**REPUBLIC OF RWANDA**

**MINEDUC**

**GASABO DISTRICT**

**SCHEME OF WORK**

**Academic year: 2022/2023 Term I School:** ……………………. **Subject: MATHEMATICS**

**Teacher’s name**: …………………………………**………Class: SENIOR FOUR…………. NUMBER OF PERIOD PER WEEK:7PERIODS**

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| **DATES** | **UNITS TITLE** | **LESSON TITTLE +**  **EVALUATION** | **LEARNING OBJECTIVES** | **TEACHING METHODS AND TECHNIQUES+EVALUATION PROCEDURES** | **RESOURCES REFERENCES** | **OBSERVATION** |
| Week 1  26-30/09 | **Unit 1: FUNDAMENTALS OF TRIGONOMETRY.**  **Key unit competence:**  Use trigonometric circle and identifies to determine trigonometric ratio and apply then to solve related problem | **1. Trigonometric concepts**   * Angle and its measurements * Unit circle * Trigonometric ratios * Trigonometric identities | **Knowledge and understanding**  -Define cosine, sine and tangent (secant, cosecant, and cotangents of any angle  Know special value (300,450,600 )   * Convert radius to degree and vice versa * Differentiate between complementary angle supplementary angle and coterminal angles   **Skills:** -Represent graphically sine, cosine, and tangent function together with unit circle, use to relate value of any angle to the value for a position acute angle  -Use trigonometry including the involving triangles  **Attitude and values:**  Appreciate the relationship between the trigonometric value for different angles | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  Schaum’s outline series trigonometry 3rd Edition 1999 |  |
| Week 2  03-07/10 | **2.Reduction to functions of positive acute angle** | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  Schaum’s outline series trigonometry 3rd Edition 1999 |  |
| Week 3  10-14/10 | **3.Triangles and application**  **Summative evaluation** | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  Schaum’s outline series trigonometry 3rd Edition 1999 |  |
| Week 4  17-21/10 | **UNIT 2:**  **PROPOSITIONAL AND PREDICATE LOGIC**  **Key unit competence**  Use mathematical logical to organize scientific knowledge and as tool of reasoning and argumentation in daily life. | **1. Generalities: fundamental definition and notation**  **2. propositional logic** | **Knowledge and understanding**  -Distinguish between statement and proposition  -convert into logical formula composite proposition and vice versa  -recognize the waste often used tautologies  -(E.g. De Morgan lowest tautologies or a contradiction  **SKILLS**  -Use mathematic logic to infer conclusion from given proposition  **Attitude and value**  -Judge the situation accurately and act with equality  -Observe situation and make appropriate decision | - Lecture  -Discussion  - written exercises  - class work | -Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 5  24-28/10 | **3.Predicate logic**  **4. Application**  **Summative evaluation** | - Lecture  -Discussion  - written exercises  - class work | -Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 6  31/10-04/11 | **UNIT 3:**  **BINARY OPERATION**  **Key unit competence**  Use mathematical logical to understand and perform operation using the properties of algebraic structure | **1.**Definition and properties of group, a ring field  2. Algebraic structures group, ring, field  **Summative evaluation** | **Knowledge and understanding**  Define a group, a ring, our integral domain and a field Demonstrate set is (or not) a group, a ring or field under give operation.  Demonstrate that a subject of a group is (or not a sub group).  **SKILLS**  Determine the properties of a give binary operations  Discover a mistake in an incorrect operation  **Attitudes and values**  Appreciate the importance and the use of properties | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 7  07-11/11 | **UNIT 4: SET R OF REAL NUMBERS**.  **Key unity competence**  Think critically using mathematic logic to understand and perform operation on the set of real number and its subset using the property of algebraic structure. | **1.Introduction**  **2.Properties of real numbers**  **3. Absolute values function**  4. **Power and radical** | **Knowledge and understanding:** Define power, au exponential, a radical, a logarithm, the absolute value of a real number.  **SKILLS:** Use logarithm and exponentials to model simple problems about growth, decay compound interest magnitude of au earthquake transform a logarithm express to equivalent power or radical form and vice versa. | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level  Achievers mathematics4 students book |  |
| Week 8  14-18/11 |  | **5.Decimal logarithm and properties**  **6.Application of Exponent in real life**  **7.Summative evaluation** |  | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level  Achievers mathematics4 students book |  |
| Week 9  21-25/11 | **UNIT 5: LINEAR EQUATION AND INEQUALITIERS**  **Key unit competence:** Model and solve algebraically or graphically daily life problems using linear equations or inequalities | **1.Equations and inequalities in one unknown**  **2. Parametric equations and inequality in on unknown** | **Knowledge and understanding**  List and clarity the steps in modeling problems by linear equation and its inequalities  **SKILLS:** Solve equation and inequalities one unknown.  **Altitude and values** Appreciate value and care for situations involving to quadratic equation and quadratic inequalities | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 10  28/11-02/12 | **3. Simultaneous equation in two unknown**  **4.Application**  **Summative evaluation** | -REB(2015) Mathematics syllabus for advanced level |  |
| Week 11  05-09/12 | **REVIEW AND SUMMATIVE EVALUATION** | | | | | |
| Week 12  12-16/12 | **EXAMS** | | | | | |
| Week 13  19-23/12 | **SCHOOL REPPORT** | | | | | |

**Academic year:2022/2023 Term II School:** ………………………..**Subject: MATHEMATICS**

**Teacher’s name**: ……………………………… **Class: SENIOR FOUR NUMBER OF PERIOD PER WEEK:7PERIOD**

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| **DATES** | **UNITS TITLE** | **LESSON TITTLE +**  **EVALUATION** | **LEARNING OBJECTIVES**  **KEY COMPETENCES** | **TEACHING METHODS AND TECHNIQUES+EVALUATION PROCEDURES** | **RESOURCESAND REFERENCES** | **OBSERVATIONS** |
| Week 1  09-13/01 | **Unit 6: Quadratic equations and inequalities**.  **Key unit competence:** Model and solve algebraically or graphically daily life problems using quadratic equations or inequalities | 1.**Equations and inequalities in one unknown.**  2. **Parametric equations and inequalities in one unknown.** | **Knowledge and understanding**  - Define a quadratic equation.  - Be able to solve problems related to quadratic equations.  **Skills:** - Apply critical thinking by solving any situation related to quadratic equations(economics problems,…)  **Attitudes and values**  - Appreciate, value and care for situations involving to quadratic equations and quadratic inequalities in daily life situations. | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 2  16-20/01 | 3. **Simultaneous equations in two unknowns.**  4. **Applications:**  o Physics (projectile motions)  o Masonry (arched shape).  **SUMMATIVE EVALUATION** | - Lecture  -Discussion  - written exercises  - class work | Achievers mathematics4 students book  Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 3  23-27/01 | **Unit 7: Polynomial, rational and irrational functions.**  **Key competences:** use concepts and definitions of functions to determine the domain of a rational function and represent them graphically in simple cases and solve related problems. | 1. **Factorization of polynomials**  2. **Generalities on numerical functions:** | **Knowledge and understanding**  - Identify a function as a rule and recognize rules that are not functions.  - Find whether a function is even, odd, or neither.  - Demonstrate an understanding of operations on polynomials, rational and irrational functions, and find the composite of two functions.  **Skills:** - Apply different properties of functions to models and solve related problems in various practical contexts.  **Attitudes and values**  - Increase self-confidence and determination to appreciate and explain the importance of functions. | -Discussion  - written exercises  - class work | Achievers mathematics4 students book |  |
| Week 4  30/01-03/02 | 3. **Application of rational and irrational functions**:  o Physics (free fall, projectile).  o Economics (cost of commodity or marginal cost).  o Chemistry (rate of reaction).  **SUMMATIVE EVALUATION** | -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 5  06-10/02 | **Unit 8: Limits of polynomial, rational and irrational functions.**  **Key Unit Competence:** Evaluate correctly limits of functions and apply them to solve related problems | 1.**Concepts of limits:**  o Neighborhood of a real number.  o Limit of a variable.  o Definition and graphical interpretation of limit of a function.  o One-sided limits.  o Squeeze theorem.  o Limits of functions at infinity.  o Operations on limits. | **Knowledge and understanding**  - Define the concept of limit for real-valued functions of one real variable.  - Evaluate the limit of a function and extend this concept to determine the asymptotes of the given function.  **Skills**  - Use the concepts of limits to determine the asymptotes to the rational and polynomial functions.  **Attitudes and values**  - Show concern for the importance, use and determination of limits of functions. | -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 6  13-17/02 | 2. **Indeterminate cases:**  3. **Applications:**  o Continuity of a function at a point or on interval.  o Asymptotes.  **SUMMATIVE EVALUATION** | -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 7  20-24/02 | **Unit 9: Differentiation of polynomials, rational and irrational functions and their applications**.  **Key Unit Competence:** Use the gradient of a straight line as a measure of rate of change and apply this to tangent and normal of curves in various contexts and use the concepts of differentiation to solve and interpret related rates and optimization problems in various contexts | 1. **Concepts of derivative of a function:**  o Definition.  o Differentiation from first principles.  o High order derivatives. | **Knowledge and understanding**  - Evaluate derivatives of functions using the definition of derivative.  - Define and evaluate from first principles the gradient at a point.  - Distinguish between techniques of differentiation to use in an appropriate context.  **Skills**  - Use properties of derivatives to differentiate polynomial, rational and irrational functions.  **Attitudes and values**  - Appreciate the use of gradient as a measure of rate of change (economics). | -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB (2015) Mathematics syllabus for advanced level |  |
| Week 8  27/02-03/03 | **Rules of differentiation**  - **Applications of differentiation:**  o Geometric interpretation of derivatives:  Equation of the tangent to a curve; Equation of normal to a curve.  o Mean value theorem for derivatives: Lagrange’s theorem. | -Discussion  - written exercises  - class work | Achievers mathematics4 students book |  |
| Week 9  06-10/03 |  | o Rolle’s theorem  o Hospital’s theorem.  o Variations of a function (maximum and minimum values, critical points, inflexion points, concavity, stationary points, increasing and decreasing function).  .  SUMMATIVE EVALUATION |  | -Discussion  - written exercises  - class work | Achievers mathematics4 students book  -REB(2015) Mathematics syllabus for advanced level |  |
| Week 10  13-17/03 | **REVIEW AND SUMMATIVE EVALUATION** | | | | | |
| Week 11  20-24/03 | **EXAMS** | | | | | |
| Week 12  27-31/03 | **SCHOOL REPPORT** | | | | | |

**Academic year:2022/2023 Term III School:** ………………………… **Subject: MATHEMATICS**

**Teacher’s name**: ………………………………. **Class: SENIOR FOUR NUMBER OF PERIOD PER WEEK:7PERIOD**

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| **DATE** | **UNIT TITLE** | **LESSON TITLES**  **+EVALUATION** | **LEARNING OBJECTIVE+KEY UNIT COMPETANCE** | **TEACHING METHODE+TECHNIQUES + EVALUATION PROCEDURES** | **RESSOURCES/ REFERENCE** | **OBSERVATION** |
| Week 1  17-21/04 | **Unit 10: Vector spaces of real numbers.**  **Key Unit Competence**: Determine the magnitude and angle between two vectors and be able to plot these vectors and point out dot product of two vectors. | **1.Vector spaces**:  o Definitions and operations on  vectors.  o Properties of vectors  o Sub-vector spaces.  o Linear combination of vectors.  o Basis and dimension. | **Knowledge and understanding**  - Define the scalar product of two vectors.  - Give examples of scalar product.  - Determine the magnitude of a vector and angle between two vectors.  **Skills**  - Calculate the scalar product of two vectors.  **Attitudes and values**  - Apply and transfer the skills of dot product, magnitude to other areas of knowledge. | .Brain storming  .group work  .individual work  .Questions and answer method | ACHIEVERS  MATHEMATICS  S4 STUDENTS BOOK |  |
| Week 2  24-28/04 | **2. Euclidian vector space**  o Dot product and properties.  o Modulus or magnitude of vectors  o Angle between two vectors.  **Summative evaluation** | . Brain storming  . group work  . individual work  .Questions and answer method | ACHIEVERS  MATHEMATICS  S4 STUDENTS BOOK |  |
| Week 3  01-05/05 | **Unit 11: Concepts and operations on linear transformations in 2D.**  **Key Unit Competence:** Determine whether a transformation of is linear or not and perform operations on linear transformations. 2 IR | 1.**Linear transformation in 2D.**  o Definitions and properties.  2.**Geometric transformations.**  o Definitions and properties.  **3.Kernel and range.**  4. **Operations on transformations**  **Summative evaluation** | **Knowledge and understanding**  - Define and distinguish between linear transformations in 2D.  - Define central symmetry, orthogonal projection of a vector, identical transformation  - Define a rotation through: an angle about the origin reflection in the x axis in y axis, in the line y= x  - Show that a linear transformation is isomorphism in 2D or not.  **SKILLS**  - Perform operations on linear transformations in 2D.  **Attitudes and values**  - Appreciate the importance and the use of operations on transformation in 2D. | . Brain storming  . group work  . individual work  .Questions and answer method | ACHIEVERS  MATHEMATICS  S4 STUDENTS BOOK |  |
| Week 4  08-12/05 | **Unit 12: Matrices of and determinants of order 2.**  **Key Unit Competence:** Use matrices and determinants of order 2 to solve systems of linear equations and to define transformations of 2D. | 1 **Matrix of a linear transformation:**  o Definition and operations.  2.**Matrices of geometric transformations**  3. **Operations on matrices:**  4. **Determinant of a matrix of order 2**  o Definition.  o Applications of determinants.  **SUMMATIVE EVALUATION** | **Knowledge and understanding**  - Define the order of a matrix.  - Define a linear transformation in 2D by a matrix.  - Define operations on matrices of order 2.  - Show that a square matrix of order 2 is invertible or not.  **Skills**  - Reorganize data into matrices.  **Attitudes and values**  - Appreciate the importance and the use of matrices in organising data. | .Brain storming  .group work  .individual work  .Questions and answer method | Shampiona 2005 mathematics 6  ACHIEVERS  MATHEMATICS  S4 STUDENTS BOOK |  |
| Week 5  15-19/05 | **Unit 13: Points, straight lines and circles in 2D.**  **Key Unit Competence:** Determine algebraic representations of lines, straight lines and circles in 2D. | 1.**Points in 2D:**  o Cartesian coordinates of a point.  o Distance between two points.  o Mid-points of a line segment.  2.**Lines in 2D:**  o Equations of line: Vector equation; Parametric equations; Cartesian equation  3.**Problems on points and straight lines in 2D:**  o Positions.  o Angles.  o Distance.  4.**Definition of a circle.** | **Knowledge and understanding**  - Define the coordinate of a point in 2D.  - Define a straight line knowing its:  o 2 points.  o Direction vector.  o Gradient.  **SKILLS**  Determine equations of a straight line (vector equation, parametric equation, Cartesian equation).  **Attitudes and values**  - Appreciate that a point is a fixed position in a plane. | .Brain storming  .group work  .individual work  .Questions and answer method | ACHIEVERS  MATHEMATICS  S4 STUDENTS BOOK  Shampiona 2005 |  |
| Week 6  22-26/05 |  | 5. **Cartesian equation of a circle.**  6. **Problems involving position of a circle and a point or position of circle and lines in 2D.**  **Summative Evaluation** |  | . Group work  . Individual work  .Brain storming | Shampiona 2005 mathematics 6  ACHIEVERS  MATHEMATICS  S4 STUDENTS BOOK |  |
| Week 7  29/05-02/06 | **Unit 14: Measures of dispersion**.  **Key unit competence**: extend understanding, analysis and interpretation of data arising from problems and questions in daily life to include the standard deviation. | 1. **Variance.**  2. **Standard deviation (including combined set of data).**  3. **Coefficient of variation.**  - **Application**  **SUMMATIVE EVALUATION** | **Knowledge and understanding**  - Define the variance, standard deviation and the coefficient of variation.  - Analyse and interpret critically data and infer conclusions.  **Skills:** - Apply and explain the standard deviation as the more convenient measure of the variability in the interpretation of data.  **Attitudes and values**  - Appreciate the importance of measures of dispersion in the interpretation of data. | .Brain storming  .group work  .individual work  .Questions and answer method | Shampiona 2005 mathematics 6 |  |
| Week 8  05-09/06 | **Unit 15: Combinatorics.**  **Key Unit Competence:**  Use combinations and permutations to determine the number of ways a random experiment occurs. | 1. **Counting techniques:**  o Venn diagrams.  o Tree diagrams.  o Contingency table.  o Multiplication principles. | **Knowledge and understanding**  - Define the combinatorial analysis.  - Recognise whether repetition is allowed or not, and if order matters or not in performing a given experiment.  - Construct Pascal  - Distinguish between permutations and combinations.  **Skills:** Determine the number of permutations and combinations of “n” items, “r” taken at a time.  **Attitudes and values**  - Appreciate the importance of counting techniques. | Brain storming  . group work  . individual work  .Questions and answer method | HIGHER ENGINEERING MATHEMATICS 15th edition 2006 |  |
| Week 9  12-16/06 |  | **2.Arrangement and permutations:**  **3.Combinations:**  **SUMMATIVE EVALUATION** |  | Brain storming  . group work  . individual work  .Questions and answer method | ACHIEVERS  MATHEMATICS  S4 STUDENTS BOOK |  |
| Week 10  19-23/06 | **Unit 16: Elementary probability**  **Key Unit Competence:** Use counting techniques and concepts of probability to determine the probability of possible outcomes of events occurring under equally likely assumptions. | - **Concepts of probability:**  o Random experiment.  o Sample space.  o Event.  o Definition of probability of an event under equally likely assumptions.  - **Properties and formulas.**  **SUMMATIVE EVALUATION.** | **Knowledge and understanding**  - Define probability and explain probability as a measure of chance.  - Distinguish between mutually exclusive and non-exclusive events and compute their probabilities.  **Skills:** - Determine and explain expectations from an experiment with possible outcomes.  **Attitudes and values**  - Appreciate the use of probability as a measure of chance. | Brain storming  . group work  . individual work  .Questions and answer method | HIGHER ENGINEERING MATHEMATICS 15th edition 2006  -Feller, W.[1968].an introduction to probability theory and its applications, third edition, Wiley, New York |  |
| Week 11  26-30/06 | **REVIEW AND SUMMATIVE EVALUATION** | | | | | |
| Week 12  03-07/07 | **EXAMS** | | | | | |
| Week 13  10-14/07 | **SCHOOL REPPORT** | | | | | |