



# Syllabus

## Cambridge O Level For centres in Mauritius Mathematics 4021

Use this syllabus for exams in 2022.  
Exams are available in the November series.



### Changes to the syllabus for 2022

The latest syllabus is version 1, published September 2019.

There are no significant changes which affect teaching.

**You are strongly advised to read the whole syllabus before planning your teaching programme.**

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# Contents

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1. Introduction.....	2
1.1 Why choose Cambridge International?	
1.2 Why choose Cambridge O Level?	
1.3 Why choose Cambridge O Level Mathematics?	
2. Teacher support.....	5
2.1 Support materials	
2.2 Endorsed resources	
2.3 Training	
3. Assessment at a glance.....	6
4. Syllabus aims and assessment objectives.....	7
4.1 Syllabus aims	
4.2 Assessment objectives	
5. Syllabus content.....	9
6. Other information.....	13

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# 1. Introduction

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## 1.1 Why choose Cambridge International?

Cambridge International prepares school students for life, helping them develop an informed curiosity and a lasting passion for learning. We are part of the University of Cambridge.

Our Cambridge Pathway gives students a clear path for educational success from age 5 to 19. Schools can shape the curriculum around how they want students to learn – with a wide range of subjects and flexible ways to offer them. It helps students discover new abilities and a wider world, and gives them the skills they need for life, so they can achieve at school, university and work.

Our programmes and qualifications set the global standard for international education. They are created by subject experts, rooted in academic rigour and reflect the latest educational research. They provide a strong platform for students to progress from one stage to the next, and are well supported by teaching and learning resources.

Every year, nearly a million Cambridge learners from 10 000 schools in 160 countries prepare for their future with the Cambridge Pathway.

### Cambridge learners

Our mission is to provide educational benefit through provision of international programmes and qualifications for school education and to be the world leader in this field. Together with schools, we develop Cambridge learners who are:

- **confident** in working with information and ideas – their own and those of others
- **responsible** for themselves, responsive to and respectful of others
- **reflective** as learners, developing their ability to learn
- **innovative** and equipped for new and future challenges
- **engaged** intellectually and socially, ready to make a difference.

### Recognition

Our expertise in curriculum, teaching and learning, and assessment is the basis for the recognition of our programmes and qualifications around the world.

Cambridge O Level is internationally recognised by schools, universities and employers as equivalent in demand to Cambridge IGCSE™ (International General Certificate of Secondary Education). There are over 700 000 entries a year in nearly 70 countries. Learn more at [www.cambridgeinternational.org/recognition](http://www.cambridgeinternational.org/recognition)



Cambridge Assessment International Education is an education organisation and politically neutral. The content of this syllabus, examination papers and associated materials do not endorse any political view. We endeavour to treat all aspects of the exam process neutrally.

## Support for teachers

A wide range of materials and resources is available to support teachers and learners in Cambridge schools. Resources suit a variety of teaching methods in different international contexts. Through subject discussion forums and training, teachers can access the expert advice they need for teaching our qualifications. More details can be found in Section 2 of this syllabus and at [www.cambridgeinternational.org/teachers](http://www.cambridgeinternational.org/teachers)

## Quality management

Cambridge International is committed to providing exceptional quality. In line with this commitment, our quality management system for the provision of international qualifications and education programmes for students aged 5 to 19 is independently certified as meeting the internationally recognised standard, ISO 9001:2015. Learn more at [www.cambridgeinternational.org/ISO9001](http://www.cambridgeinternational.org/ISO9001)

## 1.2 Why choose Cambridge O Level?

Cambridge O Level is typically for 14 to 16 year olds and is an internationally recognised qualification. It has been designed especially for an international market and is sensitive to the needs of different countries. Cambridge O Level is designed for learners whose first language may not be English, and this is acknowledged throughout the examination process.

Our aim is to balance knowledge, understanding and skills in our programmes and qualifications to enable students to become effective learners and to provide a solid foundation for their continuing educational journey.

Through our professional development courses and our support materials for Cambridge O Levels, we provide the tools to enable teachers to prepare students to the best of their ability and work with us in the pursuit of excellence in education.

Cambridge O Levels are considered to be an excellent preparation for Cambridge International AS & A Levels, the Cambridge AICE (Advanced International Certificate of Education) Diploma, Cambridge Pre-U, and other education programmes, such as the US Advanced Placement program and the International Baccalaureate Diploma programme. Learn more about Cambridge O Levels at [www.cambridgeinternational.org/olevel](http://www.cambridgeinternational.org/olevel)

## Guided learning hours

Cambridge O Level syllabuses are designed on the assumption that learners have about 130 guided learning hours per subject over the duration of the course, but this is for guidance only. The number of hours required to gain the qualification may vary according to local curricular practice and the students' prior experience of the subject.

## 1.3 Why choose Cambridge O Level Mathematics?

Cambridge O Levels are established qualifications that keep pace with educational developments and trends. The Cambridge O Level curriculum places emphasis on broad and balanced study across a wide range of subject areas. The curriculum is structured so that students attain both practical skills and theoretical knowledge.

Cambridge O Level Mathematics is recognised by universities and employers throughout the world as proof of mathematical knowledge and understanding. Successful Cambridge O Level Mathematics candidates gain lifelong skills, including:

- the development of their mathematical knowledge;
- confidence by developing a feel for numbers, patterns and relationships;
- an ability to consider and solve problems and present and interpret results;
- communication and reason using mathematical concepts;
- a solid foundation for further study.

Students may also study for a Cambridge O Level in Additional Mathematics and Statistics. In addition to Cambridge O Levels, Cambridge also offers Cambridge IGCSE and Cambridge International AS and A Levels for further study in Mathematics as well as other maths-related subjects. See [www.cambridgeinternational.org](http://www.cambridgeinternational.org) for a full list of the qualifications you can take.

### Prior learning

We recommend that candidates who are beginning this course should have previously studied an appropriate lower secondary Mathematics programme.

### Progression

Cambridge O Levels are general qualifications that enable candidates to progress either directly to employment, or to proceed to further qualifications.

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## 2. Teacher support

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### 2.1 Support materials

We offer a wide range of practical and innovative support to help teachers plan and deliver our programmes and qualifications confidently.

For teachers at registered Cambridge schools a range of additional support materials for specific syllabuses is available online from the School Support Hub. Go to [www.cambridgeinternational.org/support](http://www.cambridgeinternational.org/support) (username and password required). If you do not have access, speak to the School Support coordinator at your school.

Please see the syllabus materials DVD for access to resources.

### 2.2 Endorsed resources

We work with publishers who provide a range of resources for our syllabuses including print and digital materials. Resources endorsed by Cambridge International go through a detailed quality assurance process to make sure they provide a high level of support for teachers and learners.

We have resource lists which can be filtered to show all resources, or just those which are endorsed by Cambridge International. The resource lists include further suggestions for resources to support teaching. See [www.cambridgeinternational.org/i-want-to/resource-centre](http://www.cambridgeinternational.org/i-want-to/resource-centre) for further information.

### 2.3 Training

We offer a range of support activities for teachers to ensure they have the relevant knowledge and skills to deliver our qualifications.

### 3. Assessment at a glance

Grades available: C–E

#### Paper 1

1 hour

Short-answer questions.

Candidates should answer each question.

Weighting: 35%

#### Paper 2

2 hours

Structured questions.

Candidates should answer each question.

Weighting: 65%

- Candidates should have an electronic calculator for all papers. Algebraic or graphical calculators are not permitted. Three significant figures will be required in answers except where otherwise stated.
- Candidates should use the value of  $\pi$  from their calculators if their calculator provides this. Otherwise, they should use the value of 3.142 given on the front page of the question paper only.
- Tracing paper may be used as an additional material for each of the written papers.

#### Availability

This syllabus is examined in the November examination series.

This syllabus is available to private candidates.

It is available in Mauritius only.

#### Combining this with other syllabuses

Candidates can combine this syllabus in an examination series with any other Cambridge International syllabus, except:

- Cambridge IGCSE International Mathematics (0607)
- Cambridge O Level Mathematics (4029)
- syllabuses with the same title at the same level.

Please note that Cambridge O Level, Cambridge IGCSE and Cambridge IGCSE (9–1) syllabuses are at the same level.



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## 4. Syllabus aims and assessment objectives

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### 4.1 Syllabus aims

The aims of the curriculum are the same for all candidates. The aims are set out below and describe the educational purposes of a course in Mathematics for the Cambridge O Level examination. They are not listed in order of priority.

The aims are to enable candidates to:

1. develop their mathematical knowledge and oral, written and practical skills in a way which encourages confidence and provides satisfaction and enjoyment
2. read mathematics, and write and talk about the subject in a variety of ways
3. develop a feel for number, carry out calculations and understand the significance of the results obtained
4. apply mathematics in everyday situations and develop an understanding of the part which mathematics plays in the world around them
5. solve problems, present the solutions clearly, check and interpret the results
6. develop an understanding of mathematical principles
7. recognise when and how a situation may be represented mathematically, identify and interpret relevant factors and, where necessary, select an appropriate mathematical method to solve the problem
8. use mathematics as a means of communication with emphasis on the use of clear expression
9. develop an ability to apply mathematics in other subjects, particularly science and technology
10. develop the abilities to reason logically, to classify, to generalise and to prove
11. appreciate patterns and relationships in mathematics
12. produce and appreciate imaginative and creative work arising from mathematical ideas
13. develop their mathematical abilities by considering problems and conducting individual and co-operative enquiry and experiment, including extended pieces of work of a practical and investigative kind;
14. appreciate the interdependence of different branches of mathematics;
15. acquire a foundation appropriate to their further study of mathematics and of other disciplines.

## 4.2 Assessment objectives

The two assessment objectives in Mathematics are:

### **A Mathematical techniques**

### **B Applying mathematical techniques to solve problems**

A description of each assessment objective follows.

#### **A Mathematical techniques**

Candidates should be able to:

1. organise, interpret and present information accurately in written, tabular, graphical and diagrammatic forms;
2. perform calculations by suitable methods;
3. use an electronic calculator and also perform some straightforward calculations without a calculator;
4. understand systems of measurement in everyday use and make use of them in the solution of problems;
5. estimate, approximate and work to degrees of accuracy appropriate to the context and convert between equivalent numerical forms;
6. use mathematical and other instruments to measure and to draw to an acceptable degree of accuracy;
7. interpret, transform and make appropriate use of mathematical statements expressed in words or symbols;
8. recognise and use spatial relationships in two and three dimensions, particularly in solving problems;
9. recall, apply and interpret mathematical knowledge in the context of everyday situations.

#### **B Applying mathematical techniques to solve problems**

In questions which are set in context and/or which require a sequence of steps to solve, candidates should be able to:

10. make logical deductions from given mathematical data;
11. recognise patterns and structures in a variety of situations, and form generalisations;
12. respond to a problem relating to a relatively unstructured situation by translating it into an appropriately structured form;
13. analyse a problem, select a suitable strategy and apply an appropriate technique to obtain its solution;
14. apply combinations of mathematical skills and techniques in problem solving;
15. set out mathematical work, including the solution of problems, in a logical and clear form using appropriate symbols and terminology.

## 5. Syllabus content

Centres are reminded that the study of mathematics offers opportunities for the use of ICT, particularly spreadsheets and graph-drawing packages. For example, spreadsheets may be used in the work on Percentages (section 11), Personal and household finance (section 16), Algebraic formulae (section 20) Statistics (section 31), etc. Graph-drawing packages may be used in the work on Graphs in practical situations (section 17), Graphs of functions (section 18), Statistics (section 31), etc. It is important to note that use or knowledge of ICT will **not** be assessed in the examination papers.

Centres are also reminded that, although use of an electronic calculator is permitted on all examination papers, candidates should develop a full range of mental and non-calculator skills during the course of study. Questions demonstrating the mastery of such skills may be asked in the examination.

As well as demonstrating skill in the following techniques, candidates will be expected to apply them in the solution of problems.

Theme or topic	Subject content
<b>1. Number, set notation and language</b>	Identify and use natural numbers, integers (positive, negative and zero), prime numbers, square numbers, common factors and common multiples, rational and irrational numbers (e.g. $\pi$ , $\sqrt{2}$ ), real numbers; continue a given number sequence; recognise patterns in sequences and relationships between different sequences, generalise to simple algebraic statements (including expressions for the $n$ th term) relating to such sequences.
<b>2. Squares and cubes</b>	Calculate squares, square roots, cubes and cube roots of numbers.
<b>3. Directed numbers</b>	Use directed numbers in practical situations (e.g. temperature change, flood levels).
<b>4. Vulgar and decimal fractions and percentages</b>	Use the language and notation of simple vulgar and decimal fractions and percentages in appropriate contexts; recognise equivalence and convert between these forms.
<b>5. Ordering</b>	Order quantities by magnitude and demonstrate familiarity with the symbols $=$ , $\neq$ , $>$ , $<$ , $\geq$ , $\leq$
<b>6. Standard form</b>	Use the standard form $A \times 10^n$ where $n$ is a positive or negative integer, and $1 \leq A < 10$ .
<b>7. The four rules</b>	Use the four rules for calculations with whole numbers, decimal fractions and vulgar (and mixed) fractions, including correct ordering of operations and use of brackets.
<b>8. Estimation</b>	Make estimates of numbers, quantities and lengths, give approximations to specified numbers of significant figures and decimal places and round off answers to reasonable accuracy in the context of a given problem.

Theme or topic	Subject content
<b>9. Limits of accuracy</b>	Give appropriate upper and lower bounds for data given to a specified accuracy (e.g. measured lengths).
<b>10. Ratio, proportion, rate</b>	Demonstrate an understanding of the elementary ideas and notation of ratio, direct and inverse proportion and common measures of rate; divide a quantity in a given ratio; use scales in practical situations; calculate average speed.
<b>11. Percentages</b>	Calculate a given percentage of a quantity; express one quantity as a percentage of another; calculate percentage increase or decrease.
<b>12. Use of an electronic calculator</b>	Use an electronic calculator efficiently; apply appropriate checks of accuracy.
<b>13. Measures</b>	Use current units of mass, length, area, volume and capacity in practical situations and express quantities in terms of larger or smaller units.
<b>14. Time</b>	Calculate times in terms of the 24-hour and 12-hour clock; read clocks, dials and timetables.
<b>15. Money</b>	Calculate using money and convert from one currency to another.
<b>16. Personal and household finance</b>	Use given data to solve problems on personal and household finance involving earnings, simple interest and compound interest (knowledge of compound interest formula is not required), discount, profit and loss; extract data from tables and charts.
<b>17. Graphs in practical situations</b>	Demonstrate familiarity with Cartesian co-ordinates in two dimensions, interpret and use graphs in practical situations including travel graphs and conversion graphs, draw graphs from given data.
<b>18. Graphs of functions</b>	Construct tables of values for functions of the form $ax + b$ , $\pm x^2 + ax + b$ , $a/x$ ( $x \neq 0$ ) where $a$ and $b$ are integral constants; draw and interpret such graphs; find the gradient of a straight line graph; solve linear and quadratic equations approximately by graphical methods.
<b>19. Straight line graphs</b>	Interpret and obtain the equation of a straight line graph in the form $y = mx + c$ ; determine the equation of a straight line parallel to a given line.
<b>20. Algebraic representation and formulae</b>	Use letters to express generalised numbers and express basic arithmetic processes algebraically, substitute numbers for words and letters in formulae; transform simple formulae; construct simple expressions and set up simple equations.

Theme or topic	Subject content
<b>21. Algebraic manipulation</b>	Manipulate directed numbers; use brackets and extract common factors.
<b>22. Indices</b>	Use and interpret positive, negative and zero indices.
<b>23. Solutions of equations and inequalities</b>	Solve simple linear equations in one unknown; solve simultaneous linear equations in two unknowns.
<b>24. Geometrical terms and relationships</b>	Use and interpret the geometrical terms: point, line, parallel, bearing, right angle, acute, obtuse and reflex angles, perpendicular, similarity, congruence; use and interpret vocabulary of triangles, quadrilaterals, circles, polygons and simple solid figures including nets.
<b>25. Geometrical constructions</b>	Measure lines and angles; construct a triangle given the three sides using ruler and pair of compasses only; construct other simple geometrical figures from given data using protractors and set squares as necessary; construct angle bisectors and perpendicular bisectors using straight edges and pair of compasses only; read and make scale drawings.
<b>26. Symmetry</b>	Recognise rotational and line symmetry (including order of rotational symmetry) in two dimensions and properties of triangles, quadrilaterals and circles directly related to their symmetries.
<b>27. Angle properties</b>	Calculate unknown angles using the following geometrical properties: <ul style="list-style-type: none"> <li>(a) angles at a point</li> <li>(b) angles at a point on a straight line and intersecting straight lines</li> <li>(c) angles formed within parallel lines</li> <li>(d) angle properties of triangles and quadrilaterals</li> <li>(e) angle properties of regular polygons</li> <li>(f) angle in a semi-circle</li> <li>(g) angle between tangent and radius of a circle.</li> </ul>
<b>28. Locus</b>	Use the following loci and the method of intersecting loci for sets of points in two dimensions: <ul style="list-style-type: none"> <li>(a) which are at a given distance from a given point</li> <li>(b) which are at a given distance from a given straight line</li> <li>(c) which are equidistant from two given points</li> <li>(d) which are equidistant from two given intersecting straight lines.</li> </ul>

Theme or topic	Subject content
<b>29. Mensuration</b>	Carry out calculations involving the perimeter and area of a rectangle and triangle, the circumference and area of a circle, the area of a parallelogram and a trapezium, the volume of a cuboid, prism and cylinder and the surface area of a cuboid and a cylinder.
<b>30. Trigonometry</b>	Interpret and use three-figure bearings measured clockwise from the North (i.e. $000^\circ$ – $360^\circ$ ); apply Pythagoras' theorem and the sine, cosine and tangent ratios for acute angles to the calculation of a side or of an angle of a right-angled triangle (angles will be quoted in, and answers required in, degrees and decimals to one decimal place).
<b>31. Statistics</b>	Collect, classify and tabulate statistical data; read, interpret and draw simple inferences from tables and statistical diagrams; construct and use bar charts, pie charts, pictograms, simple frequency distributions, histograms with equal intervals and scatter diagrams (including drawing a line of best fit by eye); understand what is meant by positive, negative and zero correlation; calculate the mean, median and mode for individual and discrete data and distinguish between the purposes for which they are used; calculate the range.
<b>32. Probability</b>	Calculate the probability of a single event as either a fraction or a decimal (not a ratio); understand and use the probability scale from 0 to 1; understand that: <i>the probability of an event occurring = 1 – the probability of the event not occurring</i> ; understand probability in practice, e.g. relative frequency.
<b>33. Vectors in two dimensions</b>	Describe a translation by using a vector represented by, e.g. $\begin{pmatrix} x \\ y \end{pmatrix}$ , $\vec{AB}$ or $\mathbf{a}$ ; add and subtract vectors; multiply a vector by a scalar.
<b>34. Transformations</b>	Reflect simple plane figures in horizontal or vertical lines; rotate simple plane figures about the origin, vertices or midpoints of edges of the figures, through multiples of $90^\circ$ ; construct given translations and enlargements of simple plane figures; recognise and describe reflections, rotations, translations and enlargements.

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## 6. Other information

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### Equality and inclusion

We have taken great care in the preparation of this syllabus and assessment materials to avoid bias of any kind. To comply with the UK Equality Act (2010), we have designed this qualification with the aim of avoiding direct and indirect discrimination.

The standard assessment arrangements may present unnecessary barriers for candidates with disabilities or learning difficulties. Arrangements can be put in place for these candidates to enable them to access the assessments and receive recognition of their attainment. Access arrangements will not be agreed if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who are unable to access the assessment of any component may be eligible to receive an award based on the parts of the assessment they have taken.

Information on access arrangements is in the *Cambridge Handbook* at [www.cambridgeinternational.org/eoguide](http://www.cambridgeinternational.org/eoguide)

### Language

This syllabus and the associated assessment materials are available in English only.

### Exam administration

To keep our exams secure, we produce question papers for different areas of the world, known as 'administrative zones'. We allocate all Cambridge schools to one administrative zone determined by their location. Each zone has a specific timetable. Some of our syllabuses offer candidates different assessment options. An entry option code is used to identify the components the candidate will take relevant to the administrative zone and the available assessment options.

### Retakes

Candidates can retake the whole qualification as many times as they want to. This is a linear qualification so candidates cannot re-sit individual components.

### Grading and reporting

Cambridge O Level results are shown by one of the grades A\*, A, B, C, D or E, indicating the standard achieved, A\* being the highest and E the lowest. 'Ungraded' indicates that the candidate's performance fell short of the standard required for grade E. 'Ungraded' will be reported on the statement of results but not on the certificate. The letters Q (pending), X (no result) and Y (to be issued) may also appear on the statement of results but not on the certificate.

## How students and teachers can use the grades

Assessment at Cambridge O Level has two purposes:

- to measure learning and achievement

The assessment:

- confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus, to the levels described in the grade descriptions.

- to show likely future success

The outcomes:

- help predict which students are well prepared for a particular course or career and/or which students are more likely to be successful
- help students choose the most suitable course or career.



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