DP-1 |AISHL| Jan- TEE Syllabus and Paper Pattern:

PAPER PATTERN:

Paper -1 | Short Answer Type Questions | Max. Marks: 70 | Duration: 1 Hr 30 mins

Paper -2 | Detailed Answer Type Questions | Max. Marks: 70 | Duration: 1Hr 30 mins

**Graphic Display Calculator (GDC) is required for both the Papers.
Formula Booklet will be provided for the exam.

Syllabus for Jan Term End Examination-2026

TOPIC 1 – Number and Algebra

SL 1.1

Content	Guidance, clarification and syllabus links
Operations with numbers in the form $a \times 10^k$ where $1 \le a < 10$ and k is an integer.	Calculator or computer notation is **not** acceptable. For example, 5.2E30 is **not** acceptable and should be written as 5.2×10^{30}.

SL 1.2

Content	Guidance, clarification and syllabus links
Arithmetic sequences and series. Use of the formulae for the nth term and the sum of the first n terms of the sequence. Use of sigma notation for sums of arithmetic sequences.	Spreadsheets, GDCs and graphing software may be used to generate and display sequences in several ways. If technology is used in examinations, students will be expected to identify the first term and the common difference.
Applications.	Examples include simple interest over a number of years.
Analysis, interpretation and prediction where a model is not perfectly arithmetic in real life.	Students will need to approximate common differences.

SL 1.3

Content	Guidance, clarification and syllabus links
Geometric sequences and series. Use of the formulae for the nth term and the sum of the first n terms of the sequence.	Spreadsheets, GDCs and graphing software may be used to generate and display sequences in several ways.

Content	Guidance, clarification and syllabus links
Use of sigma notation for the sums of geometric sequences.	If technology is used in examinations, students will be expected to identify the first term and the ratio. **Link to:** models/functions in topic 2 and regression in topic 4.
Applications.	Examples include the spread of disease, salary increase and decrease and population growth.

SL 1.4

Content	Guidance, clarification and syllabus links
Financial applications of geometric sequences and series: • compound interest • annual depreciation.	Examination questions may require the use of technology, including built-in financial packages. The concept of simple interest may be used as an introduction to compound interest. Calculate the real value of an investment with an interest rate and an inflation rate. In examinations, questions that ask students to derive the formula will not be set. Compound interest can be calculated yearly, half-yearly, quarterly or monthly. **Link to**: exponential models/functions in topic 2.

SL 1.5

Content	Guidance, clarification and syllabus links
Laws of exponents with integer exponents.	**Examples:** $5^3 \times 5^{-6} = 5^{-3}, 6^4 \div 6^3 = 6, \left(2^3\right)^{-4} = 2^{-12},$ $(2x)^4 = 16x^4, 2x^{-3} = \frac{2}{x^3}$
Introduction to logarithms with base 10 and e. Numerical evaluation of logarithms using technology.	Awareness that $a^x = b$ is equivalent to $\log_a b = x$, that $b > 0$, and $\log_e x = \ln x$.

SL 1.6

Content	Guidance, clarification and syllabus links
Approximation: decimal places, significant figures.	Students should be able to choose an appropriate degree of accuracy based on given data.
Upper and lower bounds of rounded numbers.	If $x = 4.1$ to one decimal place, $4.05 \leq x < 4.15$.
Percentage errors.	Students should be aware of, and able to calculate, measurement errors (such as rounding errors or measurement limitations). For example finding the maximum percentage error in the area of a circle if the radius measured is 2.5 cm to one decimal place.
Estimation.	Students should be able to recognize whether the results of calculations are reasonable. For example lengths cannot be negative.

SL 1.7

Content	Guidance, clarification and syllabus links
Amortization and annuities using technology.	Technology includes the built-in financial packages of graphic display calculators, spreadsheets. In examinations the payments will be made at the end of the period. Knowledge of the annuity formula will enhance understanding but will not be examined. **Link to**: exponential models (SL 2.5).

SL 1.8

Content	Guidance, clarification and syllabus links
Use technology to solve: • Systems of linear equations in up to 3 variables • Polynomial equations	In examinations, no specific method of solution will be required. In examinations, there will always be a unique solution to a system of equations. Standard terminology, such as zeros or roots, should be taught. **Link to:** quadratic models (SL 2.5)

AHL 1.9

Content	Guidance, clarification and syllabus links
Laws of logarithms: $\log_a xy = \log_a x + \log_a y$ $\log_a \frac{x}{y} = \log_a x - \log_a y$ $\log_a x^m = m\log_a x$ for $a, \quad x, \quad y \quad > \quad 0$	In examinations, a will equal 10 or e. **Link to:** scaling large and small numbers (AHL 2.10).

AHL 1.10

Content	Guidance, clarification and syllabus links
Simplifying expressions, both numerically and algebraically, involving rational exponents.	**Examples:** $5^{\frac{1}{2}} \times 5^{\frac{1}{3}} = 5^{\frac{5}{6}}$, $6^{\frac{3}{4}} \div 6^{\frac{1}{2}} = 6^{\frac{1}{4}}$, $32^{\frac{3}{5}} = 8$, $x^{-\frac{1}{2}} = \frac{1}{\sqrt{x}}$

AHL 1.11

Content	Guidance, clarification and syllabus links
The sum of infinite geometric sequences.	**Link to:** the concept of a limit (SL 5.1), fractals (AHL 3.9), and Markov chains (AHL 4.19).

AHL 1.14

Content	Guidance, clarification and syllabus links
Definition of a matrix: the terms element, row, column and order for $m \times n$ matrices.	
Algebra of matrices: equality; addition; subtraction; multiplication by a scalar for $m \times n$ matrices.	Including use of technology.
Multiplication of matrices. Properties of matrix multiplication: associativity, distributivity and non-commutativity.	Multiplying matrices to solve practical problems.
Identity and zero matrices. Determinants and inverses of $n \times n$ matrices with technology, and by hand for 2×2 matrices.	Students should be familiar with the notation $\boldsymbol{I}$ and $\boldsymbol{0}$.
Awareness that a system of linear equations can be written in the form $Ax = b$.	In examinations $\boldsymbol{A}$ will always be an invertible matrix, except when solving for eigenvectors.
Solution of the systems of equations using inverse matrix.	Model and solve real-life problems including: Coding and decoding messages Solving systems of equations. **Link to:** Markov chains (AHL 4.19), transition matrices (AHL 4.19) and phase portrait (AHL 5.17).

TOPIC 2 – Functions

SL 2.1

Content	Guidance, clarification and syllabus links
Different forms of the equation of a straight line. Gradient; intercepts. Lines with gradients m_1 and m_2 Parallel lines $m_1 = m_2$. Perpendicular lines $m_1 \times m_2 = -1$.	$y = mx + c$ (gradient-intercept form). $ax + by + d = 0$ (general form). $y - y_1 = m(x - x_1)$ (point-gradient form). Calculate gradients of inclines such as mountain roads, bridges, etc.

SL 2.2

Content	Guidance, clarification and syllabus links
Concept of a function, domain, range and graph. Function notation, for example $f(x)$, $v(t)$, $C(n)$. The concept of a function as a mathematical model.	**Example:** $f(x) = \sqrt{2-x}$, the domain is $x \leq 2$, range is $f(x) \geq 0$. A graph is helpful in visualizing the range.
Informal concept that an inverse function reverses or undoes the effect of a function. Inverse function as a reflection in the line $y = x$, and the notation $f^{-1}(x)$.	**Example:** Solving $f(x) = 10$ is equivalent to finding $f^{-1}(10)$. Students should be aware that inverse functions exist for one to one functions; the domain of $f^{-1}(x)$ is equal to the range of $f(x)$.

SL 2.3

Content	Guidance, clarification and syllabus links
The graph of a function; its equation $y = f(x)$.	Students should be aware of the difference between the command terms "draw" and "sketch".
Creating a sketch from information given or a context, including transferring a graph from screen to paper. Using technology to graph functions including their sums and differences.	All axes and key features should be labelled. This may include functions not specifically mentioned in topic 2.

SL 2.4

Content	Guidance, clarification and syllabus links
Determine key features of graphs.	Maximum and minimum values; intercepts; symmetry; vertex; zeros of functions or roots of equations; vertical and horizontal asymptotes using graphing technology.
Finding the point of intersection of two curves or lines using technology.	

SL 2.5

Content	Guidance, clarification and syllabus links
Modelling with the following functions:	
Linear models. $f(x) = mx + c$.	Including piecewise linear models, for example horizontal distances of an object to a wall, depth of a swimming pool, mobile phone charges. **Link to:** equation of a straight line (SL 2.1) and arithmetic sequences (SL 1.2).
Quadratic models. $f(x) = ax^2 + bx + c \quad ; \quad a \neq 0$. Axis of symmetry, vertex, zeros and roots, intercepts on the x-axis and y-axis.	Technology can be used to find roots. **Link to:** use of technology to solve quadratic equations (SL 1.8).
Exponential growth and decay models. $f(x) = ka^x + c$ $f(x) = ka^{-x} + c \quad (\text{for } a > 0)$ $f(x) = k\mathrm{e}^{rx} + c$ Equation of a horizontal asymptote.	**Link to:** compound interest (SL 1.4), geometric sequences and series (SL 1.3) and amortization (SL 1.7).
Direct/inverse variation: $f(x) = ax^n, \quad n \in \mathbb{Z}$ The y-axis as a vertical asymptote when $n < 0$.	
Cubic models: $f(x) = ax^3 + bx^2 + cx + d$.	

SL 2.6

Content	Guidance, clarification and syllabus links
Modelling skills: Use the modelling process described in the "mathematical modelling" section to create, fit and use the theoretical models in section SL2.5 and their graphs.	Fitting models using regression is covered in topic 4. **Link to**: theoretical models (SL 2.5) to be used to develop the modelling skills and, for HL students, (AHL 2.9).
Develop and fit the model: Given a context recognize and choose an appropriate model and possible parameters. Determine a reasonable domain for a model.	
Find the parameters of a model.	By setting up and solving equations simultaneously (using technology), by consideration of initial conditions or by substitution of points into a given function. At SL, students will not be expected to perform non-linear regressions, but will be expected to set up and solve up to three linear equations in three variables using technology.
Test and reflect upon the model: Comment on the appropriateness and reasonableness of a model. Justify the choice of a particular model, based on the shape of the data, properties of the curve and/or on the context of the situation.	
Use the model: Reading, interpreting and making predictions based on the model.	Students should be aware of the dangers of extrapolation.

AHL 2.7

Content	Guidance, clarification and syllabus links
Composite functions in context. The notation $(f \circ g)(x) = f(g(x))$. Inverse function f^{-1}, including domain restriction. Finding an inverse function.	$\left(f \circ f^{-1}\right)(x) = \left(f^{-1} \circ f\right)(x) = x$. **Example:** $f(x) = (x-3)^2 - 2$ has an inverse if the domain is restricted to $x \geq 3$ or to $x \leq 3$.

AHL 2.8

Content	Guidance, clarification and syllabus links
Transformations of graphs.	Students will be expected to be able to perform transformations on all functions from the SL and AHL section of this topic, and others in the context of modelling real-life situations.
Translations: $y = f(x) + b$;$y = f(x - a)$. Reflections: in the x axis $y = -f(x)$, and in the y axis $y = f(-x)$.	Translation by the vector $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$ denotes horizontal translation of 3 units to the right, and vertical translation of 2 units down.
Vertical stretch with scale factor p: $y = pf(x)$. Horizontal stretch with scale factor $\frac{1}{q}$: $y = f(qx)$	x and y axes are invariant.
Composite transformations.	Students should be made aware of the significance of the order of transformations. **Example:** $y = x^2$ used to obtain $y = 3x^2 + 2$ by a vertical stretch of scale factor 3 followed by a translation of $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$. **Example:** $y = \sin x$ used to obtain $y = 4\sin 2x$ by a vertical stretch of scale factor 4 and a horizontal stretch of scale factor $\frac{1}{2}$.

AHL 2.9

Content	Guidance, clarification and syllabus links
In addition to the models covered in the SL content the AHL content extends this to include modelling with the following functions: Exponential models to calculate half-life.	**Link to:** modelling skills (SL2.6).
Natural logarithmic models: $f(x) = a + b\ln x$	

Logistic models: $f(x) = \frac{L}{1 + Ce^{-kx}}; L, \quad C, \quad k > 0$	The logistic function is used in situations where there is a restriction on the growth. For example population on an island, bacteria in a petri dish or the increase in height of a person or seedling. Horizontal asymptote at $f(x) = L$ is often referred to as the carrying capacity.

TOPIC 3 – GEOMETRY AND TRIGONOMETRY

SL 3.1

Content	Guidance, clarification and syllabus links
Volume and surface area of three-dimensional solids including right-pyramid, right cone, sphere, hemisphere and combinations of these solids.	In SL examinations, only right-angled trigonometry questions will be set in reference to three-dimensional shapes. In problems related to these topics, students should be able to identify relevant right-angled triangles in three-dimensional objects and use them to find unknown lengths and angles.

SL 3.2

Content	Guidance, clarification and syllabus links
Use of sine, cosine and tangent ratios to find the sides and angles of right-angled triangles.	In all areas of this topic, students should be encouraged to sketch well-labelled diagrams to support their solutions. **Link to:** inverse functions (SL2.2) when finding angles.

SL 3.3

Content	Guidance, clarification and syllabus links
Applications of right angled trigonometry, including Pythagoras' theorem. Angles of elevation and depression. Construction of labelled diagrams from written statements.	

SL 3.4

Content	Guidance, clarification and syllabus links
The circle: length of an arc; area of a sector.	Radians are not required at SL.

SL 3.5

Content	Guidance, clarification and syllabus links
Equations of perpendicular bisectors.	Given either two points, or the equation of a line segment and its midpoint. **Link to:** equations of straight lines (SL 2.1).

AHL 3.7

Content	Guidance, clarification and syllabus links
The definition of a radian and conversion between degrees and radians. Using radians to calculate area of sector, length of arc.	Radian measure may be expressed as exact multiples of π, or decimals. **Link to**: trigonometric functions (AHL 2.9).

AHL 3.10

Content	Guidance, clarification and syllabus links
Concept of a vector and a scalar. Representation of vectors using directed line segments. Unit vectors; base vectors $\boldsymbol{i}, \quad \boldsymbol{j}, \quad \boldsymbol{k}$. Components of a vector; column representation; $\boldsymbol{v} = \begin{pmatrix} v_1 \\ v_2 \\ v_3 \end{pmatrix} = v_1\boldsymbol{i} + v_2\boldsymbol{j} + v_3\boldsymbol{k}$ The zero vector $\boldsymbol{0}$, the vector $-\boldsymbol{v}$.	Use algebraic and geometric approaches to calculate the sum and difference of two vectors, multiplication by a scalar, $k\boldsymbol{v}$ (parallel vectors), magnitude of a vector $\|\boldsymbol{v}\|$ from components. The resultant as the sum of two or more vectors.

Content	Guidance, clarification and syllabus links
Position vectors $\overrightarrow{\mathrm{OA}} = a$.	
Rescaling and normalizing vectors.	$\frac{\boldsymbol{v}}{\lvert v\rvert}$, the unit normal vector. **Example:** Find the velocity of a particle with speed 7ms^{-1} in the direction $3i + 4j$.

AHL 3.11

Content	Guidance, clarification and syllabus links
Vector equation of a line in two and three dimensions: $\boldsymbol{r} = \boldsymbol{a} + \lambda \boldsymbol{b}$, where $\boldsymbol{b}$ is a direction vector of the line.	Convert to parametric form: $x = x_0 + \lambda l, y = y_0 + \lambda m, z = z_0 + \lambda n.$

AHL 3.12

Content	Guidance, clarification and syllabus links
Vector applications to kinematics. Modelling linear motion with constant velocity in two and three dimensions.	Finding positions, intersections, describing paths, finding times and distances when two objects are closest to each other. $\boldsymbol{r} = \boldsymbol{r}_0 + \boldsymbol{v}t.$ Relative position of B from A is $\overrightarrow{\mathrm{AB}}$.
Motion with variable velocity in two dimensions.	**For example:** $\begin{pmatrix} v_x \\ v_y \end{pmatrix} = \begin{pmatrix} 7 \\ 6 - 4t \end{pmatrix}$. Projectile motion and circular motion are special cases. $f(t - a)$ to indicate a time-shift of a. **Link to:** kinematics (AHL 5.13) and phase shift (AHL 1.13).

AHL 3.13

Content	Guidance, clarification and syllabus links
Definition and calculation of the scalar product of two vectors. The angle between two vectors; the acute angle between two lines.	Calculate the angle between two vectors using $\boldsymbol{v} \cdot \boldsymbol{w} = \lvert \boldsymbol{v} \rvert \lvert \boldsymbol{w} \rvert \cos\theta$, where θ is the angle between two non-zero vectors $\boldsymbol{v}$ and w, and ascertain whether the vectors are perpendicular ($\boldsymbol{v} \cdot \boldsymbol{w} = 0$).
Definition and calculation of the vector product of two vectors.	$\boldsymbol{v} \times \boldsymbol{w} = \lvert \boldsymbol{v} \rvert \lvert \boldsymbol{w} \rvert \sin\theta \boldsymbol{n}$, where θ is the angle between v and $\boldsymbol{w}$ and $\boldsymbol{n}$ is the unit normal vector whose direction is given by the right-hand screw rule. **Not required:** generalized properties and proofs of scalar and cross product.
Geometric interpretation of $\lvert \boldsymbol{v} \times \boldsymbol{w} \rvert$.	Use of $\lvert \boldsymbol{v} \times \boldsymbol{w} \rvert$ to find the area of a parallelogram (and hence a triangle).
Components of vectors.	The component of vector a acting in the direction of vector $\boldsymbol{b}$ is $\frac{\boldsymbol{a} \cdot \boldsymbol{b}}{\lvert \boldsymbol{b} \rvert} = \lvert \boldsymbol{a} \rvert \cos\theta$. The component of a vector a acting perpendicular to vector b, in the plane formed by the two vectors, is $\frac{\lvert \boldsymbol{a} \times \boldsymbol{b} \rvert}{\lvert \boldsymbol{b} \rvert} = \lvert \boldsymbol{a} \rvert \sin\theta$.