A1 FUNCTIONS 1.0 Understand the concept of relations	Students should be able to : 1.1 Represent a relation using a) arrow diagram b) ordered pairs c) graphs 1.2 Identify domain, codomain, object, image and range of a relation. 1.3 Classify a relation shown on a mapped diagram as : one to one, many to one or many to many relation.	✓ Discuss the idea of set and introduce set notation
2.0 Understand the concept of functions	2.1 Recognise function as a special relation. 2.2 Express functions using function notation. 2.3 Determine domain, object, image and range of a function. 2.4 Determine image of a function given the object and vice versa.	✓ Represent functions using arrow diagram, ordered pairs or graph. ✓ Examples of functions include algebraic (linear and quadratic), trigonometric and absolute value. ✓ Define and sketch absolute value function.
3.0 Understand the concept of composite functions	3.1 Determine composition of two functions. 3.2 Determine image of composite functions given the object and vice versa. 3.3 Determine one of the function in a given composite function given the other related function.	✓ Involve algebraic functions only. ✓ Images of composite function include arrange of values.
4.0 Understand the concept of inverse functions	4.1 Find object by inverse mapping given its image and function. 4.2 Determine inverse function using algebra. 4.3 Determine and state the condition for existence of an inverse function.	✓ Limit to algebraic function. Exclude inverse of composite function. ✓ Emphasise that inverse of a function is not necessarily a function.
A2 QUADRATIC EQUATIONS 1.0 Understand the concept of quadratic equations and its roots	Students should be able to: 1.1 Recognise quadratic equation and express it in general form. 1.2 Determine whether a given value is the root of a quadratic equation by: a) substitution b) inspection 1.3 Determine the roots of a quadratic equation by trial and improvement method.	✓ Questions for 1.2(b) are given in the form $(x+a)(x+b)=0$ a, b are numerical values. ✓ Involve the use of α and β
2.0 Understand the concept of quadratic equations	2.1 Determine the roots of a quadratic equation by a) factorization b) completing the square c) using the formula	

	2.2 Form a quadratic equation from given roots.	
3.0 Understand and use the conditions for quadratic equations to have a) two different roots b) two equal roots c) no roots	3.1 Determine types of roots of quadratic equations from the value of $b^2 - 4ac$. 3.2 Solve problems involving $b^2 - 4ac$ in quadratic equations to a) find an unknown value b) derive a relation	✓ $b^2 - 4ac > 0$ ✓ $b^2 - 4ac = 0$ ✓ $b^2 - 4ac < 0$
A3 QUADRATIC FUNCTIONS 1.0 Understand the concept of quadratic functions and their graphs	Students should be able to : 1.1 Recognise quadratic functions. 1.2 Plot quadratic function graphs a) based on given tabulated values b) by tabulating values based on given functions 1.3 Recognise shapes of graphs of quadratic functions. 1.4 Relate the position of quadratic function graphs with types of roots for f(x) = 0.	✓ Discuss cases where $a > 0$ and $a < 0$ for $f(x) = ax^2 + bx + c = 0$
2.0 Find maximum and minimum values of quadratic functions	2.1 Determine the maximum or minimum value of a quadratic function by completing the square	✓ Emphasise the marking of maximum or minimum and two other points on the graphs drawn or finding the axis of symmetry and the intersection with y-axis. ✓ Emphasise on sketching graphs and use number lines when necessary
3.0 Sketch graphs of quadratic functions	3.1 Sketch quadratic function graphs by determining the maximum or minimum point and two other points	
4.0 Understand and use the concept of quadratic inequalities	4.1 Determine the ranges of values of x that satisfies quadratic inequalities	
A4 SIMULTANEOUS EQUATIONS 1.0 Solve simultaneous equations in two unknowns: one linear equation and one non-linear	Students should be able to: 1.1 Solve simultaneous equations using the substitution method 1.2 Solve simultaneous equations involving real-life situations	✓ Limit non-linear equations up to second degree only

equation		
A5 INDICES AND LOGARITHM 1.0 Understand and use the concept of indices and laws of indices to solve problems	Students should be able to: 1.1 Find the values of numbers given in the form of a) integer indices b) fractional indices 1.2 Use laws of indices to find the values of numbers in index form that are multiplied, divided or raised to a power 1.3 Use laws of indices to simplify algebraic expressions	✓ Discuss zero index and negative indices
2.0 Understand and use concept of logarithms and laws of logarithms to solve problems	2.1 Express equation in index form to logarithm form and vice versa 2.2 Find logarithm of a number 2.3 Find logarithm of numbers by using laws of logarithms 2.4 Simplify logarithmic expressions to the simplest form	✓ Explain definition of logarithm $N = a^x ; \log_a N = x$ ✓ Emphasise that $\log_a 1 = 0 ;\ \log_a a = 1$ ✓ Discuss cases where the given number is in a) index form b) numerical form ✓ Discuss laws of logarithms
3.0 Understand and use the change of base of logarithms to solve problems	3.1 Find the logarithm of a number by changing the base of the logarithm to a suitable base 3.2 Solve problems involving the change of base and laws of logarithms	✓ Discuss: $\log_a b = \frac{1}{\log_b a}$
4.0 Solve equations involving indices and logarithms	4.1 Solve equations involving indices. 4.2 Solve equations involving logarithms.	✓ Equations that involve indices and logarithms are limited to equations with single solution only. ✓ Solve equations involving indices by: a) comparison of indices and bases b) using logarithms

G1 COORDINATE GEOMETRY	Students should be able to:	
1.0 Find distance between two points	1.1 Find distance between two points using formula	✓ Use Pythagoras' theorem to find the formula for distance between two points. ✓ Limit to cases where m and n are positive. ✓ Derivation of the formula $\left(\frac{nx_1+mx_2}{m+n}, \frac{ny_1+my_2}{m+n}\right)$ is not required ✓ Limit to numerical values ✓ Emphasise the relationship between the sign of the value for area obtained with the order of the vertices used ✓ Derivation of the formula: $\frac{1}{2}(x_1y_2+x_2y_3+x_3y_1)-(x_2y_1-x_3y_2-x_1y_3)$ is not required. ✓ Emphasise that when area of polygon is zero, the given points are collinear. ✓ Answers for learning outcomes 4.4(a) and 4.4(b) must be stated in the simplest form. ✓ Involve changing the equation into gradient and intercept form.
2.0 Understand the concept of division of a line segment	2.1 Find midpoint of two given points. 2.2 Find coordinates of a point that divides a line according to a given ration m:n	
3.0 Find areas of polygons	3.1 Find area of triangle based on the area specific geometrical shapes. 3.2 Find area of a triangle by using formula. 3.3 Find area of a quadrilateral using formula.	
4.0 Understand and use the concept of equation of a straight line	4.1 Determine the x-intercept and the y-intercept of a line. 4.2 Find the gradient of a straight line that passes through two points. 4.3 Find the gradient of a straight line using the x-intercept and y-intercept. 4.4 Find the equation of a straight line given: a) gradient and one point b) two points c) x-intercept and y-intercept 4.5 Find the gradient and the intercepts of a straight line given the equation. 4.6 Change the equation of a straight line to the general form. 4.7 Find the point of intersection of two lines.	
5.0 Understand and use the concept of parallel and perpendicular lines	5.1 Determine whether two straight lines are parallel when gradients of both lines are known and vice versa. 5.2 Find the equation of a straight line that passes through a fixed point and parallel to a given line.	✓ Emphasise that for parallel lines: $m_1 = m_2$ ✓ Emphasise that for perpendicular lines $m_1m_2 = -1$ ✓ Derivation of $m_1m_2 = -1$ is not

	5.3 Determine whether two straight lines are perpendicular when gradients of both lines are known and vice versa. 5.4 Determine the equation of straight line that passes through a fixed point and perpendicular to a given line. 5.5 Solve problems involving equations of a straight lines.	required.
6.0 Understand and use the concept of equation of locus involving distance between two points	6.1 Find the equation of locus that satisfies the condition if: a) the distance of moving point from a fixed point is constant; b) the ratio of distances of a moving point from two fixed points is constant 6.2 Solve problems involving locus.	
S1 STATISTICS	Students should be able to:	
1.0 Understand and use the concept of measures of tendency to solve problems	1.1 Calculate mean of ungrouped data. 1.2 Determine mode of ungrouped data. 1.3 Determine median of ungrouped data. 1.4 Determine modal class of grouped data from the frequency distribution table. 1.5 Find mode from histogram. 1.6 Calculate mean of grouped data. 1.7 Calculate median of grouped data from the cumulative frequency distribution table. 1.8 Estimate median of grouped data from an ogive. 1.9 Determine the effects on mode, median and mean for a set of data. 1.10 Determine the most suitable measure of central tendency for given data.	✓ Discuss grouped data and ungrouped data. ✓ Involve uniform class intervals only. ✓ Derivation of the median formula is not required. ✓ Ogive is also known as cumulative frequency curve.
2.0 Understand and use the concept of measures of dispersion to solve problems.	2.1 Find the range of ungrouped data. 2.2 Find the interquartile range of ungrouped data. 2.3 Find the range of grouped data. 2.4 Find the interquartile range of grouped data from the cumulative frequency table. 2.5 Determine the interquartile range of grouped data from an ogive. 2.6 Determine the variance of: a) ungrouped data; b) grouped data	✓ Involve grouped and ungrouped data. ✓ Determine upper and lower quartiles by using the first princi

	2.7 Determine standard deviation of ungrouped data and grouped data. 2.8 Determine the effect on range, interquartile range, variance and standard deviation for a set of data when: a) each data is changed uniformly b) extreme values exist c) certain data is added or removed 2.9 Compare the measures of central tendency and dispersion between two sets of data.	✓ Emphasise that comparison between two sets of data using only measures of central tendency is not sufficient.
T1 CIRCULAR MEASURES 1.0 Understand the concept of radian.	Students should be able to: 1.1 Convert measurement in radians to degrees and vice versa.	✓ Discuss the definition of one radian. ✓ 'rad' is the abbreviation of radian. ✓ Include measurements in radians expressed in term of π.
2.0 Understand and use the concept of length of arc of a circle to solve problems.	2.1 Determine: a) length of arc b) radius and c) angle subtended at the centre of a circle based on given information. 2.2 Find perimeter of segments of circles. 2.3 Solve problems involving lengths of arcs.	
3.0 Understand and use the concept of area of sector of a circle to solve problems	3.1 Determine: a) area of sector b) radius and c) angle subtended at the centre of circle based on given information. 3.2 Find area of segments of circles. 3.3 Solve problems involving area of sectors.	

C1 DIFFERENTIATION	Students should be able to:	
1.0 Understand the concept of radian	1.1 Determine value of a function when its variable approaches a certain value. 1.2 Find gradient of a chord joining two points on a curve. 1.3 Find the first derivative of a function y=f(x) as gradient of tangent to its graph. 1.4 Find the first derivative for polynomial using first principles. 1.5 Deduce the formula for first derivative of function y=f(x) by induction.	✓ Idea of limit to a function can be illustrated using graphs. ✓ Concept of first derivative of a function is explained as a tangent to a curve can be illustrated using graphs. ✓ Limit to $y = ax^n; a, n$ are constant, n=1,2,3 ✓ Notation of $f'(x)$ is equaivalent to $\frac{dy}{dx}$ when $y = f(x)$. $f'(x)$ read as 'f prime x'. ✓ Limit cases in learning outcomes 2.7 – 2.9 to rules introduced in 2.4 – 2.6. ✓ Emphasise the use of first derivative to determine turning points. ✓ Exclude points of inflextion. ✓ Limit problems to two variables only.
2.0 Understand and use the concept of first derivative of polynomial functions to solve problems	2.1 Determine first derivative of the function $y = ax^n$ using formula. 2.2 Determine value of the first derivative of the function $y = ax^n$ for a given value of x. 2.3 Determine first derivative of a function involving: a) addition, or b) subtraction of algebraic terms. 2.4 Determine first derivative of a product of two polynomials. 2.5 Determine first derivative of a quotient of two polynomials. 2.6 Determine the first derivative of composite function using chain rule. 2.7 Determine gradient of tangent at a point on a curve. 2.8 Determine equation of tangent at a point on a curve. 2.9 Determine equation of normal at a point on a curve.	✓ Limit problems to 3 variables only. ✓ Exclude cases involving percentage change. ✓ Introduce $\frac{d\ y}{dx^2}$ as $\frac{d}{dx}\left(\frac{dy}{dx}\right)$ or $f''(x) = \frac{d}{dx}(f'(x))$

3.0 Understand and use the concept of maximum and minimum values to solve problems.	3.1 Determine coordinates of turning points of a curve. 3.2 Determine whether a turning point is a maximum or minimum point. 3.3 Solve problems involving maximum or minimum values.	
4.0 Understand and use the concept of rates of change to solve problems	4.1 Determine rates of change for related quantities.	
5.0 Understand and use the concept of small changes and approximations to solve problems.	5.1 Determine small changes in quantities. 5.2 Determine approximate values using differentiation.	
6.0 Understand and use the concept on second derivative to solve problems.	6.1 Determine second derivative of function y=f(x). 6.2 Determine whether a turning point is maximum or minimum point of a curve using the second derivative.	
AST1 SOLUTION OF TRIANGLES 1.0 Understand and use the concept of sine rule to solve problems	Students should be able to: 1.1 Verify sine rule. 1.2 Use sine rule to find unknown sides or angles of triangle. 1.3 Find unknown sides and angles of triangle in ambiguous case. 1.4 Solve problems involving the sine rule.	✓ Include obtuse-angled triangles
2.0 Understand and use the concept of cosine rule to solve problems	2.1 Verify cosine rule. 2.2 Use cosine rule to find unknown sides or angles of a triangle. 2.3 Solve problems involving cosine rule. 2.4 Solve problems involving sine and cosine rules.	✓ Include obtuse-angled triangles
3.0 Understand and use the formula for area of triangles to solve problems	3.1 Find area of triangles using formula $\frac{1}{2}ab\sin C$ or its equivalent. 3.2 Solve problems involving three-dimensional objects.	

ASS1 INDEX NUMBER 1.0 Understand and use the concept of index number to solve problems	Students should be able to: 1.1 Calculate index number. 1.2 Calculate price index. 1.3 Find $Q_0 or Q_1$ given relevant information.	 ✓ Explain index number. ✓ Q_0 = quantity at base time ✓ Q_1 = quantity at specific time
2.0 Understand and use the concept of composite index to solve problems.	2.1 Calculate composite index. 2.2 Find index number or weightage given relevant information. 2.3 Solve problems involving index number and composite index.	✓ Explain weightage and composite index
A6: PROGRESSION 1. Understand and use the concept of arithmetic progression.	1.1 Identify characteristics of arithmetic progressions. 1.2 Determine whether given sequence is an arithmetic progression. 1.3 Determine by using formula: a) specific terms in arithmetic progressions; b) the number of terms in arithmetic progressions 1.4 Find : a) the sum of the first *n* terms of arithmetic progressions. b) the sum of a specific number of consecutive terms of arithmetic progressions c) the value of *n*, given the sum of the first *n* terms of arithmetic progressions 1.5 Solve problems involving arithmetic progressions.	Systematic Careful, hardworking, confidence Begin with sequences to introduce arithmetical and geometrical progressions. Include examples in algebraic form. Include the use of the formula $T_n = S_n - S_{n-1}$ Include problems involving real-life situations Discuss : As $n \to \infty$, $r^n \to 0$ then $S_\infty \quad \frac{a}{1-r}$ S_∞ read as "sum to infinity".
2. Understand and use the concept of geometric progression	2.1 Identify characteristics of geometric progressions 2.2 Determine whether a given sequence is a geometric progression. 2.3 Determine by using formula a) specific terms in geometric progressions b) the number of terms in geometric progressions 2.4 Find : a) the sum of the first *n* terms of	Include recurring decimals. Limit to 2 recurring digits such as $0.\dot{3}$, $0.\dot{1}\dot{5}$,... Exclude : a) combination of arithmetic progressions and geometric progressions. b) Cumulative sequences such as, (1), (2,3), (4,5,6), (7,8,9,10),.....

	geometric progressions b) the sum of a specific number of consecutive terms of geometric progressions. 2.5 Find : a) the sum to infinity of geometric progressions b) the first term or common ratio, given the sum to infinity of geometric progressions. 2.6 Solve problems involving geometric progressions.	
A7: LINEAR LAW 1. Understand and use the concept of lines of best fit. 2. Apply linear law to non-linear relations.	1.6 Draw lines of best fit by inspection of given data. 1.7 Write equations for lines of best fit. 1.8 Determine values of variables from: a) lines of best fit b) equations of lines of best fit. 2.1 Reduce non-linear relations to linear form. 2.2 Determine values of constants of non-linear relations given: a) lines of best fit b) data. 2.3 Obtain information from: a) lines of best fit b) equations of lines of best fit.	Patience Accuracy Neatness Limit data to linear relations between two variables.
C2: INTEGRATION 1. Understand and use the concept of indefinite integral.	1.1 Determine integrals by reversing differentiation. 1.2 Determine integrals of ax^n, where a is a constant and n is an integer, $n \neq -1$. 1.3 Determine integrals of algebraic expressions. 1.4 Find constants of integration, c, in indefinite integrals. 1.5 Determine equations of curves from functions of gradients. 1.6 Determine by substitution the integrals of expressions of the form $(ax + b)^n$, where a and b are constants, n is an integer $n \neq -1$.	Patience , co-operation, rational, systematic and diligence. Cooperation. Emphasize constant of integration. $\int ydx$ read as 'integration of y with respect to x" Limit integration of $\int u^n dx$ w here

		u = ax + b.
2. Understand and use the concept of definite integral.	2.1 Find definite integrals of algebraic expressions. 2.2 Find areas under curves as the limit of a sum of areas. 2.3 Determine areas under curves using formula.	Include $\int_a^b kf(x)dx = k\int_a^b f(x)dx$ $\int_a^b f(x)dx = -\int_b^a f(x)dx$ Derivation of formulae not required. Limit to one curve.
	2.4 Find volume of revolutions when region bounded by a curve is rotated completely about the (a) x-axis, (b) y-axis. 2.5 As the limit of a sum of volumes. Determine volumes of revolutions using formula.	Limit volumes of revolution about the x-axis or y-axis.
G2: VECTORS 1. Understand and use the concept of vector. 2. Understand and use the concepts of addition and subtraction of vectors.	1.1 Differentiate between vector and scalar quantities. 1.2 Draw and label directed line segments to represent vectors. 1.3 Determine the magnitude and direction of vectors represented by directed line. 1.4 Determine whether two vectors are equal. 1.5 Multiply vectors by scalars. 1.6 Determine whether two vectors are parallel. 2.1 Determine the resultant vector of two parallel vectors. 2.2 Determine the resultant vector of two non-parallel vectors using : (a) triangle law (b) parallelogram law. 2.3 Determine the resultant vector of three or more vectors using the polygon law. 2.4 Subtract two vectors which are : (a) parallel (b) non-parallel	Patience , co-operation, rational, systematic and diligence. Use notations: Vectors : $\underset{\sim}{a}$, $\overrightarrow{AB}$, **a, AB.** Magnitude : $\left\lvert \underset{\sim}{a} \right\rvert$, $\left\lvert \overrightarrow{AB} \right\rvert$, $\lvert a \rvert$, $\lvert AB \rvert$. Zero vector: $\underset{\sim}{0}$. Emphasise that a zero vector has magnitude of zero. Emphasize negative vector: $-\overrightarrow{AB} = \overrightarrow{BA}$ Include negative scalar. Include : (a) collinear points (b) non-parallel non-zero vectors.

	2.5 Represent vectors as a combination of other vectors. 2.6 Solve problems involving addition and subtraction vectors.	Emphasize : If $\underset{\sim}{a}$ and $\underset{\sim}{b}$ are not parallel and $h\underset{\sim}{a} = k\underset{\sim}{b}$, then $h = k = 0$. Emphasize : $\underline{a} - \underline{b}$ = $\underline{a} + (-\underline{b})$
3. Understand and use vectors in the Cartesian plane.	3.1 Express vectors in the form: a) $x\underset{\sim}{i} + y\underset{\sim}{j}$ b) $\begin{pmatrix} x \\ y \end{pmatrix}$ 3.2 Determine magnitudes of vectors. 3.3 Determine unit vectors in given directions. 3.4 Add two or more vectors. 3.5 Subtract two vectors. 3.6 Multiply vectors by scalars. 3.7 Perform combined operations in vectors. 3.8 Solve problems involving vectors.	Relate unit vectors $\underset{\sim}{i}$ and $\underset{\sim}{j}$ to Cartesian coordinates. Emphasise: vector $\underset{\sim}{i} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$ and vector $\underset{\sim}{j} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$ For learning outcomes 3.2 to 3.7, all vectors are given in the form $x\underset{\sim}{i} + y\underset{\sim}{j}$ or $\begin{pmatrix} x \\ y \end{pmatrix}$. Limit combined operations to addition, subtraction and multiplication of vectors by scalars.
T2: TRIGONOMETRIC FUNCTIONS 1. Understand the concept of positive and negative angles measured in degrees and radians. 2. Understand and use the six trigonometric functions of any angle	1.1 Represent in a Cartesian plane, angles greater than 360° or 2π radians for: a) positive angles b) negative angles 2.1 Define sine, cosine and tangent of any angle in a Cartesian plane. 2.2 Define cotangent, secant and Cosecant of any angle in a Cartesian plane 2.3 Find values of the six Trigonometric functions of any angle. 2.4 Solve trigonometric equations	Confidence Patience Careful Use unit circle to determine the sine of trigonometric ratios. Emphasise: $\sin\theta = \cos(90 - \theta)$ $\cos\theta = \sin(90 - \theta)$ $\tan\theta = \cot(90 - \theta)$ $\text{cosec}\,\theta = \sec(90 - \theta)$ $\sec\theta = \text{cosec}(90 - \theta)$ $\cot\theta = \tan(90 - \theta)$ Emphasise the use of triangles to find trigonometric ratios for special angles 30^0, 45^0 and 60^0.

3. Understand and use graphs of sinus , cosines and tangent functions.	3.1 Draw and sketch graphs of trigonometric functions : (a) y = c + a sin bx (b) y = c + a cos bx (c) y = c + a tan bx where a, b and c are constants and b > 0. 3.2 Determine the number of solutions to a trigonometric equation using sketched graphs. 3.3 Solve trigonometric equations using drawn graphs.	Use angles in (a) degrees (b) radians in terms of π . Emphasise the characteristics of sine, cosine and tangent graphs. Include trigonometric functions involving modulus. Exclude combinations of trigonometric functions. Basic identities are also known as Pythagorean identities
4. Understand and use basic identities	4.1 Prove basic identities : c) $\sin^2 A+\cos^2 A=1$ d) $1+\tan^2 A=\sec^2 A$ e) $1+\cot^2 A=\cos ec^2 A$ 4.2 Prove trigonometric identities using basic identities. 4.3 Solve trigonometric equation using basic identities	Include learning outcomes 2.1 and 2.2. Derivation of addition formulae not required. Discuss half-angle formulae. Exclude : $A\cos x+b\sin x=c$,
5. Understand and use addition formulae and double-angle formulae.	5.1 Prove trigonometric identities using addition formulae for $\sin(A\pm B), \cos(A\pm B)$ and $\tan(A\pm B)$. 5.2 Derive double-angle formulae for $\sin 2A$, $\cos 2A$ and $\tan 2A$. 5.3 Prove trigonometric identities using addition formulae and/or double-angle formulae. 5.4 Solve trigonometric equations.	
S2: PERMUTATIONS AND COMBINATION		
1. Understand and use the concept of permutation.	1.1 Determine the total number of ways to perform successive events using multiplication rule. 1.2 Determine the number of permutations of *n* different objects. 1.3 Determine the number of permutation of *n* different objects taken *r* at a time 1.4 Determine the number of permutations of *n* different	Predicting Critical thinking Making inferences Patience For this topic: a) Introduce the concept by using numerical examples. b) Calculators should only be used after students have understood the concept. Limit to 3 events

	objects for given conditions. 1.5 Determine the number of permutations of *n* different objects f taken *r* at a time for given conditions	Exclude cases involving identical objects.
S2: PERMUTATIONS AND COMBINATION 2. Understand and use the concept of combination	2.1 Determine the number of combinations of r objects chosen from n different objects. 2.2 Determine the number of combinations of r objects chosen from n different objects for given conditions.	Explain the concept of permutations by listing all possible arrangements. Include notations a) n! = n(n-1)(n-2)...(3)(2)(1) b) 0! =1 n! read as "n factorial" Exclude cases involving arrangement of objects in a circle. Explain the concept of combinations by listing all possible selections. Use examples to illustrate ${}^{n}C_{r} = \frac{{}^{n}P_{r}}{r!}$
S3: PROBABILITY 1. Understand and use the concept of probability	1.1 Describe the sample space of an experiment. 1.2 Determine the number of outcomes of an event 1.3 Determine the probability of an event. 1.4 Determine by using formula: a) specific terms in arithmetic progressions; b) the number of terms in arithmetic progressions.	confidence Use set notations Discuss: a. Classical probability (theoretical probability) cal progressions. b. Subjective probability c. relative frequency probability (experimental probability) Emphasize: Only classical probability is used to solve problems
2. Understand and use the concept of probability of mutually exclusive events.	2.1 Determine whether two events are mutually exclusive. 2.2 Determine the probability of two or more events that are mutually exclusive.	Emphasize: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ Using Venn Diagrams. Include events that are mutually exclusive and exhaustive. Limit to three mutually exclusive events.

3. Understand and use the concept of probability of independent events.	3.2 Determine whether two events are independent. 3.2 Determine the probability of two independent events. 3.3 Determine the probability of three independent events.	Include tree diagrams.
S4 : PROBABILITY DISTRIBUTIONS		
1. Understand and use the concept of binomial distribution.	1.1 List all possible values of a discrete random variable. 1.2 Determine the probability of an event in a binomial distribution. 1.3 Plot binomial distributions graphs. 1.4 Determine mean, variance, and standard deviations of a binomial distributions 1.5 Solve problems involving binomial distribution.	Honesty, fairness, careful, independent Includes the characteristics of Bernoulli trials. For learning outcomes 1.2 and 1.4, derivations of formulae not required.
2. Understand and use the concept of normal distributions	2.1 Describe continuous random variables using set notations. 2.2 Find probability of z-values for standard normal distribution. 2.3 Convert random variable of normal distributions, X, to standardized variable, Z. 2.4 Represent probability of an event using set notation. 2.5 Determine probability of an event. Solve problems involving normal distributions.	Discuss characteristics of: a) nnormal distribution graphs. b) gStandard normal distribution graphs Z is called standardized variable. Rational and careful Integration of normal distribution function to determine probability is not required
AST2: MOTION ALONG A STRAIGHT LINE		
1. Understand and use the concept of displacement.	1.1 Identify direction of displacement of a particle from a fixed point. 1.2 Determine displacement of a particle from a fixed point. 1.3Determine the total distance traveled by a particle over a time interval using graphical method.	cooperation independent confidence Hardworking Emphasize the use of the following symbols: s=displacement v=velocity a=acceleration t=time where s, v and a are function of time. Emphasize the difference between

		displacement and distance. Discuss positive, negative and zero displacements. Include the use of number line.
2. Understand and use the concept of velocity. 3. Understand and use the concept of acceleration.	2.1 Determine velocity function of a particle by differentiation. 2.2 Determine instantaneous velocity of a particle. 2.3 Determine displacement of a particle from velocity function by integration 3.1 Determine acceleration function of a particle by differentiation. 3.2 Determine instantaneous acceleration of a particle. 3.3 Determine instantaneous velocity of a particle from acceleration function by integration. 3.4 Determine displacement of a particle from acceleration function by integration. 3.5 Solve problems involving motion along a straight line.	Emphasize velocity as the rate of change of displacement $v = \frac{ds}{dt}$ Include graphs of velocity functions Discuss: a) uniform velocity b) zero instantaneous c) positive velocity d) negative velocity $s = \int \frac{dv}{dt}$ Emphasis acceleration as the rate of change of velocity. Discuss : a) uniform acceleration b) zero acceleration c) positive acceleration d) negative acceleration