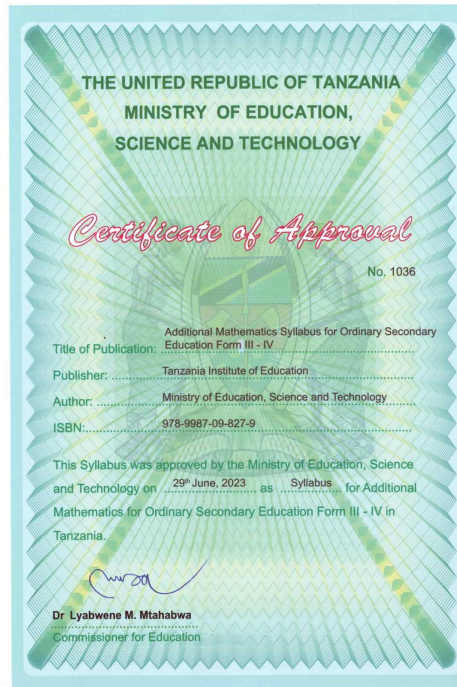


**THE UNITED REPUBLIC OF TANZANIA  
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY**



**ADDITIONAL MATHEMATICS SYLLABUS FOR ORDINARY  
SECONDARY EDUCATION  
FORM III-IV  
2023**

© Tanzania Institute of Education, 2023

Published 2023

ISBN: 978-9987-09-827-9

Tanzania Institute of Education

P.O. Box 35094

Dar es Salaam

Tel. +255 735 041 168 / 735 041 170

E-mail: [director.general@tie.go.tz](mailto:director.general@tie.go.tz)

Website: [www.tie.go.tz](http://www.tie.go.tz)

This document should be cited as: Ministry of Education, Science and Technology (2023). *Additional Mathematics Syllabus for Ordinary Secondary Education Form III-IV*. Tanzania Institute of Education.

All rights reserved. No part of this syllabus may be reproduced, stored in any retrieval system or transmitted in any form or by any means whether electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Tanzania Institute of Education.

## Table of Contents

List of Tables.....	iv
Abbreviations and Acronyms.....	v
Acknowledgements.....	vi
1.0 Introduction.....	1
2.0 Main Objectives of Education in Tanzania.....	1
3.0 Objectives of Ordinary Secondary Education – General Education.....	2
4.0 General Competences for Ordinary Secondary Education-General Education.....	2
5.0 Main and Specific Competences.....	3
6.0 Roles of Teachers, Students and Parents in teaching and learning process.....	3
6.1 The teacher.....	4
6.2 The student.....	5
6.3 The Parent.....	5
7.0 Teaching and Learning Methods.....	5
8.0 Teaching and Learning Resources.....	5
9.0 Assessment.....	6
10.0 Number of Periods.....	6
11.0 Contents of the Syllabus.....	6
Form III.....	7
Form IV.....	13
Bibliography.....	21

## List of Tables

Table 1: Main and Specific Competences for Additional Mathematics Syllabus .....	3
Table 2: Contribution of Continuous Assessment and National Examination in the final score .....	6
Table 3: Detailed Contents for Form III .....	7
Table 4: Detailed Contents for Form IV .....	13

## **Abbreviations and Acronyms**

AI	Artificial Intelligence
ICT	Information and Communication Technology
MoEST	Ministry of Education, Science and Technology
NECTA	National Examinations Council of Tanzania
TIE	Tanzania Institute of Education
TSL	Tanzania Sign Language

## Acknowledgements

The writing of the Mathematics Syllabus for Additional Mathematics for Ordinary Secondary Education Form III–IV involved various experts from Government and non-government institutions. Therefore, the Tanzania Institute of Education (TIE) would like to thank all the experts who participated in writing of this syllabus, namely lecturers, tutors, school quality assurance officers, teachers, and curriculum developers from TIE. The Institute is also grateful to the National Technical Committee that was formed by the Minister for Education, Science and Technology for coordinating the curriculum review process for pre-primary, primary, secondary and teacher education. The Committee discharged its responsibilities professionally by ensuring that the contents of this syllabus are in line with the main objective of the 2023 curricular review, which is to ensure that the graduates acquire skills, knowledge and attitudes that will enable them to create self-employment, employ others, be employed and able to sustain themselves.

Finally, TIE thanks the Ministry of Education, Science and Technology in a special way for facilitating the preparation and distribution of this syllabus.



Dr Aneth A. Komba

Director General

**Tanzania Institute of Education**

## 1.0 Introduction

Additional Mathematics for Ordinary Secondary Education is an elective subject for Form III-IV students in the General Education pathway. The purpose of learning Additional Mathematics is to allow students to enhance their mathematical foundation and deepen their abilities to think rationally, critically, and analytically in order to participate actively in the socio-economic activities. It also builds students' strong understanding of some advanced mathematical concepts, principles, skills and its applications in solving real-world problems. In this case, students who will study and pass Additional Mathematics will not be required to take Basic Applied Mathematics at Advanced secondary school, since the contents of these two subjects are similar.

This syllabus is designed to guide the teaching and learning of Additional Mathematics at Ordinary Secondary Education, Form III-IV, in the United Republic of Tanzania. The syllabus interprets the competences indicated in the 2023 Ordinary Secondary Education Curriculum. It provides information that will enable teachers to plan their teaching process effectively. It also provides teaching and learning opportunities that guide teachers to apply different methods and strategies to promote students' mathematical literacy and develop 21<sup>st</sup> century skills which include creativity, communication, collaboration, critical thinking and problem solving.

## 2.0 Main Objectives of Education in Tanzania

The main objectives of education in Tanzania are to enable every Tanzanian to:

- (a) Develop and improve his or her personality so that he or she values himself or herself and develops self-confidence;
- (b) Respect the culture, traditions and customs of Tanzania; cultural differences; dignity; human rights; attitudes and inclusive actions;
- (c) Advance knowledge and apply science and technology, creativity, critical thinking, innovation, cooperation, communication and positive attitudes for his or her own development and the sustainable development of the nation and the world at large;
- (d) Understand and protect national values, including dignity, patriotism, integrity, unity, transparency, honesty, accountability and the national language;
- (e) Develop life and work-related skills to increase efficiency in everyday life;
- (f) Develop a habit of loving and valuing work to increase productivity and efficiency in production and service provision;

- (g) Identify and consider cross-cutting issues, including the health and well-being of the society, gender equality, as well as the management and sustainable conservation of the environment; and
- (h) Develop national and international cooperation, peace and justice per the Constitution of the United Republic of Tanzania and international conventions;

### **3.0 Objectives of Ordinary Secondary Education – General Education**

The objectives of Ordinary Secondary Education, General Education are to:

- (a) Strengthen, broaden and develop a deeper understanding of the knowledge, skills and attitudes developed at the Primary Education level;
- (b) Safeguard customs and traditions, national unity, national values, democracy, respect for human and civil rights, duties and responsibilities associated with such rights;
- (c) Develop self-confidence and the ability to learn in various fields, including science and technology as well as theoretical and practical knowledge;
- (d) Improve communication using Tanzanian Sign Language (TSL), tactile communication, Kiswahili and English. The student should be encouraged to develop competence in least one other foreign language, depending on the school situation;
- (e) Strengthen accountability for cross-cutting social issues, including health, security, gender equality and sustainable environmental conservation;
- (f) Develop competence and various skills which will enable the student to employ himself or herself, to be employed and to manage his or her life by exploiting his or her environment well; and
- (g) Develop readiness to continue to advanced secondary and tertiary education.

### **4.0 General Competences for Ordinary Secondary Education– General Education**

The general competences that will be developed by a student are to:

- (a) Use the knowledge and skills acquired in the Primary Education stage to strengthen and expand academic understanding;
- (b) Value citizenship and national customs;



- (c) Demonstrate confidence in learning various professions including Science and Technology, theoretical and practical knowledge;
- (d) Use language skills including Tanzanian Sign Language (TSL), tactile communications, Kiswahili language, English and at least one other foreign language to communicate;
- (e) Use knowledge of cross-cutting issues to manage the environment around them; and
- (f) Use knowledge and skills to enable them to be self-employed or employable and manage their life and environment.

### 5.0 Main and Specific Competences

The main and specific competences to be developed are presented in Table 1.

**Table 1:** *Main and Specific Competences for Additional Mathematics Syllabus*

Main competences	Specific competences
1.0 Use advanced mathematical knowledge and skills in daily life	1.1 Use some advanced skills in coordinate geometry, trigonometry and vectors in daily life 1.2 Apply statistical skills in the fields of business and economics 1.3 Demonstrate mastery of logic in decision making 1.4 Apply the basic skills of probability in daily life
2.0 Demonstrate mastery of some advanced concepts in algebra and calculus in problem solving	2.1 Use algebra and calculus to solve problems in different contexts 2.2 Apply set theory skills in decision making

### 6.0 Roles of Teachers, Students and Parents in teaching and learning process

The syllabus for Additional Mathematics recognises that a good relationship between teachers, students, and parents/guardians is fundamental to ensure successful learning. This section outlines the roles of each participant in facilitating teaching and learning of Additional Mathematics.

## 6.1 The teacher

The teacher is expected to:

- (a) Help the student to learn and acquire the intended competencies in Additional Mathematics;
- (b) Use teaching and learning approaches that will allow students with different needs and abilities to:
  - (i) develop the competencies needed in the 21<sup>st</sup> century.
  - (ii) actively participate in the teaching and learning process.
- (c) Use student centred instructional strategies that make the student a centre of learning which allow them to think, reflect and search for information from various sources.
- (d) Create a friendly teaching and learning environment;
- (e) Prepare and improvise teaching and learning resources;
- (f) Conduct formative assessment regularly by using tools and methods which assess theory and practice.
- (g) Treat all the students equally irrespective of their differences;
- (h) Protect the student while at school;
  - (i) Keep track of the student's daily progress;
  - (j) Identify individual student's needs and provide the right intervention;
- (k) Involve parents/guardians and the society at large in the student's learning process;
- (l) Integrate cross-cutting issues and ICT in the teaching and learning process;

## 6.2 The student

The student is expected to:

- (a) Develop the intended competences by participating actively in various learning activities inside and outside the classroom;
- (b) Participate in the search for knowledge from various sources including textbooks, reference books and other publications in online libraries.

### **6.3 The Parent**

The parent/guardian is expected to:

- (a) Monitor the child academic progress in school;
- (b) Where possible, provide the child with the needed academic support;
- (c) Provide the child with a safe and friendly home environment which is conducive for their learning;
- (d) Keep track of the child's progress in behaviour;
- (e) Give the child all necessary materials required in the learning process; and
- (f) Instil in the child a sense of education commitment and positive value towards education and work.

### **7.0 Teaching and Learning Methods**

The teaching and learning methods are instrumental in developing student's competences. This syllabus suggests teaching and learning methods for each activity which includes but not limited to discussions, presentations, field visits, practical work, research, scientific experiments, and project works. However, a teacher is advised to plan and use other appropriate methods based on the environment or context. All the teaching and learning methods should be integrated with the everyday lives of students.

### **8.0 Teaching and Learning Resources**

The process of teaching and learning requires different resources. In that regard, both the teacher and students should work together to collect or improvise alternative resources available in the school and home environment when needed. The teacher and students are expected to constantly seek for information from various sources to effectively facilitate teaching and learning process. The list of approved textbooks and reference books shall be provided by TIE.

### **9.0 Assessment**

Assessment is important in teaching and learning of Additional Mathematics subject. It is divided into formative and summative assessments. Formative assessment informs both the teacher and students on the progress of teaching and learning, and in making decisions on improving the teaching and learning process. Teachers are, therefore, expected to apply a wide range of formative assessment methods which include but not limited to discussions, presentations, oral questions, experiments, observations, practical and projects.

Summative assessment, on the other hand, will focus on determining student’s achievement of learning. Teachers are expected to use a variety of summative assessments including mid-term tests, terminal, mock examinations and projects. The scores obtained from these assessments will be used as Continuous Assessment (CA). Therefore, the continuous assessments shall contribute 30% and the National Form IV Examination shall be 70% of the student’s final achievement, as indicated in Table 2.

**Table 2:** *Contribution of Continuous Assessment and National Examination in the final score*

<b>Assessment</b>	<b>Weight (%)</b>
Form III Terminal Examination	5
Form III Annual Examination	5
Form IV Annual Examination	5
Form III Project	5
Form Four Mock Examination	10
Form Four National Examination	70
<b>Total</b>	<b>100</b>

### 10.0 Number of Periods

The Additional Mathematics Syllabus for Ordinary Secondary Education provides estimates of time that will be spent in teaching and learning in consideration of the complexity of the specific competencies and the learning activities. Four periods of 40 minutes each have been allocated for this subject per week.

### 11.0 Teaching and Learning Contents

The contents of this syllabus are presented in matrix form with seven columns which include main competences, specific competences, learning activities, suggested methods, assessment criteria, suggested resources, and number of periods as presented in Table 3-4.

### Form III

**Table 3: Detailed Contents for Form III**

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Use advanced mathematical knowledge and skills in everyday life	1.1 Demonstrate mastery of logic in decision making	Explore the basic tenets of logic ( <i>logical statements/ propositions, connectives, arguments, validity of an argument, truth tables and simple circuits</i> )	<b>Group discussion:</b> Allow students in their groups to use visual representations, games, and puzzles to explore basic tenets of logic and its applications in real world	The basic tenets of logic are explored adequately	Books, Excerpts of logical arguments, circuit simulations, animations	18
2.0 Demonstrate mastery of some advanced concepts in Algebra and Calculus in problem solving	2.1 Use Algebra and Calculus to solve problems in different contexts	(a) Explore the basic tenets of Algebra ( <i>sum and product of roots of a quadratic equation, solve algebraically and graphically</i> )	<b>Exploration:</b> Allow students to work individually or in groups to explore tenets of Algebra through Graphical tools, Equation	The basic tenets of Algebra are explored adequately	Books, Algebra packages, Graphing calculators, graph papers, rulers, pencils	106

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		<i>linear and one quadratic equation, use the remainder theorem to find a remainder of a polynomial function of up to third degree) simultaneous equations involving one</i>	<b>Scenario:</b> Share with students the real-world scenarios related to Algebra and guide them to create similar scenarios through puzzles, games and other ICT tools and solve them collaboratively and individually simulation, books and other related resources			
		(b) Explore the basic tenets of Rational Functions ( <i>properties, asymptotes, domain and range, graphs</i> )	<b>Virtual representations:</b> Engage students actively through interactive simulations, virtual graphs,	The basic tenets of Rational Functions are explored appropriately	Graphing calculators, Graph papers, relevant books, AI tools	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			demonstrations, diagrams and charts to explore basic tenets of rational functions <b>Hands-on activities:</b> Engage students through demonstrations to model real-world problems related to rational functions and finding their solutions			
		(c) Explore the basic tenets of Differentiation ( <i>derivatives of polynomial and trigonometric functions</i> : first principles, <i>power rule, chain rule</i> ,	<b>Demonstrations:</b> Use step-by-step approach to demonstrate to students how to use different techniques in finding derivatives of polynomials	The basic tenets of Differentiation are explored adequately	Graphing calculators, differentiation applications, differentiation games, Mathematical software such as GeoGebra	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		<i>product rule and quotient rule)</i>	and trigonometric functions			
		(d) Apply differentiation to determine rates of change of quantities, maxima and minima of functions, turning points, points of inflection and curve sketching	<b>Project-based learning:</b> Guide students through individual and group project works to explore, model, and solve real world problems related to differentiation	Differentiation is appropriately applied to determine rates of change of quantities, relative maximum and minimum of functions, turning points, points of inflection, and curve sketching		
		(e) Determine indefinite and definite integrals of polynomial expressions and simple trigonometric functions	<b>Think-Ink-Pair-Share:</b> Guide students individually and in groups to discover, explore and share ways of obtaining	Indefinite and definite integrals of polynomials and simple trigonometric functions are adequately determined		



Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			anti-derivatives of polynomials and simple trigonometric functions			
		(f) Apply Integration to determine area under a curve and volume of a solid of revolution of a simple curve about an axis	<b>Problem-based learning:</b> Guide students individually and in groups to explore, model scenarios and solve real world problems related to finding area under a curve and volume of solids of revolution of simple functions by using Integration	Area under a curve and volume of solid of revolution of simple curves about the axes are determined correctly		

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	2.2 Apply sets theory skills in decision making	(a) Explore the basic tenets of set theory ( <i>operation on three sets, Venn diagrams, cardinality of a set, set properties and De Morgan's laws</i> )	<p><b>Exploration:</b> Individually or groups, allow students to explore through various books, set simulations, and other ICT tools to explore the basic tenets of set theory</p> <p><b>Problem-based learning:</b> Guide students to formulate and solve scenarios and real-world problems related to basic tenets of sets</p>	The basic tenets of Set Theory are adequately explored	Real objects, set simulations, charts of different sets, playing cards, manila papers, marker pens, colored chalks	16

## Form IV

**Table 4:** Detailed Contents for Form IV

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
1.0 Use advanced mathematical knowledge and skills in daily life	1.1 Use some advanced skills in coordinate geometry, Trigonometry and Vectors in daily life	(a) Explore the basic tenets of coordinate geometry ( <i>ratio theorem, perpendicular distance, angle between two intersecting lines, equation of a circle, locus of a moving point equidistant from a fixed point on a plane, locus of a moving point equidistant from two fixed points and locus of a moving point at a fixed distance from a fixed line on a plane</i> )	<b>Simulations</b> Provide students with various resources such as simulations, graphs and ICT tools to explore basic tenets of coordinate geometry	The basic tenets of coordinate geometry are explored appropriately	Graph papers, geometrical models, shape and angles animations, Geoboards, AI tools, Mathematical software such as Maple, GeoGebra, MATLAB, and Mathematica	90

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Explore the basic tenets of trigonometry ( <i>trigonometric identities, double angle and compound angle formulae and solving trigonometric equations</i> )	<b>Heuristic methods:</b> Lead students individually or in groups through questions to explore, discover and apply the basic tenets of trigonometry	The basic tenets of trigonometry are explored appropriately		
		(c) Explore the basic tenets of vectors in three dimensional space ( <i>components, representations, dot and cross products of two vectors</i> )	<b>Jigsaw:</b> Guide students through home and expert groups to explore and make presentations on the concepts of vectors in 3D planes	The basic tenets of vectors in three-dimensional plane are described appropriately	Scientific calculators, Mathematical software such as Maple, Geogebra, MATLAB, Mathematica, and AI tools	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			through vector simulations, books, visual representations such as graphs and diagrams and make presentations			
		(d)Apply the dot product of vectors to solve problems involving angles between two vectors and work done by a force on an object	<b>Group Discussion:</b> Guide students in groups to use books, animations, and AI tools to explore and solve problems related to the applications of dot product of vectors	Dot product of vectors is adequately applied to solve problems involving angle between two vectors and work done by force on an object	Vector animations, Mathematical software such as GeoGebra, MATLAB	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(e) Apply the cross product of vectors to find a unit vector normal to a given plane and to find area of a plane figure	<b>Problem-based learning:</b> Allow students individually or in groups to use relevant books, animations, graphs, and AI tools to explore and find solutions to scenarios and real-life problems related to concept of cross product of vectors	Cross product of vectors is used correctly to find unit vector normal to a given plane and areas of a plane figure		
	1.2 Apply statistical skills in the fields of business and economics	Explore the basic tenets of statistics ( <i>measures of dispersion: range, variance and standard deviation</i> )	<b>Exploration:</b> Give students opportunities either individually or in groups to	The basic tenets of statistics are explored appropriately	Statistical packages, Statistics books, AI tools, collected	10

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			<p>explore through books, statistical packages and AI tools the basic tenets of measures of dispersion and make presentations</p> <p><b>Project:</b> Guide Students individually or in groups to conduct simple research project through field visit to collect, analyse and report findings of data from business, economics and other fields</p>		<p>data, graph papers, statistical graph charts</p>	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
	1.3 Apply the basic skills of probability in daily life	(a) Explore the basic tenets of counting techniques ( <i>fundamental principle of counting, permutations, and combinations</i> )	<b>Researching:</b> Organize students in groups or individually to explore and make summary of basic concepts of counting techniques through relevant books, demonstrations through real world scenarios and animations	The basic tenets of counting techniques are explored appropriately	Counting simulations, Real objects, abacus	40
		(b) Explore the basic tenets of probability ( <i>independent events and conditional probability</i> )	<b>Experiments:</b> Guide students in teams or individually to carry out random	The basic tenets of probability are explored adequately	Counting simulations, Real objects, abacus, dice, coins, deck of cards	



Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
			experiments in exploring the probability related problems using dice, deck of cards and other resources			
2.0 Demonstrate mastery of some advanced concepts in Algebra and Calculus in problem solving	2.1 Use Algebra and Calculus to solve problems in different contexts	(a) Explore the basic tenets of $3 \times 3$ matrices ( <i>operations, determinant, and inverse</i> )	<b>Heuristic method:</b> Lead students individually or in groups through questions, ICT tools, puzzles and games to explore, discover and solve problems of the basic tenets of $3 \times 3$ matrices	The basic tenets of $3 \times 3$ matrices are explored adequately	Scientific calculators, Mathematical software such as Maple, GeoGebra, MATLAB, and AI tools	

Main competences	Specific competences	Learning activities	Suggested teaching and learning methods	Assessment criteria	Suggested resources	Number of periods
		(b) Use $3 \times 3$ matrices to solve systems of linear simultaneous equations with three unknowns	<b>Problem-based learning:</b> Organize students to work individually or in groups to formulate scenarios and find real world problems related to simultaneous equations, model them using $3 \times 3$ matrices and find their solutions	$3 \times 3$ matrices are used appropriately in solving systems of linear simultaneous equations with three unknowns		

## Bibliography

- Ministry of Education and Vocational Training. (2005). Additional Mathematics syllabus for *ordinary secondary education Form I-IV*. Tanzania Institute of Education.
- Ministry of Education and Vocational Training. (2010). Additional Mathematics syllabus for *ordinary secondary education Form I-IV*. Tanzania Institute of Education.
- Ministry of Education, Science and Technology. (2022). Additional Mathematics for Secondary *Schools student's book form one*. Tanzania Institute of Education.
- Ministry of Education, Science and Technology. (2022). *Additional Mathematics for Secondary schools, student's book form two*. Tanzania Institute of Education.
- Ministry of Education, Science and Technology. (2022). *Additional Mathematics for secondary schools, student's book form three*. Tanzania Institute of Education.
- Ministry of Education, Science and Technology. (2022). *Additional Mathematics for secondary schools, student's book Form Four*. Tanzania Institute of Education.
- Singapore–Cambridge General Certificate of Education Ordinary Level (2022). *Additional Mathematics (Syllabus 4049)*. University of Cambridge.
- University of Cambridge Local Examination Syndicate. (2020). *Cambridge o-level Additional Mathematics 0606, Cambridge assessment international education*. University of Cambridge.
- University of Cambridge Local Examination Syndicate. (2021). *Cambridge o-level Additional Mathematics 0606, Cambridge assessment international education*. University of Cambridge.
- University of Cambridge Local Examination Syndicate. (2022). *Cambridge o-level Additional Mathematics 0606. Cambridge assessment international education*. University of Cambridge.