

Guidelines for selecting Mathematics contents for Grade 9-11

City Government of Addis Ababa Education Bureau

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Introduction

The Ethiopia general education was fully interrupted because of Covid-19 pandemic since 15 February 2020. The Ministry of Education has decided

students to pass freely to the next grade except for Grade 8 and 12 students who have to take regional and national examination respectively.

The Ministry of Education decided to continue the teaching and learning process in 2020/21 according to the Ministry of Health protocols.

Hence, the city government of Addis Ababa Education Bureau is preparing to cover the uncover portions from Grade 1 to 12 through make up classes before starting the 2020/21 teaching and learning. For this end City Government of Addis Ababa education Bureau has prepared this Mathematics Make up Lesson Guide line from Grade 1 to 12. This guide line comprises rational and objectives of the guide line and issues considered, content selection criteria, selected contents, methodology and the role of teachers and students for makeup class.

1. Rational

The rational for providing make up classes before starting the next academic year teaching and learning process are to

- minimize the effect on the students behavior caused by uncover second semester portions
- cover the uncovered portion of the teaching and learning
- provide similar contents throughout the country and
- Provide prerequisite contents which are helpful to continue the next grades teaching and learning process smoothly.

2. Objectives

The objectives of the guide line are to:

- show the rational of covering the uncovered portion before starting the new grade
- show issues considered in selecting lessons and
- identify selected contents for each grade level

3. Content Selection Criteria

Selected contents are identified if it is newly introduced concept, highly applicable for real life situations, Basic for other subjects and basic for further learning.

In this guide line contents such as unnecessary repeated contents, those easy contents that students can understand easily and application problems that can be used as an elaboration example under the main contents are omitted. There are units in which all contents are crucial. In this case, the numbers of periods are reduced proportionally.

4. Selected Contents

Grade 9

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
1	Unit 5: Geometry and Measurement	5.1.1 Measures of Angles of a Regular Polygon	1	• Newly introduced concept • It will not be repeated on the next grades	Competencies: • Define regular polygon • Calculate the measure of each interior angle, each exterior angle and central angle of a regular polygon
		5.1.2 Properties of Regular Polygons	1	• Newly introduced concept • It will not be repeated on the next grades	Competencies: • Define apothem • Determine the length of side, perimeter, area and apothem of a given regular polygon.
		5.3.3 Trigonometrical Values of Angles from Tables	1	• Newly introduced concept • Basic for further learning	Competencies: • find the trigonemetrical values of angles from trigonometrical table. • find the angle whose trigonometrical value is given (using trigonometrical table.) • determine the trigonometrical values for obtuse angles using trigonometrical table.
		5.4.1 Symmetrical Properties of Circles	1	• Newly introduced concept • Basic for further learning	Competencies: • discover the symmetrical properties of circles • use the symmetrical properties of circles to solve related problems
		5.4.3 Arc Lengths, Perimeters and Areas of Segments and Sectors	2	• Newly introduced concept • Basic for further learning	Competencies: • Find arc length, perimeters and areas of segments and sectors
		5.5.1 Areas of Triangles and	2	• Newly introduced concept	Competencies: • calculate areas of triangles

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
		Parallelograms		• Basic for further learning	• calculate areas of parallelograms.
2	Unit 6: Three Dimensional Geometry and vectors in Space	6.1.2 Distribution and Histogram	1	• Basic for further learning • Applicable for real life situation	Competencies: • Construct a frequency distribution table for ungrouped data • construct a histogram for a given data • interpret a given histogram
		6.1.3 Measures of Location (Mean, Median and Mode(s))	2	• Basic for further learning • Applicable for real life situation	Competencies: • determine the Mean, Median and Mode of a given data • describe the purposes and uses of Mean, Median and Mode • identify the properties of the Mean of a given data (population function)
		6.1.4 Measures of Dispersion for Ungrouped Data	2	• Basic for further learning • Applicable for real life situation	Competencies: • compute the measures of dispersion for ungrouped data (manually and using scientific calculator) • describe the purpose and use of measures of dispersion for ungrouped data
		6.2 Probability	2	• Basic for further learning • Applicable for real life situation	Competencies: • determine the probability of an event from a repeated experiment • determine the Theoretical probability of an event
3	Unit 7: Vectors in Two Dimensions	7.1 Introduction to vectors and Scalars	1	• Newly introduced concept • Basic for further learning • Basic for other subjects	Competencies: • differentiate Vectors from scalars quantities
		7.2 Representation of	1	• Newly introduced concept	Competencies: • represent vectors pictorially

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
		a vector		• Basic for further learning • Basic for other subjects	• explain what is meant by magnitude and direction of a vector.
		7.3 Addition and subtraction of vectors Multiplication of Vector by scalar	2	• Newly introduced concept • Basic for further learning • Basic for other subjects	Competencies: • determine the sum of given vectors • determine the difference of two vectors • multiply a given vector by a given scales
		7.4 Position vector of a point	1	• Newly introduced concept • Basic for further learning • Basic for other subjects	Competencies: • express any given vector as position vector

5. Methodology

To minimize the spread of Covid-19, teachers could use suggested methodologies in the teacher guide especially questioning and answering, think-do-share strategy, individual assignment, individual project work, homework etc. The sitting arrangement should also be fixed.

6. The role of teacher and student

Teachers are highly expected to use the 30 periods effectively to cover the uncovered second semester portions based on this guide line. The main points under this sub unit should be discussed and some examples should be used to elaborate the major points in the class room. Teachers should provide selected exercise and reading assignment for those omitted contents.

Students have to follow make up classes attentively, study the whole uncovered portions and work exercise questions found on the textbook and ready for the next grade.

Grade 10

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
1	Unit 5: Trigonometric Functions	5.1.2 Values of Trigonometric Functions for Related Angles	2	• Newly introduced concept • Prerequisite knowledge for other grades • Basic for other subjects	Competencies: • determine the algebraic signs of the sine, cosine and tangent functions of angles in different quadrants. • describe the relationship between trigonometrical values of complementary angles. • describe the relationship between trignonometrical values of supplementary angles. • determine the relationship between trigonometrical values of coterminal angles. • determine the trigonometrical values of large angles
		5.1.3 Graphs of the Sine, Cosine and Tangent Functions	3	• Newly introduced concept • Prerequisite knowledge for other grades • Basic for other subjects	Competencies • construct a table of values for y = sin θ, cos θ and tan θ where $-2\pi \leq \theta \leq 2\pi$. • draw the graph of y = sin θ, cos θ and tan θ • determine the domain range and period of the sine, cosine and tan function.
		5.2 The Cosecant, Secant and Cotangent Functions	2	• Newly introduced concept • Prerequisite knowledge for other grades • Basic for other subjects	Competencies • define the cosecant, secant and cotangent function • determine the values of cosecant, secant and cotangent function for some angles. • explain the concept of co-functions.
		5.3 Simple Trigonometric Identities	2	• Newly introduced concept • Prerequisite knowledge	Competencies • derive some of the trignometric identities. • Identify the quotient identities

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
				for other grades • Basic for other subjects	• Solve problems related to trigonometrical identities.
2	Unit 6: Plane Geometry	6.1 Theorems on Triangles	3	• Newly introduced concept	Competencies • apply theorems on triangles to solve related problems.
		6.3.2 Angles and Arcs Determined by Lines Intersecting Outside a Circle	2	• Newly introduced concept	Competencies • Apply the theorems on angles and arcs determined by lines intersecting outside a circle to solve related problems
3	Unit 7: Measurement	7.2 Pyramids, cones and spheres	4	• Newly introduced concept • Applicable in real life situation	Competencies • Calculate surface areas of a given pyramid, cone and sphere • calculate the volumes of a given pyramid, cone and sphere.
		7.3 Frustums of pyramids and cones	4	• Newly introduced concept • Applicable in real life situation	Competencies • define frustums of a pyramid and of a cone • calculate the surface areas of frustums of pyramids of cones • calculate the volumes of pyramids or of cones

7. Methodology

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8. The role of teacher and student

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Grade 11

For Natural Science Stream

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
1	Unit 6: Matrices and Determinants	6.1 Matrices (Definition, Types of Matrices, equality of Matrices and Multiplication of Matrices)	3	• Newly introduced concept • Basic for further learning	Competencies • define matrix • Determine the product of two matrices. • Describe the properties of the product of two matrices. • Determine the transpose of a matrix Focus on definition and properties of Matrices and Multiplication of Matrices
		6.2 Determinants and their properties	2	• Newly introduced concept • Basic for further learning	Competencies • determine the determinant of a square matrix of order2 • calculate the determinate of a square matrix of order 3. • describe the properties of determinants.
		6.3 Inverse of a square matrix (2 x 2 Matrices)	1	• Newly introduced concept • Basic for further learning	Competencies • Determine inverse of a square matrix Focus on 2 x2 square Matrices and students can proceed to others
		6.4 Systems of equations with three variables	2	• Newly introduced concept • Basic for further learning	Competencies • Solve systems of equations using Cramers rule
2	Unit 7: complex numbers	7.1 The concept of complex numbers	1	• Newly introduced concept	Competencies • define complex numbers. • properties of complex number

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
		7.2.2 Multiplication and Division of Complex Numbers	1	• Newly introduced concept	Competencies • determine the product and division of two complex numbers.
		7.4 Simplification of Complex Numbers	1	• Newly introduced concept	Competencies • Write the simplified form of expressions involving complex numbers.
		7.5 Argand Diagram and Polar Representation of Complex Numbers	1	• Newly introduced concept	Competencies • describe how to set up the Argand Plane. • Plot the point corresponding to a given complex numbers. • identify the complex number that corresponds to a given point in the Argand Plane. • represent any complex number in the polar form • determine the modulus and argument of a given complex number.
3	Unit 8: Vectors and Transformation of The Plane	8.3 Scalar (inner or dot) product of vectors	1	• Newly introduced concept • Basic for other subjects	Competencies • find the scalar product (inner product, of two vectors • describe some properties of scalar product of vectors.
		8.5 Transformations of the plane	3	• Newly introduced concept • Basic for other subjects	Competencies • explain what is meant by transformation of the plane. • describe the main properties of rigid motion. • Translate points, lines and circles using vectors. • Reflect points, lines, circle and some other plane figures. • Determine the images of a given plane figure when rotated through an angle θ

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
4	Unit 9: Further on trigonometric Functions	9.1 The functions y = sec x, y = cosec x and y = cot x	1	• Newly introduced concept	Competencies • define and describe the functions sec x, cosec x and cot x. • Sketch graphs of sec x, cosec x and cot x
		9.2 Inverse of trigonometric functions	1	• Newly introduced concept	Competencies • define the inverse trigonometric functions. • Sketch the graph of the inverse trigonometric function.
		9.3 Graphs of some trigonometric functions	2	• Newly introduced concept	Competencies • Sketch the graphs of y = a sin x, y = a sin kx, y = a sin (kx +b) and y = a sin (kx + b) + c and List the properties of these graphs. Focus on the graph of sine and students will continue the rest part of it

Grade 11

For Social Science Stream

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
1	Unit 6: Matrices and Determinants	6.1 Matrices (Definition, Types of Matrices, equality of Matrices and Multiplication of Matrices)	3	• Newly introduced concept • Basic for further learning	Competencies • define matrix • Determine the product of two matrices. • Describe the properties of the product of two matrices. • Determine the transpose of a matrix Focus on definition and properties of Matrices and Multiplication of Matrices

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
		6.2 Determinants and their properties	2	• Newly introduced concept • Basic for further learning	Competencies • determine the determinant of a square matrix of order 2. • calculate the determinate of a square matrix of order 3. • describe the properties of determinants.
		6.3 Inverse of a square matrix (2 x 2 Matrices)	1	• Newly introduced concept • Basic for further learning	Competencies • Determine inverse of a square matrix Focus on 2 x2 square Matrices and students can proceed to others
		6.4 Systems of equations with three variables	2	• Newly introduced concept • Basic for further learning	Competencies • Solve systems of equations using Cramers rule
2	Unit 7: complex numbers	7.1 The concept of complex numbers	1	• Newly introduced concept	Competencies • define complex numbers. • properties of complex number
		7.2.2 Multiplication and Division of Complex Numbers	1	• Newly introduced concept	Competencies • determine the product and division of two complex numbers.
		7.4 Simplification of Complex Numbers	1	• Newly introduced concept	Competencies • Write the simplified form of expressions involving complex numbers.
		7.5 Argand Diagram and Polar Representation of Complex Numbers	1	• Newly introduced concept	Competencies • describe how to set up the Argand Plane. • Plot the point corresponding to a given complex numbers. • identify the complex number that corresponds to a given point in the Argand

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					Plane. • represent any complex number in the polar form • determine the modulus and argument of a given complex number.
3	Unit 10: Introduction to Linear Programming	10.3 Maximum and Minimum value	2	• Newly introduced concept • Basic for further learning	Competencies • find maximum and minimum values of a given objective function under given constraints.
		10.4 Real life linear programming problems	2	• Newly introduced concept • Basic for further learning	Competencies • create inequalities from real life examples for linear programming and solve the problem
4	Unit 11: Mathematical Applications in Business	11.2 Compound Interest and Depreciation	4	• Newly introduced concept • Applicable in real life situation	Competencies • calculate payment by installment for a given simple interest arrangement. • calculate the compound interest of a certain amount invested for a given period of time. • apply the formula for compound interest to solve practical problems in business. • compute annuity for a give arrangement in compound interest. • describe what is depreciation mean and some of its causes • compute depreciation by using either of the two methods appropriately.
		11.4 Taxation	1	• Newly introduced concept • Applicable in real life situation	Competencies • give name three types of activities that government performs and examples of each • explain why governments collect taxes. • describe the basic principles of taxation

No	Unit	Sub-Unit	No of periods	Rationale (for selection of the content)	Description (knowledge, skill and attitude) and suggested methodology
					• describe the various kinds of taxes. • give their opinion about "income taxes" mean for them in relation to their future first job. • calculate different types of taxes based on the "rate of tax" in Ethiopia

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