Bhutan Council for School Examinations and Assessment

Mathematics
Assessment Syllabus
Key Stage 4 (Classes IX and X)
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 students 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:** Math 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 nurtures learners to become:

Confident – able to use mathematical language and techniques to ask questions, explore ideas, and communicate effectively.
Responsible – taking ownership of their learning and applying mathematical knowledge and skills to reason, solve problems, and collaborate with others.
Reflective – making connections within mathematics and across other subjects, while evaluating methods and checking solutions.
Innovative – applying their understanding to tackle unfamiliar problems with creativity, flexibility, and efficiency.
Engaged – inspired by the beauty, patterns, and structures of mathematics, and curious about its diverse applications in society and the economy.

Key Concept

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

Skills

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 Mathematics curriculum equips students with skills and knowledge that are valued by universities and employers worldwide**.**

Students who complete 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 frameworks, 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:

- foster a positive attitude towards mathematics, encouraging enjoyment, building confidence, and inspiring curiosity and lifelong learning.
- develop strong number sense and appreciate the significance of the results they obtain.
- apply mathematical knowledge and skills to their own lives and the wider world.
- use creativity and perseverance to analyse and solve problems.
- communicate mathematical ideas clearly and effectively.
- reason logically, make inferences, and draw sound conclusions.
- achieve fluency and appreciate the interconnections among different areas of mathematics.
- build a solid foundation for further study in mathematics and related subjects.

Content Overview

Assessment Component	Strand	Class IX	Class X
Mathematics 1	Number and Operation	1: Using a calculator	10: Radical
		2: Real Numbers	11: Matrices
		3: Representing and Comparing Numbers: Fractions, Decimals (terminating and non-terminating), and Percentages	12: Commercial mathematics
		4: Ratio and Proportion	
		5: Rates	
		6: Exponent and laws of exponent	
		7: Scientific notation	
		8: Sets and Venn diagram	
		9: Commercial mathematics	
	Patterns and Algebra	1: Polynomial expressions	5: Linear Functions and Relations
		2: Linear and Non-Linear Relations and Graphs	6: Solving Systems of Linear Equations
		3: Linear Equations and Inequalities	7: Forms of Quadratic Functions
		4: Sequences	8: Solving Nonlinear Equations
			9: Differentiation

Mathematics 2	Measurement and geometry	1: Geometrical terms	16: Surface Area of 3-D Shapes
		2: Circle terms	17: Volume Area of 3-D Shapes
		3: Circle, arcs and sectors	18: Trigonometry
		4: Angles	19: Symmetry
		5: Precision and Accuracy	20: Constructions
		6: Units of measurement	21: Geometric and Symmetry Properties of Circles
		7: Area and perimeter of regular polygons and compound shapes	
		8: Surface area of 3-D shapes	
		9: Volume of 3-D shapes	
		10: Pythagorean theorem	
		11: Trigonometry	
		12: Congruence and Similarity of Triangles	
		13: Transformation	
		14: Vectors in two dimensions	
		15: Length and midpoint	
	Data Management and Probability	1: Collecting, Displaying and Analysing Data	3: Collecting, Displaying and Analysing Data
		2: Probability	4: Data Involving Two Variables
			5: Probability

Assessment Overview

Key Stage 4 Mathematics Components:

Paper 1
Mathematics 1 1 hours 30 minutes 60 marks Mathematics 1 subject content of Classes IX and X Approximately 25% from Class IX 10 MCQ and 5 structured questions Written examination Externally assessed 40% to the total marks

Paper 2
Mathematics 2 1 hours 30 minutes 60 marks Mathematics 2 subject content of Classes IX and X Approximately 25% from Class IX 10 MCQ and 5 structured questions Written examination Externally assessed 40% to the total marks

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

Assessment Objectives

The assessment objectives (AOs) are:

AO1: Knowledge and understanding of mathematical techniques
- Recall and apply mathematical knowledge and techniques
- Carry out routine procedures in mathematical and everyday situations
- Understand and use mathematical notation and terminology
- Perform calculations with a calculator
- Organise, process, present and understand information in written form, tables, graphs and diagrams
- Estimate, approximate and work to degrees of accuracy appropriate to the context and convert between equivalent numerical forms
- Understand and use measurement systems in everyday use
- Measure and draw using geometrical instruments to an appropriate degree of accuracy
- Recognise and use spatial relationships in two and three dimensions.

AO2: Analyse, interpret and communicate mathematically
- Analyse a problem and identify a suitable strategy to solve it, including using a combination of processes where appropriate
- Make connections between different areas of mathematics
- Recognise patterns in a variety of situations and make and justify generalisations
- Make logical inferences and draw conclusions from mathematical data or results
- Communicate methods and results in a clear and logical form
- Interpret information in different forms and change from one form of representation to another.

Weighting for assessment objectives

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

Assessment objective	Weighting in Key Stage 4 %
AO1 Knowledge and understanding of mathematical techniques	50
AO2 Analyse, interpret and communicate mathematically	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 of mathematical techniques	50	50	50
AO2 Analyse, interpret and communicate mathematically	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.

Prior Knowledge

To successfully take up Key Stage 4 Mathematics, learners are expected to have completed Key Stage 3 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 KS4.

Specifically, students should have a solid understanding of the following areas from KS3:

- **Strand A:** This strand covered essential number concepts that students were expected to master by the end of Key Stage 3, including operations with decimals, integers, fractions, and rational and irrational numbers. It also included understanding of ratios, proportions, percentages, powers, exponents and their laws, scientific notation, and basic consumer math. This foundational knowledge enabled students to apply numerical skills confidently and accurately in real-life.
- **Strand B:** Students develop their understanding of algebraic concepts such as sequences, linear equations, and polynomials. By the end of Key Stage 3, students were expected to identify and continue number patterns, form and solve linear equations, and perform basic operations with polynomials, including simplifying expressions and combining like terms. This strand laid the groundwork for more advanced algebraic reasoning and problem-solving in Key Stage 4.

- **Strand C:** Students gained foundational knowledge in measurement and geometry, including the use of SI units, calculating area and perimeter, and finding the circumference of circles and the perimeter of polygons. They learned to calculate volume, construct and measure angles, and understand angle properties in polygons and around parallel and transversal lines. Skills in coordinate geometry and geometric transformations were also developed, along with constructing triangles and applying the Pythagorean Theorem.
- **Strand D**: Students developed essential skills in data handling and probability by learning to collect, organize, display, and interpret data using charts, graphs, and tables. They also explored basic probability concepts, including the likelihood of events, and calculated simple probabilities.

Class IX Subject content

Mathematics 1

Candidates should be able to:

A	Numbers and Operations
A1	Using a calculator
A1.1	Use a calculator effectively by avoiding rounding during intermediate steps and rounding only the final answer.
A1.2	Input values correctly on a calculator, for example, entering 1 hour 45 minutes as 1.75 hours or as 1° 45′ 0″.
A1.3	Interpret the calculator display appropriately (e.g. in money 4.8 means 4 ngultrum and 80 cheltrum; in time 3.25 means 3 hours 15 minutes).
A2	Real numbers
A2.1	Define, identify and use different types of real numbers (natural numbers, whole numbers, integers, prime numbers, square numbers, cube numbers, rational numbers, and irrational numbers).
A2.2	Justify if a given number is rational or irrational.
A2.3	Place irrational numbers on a number line relative to known rational numbers.

A2.4	Demonstrate that the set of real numbers includes both rational and irrational numbers
A2.5	Represent and interpret inequalities, including on a number line.
A2.6	Order quantities by magnitude using the symbols =, ≠, >, < , ⩾ and ⩽
A2.7	Estimate the results of calculations by rounding numbers to a specified degree of accuracy, such as to the nearest whole number, tenth, or significant figure.
A2.8	Determine upper and lower bounds for data rounded to a specified accuracy.
A2.9	Determine the upper and lower bounds of results when calculations involve values rounded to a given degree of accuracy.
A2.10	Use the four operations for calculations with real numbers using BEDMAS.
A3	Representing and Comparing Numbers: Fractions, Decimals (terminating and non-terminating), and Percentages
A3.1	Use the language and notation of proper fractions, improper fractions, mixed numbers, decimals, and percentages in mathematical contexts.
A3.2	Convert between proper fractions, improper fractions, mixed numbers, decimals, and percentages, and explain the relationships among these forms.
A3.3	Use the knowledge of percentage and decimal to convert between different currencies.
A4	Ratio and proportion
A4.1	Simplify ratios to their simplest form.
A4.2	Divide a given quantity according to a specified ratio.
A4.3	Apply proportional reasoning and ratios to solve real-life problems.
A5	Rates
A5.1	Use measures of rate (eg. hourly rates of pay, flow rates, fuel consumption, average speed, etc.).
A6	Exponent and Laws of Exponent.
A6.1	Explain the laws of exponents and describe how they are used to simplify mathematical expressions.
A6.2	Apply the following exponent rules/laws: • $a^m \times a^n = a^{m+n}$ • $a^m \div a^n = a^{m-n}$ • $(ab)^n = a^n b^n$ • $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$ • $(a^m)^n = a^{mn}$

	• $a^0 = 1$ • $a^{-n} = \frac{1}{a^n}$ • $a^{\frac{1}{2}} = \sqrt{a}$ • $a^{\frac{1}{n}} = \sqrt[n]{a}$ • $a^{\frac{m}{n}} = \sqrt[n]{a^m}$
A7	Scientific Notations.
A7.1	Express numbers in standard form as $A \times 10^n$, where n is a positive or negative integer and $1 \leqslant A < 10$.
A7.2	Convert numbers from standard to scientific form and vice versa.
A7.3	Perform calculations using numbers in standard form.
A8	Sets and Venn diagram.
A8.1	Use set language and notation to describe sets of numbers, shapes, objects, etc.
A8.2	Represent sets using Venn diagrams and carry out different operations on sets (union, intersection and complementary).
A8.3	Apply set theory to solve problems in real life context.
A9	Commercial Mathematics
A9.1	Solve problems involving purchases using the idea of percentage.
A9.2	Express one quantity as a percentage of another.
A9.3	Use reverse percentage methods to find original values.
A9.4	Calculate simple interest, rates, time, principal and amount.
B	**Patterns and Algebra**
B1	Polynomial expressions
B1.1	Substitute numbers into expressions and formulas.
B1.2	Interpret and classify different types of polynomials.
B1.3	Simplify polynomial expressions by combining like terms.
B1.4	Add and subtract polynomials pictorially and symbolically.
B1.5	Multiply symbolically: a polynomial by a monomial, multiply a binomial by a binomial and a monomial by a scalar, a polynomial by a scalar.

B1.6	Divide symbolically: monomial by a monomial; polynomial by a scalar; polynomial by a monomial.
B2	Linear and Non-Linear Relations and Graphs
B2.1	Describe relationships between variables, from graphs, tables and word problems.
B2.2	Explain why the data in a table or graph represents a linear, quadratic, cubic, reciprocal or exponential relationship.
B2.3	Derive the formula of slope from the graph as rise/run (rise the vertical change, and run the horizontal change) and relate the y-intercept to the value of the y-coordinate where the graph crosses the y-axis.
B2.4	Graph the linear equation in slope and y-intercept form.
B2.5	Calculate the gradient/ slope of a straight line from the coordinates of two points on it.
B2.6	Determine the slope and y-intercept by examining a table, graph, or equations.
B2.7	Recognize the two forms of linear equations: (y = mx+b) given the slope (m) and y-intercept (b), and standard form (ax + by = c).
B2.8	Graph the linear equation in standard form.
B2.9	Determine the gradient and equation of a line parallel to a given line.
B2.10	Determine the gradient and equation of a line perpendicular to a given line.
B3	Linear Equations and Inequalities
B3.1	Solve linear equation problems graphically and algebraically.
B3.2	Solve fractional equations where numerators and denominators may include numerical values or linear algebraic expressions.
B3.3	Represent inequality using symbols of inequality and solve linear inequalities algebraically.
B3.4	Describe inequalities using graphs.
B3.5	Write inequalities that show the area covered by a shape or region.
B4	Sequences
B4.1	Identify and continue numerical sequences or patterns.
B4.2	Spot patterns in number sequences, figure out how each term changes, and see how different sequences relate.
B4.3	Determine and apply the nth term formula for the given sequences: • linear • simple quadratic • simple cubic.

Mathematics 2

Candidates should be able to:

C	Measurement and Geometry
C1	Geometrical Terms
C1.1	Apply and understand the meanings of the following geometrical terms: • point • vertex • line • plane • parallel • perpendicular • perpendicular bisector • right angle • acute, obtuse and reflex angles • interior and exterior angles • similar • congruent • scale factor.
C2	Circle Terms
C2.1	Use and interpret the vocabulary related to circles, including the following terms: • centre • radius (plural radii) • diameter • circumference • semicircle • chord • tangent • major and minor arc • sector • segment.
C3	Circles, arcs and sectors
C3.1	Calculate arc length and sector area as fractions of a circle's circumference and area, when the sector angle is a factor of 360°
C4	Angles
C4.1	Determine missing angles and give explanations based on the following geometric rules: • sum of angles at a point = 360° • sum of angles at a point on a straight line = 180° • vertically opposite angles are equal • angle sum of a triangle = 180° • angle sum of a quadrilateral = 360°.

C4.2	Calculate unknown angles and give geometric explanations for angles formed within parallel lines: • corresponding angles are equal • alternate angles are equal co-interior (supplementary) angles sum to 180°.
C4.3	Use angle properties of regular and irregular polygons.
C5	Precision and accuracy
C5.1	Demonstrate understanding that precision depends on how finely an instrument is calibrated (or graduated) (e.g. measuring length using cm ruler or mm ruler).
C5.2	Demonstrate understanding that accuracy depends upon how correctly the measurement is taken.
C5.3	Express measurements using significant figures.
C6	Units of Measurement
C6.1	Use metric measurements for mass, length, area, volume, and capacity in practical situations, converting quantities to different unit scales.
C7	Area and perimeter of regular polygons and compound shapes.
C7.1	Calculate area and perimeter of regular polygons (Pentagon, Hexagon, Heptagon, Octagon, Nonagon, and Decagon) with given dimensions.
C7.2	Calculate perimeters and areas of compound shapes and parts of shapes.
C8	Surface Area of 3-D Shapes
C8.1	Calculate the surface area of following 3-D shapes using formula and nets. • Rectangular based prism • Cylinder
C8.2	Solve problems related to finding: • Surface area when dimensions are given. • unknown dimension when surface area is given. • Calculate surface area of real life based composite shapes made up of rectangular prism and cylinder.
C9	Volume of 3-D Shapes
C9.1	Calculate the volume of following 3-D shapes. • Rectangular based prism • Cylinder
C9.2	Calculate volume of real life based composite shapes made up of rectangular based prisms and using cylinders.
C10	Pythagorean Theorem
C10.1	Understand and state the Pythagorean Theorem.
C10.2	Apply the theorem to calculate the length of a side in right-angled triangles.
C10.3	Solve real-life problems involving right-angled triangles using the Pythagorean theorem.

C11	Trigonometry
C11.1	Develop primary trigonometric ratios by applying properties of similarity and side-angle relationships.
C11.2	Use calculators to determine the trig ratios sin θ, cos θ, and tan θ.
C11.3	Use the sine and cosine ratios to articulate the relationships between the sides and angles of a triangle.
C12	Congruence and Similarity of Triangles
C12.1	Demonstrate understanding of the meaning of similarity.
C12.2	Demonstrate understanding of the meaning of congruence.
C12.3	Explain and apply the conditions necessary for similarity.
C12.4	Explain and apply the conditions necessary for congruency.
C12.5	Compare and contrast congruence and similarity as they relate to triangles.
C12.6	Solve problems related to similarity based on real life context.
C12.7	Solve problems related to congruence based on real life context.
C13	Transformations
C13.1	Use and interpret Cartesian coordinates in two dimensions.
C13.2	Apply translation, reflection, rotation, and dilation to shapes on the coordinate plane using mapping notation.
C13.3	Describe the nature of a transformation based on a given mapping notation.
C13.4	Identify and describe the sequence of geometric transformations (such as translation, reflection, rotation, or dilation) that map the pre-image to the image.
C14	Vectors in two dimensions
C14.1	Represent and describe a translation with a vector given by $\binom{x}{y}$, $\overrightarrow{AB}$, or a
C14.2	Carry out vector addition and subtraction operations.
C14.3	Carry out multiplication of a vector by a scalar quantity.
C15	Length and midpoint
C15.1	Find the length of a line segment.
C15.2	Determine the coordinates of the midpoint of a line segment.

D	Data Management and Probability
D1	Collecting, Displaying and Analysing Data
D1.1	Compute the 5 number summary (minimum, Q1, Q2, Q3 and maximum) for a given set of ungrouped data.
D1.2	Explain the fundamental steps involved in data management as part of the research methodology.
D1.3	Determine, discuss and justify why a particular display is suited to a specific type of data, or to a given context or purpose.
D1.4	Draw and interpret: • Bar charts • pie charts • histograms • stem-and-leaf diagrams • simple frequency distributions.
D1.5	Draw inferences and conclusions from a number of data displays.
D1.6	Identify and explain misleading features of graphs.
D1.7	Draw and interpret cumulative frequency tables and diagrams.
D1.8	Compare sets of data using tables, graphs and statistical measures
D2	Probability
D2.1	Understand and use the probability scale from 0 to 1.
D2.2	Understand and use probability notation.
D2.3	Calculate the probability of a single event.
D2.4	Understand that the probability of an event not occurring = 1 – the probability of the event occurring.
D2.5	Compare the experimental probability of an event with the theoretical probability for that event.
D2.6	Calculate the number of possible outcomes for independent events using outcome charts and tree diagrams.
D2.7	Determine the expected frequencies based on probabilities.
D2.8	Describe independent events and support your explanation with examples and reasoning.
D2.9	Calculate probabilities of independent events; *P(A) x P(B) = P(A and B).*

Class X Subject content

Mathematics 1

Candidates should be able to:

A	**Numbers and Operations**
A10	Radicals
A10.1	Understand how radical expressions are connected to irrational numbers.
A10.2	Convert an entire radical to a mixed radical and vice versa.
A10.3	Perform basic arithmetic operations on radical expressions.
A11	Matrices
A11.1	Describe matrices and identify features of the matrix (e.g. row, column, dimension, location and element).
A11.2	Classify types of matrices (square matrix, column matrix, row matrix, identity matrix).
A11.3	Justify inductively if two matrices can be added, subtracted, or multiplied by checking the orders of the matrices.
A11.4	Apply operations on matrices (addition, subtraction and multiplication) in problem situations.
A11.5	Represent a network as a matrix and interpret a matrix in terms of a corresponding network situation.
A12	Commercial Mathematics
A12.1	Demonstrate understanding of the long term difference between simple and compound interest.
A12.2	Draw and interpret graphs of exponential growth and decay, and apply this understanding to real-life problems such as compound interest.
A12.3	Investigate and evaluate various investment opportunities and financing options.
B	**Patterns and Algebra**
B5	Linear Functions and Relations
B5.1	Demonstrate an understanding of a relation and a function through examples.
B5.2	Convert equations of line from one form to another (slope and y-intercept form to standard form and vice versa).
B5.3	Construct algebraic expressions, equations, and formulas to represent and solve problems real world situations.
B5.4	Apply linear functions to a real-life situations.
B5.5	Create and interpret graphs from given data using digital tools in various formats.

B6	Solving Systems of Linear Equations
B6.1	Solve pairs of linear equations graphically by plotting equations on a coordinate plane and identifying the point of intersection as the solution.
B6.2	Solve pairs of linear equations by comparison method, substitution method, elimination method and relate to the real-life contexts.
B7	Forms of Quadratic Functions
B7.1	Recognise the three forms of quadratic functions: • $y = ax^2 + bx + c,\ a \neq 0$ • $y = a(x-h)^2 + k, a \neq 0$ • $y = a(x-p)(x-q), a \neq 0$
B7.2	Determine whether quadratic functions in different forms are equivalent to each other.
B8	Solving Nonlinear Equations
B8.1	Factorise and simplify rational expressions
B8.2	Solve quadratic equations using factorisation, completing the square, and the quadratic formula.
B8.3	Determine the roots (x-intercepts) of quadratic equations.
B9	Differentiation
B9.1	Construct a tangent line to a non-linear graph at a given point and determine the slope by calculating the gradient of the tangent.
B9.2	Find the derivative of algebraic functions of the form ax^n, where 'n' is a non-negative integer, including simple sums of up to three such terms.
B9.3	Apply the concept of differentiation to identify turning points (maxima and minima) of a function by: • Constructing accurate sketches of graphs, • using the second derivative test, and • analyzing the sign of the first derivative on either side of the turning point

Mathematics 2

Candidates should be able to:

C	**Measurement and Geometry**
C16	Surface Area of 3-D Shapes
C16.1	Calculate the surface area of various 3-D shapes (prisms, pyramids, cones, and spheres).
C16.2	Solve problems related to finding: • Surface area when dimensions are given. • unknown dimension when surface area is given.

	• Calculate surface area of real-life based composite shapes using appropriate formulas.
C17	Volume of 3-D Shapes
C17.1	Calculate the volume of prisms, Pyramids, cones and spheres.
C17.2	Calculate volume of real-life based composite shapes using appropriate formulas.
C18	Trigonometry
C18.1	Demonstrate the understanding of conventions of signs of angles.
C18.2	Deduce the relationship between degrees and radians.
C18.3	Determine the exact values of sine, cosine, and tangent for special angles (0°, 30°, 45°, 60°, and 90°), and use them to solve trigonometric problems.
C18.4	Solve trigonometric equations with sin *x*, cos *x* or tan *x*, where $0° \leqslant x \leqslant 360°$.
C18.5	Apply trigonometric identities (such as $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$) to simplify expressions.
C18.6	Calculate angles of elevation and depression.
C18.7	Use the formula to calculate area of triangle = $\frac{1}{2}ab\sin x$.
C18.8	Examine graphs of trigonometric functions to determine periods using relevant graphing software.
C19	Symmetry
C19.1	Demonstrate and compare mirror symmetry for 2-D shapes.
C19.2	Demonstrate and compare mirror symmetry for 3-D shapes.
C19.3	Demonstrate and compare Rotational Symmetry for 2-D shapes.
C19.4	Demonstrate and compare Rotational Symmetry of 3-D shapes.
C19.5	Use lines of symmetry to inductively verify names of regular polygons.
C19.6	Compare properties of reflectional and rotational symmetry for both 2-D and 3-D shapes using technology.
C20	Constructions
C20.1	Measure and draw lines and angles.
C20.2	Draw perpendicular lines and bisect angles accurately using a compass and straightedge.
C20.3	Construct triangles using only a ruler, protractor, and compasses, given: • Three sides (SSS). • Two sides and the included angle (SAS).

	• One side and two angles (ASA or AAS).
C21	Geometric and Symmetry Properties of Circles
C21.1	Determine unknown angles and support your reasoning using known geometrical properties of circles: • Angle in a semicircle = 90° • angle between tangent and radius = 90° • angle at the centre is twice the angle at the circumference • angles in the same segment are equal • opposite angles of a cyclic quadrilateral sum to 180° (supplementary) • alternate segment theorem.
C21.2	Use the following symmetry properties of circles: • equal chords are equidistant from the centre • the perpendicular bisector of a chord passes through the centre • tangents from an external point are equal in length.
D	**Data Management and Probability**
D3	Collecting, Displaying and Analysing Data
D3.1	Compare the following methods of displaying data and evaluate their effectiveness: • stem leaf plot (ungrouped data) • box and whisker plot (grouped and ungrouped data) • histogram (grouped and ungrouped data)
D3.2	Use the 5-number summary (minimum, Q1, Q2, Q3 and maximum) of data to create a box plot.
D3.3	Draw and interpret histograms for grouped data.
D3.4	Use the concept of frequency density to interpret and calculate values from grouped data.
D3.5	Compare a box plot to a histogram for a given set of data.
D3.6	Construct and analyse cumulative frequency tables and graphs.
D3.7	Estimate and interpret the median, percentiles, quartiles and interquartile range from cumulative frequency diagrams.
D3.8	Calculate the measures of central tendencies of a grouped data.
D3.9	Predict, observe and explain how the different measures of central tendency are affected by extreme data values (or outliers) and discuss their appropriate use in different contexts.
D4	Data Involving Two Variables
D4.1	Identify the independent and dependent variables in a scatter plot and interpret the relationship between two continuous variables.
D4.2	Draw and interpret scatter plots.
D4.3	Demonstrate how interpolation and extrapolation using a line of best fit is meaningful for a given set of real life data.

D4.4	Demonstrate understanding that a correlation coefficient is a description of the strength of the correlation represented by a linear pattern.
D4.5	Identify strong, weak, negative and positive correlations based on scatter plots and correlation coefficients.
D4.6	Draw appropriate conclusions from line and curve fitting to a scatter plot.
D5	Probability
D5.1	Calculate probability of dependent and independent events.
D5.2	Distinguish dependent and independent events using reasoning and calculations.
D5.3	Calculate and interpret conditional probabilities and explain how the probability of an event changes based on given conditions.

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, E and G. 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 techniques. They accurately recall, select, and apply knowledge across a wide range of contexts, carrying out complex and multi-step procedures with precision. They show strong ability to organise and process information**,** presenting it clearly in tables, graphs, and diagrams, and use mathematical notation fluently. They consistently estimate, approximate, and work to appropriate degrees of accuracy. They measure and construct accurately, and confidently apply spatial reasoning.	Candidates show a well-developed ability to analyse and interpret problems**,** identify efficient strategies, and make effective connections across different areas of mathematics. They generalise and justify results with logical reasoning, communicate methods clearly, and interpret information flexibly across different representations.
C	Candidates demonstrate sound knowledge and understanding of mathematical techniques. They are generally able to recall and apply knowledge to routine situations, with accuracy in most steps, though some errors may occur in complex processes. They present information appropriately in tables, graphs, and diagrams, and use notation with reasonable fluency. They can estimate and work with appropriate levels of accuracy in familiar contexts, and use geometrical instruments adequately.	Candidates are able to analyse problems and select suitable strategies in straightforward cases, sometimes requiring support for more complex tasks. They recognise patterns, draw reasonable conclusions, and communicate their reasoning and methods clearly in most instances.
E	Candidates demonstrate a basic knowledge and partial understanding of mathematical techniques. They can recall and apply some knowledge to simple routine tasks, but accuracy is inconsistent and errors are frequent in unfamiliar situations. Their ability to organise and present information is limited; graphs and diagrams may be incomplete or contain inaccuracies. They show some understanding of measurement and spatial reasoning but with limited accuracy.	Candidates display a restricted ability to analyse and interpret problems**;** they may adopt inefficient strategies and make only simple connections. They sometimes identify patterns and draw conclusions but often without justification. Communication of methods and reasoning is limited or unclear.
G	Candidates demonstrate a very limited knowledge and understanding of mathematical techniques. They show difficulty in recalling basic facts and procedures, and may complete only the simplest routine tasks, often with significant error. Their use of notation is inconsistent and presentation of information is poor. Estimation, accuracy, and spatial reasoning are rarely applied correctly.	Candidates show little ability to analyse or interpret problems. They struggle to select strategies, make connections, or generalise. Conclusions, if attempted, are often incorrect or unsupported, and communication of methods is weak or unclear.

4. Details of the assessment

Paper 1 Mathematics 1

Written paper, 1 hour 30 minutes, 60 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 5 structured questions worth 10 marks each 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 of mathematical techniques	Knowledge	15% to 25%
	Understanding	25% to 35%
AO2 Analyse, interpret and communicate mathematically	Applying	20% to 30%
	Analysing	10% to 20%
	Evaluating	5% to 15%

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

Paper 2 Mathematics 2

Written paper, 1 hours 30 minutes, 60 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 5 structured questions worth 10 marks each 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 %
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AO2 Analyse, interpret and communicate mathematically	Applying	20% to 30%
	Analysing	10% to 20%
	Evaluating	5% to 15%

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

Coursework

School based assignment, 1 years, 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 IX or X.

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 his 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 Word	What it means
Calculate	Figure out the number that answers a question; compute
Classify	Put things into groups according to a rule and label the groups; organize into categories
Compare	Look at two or more objects or numbers and identify how they are the same and how they are different (e.g., compare the numbers 6.5 and 5.6; compare the size of the students' feet; compare two shapes)
Conclude	Judge or decide after reflection or after considering data
Construct	Make or build a model; draw an accurate geometric shape (e.g., use a ruler and a protractor to construct an angle); the term construct is sometimes reserved for drawings that use a compass and straightedge only.
Create	Make your own example or problem
Describe	Tell, draw, or write about what something is or what something looks like; tell about a process in a step-by-step way.
Determine	Decide with certainty as a result of calculation, experiment, or exploration
Draw	1. Show something in diagram form 2. Pull or select an object (e.g., draw a card from the deck; draw a tile from the bag).
Estimate	Use your knowledge to make a sensible decision about an amount; make a reasonable guess (e.g., estimate how long it takes to walk from your home to school; estimate how many leaves are on a tree; estimate 3210 ÷ 789).
Evaluate	1. Determine whether something makes sense; judge 2. Calculate the value as a number (e.g., evaluate the expressionm2 + 3, for m = 5)
Explain	Tell what you did; show your mathematical thinking at every stage; show how you know
Explore	Investigate a problem by questioning, brainstorming, and trying new ideas
Justify	Give convincing reasons for a prediction, an estimate, or a solution; tell why you think your answer is correct
Measure	Use a tool to describe an object or determine an amount (e.g., use a ruler to measure a height or distance; use a protractor to measure an angle; use balance scales to measure mass; use a measuring cup to measure capacity; use a stopwatch to measure elapsed time)
Predict	Use what you know to work out what is going to happen (e.g., predict the tenth number in the number pattern 1, 2, 4, 7, …)
Reason	Develop ideas and relate them to the purpose of the task and to each other; analyse relevant information to show understanding
Relate	Describe how two or more objects, drawings, ideas, or numbers are similar

Represent	Show information or an idea in a different way (e.g., draw a graph of an equation; make a model from a word description; create an expression to model a situation)
Show your work	Record all calculations, drawings, numbers, words, or symbols that make up the solution
Simplify	Write a number or expression in a simpler form (e.g., combining like terms of a polynomial, writing an equivalent fraction with a smaller numerator and denominator)
Sketch	Make a rough drawing not necessarily to scale, often to help with visualization and problem solving (e.g., sketch a picture of the field with given dimensions)
Solve	1. Develop and carry out a process for finding an answer to a problem 2. to find the value of a variable in an equation or inequality
Sort	Separate a set of objects, drawings, ideas, or numbers according to an attribute (e.g., sort 2-D shapes by the number of sides)
Validate	Check an idea by showing that it works
Verify	Work out an answer or solution again, usually in another way; show evidence of; check a result

Symbols and conventions learners should recognise

Symbol	Definition
=, ≠, >, < , ⩾ and ⩽	The symbols =, ≠, >, <, ⩾, and ⩽ represent equal to, not equal to, greater than, less than, greater than or equal to, and less than or equal to, respectively, and are used to compare the values of numbers or expressions.
Union (A ∪ B) Intersection (A ∩ B) Complement (A')	Union (A ∪ B) includes all elements in A or B or both, Intersection (A ∩ B) includes only elements common to both A and B, and Complement (A') includes all elements not in set A.
y = mx+b	Slope (m) and y-intercept(b) form
ax + by = c	Standard form

List of formulae
Class X

Strand A : Numbers and Operations

$\text{SI} = \text{prt}\ or\ \frac{PRT}{100}$ $\qquad$ $\text{A} = p\left(1+\frac{r}{n}\right)^{nt}\ or\ p\left(1+\frac{r}{n\times 100}\right)^{nt}$

Strand B : Patterns and Algebra

$f(x) = ax^2 + bx + c$

$f(x) = a(x-p)(x-q)$

$f(x) = a(x-h)^2 + v$

Factorising

$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Derivative

$\frac{d}{dx}\left(x^n\right) = nx^{n-1}$

Strand C : Measurement and Geometry

Area : $\qquad$ *Perimeter* :

$A_{square} = s^2 / e^2 / l^2$ $\qquad$ $P_{square} = 4s / 4e / 4l$

$A_{rectangle} = l \times w$ $\qquad$ $P_{rectangle} = 2(l + w)$

$A_{triangle} = \frac{1}{2}bh$ $\qquad$ $P_{triangle} = s + s + s / (a + b + c)$

$A_{circle} = \pi r^2$ $\qquad$ $C_{circle} = 2\pi r$

Volume:

$\text{V}_{\text{rectangular prism}} = \text{lwh}$ $\qquad$ $\text{V}_{\text{cube}} = \text{e}^3$

$\text{V}_{\text{any prism}} = \text{Ah}$ $\qquad$ $\text{V}_{\text{pyramid}} = \frac{\text{Ah}}{3}$

$\text{V}_{\text{cylinder}} = \pi\text{r}^2\text{h}$ $\qquad$ $\text{V}_{\text{cone}} = \frac{\pi\text{r}^2\text{h}}{3}$

$\text{V}_{\text{sphere}} = \frac{4}{3}\pi\text{r}^3$

Surface Area:

$\text{SA}_{\text{rectangular prism}} = 2(\text{lw} + \text{wh} + \text{lh})$ $\qquad$ $\text{SA}_{\text{cube}} = 6\text{s}^2$

$\text{SA}_{\text{any prism}} = 2\text{A} + \text{hP}$ $\qquad$ $\text{SA}_{\text{pyramid}} = \text{A} + \text{Area of lateral faces}$

$\text{SA}_{\text{cylinder}} = 2\pi\text{r}^2 + 2\pi\text{rh}$ $\qquad$ $\text{SA}_{\text{cone}} = \pi\text{r}^2 + \pi\text{rs}$

$\text{SA}_{\text{sphere}} = 4\pi\text{r}^2$

Degree and radian

$\pi\ rad = 180°$

Strand D : Data management and probability

$\text{Mean} = \frac{\sum fx}{\sum f}$ $\qquad$ $Q_1 = L + \frac{i}{f}\left(\frac{n}{4} - c\right)$

$Q_2 = L + \frac{i}{f}\left(\frac{n}{2} - c\right)$ $\qquad$ $Q_3 = L + \frac{i}{f}\left(\frac{3n}{4} - c\right)$

Class IX

Strand A : Numbers and Operations

$SI = prt \ or \ \frac{PRT}{100}$

$Mark\ up = SP - CP$ $\qquad$ $Mark\ down = CP - SP$

$Mark\ up\% = \frac{mark\ up}{CP} \times 100\%$ $\qquad$ $Mark\ down\% = \frac{mark\ down}{CP} \times 100\%$

Strand B : Patterns and Algebra

$a_n = a_1 + (n-1)d$

$S_n = \frac{n}{2}(2a_1 + (n-1)d)$

Strand C : Measurement and Geometry

Area: $\qquad$ Perimeter:

$A_{square} = s^2 / e^2 / l^2$ $\qquad$ $P_{square} = 4s / 4e / 4l$

$A_{rectangle} = l \times w$ $\qquad$ $P_{rectangle} = 2(l + w)$

$A_{triangle} = \frac{1}{2}bh$ $\qquad$ $P_{triangle} = s + s + s / (a + b + c)$

$A_{circle} = \pi r^2$ $\qquad$ $C_{circle} = 2\pi r$

Volume:

$V_{rectangular\ prism} = lwh$ $\qquad$ $V_{any\ prism} = Ah$

$V_{cylinder} = \pi r^2 h$

Surface Area:

$SA_{rectangular\ prism} = 2(lw + wh + lh)$ $\qquad$ $SA_{cube} = 6s^2$

$SA_{any\ prism} = 2A + hP$

$SA_{cylinder} = 2\pi r^2 + 2\pi rh$

Pythagorean Theorem

$c^2 = a^2 + b^2$

Length and midpoint

$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

Strand D : Data management and probability

$P(A) \times P(B) = P(A \ and \ B)$

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 Board Examination VIII (BE VIII).

Guided learning hours

The course is designed to require approximately 100 guided learning hours for Class IX and 100 guided learning hours for Class X.

Combining with other syllabuses

Candidates may take this syllabus alongside other BCSEA syllabuses, except where syllabuses have the same title and level.

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