002 MATHEMATICS

Aims

This course is designed to provide trainees with a sound knowledge of mathematical concepts as aids in the conceptualization, interpretation, and application of the technical soft wares and hard wares as well as to enhance their mathematical problems – solving ability in their various trades. It is also to form a basis for post secondary technical education.

All candidates are expected to answer questions from General Mathematics while those in Secretarial Studies and Book-Keeping are in addition to answer questions from Commercial Mathematics.

Examination Scheme:

The examination consists of Two Papers:

002-1 - Paper I (1½ Hrs)

002-2 - Paper II (2½ Hrs)

The total mark for both papers is 150.

1. Paper I: is made up of 50 multiple-choice items for 50 marks. All candidates are expected to attempt this paper.
2. Paper II: Consists of three sessions namely A, B and C.
   (a) Section A consists of five questions from General Mathematics. All candidates are expected to attempt all questions. This section carries 40 marks.
   (b) Section B consists of six questions. All candidates are to attempt any four of the six questions except Secretarial and Business candidates who are to attempt only two questions. Each question carries 15 Marks.
   (c) Section C consists of four questions from Commercial Mathematics for Secretarial and Business candidates only. Candidates are expected to attempt any two out of the four questions. Each question carries 15 marks.

Candidates should be familiar with units-length, area, cubic capacity, mass – and their abbreviations. Any currency unit used will be defined.

Examination Materials:

Candidates are allowed to use the recommended mathematical statistical tables in the examination hall for the papers. It is strongly recommended that schools/candidates obtain copies of these tables for use through the course.

Candidates should bring rules and complete mathematical instrument set for all papers. Borrowing of instruments from other candidates in the examination hall will not be allowed. The use of noiseless, cordless and non-programmable calculators is allowed.

If required, the following will be provided for any paper.

(i) Graph paper ruled in 2mm squares

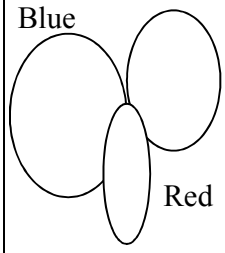
(ii) Plain drawing sheets for construction work.

002 GENERAL MATHEMATICS

Topic/objectives	Contents	Activities/Remarks
1. **Number Bases.** Count and perform Basic arithmetic operations in different bases.	(i) Number bases – counting in different bases: Converting from one base to another; addition, subtraction, multiplication and division in different bases. (ii)_Modules arithmetic	Arithmetic operation in different bases should exclude fractions. Comparison between place value system and additive system should be stressed e.g. 4520 means 4 thousands, 5 hundreds, 2 tens and 0 unit: 26 in base eight means 2 eight and 6 unit etc. Relate to market days etc. Truth sets (solution sets) for various open sentences e.g. 3 x 2 a(mod)48+y=4(mod)9
2. System Internationale Unit. Solve problems involving S.I. and imperial units.	Difference between S.I. and Imperial units of linear measures: conversion of S.I. units and vice versa: mm to m; m to km and vice versa; exercises involving time – hours, minutes and seconds	The basic units of S.I. units must be emphasized e.g the basic units of mass, length, time, area, volume are gramme, metre, second, square metre, cubic metre respectively. The advantages of S.I. units over the imperial units should be deduced by students; the use of S.I. units in science, social sciences should be brought out and exercise should be related to practical use.
3. Fractions Solve arithmetic operations involving vulgar and decimal fractions.	The law of equivalence of decimals and vulgar/common fractions. Vulgar fractions to decimal fractions and vice versa. Basic processes – addition, subtraction, multiplication and division – applied to decimals and fractions (vulgar/common fractions.)	Decimal fraction should be confined to two places e.g. 0.13 x 2.14 etc. Interrelationship between the different fractional systems e.g. 0.5 x 0.2 = ½ x $_{1/5}$ and $_{2/5}$ = 0.4 – 40% etc should be stressed.

4. Standard Forms. Express numbers in standard forms and to the required number of significant figures decimal places.	Standard forms, decimal places and significant figure. Rounding off number and give answer in the required number of decimal places ad significant figures; express number in standard forms; A x 10^n where $1 \leq A \leq 10$ and n is either – ve or + ve integer	
5. Ratio and Proportion . Solve problems on ratio and proportion.	Ratio and proportion. Relationship between ratio and proportion representative fraction Examples and exercises on direct and inverse ratios and proportions including representative fraction.	Relate these to the students' work in science and technical subjects.
6. Variation	Direct, inverse and partial variations. Joint variations.	Applications to simple practical problems.
7. Percentages, Profit and Loss. Apply the principles of percentages to fractions and decimals.	Percentages, profit and loss calculation. Conversion of fraction and decimal to percentages and vice versa; percentage change, commercial arithmetic including profit and loss, small decimal fractions. Application of profit and loss to commerce generally.	The means of transactions e.g. money, cheques, money orders, postal orders etc. should be mentioned.
8. Simple Interest Solve problems involving simple interest.	Simple Interest – Calculation of Principal (P), Interest (I), Rate (R) and Time (T) using $I = \frac{PRT}{100}$	Transformation of the formula for P.R and T should be clear.
9. Logarithms Apply logarithms, square And square root tables in calculations.	Based 10 logarithms tables and anti-logarithm tables, calculation involving multiplication, division, powers and roots using logarithm tables. Examples and exercise from simple to complex combination of multiplication, division, powers and roots of numbers e.g. $\sqrt{\frac{172.7 \times 15.4^2}{2.61^3}}$ etc.	
10. Indices Apply the laws of indices in simplification and calculation.	Indices as a shorthand notation. Laws of indices: (a) $a^x \times a^y = a^{x+y}$ (b) $a^x \div a^y = a^{x-y}$. (c) $(a^x)^y = a^{xy}$	The use of indices in science and technical subjects should be emphasized and exercises should be related to practical use. Trainers should be encouraged to discover

		the laws and deduce the meaning of a^{o}, a^{-x}, $\frac{a1}{x}$ By considering $a^{x} \div a^{x}$, $a^{o} \div a^{x}$ and $a^{x}.a^{x}=a^{1}$, where 2x=1, etc
11. Relationship Indices and Logarithms Explain the relationship between indices and logarithms.	Indices and logarithms as inverse operations e.g. $Y = 10^{x}$ $x = \log 10^{y}$ graphs of $Y = 10^{x}$ ($0 \leq x \leq 1$) Use of graph for multiplication and division.	Students should ONLY be familiar with the graph of $Y = 10^{x}$
12. Rules of Logarithms. Identify and apply the basic rules of Logarithms.	Rules of Logarithms (a) Log 10 (xy) = Log 10 X + Log 10y (b) Log 10 ($\frac{x}{y}$) = Log 10x – Log 10y (c) Log $10x^{p}$ = plog10x slketches and comparison with indices to be made. Copious examples to lead to the verification of these rules e.g. $\text{Log}_{10}(30)=\log_{10}(3x10)=\log_{10}3+\log_{10}10=\log 3+1$ $\log 81=\log_{10}3^{4}=4\log_{10}3=4x0.4771=1.9084$ etc Use logarithm tables in problems on compound interest, investment and annuities	
13. Arithmetic and Geometric Progressions. (a) Identify sequence patterns and calculate the nth term of a given sequence in AP and GP. (b) Calculate the sum of AP and GP	Sequences and series. Difference between AP and GP. Nth terms of AP and GP. Sum of AP and GP	Scope and depth of treatment of these topics should be limited to ordinary level mathematics.
14. Sets solve problems involving sets using Venn	Meaning of set, universal set, finite and infinite sets, empty set and sub-sets. Idea and Notation for Union (U) intersection ($\cap$), empty ($\varnothing$),	Introduce set as a tool and not as a topic. Do not use set to solve exercise that can be

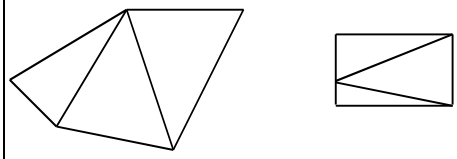
diagrams	complement of A, say (A'), disjoint sets. Venn Diagrams. Use Venn diagrams as a diagrammatic representation of sets e.g. Blue  white Red Problem solving involving sets and classification using Venn diagrams. Classification of objects based on students experiences both in school and in the home. Compare alternative methods of solving the same exercise(s)	quickly and easily solved by other methods except for the sake of comparison. Treatment this topic briefly. Do not use more than three sets for illustration. Include the interpretation of terms like union, intersection etc. Consider alternative methods advantage and appropriateness of solving the same exercises particularly with brighter students.
15. Logical reasoning	Simple statements . True and false statements. Negation of 5 statements. Implication, equivalence and valid argument.	Use of symbols: ~, ⇒, ⇐ ⇔ Use of Venn diagrams preferable.
16. Surds	Simplification and Rationalization of simple surds.	Surds of the form $\underline{a}$ and $\sqrt{b}$ $a\sqrt{b}$ whee a is rational and b is a positive integer.
17. Algebraic Processes Solve basic arithmetic operations with algebraic symbols.	Like and unlike terms. Ilustrate this with objects around the students' environments e.g. grains-rice and beans etc. Addition, subtraction, multiplication and division of simple algebraic expression. Insertion and removal of brackets. Use of letters to represent numbers. Solution of exercises in symbolic forms e.g. if 2 pencils cost 50 kobo, hoe much would 3 pencils of the same type cost? How much will Y pencils of the same type cost? If Bayo who has 3 mangoes has 2 less than Joy, how many mangoes	Exercise should include operations such as 4x + 7x, 8y-2y; 3 x 2m; 4f + 3m – 4f + 2m etc. Emphasize the use of operations – collection of like terms removal and use of brackets. The importance of defining precisely what the symbol represents should be emphasized. Simple cases only should be treated. Substitution of values

	has Joy? Construction and evaluation of formulae Change of subject of formulae e.g. if V = ¼ ∏d^2h express d in terms of V and h etc.	into the formulae should be included.
18. Simple Equations Solve problems involving simple equations.	Simple equations, illustrate the meaning of equality with reference to simple equations by using the idea of simple balance. Bring out the meaning of equality sign by adding or subtracting quantities to each side or by multiplying and dividing each side by a common factor (excuding each side by a common factor (excluding zero). Solving of simple equations e.g. 2y+6=4y+2 etc. Simple equations in one variable. Substitute different values for unknown in literal statements of the form k + 7 = 13. It may also be expressed in words to find the correct value e.g. to what can I add 7 to obtain a result of 13?.	The expression "cancel out" should be avoided.
19. Algebraic Process; Linear simultaneous Equation. Solve linear simultaneous equations in two variables.	Simultaneous linear equations. Solution of simultaneous linear equation of the form. x + y = 8; 2x + 3y = 4 using (a) elimination method (b) subtraction method Application to word problems	Check the accuracy of answer by substitution. This should be encouraged.
20. Algebraic Expressions. (a) Solve simple equations involving fractions. (b) Factorise simple quadratic expressions.	HCF and LCM. Exercises on HCF and LCM of given algebraic expression. Simplification of algebraic fractions (with monomial denominators). Simple equations involving fractions i.e. $\frac{1}{x+3} = \frac{4}{x-4}$ Solve a variety of simple equations with	Application of expression and factorization of algebraic terms to the simplification of expression such as: $\frac{1}{4x} + \frac{1}{x} = \frac{5}{4x}$ $\frac{1}{x} + \frac{1}{y} = \frac{y+x}{xy}$

	practical applications to word problems. Factorable and non-factorable expressions. Non-quadratic expressions. Introduction of brackets and Removing common factors in non-quadratic expressions. Application of perfect squares and difference of two squares. Factorisation of expressions of the form; $a^2 + 2ab + b^2$, and a^2-b^2 etc and their application. Factorisation of simple quadratic expressions. Exercises on factorization of simple quadratic expressions e.g. $a^2 + 7a + 12 = (a+3)(a+4)$ etc.	Note: It is used for rapid calculation. Use appropriate method(s)
21. Graphs of Algebraic Expression Solve simultaneous linear and quadratic equations graphically.	Co-ordinates, meaning of Cartesian plane. Linear equations in two variables. Tables of values, Linear graphs, Quadratic graphs Examples on co-ordinates of points. Compile table of values to draw: (a) Linear Graphs (b) Two linear graphs (c) Quadratic graphs, using the same axes. Consider cost situations leading to graphs of the form: $y = ax$; $y = ax + b$ etc.	The intersection of the two lines is the solution of the two linear equations. When the two lines do not meet (i.e. parallel), there is no solution. Also where the graph of a quadratic intersect with the x, axis, the points of the intersection are the solutions of the quadratic equation.
22. Quadratic Equations. (a) Solve quadratic equations using appropriate method. (b) Construct quadratic equations with given roots. (c) Solve word problems	Definition of quadratic equations. Solution of quadratic equation by factorization. Solution of quadratic equation by completing the square. Expansion of expressions like $(a\pm b)^2$ Given an expression of the form $y = x^2 \pm ax$, and trainers should be able to find a constant term, k which can be added to make the expression a perfect square e.g. $(x^2 + 8x)+16=(x+k)^2$ etc Deduce the formula of quadratic	The use of the 'scissors methods' can also be introduced. Compare this method with the factorization method and emphasize the advantage of one over the other. Compare this method with the previous

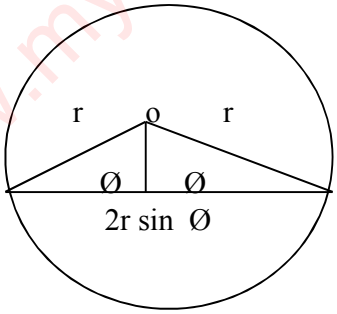
involving quadratic equations.	equation ($ax^2 + bx + c$) from completing the square. Solution of quadratic equation by formula method e.g. $X = \frac{- b \pm \sqrt{b^2-4ac}}{2a}$ Construction of quadratic equation with given roots e.g. Given the roots x = 2; $x=3 \Rightarrow (x-2)(x-3)= 0$ $\Rightarrow x^2-5x+6=0$ Given x = -2 and x = 3 $\Rightarrow (x+2)(x-3) = 0$ $\Rightarrow x^2 - x - 6 = 0$ Application of solution of linear and quadratic equation in practical problems. Formulate problems leading to quadratic equations.	methods. Difference between an equation and expression should be emphasized.
(d) Graphs of Linear and Quadratic function.	(a) Co-ordinate plane axes ordered pairs. (b) Computation of tables of values (c) Drawing graphs of linear and quadratic functions. (d) Interpretation of graphs (e) Graphical solution of the form $y=mx+k$ and $ax^2 +bx+c=y$. (f) Drawing of a tangent to a curve. (g) Use of tangent to determine gradient.	(a) the coordinate of the maximum and Obtaining minimum points from the graphs. (b) Intercepts on the axes. (c) Identifying axis of smelly recognizing sketched graphs Recognising sketched graphs. Use of quadratic graph to solve a related equation e.g. Graph of $y = x^2 - 5x+6$ to solve $x^2-5x+4=0$ (a) By drawing relevant tangent to determine the gradient. (b) The gradient M_1 of the line joining points $(x_1,y,)$ and (x_2,y_2) $M1 = \frac{y_2-y_1}{X_2-x_1}$ include word problems.
(e) Linear Inequalities	(a) Solution of linear inequalities in one variable. (b) Representation on the number line. (c) Graphical solution of linear inequalities in two variables.	

23 Plane figures Identify plane figures by their properties	Properties of plane figure e.g. rectangle, triangle, rhombus parallelogram, square, kite, trapezium. Quadilateral, polygon and circles. Relate the shape to solid and lead the students to draw them.	Students should be encouraged to discover the properties for themselves and faces of shapes.
24. Perimeters and Areas of Plane Figures Circulate the perimeter and areas of simple geometric plane figures.	Meaning of perimeter and area of plane figure. Calculation of perimeters of plane figures, squares, rectangles etc. Use string to measure round the boundaries of plane figures.	Lead the students to develop the formulae for the perimeter of square, rectangle, and a circle. The use of the units cm and m should be used in the activities.
25. Areas of Regular and Irregular Shapes Calculate the areas of regular and irregular shapes	Areas of regular and irregular shapes: (a) Triangle = ½ base x height (b) Rectangle = length x breadth (c) Rhombus = one side x height (d) Parallelogram = one parallel side x height (e) Square = side x side (f) Kite (g) Trapezium = ½ height x sum of parallel sides (h) Quadrilaterals = ½ diagonal x (sum of sides)	Lead the students to discover that there is no direct relationship between perimeter, area of shapes e.g. shapes with the same perimeters do not have the same area.
26. Lines and Angles Identify the different types of lines and angles.	Definition of a point, line, parallel lines, straight lines, curve; and perpendicular lines. Identification of different angles e.g. acute, obtuse, right angles, reflex, 30^0, 60^0, 90^0, 120^0, 190^0 etc. Complimentary, and suplementary; adjacent angles, vertically opposite angles, alternate and corresponding angles. Angle measurement.	It is pertinent that students discover these special properties of angles themselves.
27. Polygons (a) Identify the types of triangles and polygons. (b) Apply the sum of the angles of a triangle to	Types of triangle and quadrilateral e.g. isosceles right angled, scalene, obtuse, equilateral triangles rhombus, parallelograms. Squares, kite etc. Types of polygon e.g. pentagon, hexagon, heptagon, octagon, decagon, practical illustration of types of polygon.	Students should discover the relationship between these plane figures e.g. rectangle, rhombus are special parallelogram, a square is a parallelogram but a parallelogram may not be a square etc.

calculate any interior or exterior angle of a triangle. (c) Apply the sum of interior angles of a polygon of n sides to calculate any interior or exterior angle.	Application of the sum of a triangle to calculate interior or exterior angles of a triangle. Angle sum of a convex polygon. Application of sum of interior and exteriror angles of a polygon. Formulae of the sum of the interior and exterior angles of a convex polygon e.g. divide an n—sided polygon Into: (a) n – sided polygon (b) n triangles e.g.  (n-2) triangles n triangles formula for sum formula for sum interior angle of interior angles angle = $(n-2)x180^0 = nx\ (180^0) -360^0$ Use similar method to arrive at the formula for the sum of exterior angles of a polygon i.e. 4 right angles or 360^0	Illustrate this method with several examples before generalization is arrived at. The use of right angle(s) should also be emphasized.
28. Constructions. **Construct simple** geometrical constructions	Measuring and drawing angles. Use protractors and rulers to measure and draw angles. Construction of parallel and perpendicular lines. Bisection of a line segment. Bisection of an angle. Construction of angles equal to a given angle e.g. 30^0, 45^0 60^0 90^0, 105^0, 120^0 etc Construction of triangles and quadilaterals using set-square, protractor and a pair of compasses.	Parallel and perpendicular lines should be constructed using ruler and set-square only. Line segment and angles bisection should be carried out using compasses and straight edge ruler. Division of a line segment into a given number of equal parts or into parts in a given ratio should be carried out. Checking the accuracy of constructions. Neatness and accuracy should be emphasized.
29. Loci. Define and	Definition of locus. Ilustrate locus based on geometric principles with a variety of	Limit the locus of points to two dimension. Locus

construct loci of moving points in two dimensions.	constructions and measurements on paper and also by considering practical situations e.g. sports tracks and fields, tethering goat etc. Loci of points that are: (a) at a given distance from a given point. (b) at a given distance from a given straigth line. (c) Equidistance from two given points. (d) At a given segment of a straight line subtends a given angle (constant angle locus).	of points should be shown to be directly related to parallel lines, perpendicular bisectors, angle bisectors etc.
30. Mid-point and Intercept Theorems. Apply the intercept and mid-point theorems to solve exercises.	Midpoint and intercept theorems. Application of the mid-point and intercept theorems to solve exercises related to the proportional division of lines.`	Note that the mid-point theorem is a special case of one of the intercept theorems.
31. Similar Triangles Apply the properties of similar triangles to solve exercises on plane geometrical figures and solids.	Properties of similar triangles, Compare angles and sides of similar triangles by measurement, sliding, rotation or tracing. Application of the properties of similar triangles to solve simple problems on areas and volumes of similar plane geometrical shapes and solid respectively.	Note that in similar triangle: (a) corresponding angles are equal. (b) ratio of responding sides is a constant. Illustrate that the bisector angle on a triangle divides the opposite side in the ratio of the side containing the angles.
32. Chord and Tangent of a Circle. (a) Illustrate with examples the theorems associated with the chord and tangent of a circle. (b) Apply the theorem associated with Chord and tangent of a circle to	Theorems associated with the chord and tangent of a circle; (a) equal chord substends equal angle at the circumference; (b) the angle which an arc subtends at the circumference; (c) angles in the same segment are equal; (d) angles of the opposite segment are su[pplementary in a cyclic quadrilatreral; (e) angles in a semicircle is a right angle;	Deductive proofs of these theorem are not required. Role learning of the theorem without understanding the principles should be discouraged

construction exercises.	(f) an angle in a major segment is acute and angle in a minor segment is acute and angle in a minor segment is obtuse; (g) the rectangle contained by the segment of one is equal to the rectangle contained by the others (both externally and internally); (h) a tangent is perpendicular to the radius of a circle; (i) If two circles touch, the point of contact is on the line of centre; (j) the tangents of circle from an extended point are equal; (k) the direct and transverse common tangents to two circles are equal. Application of the theorems associated with chord and tangent of a circle to construction of chains, belts, gears and sprockets, etc.	Project work should be encouraged.
33. Congruent Triangles. Apply the conditions of congruency to solve exercises on triangles	Meaning of congruent. Conditions of congruency e.g. (a) Side-Side-Side (SSS) (b) Side-Angle-Side (sas (c) Side-Angle-Angle (SAA) (d) Right Angle-Hypotenus-Side (RHS) Application of conditions of congruency to solve related problems.	
34. Properties of Quadrilaterals. Solve problems involving the properties of parallelograms	Properties of: (a) Parallelogram (b) Rhombus (c) Rectangle (d) Square Application of parallelogram properties to solve exercises.	Practical illustration of this topic is important; trainers are encouraged to discover the relationships between and among these plane figures.
35. Circles-Arcs, Radius, Diameter, Sector and Segment. Calculate lengths and areas related to the circle	Parts of a circle – arc, radius diameter, sector and segment. Sector and segment. Length of arc of circles. Perimeter of sectors and segments. Draw circles, draw in various sectors and list in pairs the angle at the centre (Ø) and the arc (L) measured with string for	

	each circle. For each sector, compare the ratio **Ø = L** 360^0 2Πr Ø hence, deduce the formula L = $\frac{2\Pi r\ Ø}{360^0}$ Work ample examples on perimeters. Application of trigonometric ratios when required to determine lengths of chords. Areas of sectors and segments of a circle. Draw circle, cut into a number of sectors of equal angles at the centre e.g. 30^0 60^0, 90^0, etc Measure the angle and compare the ratios: **Ø and A** 360^0 Πr deduce the formula: A= $\frac{2\Pi r\ Ø}{360^0}$ Use trigonometric ratios to determine the length of the chord i.e.  Calculation of the area of a segment sector area minus triangle area. Deduce and use the formula: = ½ r^2 sin Ø	
36. Mensuration **Pythagoras Theorem** Apply the principles of	Pythagors Rule. Calculation of lengths using the Pythagoras rule.	Use a square of a + b or any number you choose. Use diagram to show that $a^2 + b^2 = c^2$

Pythagoras' to solve problems involving right-angled triangles.		
37. Areas and Volumes of solids Calculate the surface area and volume of solid figures	Types of solid figures e.g. cuboids, cylinder, cone, pyramids, prisms, hemisphere ande frustum of cone and pyramid. Surface areas of : (a) Cuboids (b) cylinder (c) cone (d) pyramids (e) prisms (f) hemisphere (g) frustum of cone and (h) pyramid. Volumes of solid figure listed in (a) to (b) contents above. Fill hollow cubes and cuboids with unit cubes. Derive formulae of cuboids; proceed to show that the volume of a right-triangular prisms is half of the volume of its related cuboids. Make cardboard model of cone and cylinder of same height and the same circular base. Compare volumes of contents of cone and cylinder to discover the formulae for the volume of cone. Volumes of containers, hollow solids, pipes and hollow bricks. Calculation of volumes of given containers, hollow solids, pipes and hollow bricks.	It is pertinent that trainers are allowed to discover these solid figures with the aid of objects around them e.g. tins, sugar box, bowl, buckets etc. Emphasise the formulae for the total surface area of solids e.g. cylinder = $(2\pi r^2 + 2\ \pi rh)$ square units etc. Unit cubes can be got from sugar cubes, cubes made from local clay, wood, cubes by a local carpenter or students in a woodwork class.
38. Longitude and Latitude Calculate distances along lines of latitudes and longitudes.	Definition of latitude and longitude as angles. Definition of latitude and longitude from the geographical point of view. Relationship and comparison between the two definitions above. Revision of surface area and volume of sphere. The earth as a sphere. Calculations of distances on the lines of latitude and longitudes. Work examples involving known places and check results from good atlases.	Treat simple examples.

39. Irregular Geometric Figures Solve exercises involving areas of irregular figures.	(a) Regular and irregular plane figures. (b) Areas of irregular plane figures Use mid-ordinate and trapezoidal rules to calculate the areas of irregular plane figures.	Trainers suggest examples.
40. Everyday Statistics. (a) Interpret graphs and charts. (b) Calculate statistical average with equal and unequal forms.	Practical presentation of data using histogram, bar chart, line-graph and pie-chart. Interpretation of graphs and charts. Frequency distribution of equal and unequal forms. Identification of mode, and median in a set of data. Calculation of mean mode and median of grouped data.	Students can work in groups and results discussed by the whole class. Discuss which of the central measures i.e. mode, median and mean is most useful. Methods of determining median mode for grouped data, including equal class interval for grouped data.
41. Probability. (a) Define probability terms. (b) Solve problems on theoretical and experimental probabilities.	Meaning of the terms: Probability, Events, Mutually exclusive events, independent events. Trials. Experimental probability. Throwing dice or tossing of coins. Number of boys and girls in different classes and corresponding probability of a girl. Theoretical probability. Theoretical consideration of short parents producing short Children. Consider also 1 short parent and 1 tall parent and probable offspring. Mutually exclusive events. Exercises on probability of mutually exclusive events. Addition and multiplication laws of probability. Illustrate the addition law in mutually exclusive events. Also illustrate the multiplication law in independent event. Interpretation of and or both/and; or either/or.	Treat theoretical probability as a limiting value of experimental probability as a number of trials become large. Use the addition law to solve exercises containing the word **or** or **either/or.**
42. Trigonometry. Apply	Trigonometric Ratios Define the trigonometric ratios and their	

trigonometric ratios to solve simple problems	inverse:- Sine-cosecant, tangent-cotangent using right-angled triangle. Trigonometric Ratios of angles greater than 90^0 Use the Cartesian plane to determine the trigonometric ratios of angles greater than 90^0 Tables of trigonometric ratios. Use table to find value of trigonometric ratios and vice versa. Application of trigonometric ratios. Use trig. Ratios to solve exervises related to: (a) heights and distance and angles of elevation and depression; (b) area of a triangle using the formula ½ ac Sin B and (d) area of polygons.	
43. Trigonometry Apply sine and cosine rules to solve problems	Sine and Cosine Rules – Statement only. Application of sine and cosine rules to solve related problems e.g. problems in triangles, bearing etc.	Note when to apply each of the rules
44. Vectors and transformation in a plane. (i) Vectors in a plane. (ii) Transformations in the Cartesian coordinate plane.	(i) Vector as a directed line, segment, magnitude, equal vectors, sums and differences of vectors. (ii) Parallel and equal vectors. (iii) Multiplication of a vector by a Scalar. (iv) Cartesian components of a vector (v) Reflection. (vi) Rotation. (vii) Translation.	Column notation emphasis on graphical representation. Notation O Vector O) for the zero The reflection of points and shapes in the x and y axes and in the lines x = k, and y = k where k is a rational number. Determination of the mirror lines of points. shapes and their images. Rotation about the origin. Use of the translation Vector.

COMMERCIAL MATHEMATICS

Topic/Objective	Contents	Activities/Remark
1. Significant Figures Identify the problems of significant digit as it relates to zero.	Significant figures. Identification of significant digits as it relates to zero e.g. (a) a zero that falls between significant digits e.g. 50502 (b) a zero that falls after a significant digit especially when number contains decimal points e.g. 13,840 (c) a zero that falls after the last significant digits of a whole number e.g. 67000	
2. Statistical Computation (a) State different kinds of averages and their uses. (b) Calculate statistical problems as related to basic business problems.	Meaning of "Average" Use of an average as: (a) it provides for a summary (b) it provides for a common denominator (c) as a measure of typical size Kinds of average: (a) moving average; (b) median (c) mean; (d) weighted average (e) quartile and percentile, range, interpercentile and interquartile range. Mean of distribution and its calculations, range, variance and standard deviation.	
3. Ratios and Proportions. Solve exercises on proportions and proportional parts.	Ratios and proportion. Express two or more quantities as a ratio. Divide a given quantity in a given proportion. Sole problems in direct and indirect ratio and proportion. The concept of partnership in simple business operations. Solve exercises in simple business operations. Meaning of percentages. Conversion between fractions decimals and percentage.	Study of application such as speeds, productivity, consumption and reciprocal.

4. Percentages. Solve exercises in percentages related to buying and selling	(a) Calculation of percentage increase (b) Explain the concepts "buying price" , "cost price" and "selling price" (c) Solving problems in buying price, cost price, and selling price. (d) Explain "Make-up" and percentage (e) Explain "Mark-down" and "mark-down percentage".	When treating fractions, decimals and percentages, buying and selling should be taken into account.
5. Profit and Loss Solve exercises involving profit and loss	Meaning of "profit and Loss" and (a) Difference between (b) "Gross Profit" and "Net profit", "Gross Loss" and "Net Loss" (c) Calculation of gross and net profit as percentage of sales. (d) Calculation of probability ratios, gross profit and net profit as percentages of sales.	
6. Aliquot Parts Commission and Discount Solve problems involving Aliquot parts commission and discount	Meaning of Aliquot parts (a) Exercises involving ratio e.g. dividing profit between A,B, and C in the ratio 4:2:1 or 4:2:3 (b) Commission where commissions are to be received or paid as a percentage of profit. (c) Difference between discount and commission. (d) Trade discount, cash discount and quantity discount. (e) Solve problems involving discount and commission.	
7. Costing Identify the various element by costs	Costing (a) Elements of cost e.g. buying prices, tax, commission transport and discount, labour, storage delivery charges. (b) Calculation of unit cost of a product taking into accounts the elements of cost. (c) Solve problems involving cost.	

8. Budgeting. Applying the principle of simple budgeting.	(a) Meaning of budgeting (b) Budgeting techniques (c) Elements of budgeting i.e. income, expenditure etc. (d) Preparation of simple budget for a family or small firms. (e) Comparison of actual with the budget.	
9. Cost and Selling Price Solve problems involving cost and selling price.	Cost and Selling Prices (a) Calculation of gross profit as a percentage on cost (b) Calculation of gross profit as a percentage of selling. (c) Calculation of gross price when profit on cost percentage and price are given. (d) Calculation of selling price when profit as a percentage and cost price is given.	
10. Simple and Compound Interest. Solve simple problem involving simple and compound interest.	Difference between simple and compound interest. Simple Interest – exercises on simple interest. Compound interest – exercises on compound interest.	The formula and tabulation methods of calculating compound interest should be taught.
11. Depreciation Calculate depreciation.	Meaning of depreciation. Difference between depreciation and present value. Methods of computing depreciation e.g. (a) straight – line method (b) reducing balance method, (c) sum of the digits method, Calculation of depreciation.	
12. Instalmental Payment and Hire Purchase Solve problems involving instalmental payments and Hire Purchase.	Difference between instalmental payment and hire purchases. Solve problems on hire purchases, instalmental payment and mortgages.	
13. Rates. Convert one currency to another currency i.e. foreign exchange.	Exchange rates. Rates and their uses. Conversion of one currency to another currency.	

14. Rates, Income Tax, Insurance and Freights. Solve problems involving income tax, rates on insurance and freights.	Use of rates in relationship with various payments like taxes, insurance, freight rates etc. Calculation of various rates. Computation of income tax at various income levies.	
15. Payrolls Prepare payment of wages	Wages and payroll. Enumeration of elements involved in preparing wage e.g. salaries, allowances, overtime bonus, tax, rent and other rates, professional payments, pension etc. Preparation of payroll cards, wage sheet, pay slips etc. Preparation of cash analysis for wage payment. Preparation of wage packets for individuals	The merits and demerits of the use of computer in preparing payrolls and wages should be mentioned.
16. Stock and Shares. Solve simple problems in stock and shares	Meaning of stock, shares, debentures and bonds. Enumeration of different kinds of stocks and shares e.g. preferential, ordinary, debenture shares. Solve simple exercises on stocks, shares, debentures and bonds.	
17. Bankruptcy Solve problems involving bankruptcy.	Definition of bankruptcy. Calculation of dividends in bankruptcy. Solve problems in bankruptcy.	