Ministry of Education

National Mathematics Policy Guidelines

(September 3, 2013)

CONTENTS

EXECUTIVE SUMMARY

The unsatisfactory performance of students in mathematics and the low levels of numeracy exhibited by students and graduates of the Jamaican educational system has been a cause of much concern for stakeholders in education and in the private and public sectors. The impact of this current trend is significant as Science Technology Engineering and Mathematics (STEM) has become the driving force of emerging job markets. With less than 20% of a given secondary cohort leaving the formal education system with mathematics qualifications, there is a small percentage of the population able to access the opportunities which are and will become available in the coming years.

In response to what is clearly a crisis, the Government of Jamaica is seeking to improve the standard of mathematics education in an attempt to raise the levels of numeracy and attainment in mathematics of all students in Jamaica. In so doing the National Mathematics Policy has been developed.

Informed by reviews of research and by international trends in mathematics education, the Ministry of Education (MoE) has adopted a policy position which places emphasis on numeracy as a proficiency to be attained by all pupils in the educational system. Within this Policy, emphasis is placed on standards which are aimed at supporting improved teaching at the early childhood, primary and secondary levels of the education system. The Policy articulates a Vision for mathematics education in Jamaica and establishes standards to guide the teaching and learning of the subject at the early childhood, primary and secondary levels of the system. In addition, the Policy provides guidance on the minimum qualifications required to be a teacher of mathematics and outlines mandatory components of the mathematics curriculum, particularly at the early childhood and primary levels.

In an attempt to address the issue of teacher quality, the policy outlines clear standards for mathematics teacher education in Jamaica.

While the Policy outlines a framework for implementation, monitoring and evaluation, details are provided in the guidelines and standards which accompany the document and in the National Strategic Plan which will be published separately.

SECTION 1
INTRODUCTION

RATIONALE

The concepts and principles embedded within mathematics underpin several activities in which we are engaged on a day to day basis – weather prediction, banking, interpreting data, analysing trends – to name a few.   In order for a country to reap positive benefits from the outcomes of mathematics teaching, its citizenry should be able to engage in these activities with confidence and with more than a transactional understanding of these concepts and principles.

In Jamaica, however, there is the concern that an insufficient number of persons in the society are equipped with the skills and understandings required to function effectively in life after school and are unable to apply the mathematics they have learnt in a meaningful way and in unfamiliar contexts. The lack of mathematical understanding has been, too often, reflected in the unsatisfactory performance of students of Mathematics at all levels of the education system. Poor attitudes to the subject are also very evident among many students, and some view mathematics as being of little use to them outside of school. . Understandably, there are several factors which contribute to this situation, but, the fact that there are no commonly agreed aims and objectives for mathematics education in Jamaica, has only served to exacerbate the problem.

Experiences provided in the mathematics classroom should be geared towards the development of skills which enable not only meaningful use of the ideas learnt, but also the development of problem solving and critical thinking skills. This cannot be achieved, however, unless focus is placed on the **quality** of mathematics teaching. As such, attention must be paid to producing teachers of the highest quality and to ensuring that the product of mathematics education meets the standards and expectations set.

The National Mathematics Policy seeks to outline principles, and define standards for the teaching and learning of mathematics in Jamaica in order to improve the quality of
    a) teachers of mathematics and
    b) mathematics teaching at all levels of the education system.

As Jamaica strives to take its place within a fiercely competitive and highly globalized marketplace, its school graduates must be equipped with the requisite mathematical knowledge needed, and must, too, possess reasoning, problem solving and critical thinking skills if they are to support national development and if they are to access the kinds of jobs that are emerging and compete internationally. .

SITUATION ANALYSIS

Table 1 which shows data generated from the assessment of students in the Grade 3 Diagnostic Test between 2003 and 2011, demonstrates the less than satisfactory performance of students at that level.
Table 1 (below), shows statistics on performance for the period 2002 to 2012 in the Grade 3 Mathematics Diagnostic Test

Table 1   **Grade Three Diagnostic Test Mastery by Strand**

YEAR	PERCENTAGE MASTERY				
	2003	**2005**	**2006**	**2010**	**2011**
NUMBER	16.4	30.1	35.9	44.0	49.6
ESTIMATION AND MEASUREMENT	12.8	24.2	25.1	51	35.4
GEOMETRY	30.8	34	56.1	53.1	36
ALGEBRA	28.4	25.5	56.8	44.9	44.7
STATISTICS	13.9	34.2	57.5	36.6	40.7

Source: Student Assessment Unit, MOE, Kingston, Jamaica

The test which assesses mastery of concepts developed in the Grade 1 – 3 curriculum consists mainly of items designed to evaluate knowledge of, and competence in, using number related concepts. Examination of the data indicates low levels of mastery across all five strands of the curriculum, with particularly low levels in number.

In 2003, only 16.4% of the grade 3 cohort was able to attain mastery in Number - a rate which increased to 49.6% in 2011.

Table 2   **Performance on the Grade 4 Numeracy Test 2009 – 2012**

YEAR	PERCENTAGE MASTERY
2009	45
2010	41
2011	49
2012	54

Source: Student Assessment Unit, MOE, Kingston, Jamaica

As shown in Table 2, the Low levels of performance continued in Grade 4 with less than 50% of a given cohort attaining mastery on the Grade 4 Numeracy Test.

Table 3   Mastery Levels per Strand (2011) Grade 4 Numeracy Test

STRAND	PERCENTAGE MASTERY
Number Representation	**58.2**
Number Operation	**45.3**
Measurement	**69.3**
Geometry	**75.3**
Algebra	**54.5**
Statistics	**47.0**

Source: Student Assessment Unit, MOE, Kingston, Jamaica

A closer analysis of the 2011 results show that that the levels of mastery, particularly in the Number Strands, remain unsatisfactory with less than 50% of the cohort being able to master number operation and statistics.

The Grade Six Achievement Test (GSAT) was introduced to the Jamaican education system in 1999. Table 4 shows the national average for the period 2002 – 2012, data which indicates that over the years there has been sustained improvement in the performance of students on the test. Despite the increase, current levels of attain continue to be relatively low, with a national average for 2012 of 63%. It is important to note that a contributing factor to the 6% increase seen between 2010 and 2011 was no doubt as a result of the implementation of the Competence Based Transition Policy which saw more than 6,000 students not being allowed to sit the 2010 GSAT examinations because they had failed to attain mastery in the Grade 4 Literacy Test.

Table 4   GSAT National Average 2002 – 2012

YEAR	NATIONAL AVERAGE GSAT
2002	**51**
2003	**48**
2004	**44**
2005	**58**
2006	**53**
2007	**46**
2008	**55**
2009	**53**
2010	**57**
2011	**62**
2012	**63**

Source: Student Assessment Unit, MOE, Kingston, Jamaica

The Caribbean Examinations Council's CSEC Mathematics Examination is the main means of assessing mathematical knowledge normally at the end of five years of secondary education in Jamaica.

An analysis of the data for the period 2001 – 2011 shows that while 23 – 45% of a given sitting cohort was able to attain Grades 1 – 3 Proficiency in the examination during the period, this represents only between 10 and 21% of the given age cohort.

Table 5   Performance on CSEC Mathematics Examination 2001 - 2011

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Eligible Cohort	36,560	36,830	39,491	35,720	36,969	39,038	40,037	39,155	42,108	44,842	43,497	
%age attaining Grades 1-3 as %age of Cohort	13	16	15	10	17	17	16	21	19	21	19	17
Sitting	16,376	16,176	16,795	15,362	15,635	18,153	18,606	18,758	19,990	20,742	20,850	
Awards	4,741	5,849	6,086	3,609	6,195	6,581	6,599	8,103	8,185	9,271	8,318	
%age attaining Grades 1-3 %age of Total Sitting	29%	36%	36%	23%	40%	36%	35%	43%	41%	45%	40%	37%

Source: Caribbean Examinations Council

Even while the statistics on these specific examinations, taken as a whole, is an indicator of a serious problem with respect to the teaching and learning of mathematics in Jamaica, the annual reports of the Caribbean Examinations Council consistently point out that generally, candidates neither demonstrate basic mathematical skills nor good reasoning and problem solving skills, and refer to a lack of conceptual understanding amongst the candidates particularly as it relates to basic or foundation concepts. (June 2012 CSEC Mathematics Examiners Report)

The implications to the nation of consistently poor performance in mathematics are far-reaching and significant. Not only is it important that Jamaica produces good mathematicians in order that they may fit key roles in society, but it is also vital that persons who emerge from the school system – at whatever level – are equipped with basic numeracy skills in order that they may be empowered to participate equitably, effectively and efficiently in the wider society. Indeed, literacy and numeracy skills are requisites for successful participation in society in the 21st century and the structures of education must be seen to contribute to the development of such skills.

The National Mathematics Policy is focused on establishing principles and standards to guide the teaching and learning of mathematics in Jamaica, in the hope that this will impact on the levels of performance and the numeracy skills of students at the early childhood, primary and secondary levels of the system. The Policy also outlines requirements for the training of mathematics teachers.

THE POLICY

2.1   VISION

To promote the development of a numerate society.

2.2   POLICY GOALS

The National Mathematics Policy acknowledges the importance of developing Numeracy, that is, the use of mathematics both as a natural tool throughout the curriculum, and one to be used in everyday life. As a result the policy seeks to establish standards to guide
- improve quality and competence of mathematics educators
- improved teaching and learning of mathematics
- development of standards and guidelines to support teaching and learning of mathematics

2.3   POLICY GUIDELINES

For the purposes of this Policy, 'Numeracy" and "Mathematical Literacy" will be used interchangeably. The definition to be adopted will be one that is now internationally accepted, and which has been articulated by the Programme for International Student Assessment (PISA)[i]. " Mathematical literacy is the capacity to identify and understand the role that mathematics plays in the world, make well-founded judgments, and use and engage with mathematics in ways that meet the needs of one's life as a constructive, concerned and reflective citizen."

For this capacity to be developed, then mathematics teaching should develop:

- The ability to apply numbers to a range of mathematical skills and processes in order to solve problems in everyday life.

- the ability to use mathematics in such a way as to demonstrate an understanding of number, measurement, spatial sense, statistical ideas and patterns, and not simply to perform learned operations, the ability and propensity to combine mathematical knowledge with various skills such as estimating, computing, reasoning, analysing evaluating and predicting to solve problems and interpret their world.

- Confidence in using mathematical ideas, principles and procedures

- critical thinking skills to recognize those situations to which their knowledge is applicable and, when necessary, use intuition to aid in the solution of unfamiliar quantitative problems which arise in day-to-day life.

Further, a numerate person will be comfortable communicating, using the language of mathematics and will be versatile in the use of mental strategies as well as paper and pencil methods to arrive at solutions. Numeracy is the foundation for all mathematical attainment hence it can be achieved at various levels. The Numeracy Taxonomy developed by the Ministry of Education and published in the National Comprehensive Numeracy Programme's main

document outlines the skills and competences that students should develop at each stage of their journey throughout the school system.

2.3.1   The Teaching Approach

In recognition of the important role that mathematics plays, the MOE has determined that mathematics lessons should be focused on facilitating the development of

- conceptual understanding
- computational fluency and
- problem solving skills

Mathematics teaching **at all levels of the educational system** will:
1) provide opportunities for learners to develop an awareness of how the mathematical concepts and relationships they encounter are relevant and useful (i) in various aspects of out-of-school life and (ii) in other learning areas;
2) enable learners to experience mathematics in a variety of contexts;
3) enable learners to see mathematics as an interesting and stimulating subject that can be enjoyed;
4) facilitate the development of positive attitudes towards mathematical engagement and activity;
5) stimulate the learner's curiosity by providing opportunities to explore number patterns and their relationships;
6) facilitate the development of analytical, reasoning and critical thinking skills;
7) provide the environment in which the learner may be able to develop a sense of confidence in working within a mathematical environment;
8) use available and emerging technologies to
   i) enhance the learner's understanding of mathematical concepts;
   ii) assist in the development of specific mathematical thinking skills, such as spatial skills;
   iii) assist learners to use the technology to explore mathematical ideas;
9) develop a flexible approach to the learning of mathematics so that learners will be encouraged to develop their own strategies for calculating and for problem-solving which they are able to explain to others;
10) encourage mental processes, including the use of mental imagery, as a tool for exploring mathematical situations;
11) help learners to develop a spirit of inquiry;
12) provide ample opportunity for the development of mathematical processes such as conjecturing, generalizing, justifying and proving through the exploration of open ended problems and investigations;
13) help learners to acquire the range of knowledge, skills and concepts they will need for further study in Mathematics;
14) assist learners to develop an understanding of the language of mathematics and to use this language comfortably and confidently both in and outside of the classroom;

15) promote meaningful mathematical discourse among learners by
     i) engaging them in group activities
     ii) encouraging discussion in the mathematics classroom;
16) help learners to see the inter-connectedness of the Mathematics they learn;
17) foster in learners an awareness of the importance of accuracy, as well as an understanding of the need to make estimates and approximations.

These goals will be operationalized in the classroom through the use of appropriate teaching methodologies which are underpinned by the notion of constructivism and which focus on understanding and the development of skills and processes rather than number crunching and the memorization of facts and formulae.

All mathematics teaching should therefore be focused on **understanding, application and communication of mathematical ideas.** Classroom activities will focus on the development of mathematical processes, and learners will be enabled to represent mathematical ideas in ways that make sense to them. For example, in teaching number, students will be involved in activities that reflect everyday use of numbers so that they become not only aware of *how* numbers are used but also *why* they are used. This will aid their *understanding* of number. Further, they would be encouraged to demonstrate this understanding by *applying* this knowledge in a variety of situations and to *communicate* their understanding in different ways, both orally to their peers and to the teacher as well as in written form.

Teachers therefore will:
- adopt an investigative approach to teaching in order that the students' own
- skills of inquiry may be nurtured and developed;
- include mental and oral work regularly in the mathematics classroom;
- adopt a good balance of whole group interactive teaching, individual work
- and cooperative learning ;
- use questioning extensively and effectively, giving learners enough time to think before answering;
- ensure that, wherever possible, learners have access to a variety of resources, including Information and Communication Technology and to
- use such technology so that learning outcomes are enhanced;
- focus lessons on sense-making rather than the regurgitation of facts, formulae or algorithms;
- encourage the use of correct mathematical vocabulary and notation;
- encourage and support meta-cognitive activity, i.e. the students' reflection on their own thinking;
- use strategies which will ensure equal access to mathematics for both male and female learners;
- use diagnostic measures to determine the special needs of learners and plan strategies to cater for such needs.
- use assessment strategies which match classroom activity and which allow for students to demonstrate what they know and understand;

2.3.2 Planning for Instruction

Every mathematics lesson must be guided by an individual lesson plan and must provide opportunities for students to:

- Be engaged
- Explain
- Explore
- Elaborate
- Evaluate

2.3.3 Assessment

Assessment in mathematics must not be restricted to traditional summative styles such as end-of-term/end-of-year tests. Rather, assessment must be an integral part of teaching and must be used to support the learning process. This means that any assessment strategy used by the teacher must provide useful information to **teachers, students and parents**

The position of the Ministry of Education therefore is that **assessment in mathematics will focus on the learners' understandings as well as their procedural skills. It must be used both to diagnose the nature and causes of barriers to learning and to monitor the progress of learning and teaching** so as to improve learning**.**

Assessment must be a continuous, planned process of gathering information and must, in addition to informing the teaching/learning process, enable the teacher to track the progress of pupils measured against Attainment Targets.

In addition to the opportunities for continuous assessment which should be used by the school throughout the delivery of the formal curriculum, the Ministry of Education will spearhead national assessments in mathematics at vital stages of students' educational cycle.

- Grade 1
- Grade 2
- Grade 4
- Grade 6
- Grade 9
- Grade 11

Early Childhood to Grade 6:

At the start of grade 1, teachers need information on the students' number concept s and readiness in order to plan for instructions. The Grade 1 Inventory developed by the MoE for this purpose should be administered, the data gathered analysed and used to inform decision making

as it relates to numeracy development for each cohort of students. This approach should also be taken with the Grade 2 Diagnostic Test which should be administered at the end of Grade 2.

Grade 4 – At this stage students have covered four years of mathematics instructions in the primary school system. Though teachers are conducting their own assessment it is necessary to obtain information on students' performance on a national level so as to plan for instructions. The instrument administered at this stage will be the first nationally administered test designed to evaluate student's numeracy development.

Grade 6 – At the end of Grade 6 students prepare to transition from primary to secondary education. This becomes another crucial stage to assess the progress. It is recommended that schools receiving students in Grade 7 administer a diagnostic test to evaluate the mastery of concepts which are critical to the students ability to successfully access the Grade 7 curriculum. Items should be designed to support the identification of common errors and misconceptions.

Secondary

Grade 9 – It is important at this stage to find out what students know as they prepare make crucial decisions about selection of subjects that tends closer to career choices.
Grade 11 - A national assessment is required as students should be certified nationally when they terminate the secondary level.

It is critical that assessment be used to not just evaluate student performance, but to guide and inform instruction. As a result, school leadership should ensure that data generated from the administration of assessment tools is carefully scrutinised, common errors and misconceptions identified and the information used to plan relevant remedial programmes.

Assessment must
- reflect the mathematics that pupils should know and be able to do;
- engage students in tasks that involve problem solving, reasoning and communication (both written and oral);
- provide opportunities for pupils to demonstrate their application of mathematics to real world situations;
- facilitate creative thought through the use of problems which hold the possibility for alternative solutions.

In order to accomplish this, teachers must use a range of sources to provide information, utilizing both formal and informal methods. Paper-and-pencil tests are only one source of such information, and by themselves are limiting and inadequate in describing fully a student's knowledge and understanding of mathematics. Others sources which may be utilized include:
- Observation
- Listening to pupils
- Use of games
- Questioning
- Portfolios

- Journals
- Projects

The instrument developed for administration at the end of Grade 11, should be an achievement instrument designed to evaluate what students should know and be able to do based on the national curriculum and will, in addition to measuring mathematical competency, will also measure the extent to which students have attained an appropriate level of mathematical literacy.

All students in Grade 11 must sit the Grade 11 assessment whether or not they are registered to sit the CSEC mathematics examination.

Grades 12 – 13, Community Colleges, Colleges and Universities and other professional organisations will develop their own mathematics programme with support from the Ministry of Education.

2.3.4   Reporting

Schools will develop reporting procedures in order to provide feedback to parents, students and the Ministry of Education, in order to track the level of numeracy throughout the school life of students. Student learning outcome targets for each year will be established and used as criteria for assessment.

2.3.5   Teaching Time

In order to ensure that students are given the opportunity to develop the knowledge, skills and competences which are facilitated through the curriculum, adequate contact hours for mathematics instruction must be provided for in the school timetable.

2.3.5.1   Early Childhood and Primary

In the context of the Primary Curriculum, teachers are expected to take advantage of the opportunity to integrate mathematics-related ideas in the integrated lesson. However, time must be provided each day for focus on the development of numeracy skills.

At the Early Childhood (ages 3 – 5), a MINIMUM of 25 – 30 minutes per day is to be focused on the development of numeracy skills during the guided learning sessions.

For students in Grades 1 – 3 (Lower primary) and Grades 4 - 6, the time for discrete instruction in mathematics is to be no less than 1 hour per day.

2.3.5.2   Secondary

All secondary schools should provide a minimum of 240 minutes dedicated to the teaching and learning of mathematics and numeracy per 5-day week for students in Grades 7 - 11. This must include at least 4 separate sessions of teacher contact per week. In addition, adequate time will be

provided to complete the mathematics syllabuses for local, regional and international examinations.

2.3.6   The Design of Mathematics Teacher Education Programmes

While the courses are designed specifically to explore mathematical concepts, the courses should not be delivered as lectures but should be delivered using a methodology which requires the lecturer to employ methodologies which

    a) allow for the development of concepts (prospective teachers must master the content at least 2 grade levels above which they are being prepared to teach)

    b) appreciate the concepts behind traditional and emerging algorithms and those which students may invent

    c) provide an opportunity to identify and make connections within and across strands

    d) explore the application of the related mathematical ideas to real life contexts and other disciplines

    e) provide an opportunity for participants to share their ideas for problem solving and elicit their reasoning

    f) explore common misconceptions, errors and overgeneralisations

    g) support prospective teachers in developing the habits of mind of a mathematical thinker - the ability to identify patterns, reason, prove. Students should be engaged so that they learn to look at problems from multiple angles

Teacher educators must therefore ensure that they model best practices by engaging their student teachers in the exploration of the related concepts and by consistently linking the concepts to real world contexts. It is also critical that courses are developed to provide prospective teachers with opportunities to integrate the use of ICT technologies in the design and delivery of mathematics lessons.

2.3.6.1   Managing Student Progress in Teacher Education Programmes

Each teacher education institution should have adequate systems in place to manage student data. Regulations should be developed (in accordance with international standards) to manage students who are consistently failing to perform in core courses. It is critical however that for students to be assessed as having passed a course, students should be required to attain a pass in BOTH course work and the final examination.

2.4   STANDARDS

2.4.1   Qualification to Teach Mathematics in Jamaica

MINIMUM QUALIFICATIONS	TEACHING LEVEL	MINIMUM CREDIT REQUIREMENT MATHEMATICS EDUCATION
First Degree in Early Childhood Education	Early Childhood – Grade 3	18
First Degree in Primary Education	Grades 4 – 6	21
First Degree with the requisite number of credit in Mathematics content and Teacher Training (See Standard 2)	Grades 7 – 11	45
First Degree with the requisite number of credit in Mathematics content and Teacher Training (See Standard 2)	Grades 12 and 13 and Post Secondary	60
Masters in Mathematics Education (should have adequate mathematics content from first degree)	Tertiary (Teacher Education)	

Persons who pursue a programme with Mathematics education as a minor (or a minimum of 21 credit hours in mathematics/mathematics education should only be allowed to teach to Grade 9

Teachers who do not possess the new minimum requirement of a First Degree but have a Diploma in Secondary Education (Single Option Mathematics) should only be allowed to teach up to Grade 9 while those who pursued with a Double Option Mathematics Diploma may be allowed to teach to Grade 11

Lecturers of Mathematics Education in Teachers' Colleges should possess at least a Master's Degree in Education with emphasis on Mathematics Education.

2.4.2   Components of the Mathematics Curriculum

The development of mathematical literacy is facilitated through the exploration of mathematical ideas. The early childhood classroom should support the development of these skills while the upper primary curriculum should provide students with the opportunity to explore the development of more discrete mathematical ideas. The curriculum should therefore be developed to include the following five major content areas: -

- Number and Composition
- Algebra
- Measurement
- Data Handling (Statistics) and
- Shape and Space (Geometry)

The national curriculum developed by the Ministry of Education should be used to guide and inform mathematics teaching at the early childhood, primary and secondary levels of the education system.

2.4.3   The Teaching Approach

Mathematics teaching at all levels of the education system should be designed to support students in developing conceptual understanding, critical thinking and problem solving skills. The curriculum and the teaching approach together should be designed to help students develop:

- the ability to make sensible choices about which method to use
- the ability to recognize major problem types and how to deal with them efficiently
- Confidence in their ability to carry out the procedure properly;

The teaching approach should also;
- provide students with the opportunity to develop general problem-solving skills so that they can get the problem into a state where their algorithmic and procedural knowledge is of some use.
- be driven by mathematics discourse as a result of investigatory activities in which students are engaged
- focus on the development of concepts and be conducive to the development of computational fluency and problem solving skills

2.4.4   Teacher Education

In order for the Jamaican education system to produce students with the characteristics outlined in section…, it is critical that its classrooms be furnished with teachers of mathematics at both the primary and secondary levels who demonstrate
a) A positive attitude towards the subject from a personal and professional perspective
b) A sound understanding of the mathematical content needed to teach at the level to which they are assigned
c) the Knowledge and expertise required to use the most effective methods to teach the content

It is therefore imperative that persons certified to teach mathematics in the Jamaican education system be graduates of teacher education programmes with a focus on mathematics education, and meeting requirements stated in this Policy.

Teacher training programmes are expected to adequately prepare teachers to teach mathematics in ways articulated in this Policy.

2.4.4.1   Matriculation

LEVEL	MINIMUM REQUIREMENT	SPECIAL NOTES
Early Childhood to Grade 3	Grade 3 Proficiency Level in CSEC Mathematics at	
Grades 4 – 6	Grade 1 or 2 Proficiency Level CSEC Mathematics at	
Grades 7 – 11	Grades 1 or 2 Proficiency Level in CSEC Mathematics at AND CSEC Additional Mathematics	Persons who meet the first requirement but do not have additional mathematics should be required to sit a qualifying course BEFORE accessing the mathematics courses in the teacher education programme. The qualifying course should be developed by the institution and the content should be equivalent to that contained in the Additional Mathematics syllabus. Students should pass this course on the first sitting or the supplemental examination.
Grades 7 – 13	CAPE 1	

2.4.4.2   Diagnostic Testing

All candidates entering teacher education programmes to be trained to teach mathematics regardless of the levels of whether they are being to prepared to teach at the primary or secondary level of the education system; will be required to sit a standardised diagnostic mathematics test on entry. This test will be developed by a team comprised of lecturers from each training institution, and two representatives from the Ministry of Education. The design of the instrument should include open ended questions which are diagnostic in design so that they are able to identify gaps and misconceptions in the understanding and/or knowledge of the potential student.

Each institution is required to ensure that gaps identified are addressed before students are allowed to graduate.

2.4.4.3   Design of Teacher Education Programme

The programme of study should provide all candidates with the opportunity to explore concepts which they will be required to teach from the relevant curriculum using a suite of methodologies. The teacher-in-training must experience mathematics in ways which will enable them to provide

the appropriate environment for their own students once they enter the system. As such, teacher training programmes in mathematics education should also allow the teacher-in-training to:

- be engaged
- explore
- explain
- elaborate and
- evaluate

Courses included in the programme should adequately address concepts which prospective teachers will be required to teach. While teaching of content is critical, the mathematical education programme should see a seamless synergy between content and methodology. Teacher educators should model the methodologies being espoused. The teacher education programme should therefore support the prospective teacher in developing the knowledge, skills and competences relating to effective strategies for developing the related concepts

PROGRAMME	COURSES
Early Childhood Early Years (3 – 5 years)	Number
	Geometry and Measurement
	Pedagogy
Early Childhood Early – Grades (1 – 3)	Number
	Geometry and Measurement
	Algebraic Thinking and Using Data
	Pedagogy
Primary Mathematics 4 – 6	Number
	Geometry
	Measurement
	Algebra and Data
	Pedagogy
Secondary 7 – 11	Number Theory
	Algebra 1 and 2
	Geometry
	Trigonometry
	Measurement
	Functions
	Calculus 1
	Data Analysis, Statistics and Probability
Secondary 7 – 13	All of the above in addition to
	Calculus 2
	Introductory Analysis
	Linear Algebra
	Discrete Mathematics and Computer Science

2.4.4.4   Practicum Experiences

All teachers-in-training must be provided with frequent opportunities to observe mathematics teaching and learning taking place as well as the opportunity to develop the skills and competences needed to deliver a mathematics lesson. Where students are assigned to schools, the length of their period of assignment should increase over the period of the programme and the tasks assigned to them over the period (whether that for observation or the extent to which they will be required to teach – introduction of lesson or the development and delivery of the entire lesson) should increase in the level of difficulty.

In managing the practicum experience, teacher training institutions must ensure that opportunities are provided for the student teacher to make connections between theory and practice particularly as it relates to the teaching and learning of mathematics. Carefully selected mentors should be identified within the context to which the student has been identified.

ALL primary and early childhood student teachers, must be observed teaching mathematics by a mathematics specialist during the penultimate practicum experience. The grade obtained from this exercise must be used in calculating the final grade for the practicum experience.

Teachers-in-training must be seen at least three times during their Practicum assignment by mathematics education specialist.

MINIMUM TIME REQUIREMENT RELATING TO MATHEMATICS		DESCRIPTION OF PRACTICUM EXPERIENCE
PRIMARY	SECONDARY	
3 Hours	10	Observing the teaching and learning of mathematics – maintenance of journal complemented by reflection and discussion in college
5 Hours	25	Assisting in planning and instruction
60 Hours	180	Planning and teaching supervised by college

3.0   KEY STAKEHOLDERS AND THEIR ROLES

For the successful implementation of the policy to meet the stated goals and objectives, each stakeholder will need to play its part.

3.1 The Government of Jamaica

The Government of Jamaica will provide the human and material resources, facilitating the process by securing for the system:
- teachers, who satisfy the minimum qualification requirements in all schools;
- teachers trained in mathematics/numeracy at appropriate levels in all schools;
- adequate classroom space to avoid overcrowding and noise levels which inhibit mathematics learning;

3.2 The Ministry of Education

The Ministry of Education will
- disseminate the policy document to all stakeholders
- sensitise stakeholders to implications of the policy: timelines, outcomes
- Ensure that human resource exists at the national level and in each region to provide guidance and monitor implementation of the policy in schools
- ensure that adequate resources (particularly manipulatives) are provided to support the effective implementation of the curriculum
- Provide student performance data generated from the administration of national tests, in a timely manner to allow adequate time for analysis and remediation where needed
- Develop resource materials such as activity booklets and modules to support the design and delivery of mathematics lessons
- Develop and review accordingly Mathematics Standards to guide curriculum development and instruction for Grades 1 – 11
- Provide expertise for the monitoring and implementation of the policy
- Ensure that data generated from the administration of summative and formative assessments is analysed and used to guide decision making

3.3 The Jamaica Teaching Council

The Jamaica Teaching Council will
- Maintain the application of its professional standards to the licensing of teachers
- Ensure that adequate opportunities for professional development are provided for mathematics teachers at all levels of the education system

3.4 Teacher Training Institutions

Teacher training institutions will
- Adhere to stated matriculation requirements
- design and deliver mathematics education programmes which support student teachers in developing the mathematical knowledge for teaching

- produce mathematics teachers who are competent and who are aware of numeracy initiatives at primary and secondary levels
- produce specialist teachers capable of addressing the problem of low, or taking intervention to improve, numeracy levels
- produce teachers who are sensitive to the view of mathematics as being much more than rules, algorithms and formulae.

3.5 School Leadership

Schools and school boards will study the policy and implement it, and
- implement the relevant elements within their institutional contexts;
- promote mathematics and numeracy development of pupils;

3.6 Parents and the Community

Parents and Community will gain an understanding of the policy with a view to supporting it and take active roles in the mathematics and numeracy development of their children.

3.7 Learners

Students at all levels of the system will
- abide by conditions agreed with school administrators for developing their competence in mathematics and numeracy
- develop and utilize with teacher support strategies for monitoring their progress in all areas of mathematics learning and numeracy development
- engage with teachers in feedback to clarify difficulties and set reasonable conditions for their on-going development
- endeavour to achieve levels, standards and outcomes set by their teachers, schools and by the MOE;
- engage in discussions at the secondary level, on the mathematics education policy, and its implications for their own personal development in mathematics and numeracy.

4.0 Linkages to other Policies or Programmes

The National Mathematics and Numeracy Policy is linked to and supported by
- The National Curriculum Policy
- The ICT in Education Policy
- The National Assessment Programme and
- The National Comprehensive Numeracy Programme

5.0   IMPLEMENTATION, MONITORING AND EVALUATION

Implementation, monitoring and evaluation of the National Mathematics and Numeracy Policy should be guided by a rolling strategic plan developed to outline strategies which will be used by the Ministry of Education. Oversight for the implementation of the plan should be managed by a National Mathematics Working Group and supported by the following sub-committees
a) Regional Mathematics Committee
b) Mathematics Professional Development Committee
c) Mathematics Initial Teacher Education Committee
d) Public Education and Marketing Committee
e) Gender issues in Mathematics Education

6.0   POLICY REVIEW

The Policy will be subject to review and revision at the end of every five years, or at any earlier time as deemed necessary by the Ministry of Education. The review is to be initiated by the Chief Education Officer and supported by the relevant units.

Mathematics and Numeracy Policy Committee

The National Mathematics Policy was first drafted in 2003 by Dr Camille Bell-Hutchinson then a lecturer in the Department of Educational Studies, UWI, Mona.   This followed an extended period of consultation and input from the public and private sector. The original project team comprised:
Ms Patricia Johnson, Miss Patt Flett, Mr Aldin Bellinfantie, Mrs Rosalyn Kelly, Mrs Lorna Thompson, Mr Derrick Hall and Mrs Janice Steele.
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This revised policy document is the result of a review of current practice and international standards. The Review process was led by Dr. Tamika Benjamin, National Mathematics Coordinator, at the Ministry of Education and benefited from contributions from:

Mrs Rosalyn Kelly	Retired Senior Education Officer, Core Curriculum Unit
Mr Derrick Hall	Senior Education Officer, Core Curriculum Unit
Mrs Novlet Plunkett	Head Department of Mathematics Mico University College
Dr Donna Powell – Wilson	Head Mathematics Department, Shortwood Teachers' College
Dr Camella Buddoo	Lecturer, Mathematics Education, School of Education
Dr Byron Buckley	
Ms Nicolette Deer	

Dr Camille Bell-Hutchinson, Mathematics Educator, and currently the Campus Registrar at The University of the West Indies, Mona Campus, acted as Consultant to the team and was responsible for the production of the final draft of the Policy.

The team also received support from Mrs. Maxine Henry-Wilson (JTEC), Mr. Maurice Smith (Technical Assistant to the Chief Education Officer) and members of the Policy Analysis Research and Statistics Unit in the Planning and Development Division of the Ministry of Education.