6.1	Solve probability problems by using both the addition and multiplication theorems of probability.
D6.2	Solve problems involving conditional problem in simpler cases
D6.3	Use concept of permutation and combination in calculating probabilities.

Grade descriptors

Grade descriptors are intended to illustrate the standards of achievement expected of candidates awarded particular grades. They provide a general indication of the performance required at Grades A, C and E. The descriptors are not mark schemes and should be interpreted in relation to the content of this syllabus, the assessment objectives, and the contexts in which tasks are set. They are designed to help teachers and examiners understand the level of performance typical of each grade, and to support benchmarking of candidate work.

Grade	AO1	AO2
A	Candidates demonstrate thorough knowledge and secure understanding of mathematical concepts, terminology, and notation. They recall and apply techniques accurately and fluently.	Candidates consistently identify suitable procedures, apply appropriate combinations of skills to solve both routine and complex problems, and present their work clearly and logically, with well-justified conclusions.
C	Candidates show a sound knowledge and understanding of mathematical concepts, terminology, and notation. They generally recall and apply techniques correctly, though occasional errors may occur.	Candidates can usually identify appropriate procedures in straightforward situations, apply skills to standard problems with some success, and present work that is mostly clear, with conclusions that are reasonably communicated.
E	Candidates demonstrate a basic knowledge and partial understanding of mathematical concepts, terminology, and notation. They recall some techniques but often with inaccuracies.	Candidates may recognise appropriate procedures in simple situations but struggle with unfamiliar problems or combining skills effectively. Their work is inconsistently presented, and conclusions are sometimes incomplete or unclear.

4. Details of the assessment

Paper 1 Business Mathematics 1

Written paper, 1 hour 45 minutes, 70 marks.
All questions in the examination papers are compulsory.

Section A in this paper has 10 multiple-choice items of the four-choice type worth 10 marks each testing part of assessment objective AO1(knowledge and understanding) and part of assessment objective AO2 (applying) questions.
Section B in this paper has 8 to 10 structured questions worth 4 to 10 marks of various length and often contain several parts, labelled (a), (b), (c), which may have sub-parts (i), (ii), (iii), each testing assessment objectives AO1 and AO2 questions.

Assessment Objectives	Level	Marks Allocation %
AO1 Knowledge and Understanding	Knowledge	15% to 25%
	Understanding	25% to 35%
AO2 Application and communication	Applying	20% to 30%
	Analysing	10% to 20%
	Evaluating	5% to 15%

Questions are based on the Business Mathematics 1 syllabus content of Classes XI and XII. Approximately 25% of the marks are based on Class XI content.
Candidates must use the formulae given in the appendix. These are the only formulae accepted in candidate responses.

Paper 2 Business Mathematics 2

Written paper, 1 hour 45 minutes, 70 marks.
All questions in the examination papers are compulsory.

Section A in this paper has 10 multiple-choice items of the four-choice type worth 10 marks each testing part of assessment objective AO1(knowledge and understanding) and part of assessment objective AO2 (applying) questions.

Section B in this paper has 8 to 10 structured questions wroth 4 to 10 marks of various length and often contain several parts, labelled (a), (b), (c), which may have sub-parts (i), (ii), (iii), each testing assessment objectives AO1 and AO2 questions.

Assessmnet Objectives	Level	Marks Allocation %
AO1 Knowledge and Understanding	Knowledge	15% to 25%
	Understanding	25% to 35%
AO2 Application and communication	Applying	20% to 30%
	Analysing	10% to 20%
	Evaluating	5% to 15%

Questions are based on the Business Mathematics 2 syllabus content of Classes XI and XII.
Approximately 25% of the marks are based on Class XI content.
Candidates must use the formulae given in the appendix. These are the only formulae accepted in candidate responses.

Coursework

School based assignment, 1 year, 40 marks.
Internally assessed and externally verified.

Coursework component 3 tests assessment objectives AO1 and AO2. Candidates submit one coursework assignment over two years period based on content of class XI or XII.

BCSEA coursework is designed to allow assessment of candidates' ability to use and apply mathematics in practical, real-life tasks and within mathematics itself. The coursework component has been developed to translate the requirements of the curriculum into good classroom practice for candidates across the whole ability range and to provide opportunities for candidates to use information technology where appropriate.

Further details about types of coursework task, mark schemes and guidance around administration will be provided before the first year of assessment

Examination information

Structure of the question paper

All questions in the examination papers are compulsory. An approximate number of questions for each paper is given in the Section 4: Details of the Assessment of this syllabus. Questions are of varied lengths and often contain several parts, labelled (a), (b), (c), which may have sub-parts (i), (ii), (iii), as needed. Some questions might require candidates to sketch graphs or diagrams, or draw accurate graphs.

Answer space

Candidates answer on the question paper. All working should be shown neatly and clearly in the spaces provided for each question. If additional space is required, candidates should use the blank page at the end of the question paper, where the question number or numbers must be clearly shown.

Additional materials for examinations

Candidates are expected to have the following equipment in examinations:

- a scientific calculator (see the following section)
- a list of formulae is supplied in examinations for the use of candidates. A copy of the list of formulae is given for reference in this syllabus.

Calculators

It is expected that candidates will have a calculator with standard 'scientific' functions available for use in all the examinations. Computers, graphical calculators and calculators capable of symbolic algebraic manipulation or symbolic differentiation or integration are not permitted. The General Regulations concerning the use of calculators are contained in the Operational Guidelines for Examination and Assessment (OGEA) available from www.bcsea.bt.

Candidates are expected to show all necessary working; no marks will be given for unsupported answers from a calculator.

Degrees of accuracy

Candidates should present numerical answers to three significant figures unless a different level of accuracy is specified in the question. To earn accuracy marks, candidates should avoid rounding figures until they have their final answer.

Command words

Command words and their meanings help candidates know what is expected from them in the exam. The table below includes command words used in the assessment for this syllabus. The use of the command word will relate to the subject context.

Command words	What it means
Apply	Use a theorem, law, or method to solve problems.
Calculate	Perform numerical computations.
Classify	Categorize mathematical objects based on properties (e.g., maxima, minima, inflection points).
Compute	Find a numerical value using a given method or formula.
Construct	Create a mathematical object (e.g., graph, diagram, equation) using given conditions.
Comment	Give a brief mathematical explanation or observation.
Compare	Examine the relationship between two quantities or probabilities.
Decompose	Break down a mathematical expression into simpler parts (e.g., partial fractions).
Describe	Explain a property or behavior (e.g., nature of roots using discriminant).
Determine	Find or calculate a specific value or property.
Differentiate	Find the derivative of a function.
Draw	Represent a diagram or graph accurately using given information.
Evaluate	Compute the value of an expression or integral.
Expand	Write out $(a+b)^n$ & $(a-b)^n$as a sum of terms (binomial expansion).
Explain	Give clear reasoning or justification using mathematical concepts.
Factorize	Express a polynomial as a product of simpler polynomials.
Find	Compute or locate a mathematical object (e.g., inverse function, stationary points).
Identify	Recognize and name a mathematical property or function.
Illustrate	Represent a concept graphically or visually.
Integrate	Find the antiderivative of a function.
Interpret	Explain or give meaning to a mathematical relationship or graphical representation.
Predict	Estimate an unknown value using a mathematical model (e.g., regression).
Prove	Show a statement is true (e.g. right-hand side is equal to left-hand side)
Represent	Express data or functions in a different form (e.g., stem-and-leaf plot, histogram).
Simplify	Reduce an expression to a more compact form using identities.
Show	Provide structured evidence that leads to a given result
Sketch	Draw a rough graph representing a function or relationship.
Solve	Find the solution(s) to an equation, inequality, or problem.
State	Give the answer or fact without working.
Test	Check whether a statement or solution satisfies given conditions.
Use	Employ a mathematical tool or concept in a given situation.
Verify	Confirm the truth of a result by showing it is correct mathematically.

Symbols and conventions learners should recognise

Symbol	Definition
$\cap$	intersection, the common elements among sets
θ	theta, the representation of an angle
| x |	modulus x or absolute value of x, the magnitude of x, or the distance of x from zero
$\neq$	not equal to
$\frac{dy}{dx}$ or $f'(x)$	Derivative of *y* with respect to *x*, which means the slope of the tangent to the curve at a given point.
$<, >, \leq, \geq$	Inequality symbols - which are less than, greater than, less than or equal to, and greater than or equal to signs.

List of formulae

Class XI

Strand A: Numbers and Operations

$$C_{ij} = (-1)^{i+j} M_{ij}$$

$$A A^{-1} = A^{-1} A = I$$

$$A^{-1} = \frac{1}{\det A} \cdot adjA$$

Strand B: Patterns and Algebra

$$|x| = \begin{cases} x, \text{ if } x \geq 0 \\ -x, \text{ if } x \leq 0 \end{cases}$$

$$|a| = |b| \Leftrightarrow a^2 = b^2$$
$$|a| > |b| \Leftrightarrow a^2 > b^2$$
$$|a| < |b| \Leftrightarrow a^2 < b^2, \text{ if } b \neq 0.$$

$$ax^2 + bx + c = 0, (a \neq 0)$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$T_n = a + (n-1)d$$
$$S = \frac{n}{2}(a + l)$$
$$S = \frac{n}{2}[2a + (n-1)d]$$
$$n^{th} \ term = S_n - S_{n-1}$$

$$t_n = ar^{n-1}$$
$$S_n = \frac{a(1-r^n)}{1-r} (r \neq 1)$$
$$S_n = \frac{a - lr}{1-r} = \frac{lr - a}{r-1}$$

$$A.M = \frac{a+b}{2}, \text{ if } a \text{ and } b \text{ are the given numbers}$$

$$G.M = \sqrt{ab}$$

$$\frac{dy}{dx} \text{ or } f'(x) = \lim_{\delta x \to 0} \frac{f(x + \delta x) - f(x)}{\delta x}$$

$$\frac{d}{dx} x^n = nx^{n-1}$$
$$\frac{d}{dx}(ax+b)^n = n(ax+b)^{n-1} \times a$$

$$\frac{d}{dx}(uv) = u\frac{d}{dx}v + v\frac{d}{dx}u$$

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v\frac{d}{dx}u - u\frac{d}{dx}v}{v^2}$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + c, n \neq -1$$

$$\int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{n+1} \times \frac{1}{a} + c, n \neq -1$$

$$\int_a^b f(x)dx = [F(x)]_a^b = [F(b) - F(a)]$$

Strand D: Data Management and Probability

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}, \qquad \bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$$

$$\bar{x} = A + \frac{\sum fd}{\sum f}, \text{ where } d_i = x_i - A$$

$$\bar{x}_w = \frac{\sum_{i=1}^{n} w_i x_i}{\sum_{i=1}^{n} w_i}, \quad \bar{x} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$$

Median (M_d) = Size of $\frac{n+1}{2} th$ item

$$M_d = l + \frac{i}{f}\left(\frac{n}{2} - c\right)$$

Interquartile range $= Q_3 - Q_1$

$$Q_1 = \frac{n}{4}, \; Q_1 = \frac{n+1}{4} th \text{ item}, \; Q_1 = l + \frac{i}{f}\left(\frac{n}{4} - c\right)$$

$$Q_3 = \frac{3n}{4}, \; Q_3 = \frac{3(n+1)}{n} th \text{ item}, \; Q_3 = l + \frac{i}{f}\left(\frac{3n}{4} - c\right)$$

Quartile deviation $= \frac{Q_3 - Q_1}{2}$

$$\sigma = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$$

$$\sigma = \sqrt{\frac{\sum (x-M)^2}{n}} = \sqrt{\frac{\sum (d_x)^2}{n}}$$

$$\sigma = \sqrt{\frac{\sum f(x-M)^2}{\sum f}} = \sqrt{\frac{\sum f(d_x)^2}{\sum f}}$$

$$P(E) = \frac{n(A)}{n(S)}$$

$$P(\bar{A}) = 1 - P(A)$$

$$P(A) + P(\bar{A}) = 1$$

Class XII

Strand A: Numbers and Operations

$$C_{ij} = (-1)^{i+j} M_{ij}$$

$$A A^{-1} = A^{-1} A = I$$

$$A^{-1} = \frac{1}{\det A} \cdot adjA$$

$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

$$(a^m)^n = a^{m \times n}$$

$$(ab)^n = a^n b^n$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$a^{\frac{1}{n}} = \sqrt[n]{a}, \quad \left(a^{\frac{1}{n}}\right)^n = a$$

$$\log_a \left(\frac{m}{n}\right) = \log_a m - \log_a n$$

$$\log_a m^n = n \log_a m$$

$$\log_a \left(\frac{1}{n}\right) = -\log_a n$$

$$\log_a (m^p) = p \log_a m$$

$$A = \frac{a}{i}(1+i)\left[(1+i)^n - 1\right]$$

$$A = \frac{a}{i}\left[(1+i)^n - 1\right]$$

$$P = \frac{a}{i}(1+i)[1-(1+i)^{-n}]$$

$$P = \frac{a}{i}[1-(1+i)^{-n}]$$

$$\text{Present worth}(P) = \frac{A}{1+ni}$$

Strand B: Patterns and Algebra

$$|x| = \begin{cases} x, \text{ if } x \geq 0 \\ -x, \text{ if } x \leq 0 \end{cases}$$

$$|a| = |b| \Leftrightarrow a^2 = b^2$$
$$|a| > |b| \Leftrightarrow a^2 > b^2$$
$$|a| < |b| \Leftrightarrow a^2 < b^2, \text{ if } b \neq 0.$$
$$|x-a| < b \Leftrightarrow a-b < x < a+b$$

If $P(x)$ is divided by $D(x)$, then
$P(x) = D(x).Q(x) + R(x)$
Where: $Q(x)$ is quotient
$R(x)$ is Remainder

$(x-a)$ is factor of $f(x)$ if and only if $f(x) = 0$.
Conversely: if $f(a) = 0$, then $(x-a)$ is a factor.

If a polynomial $P(x)$ is divided by $x-c$,
the remainder is $P(c)$.
If a polynomial $P(x)$ is divided by $ax-b$,
the remainder is $P\left(\frac{b}{a}\right)$.

$$a^2 - b^2 = (a+b)(a-b)$$
$$(a \pm b)^2 = a^2 \pm 2ab + b^2$$
In the quadratic equation $ax^2 + bx + c = 0$,
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = x^n, \; y' = nx^{n-1}$$

If $y = u \pm v$, then $\frac{dy}{dx} = \frac{du}{dx} \pm \frac{dv}{dx}$

If $y = uv$, then $\frac{dy}{dx} = u\frac{dv}{dx} + v\frac{du}{dx}$

If $y = \frac{u}{v}$, then $\frac{dy}{dx} = \frac{v\frac{du}{dx} - u\frac{dv}{dx}}{v^2}$

$$\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$$

$$\int x^n \, dx = \frac{x^{n+1}}{n+1} + c$$

$$C(x) = F + V(x), \; A(x) = \frac{C(x)}{x}$$

$$R(x) = p.x, \; P(x) = R(x) - C(x)$$

$$MC = \frac{d}{dx}\big(C(x)\big), \; MR = \frac{d}{dx}\big(R(x)\big)$$

$$y=(ax+b)^n,\ y'=n(ax+n)^{n-1}\times a$$

Strand D: Data Management & Probability

$${}^{n}p_r=\frac{n!}{(n-r)!}$$

$${}^{n}C_r=\frac{n!}{r!(n-r)!}$$

$$\overline{X}=\frac{\sum fx}{\sum f}\ \text{or}\ \bar{X}=\frac{\sum x}{n}$$

$$r=\frac{n\sum xy-\sum x\sum y}{\sqrt{n\sum x^2-\left(\sum x\right)^2}\sqrt{n\sum y^2-\left(\sum y\right)^2}}$$

$$r=\frac{\sum(x-\bar{x})(y-\bar{y})}{n\sigma_x\sigma_y}$$

$$r=1-\frac{6\sum d^2}{n(n^2-1)},$$

$$\text{Correction factor}=\frac{1}{12}\left(m^3-m\right)$$

$$b_{yx}=r\frac{\sigma_y}{\sigma_x}=\frac{n\sum xy-\sum x\sum y}{n\sum x^2-\left(\sum x\right)^2}$$

$$b_{xy}=r\frac{\sigma_x}{\sigma_y}=\frac{n\sum xy-\sum x\sum y}{n\sum y^2-\left(\sum y\right)^2}$$

$$y-\bar{y}=\frac{\text{cov}(x,y)}{\sigma_x^{\,2}}(x-\bar{x})\ =\ r\frac{\sigma_y}{\sigma_x}(x-\bar{x})$$

$$x-\bar{x}=\frac{\text{cov}(x,y)}{\sigma_x^{\,2}}(y-\bar{y})\ =\ r\frac{\sigma_x}{\sigma_y}(y-\bar{y})$$

$$P(A\cup B)=P(A)+P(B)-P(A\cap B)$$

$$P(A)+P(\overline{A})=1$$

$$P(B/A)=\frac{P(A\cap B)}{P(A)}$$

$$P(A/B)=\frac{P(A\cap B)}{P(B)}$$

5. What else you need to know

This section provides key information about the syllabus and administrative processes. It is intended to help teachers, candidates, and schools understand how to manage entries, assessments, and access arrangements effectively. More information is available on the BCSEA portal (www.bcsea.bt) and through official guidance documents.

Before you start

Previous study

Learners beginning this course are recommended to have completed prior study in mathematics equivalent to the Bhutan Certificate of Secondary Education (BCSE).

Guided learning hours

The course is designed to require approximately 140 guided learning hours for class XI and 140 guided learning hours for Class XII.

Combining with other syllabuses

Candidates may take this syllabus alongside other BCSEA syllabuses, except where syllabuses have the same name and key stage.

Making entries

Schools are responsible for submitting candidate entries. Schools should ensure candidates are entered for the correct syllabus components. Entry instructions are available in the Operation Guidelines for Examination and Assessment (OGEA) available at www.bcsea.bt.

Retakes

Candidates may retake Business Mathematics components as required.

Language

This syllabus and all assessment materials are available in English only.

Accessibility and equality

Syllabus and assessment design

- BCSEA aims to avoid discrimination and maximise inclusivity for all candidates, including those with special educational needs and disabilities (SEN), religion, gender, or other protected characteristics**.**
- Materials are designed to be accessible, using clear language and recognized design principles.

Access arrangements

- BCSEA provides access arrangements to minimise barriers for candidates with SEN, disability, illness, or injury.
- Arrangements should reflect a candidate's normal way of working**.** Approval must ensure that adjustments are reasonable, cost-effective, and do not compromise assessment integrity.
- schools should confirm access arrangements at the start of the course. For special arrangements not included in standard lists as per OGEA, contact BCSEA for guidance.
- Candidates unable to access all components may receive an award based on completed components.

After the exam

Grading and reporting

- Grades A – E, with 'A' as highest and 'E' as lowest.
- **Ungraded:** Candidates not meeting the lowest grade standard are reported as **Ungraded** (U).