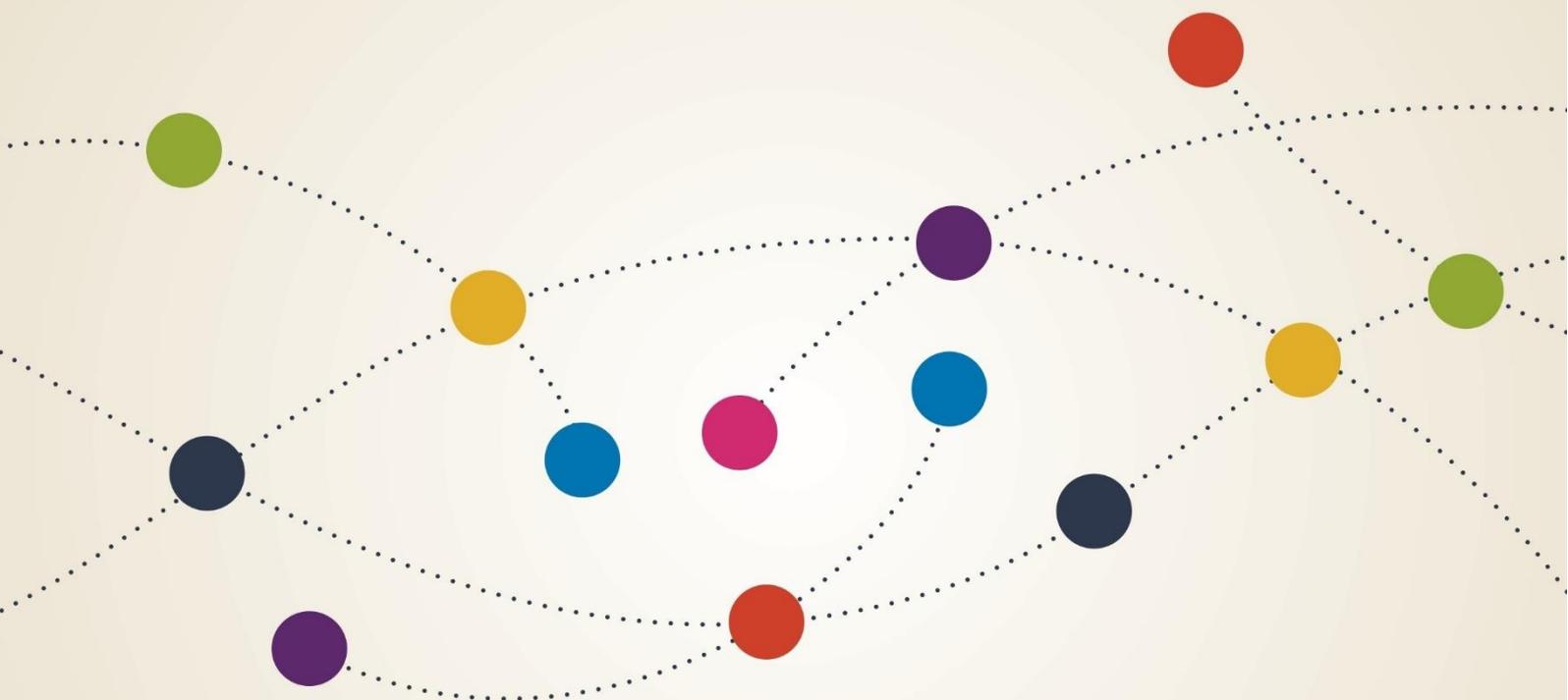


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Leaving Certificate Applied: Mathematical Applications

Draft Module Descriptor

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Introduction

Senior cycle

Senior cycle students are approaching the end of their time in school and are focusing on the directions they would like to take in their future lives. Senior cycle plays a vital role in helping students to address their current needs as young adults and in preparing them for life in a changing economic and social context.

Senior cycle is founded on a commitment to educational achievement of the highest standard for all students, commensurate with their individual abilities. To support students as they shape their own future there is an emphasis on the development of knowledge and deep understanding; on students taking responsibility for their own learning; on the acquisition of key skills; and on the processes of learning. The broad curriculum, with some opportunities for specialisation, supports continuity from junior cycle and sets out to meet the needs of students, some of whom have special educational needs, but who all share a wide range of learning interests, aptitudes and talents.

The curriculum at senior cycle promotes a balance between knowledge and skills, and the kinds of learning strategies relevant to participation in, and contribution to, a changing world where the future is uncertain.

Assessment in senior cycle involves gathering, interpreting and using information about the processes and outcomes of learning. It takes different forms and is used for a variety of purposes. It is used to determine the appropriate route for students through a differentiated curriculum, to identify specific areas of difficulty or strength for a given student and to test and certify achievement. Assessment supports and improves learning by helping students and teachers to identify next steps in the teaching and learning process.

The experience of senior cycle

The vision of senior cycle sees the learner at the centre of the educational experience. That experience will enable students to be resourceful, to be confident, to participate actively in society, to build an interest in learning, and to develop an ability to learn throughout their lives.

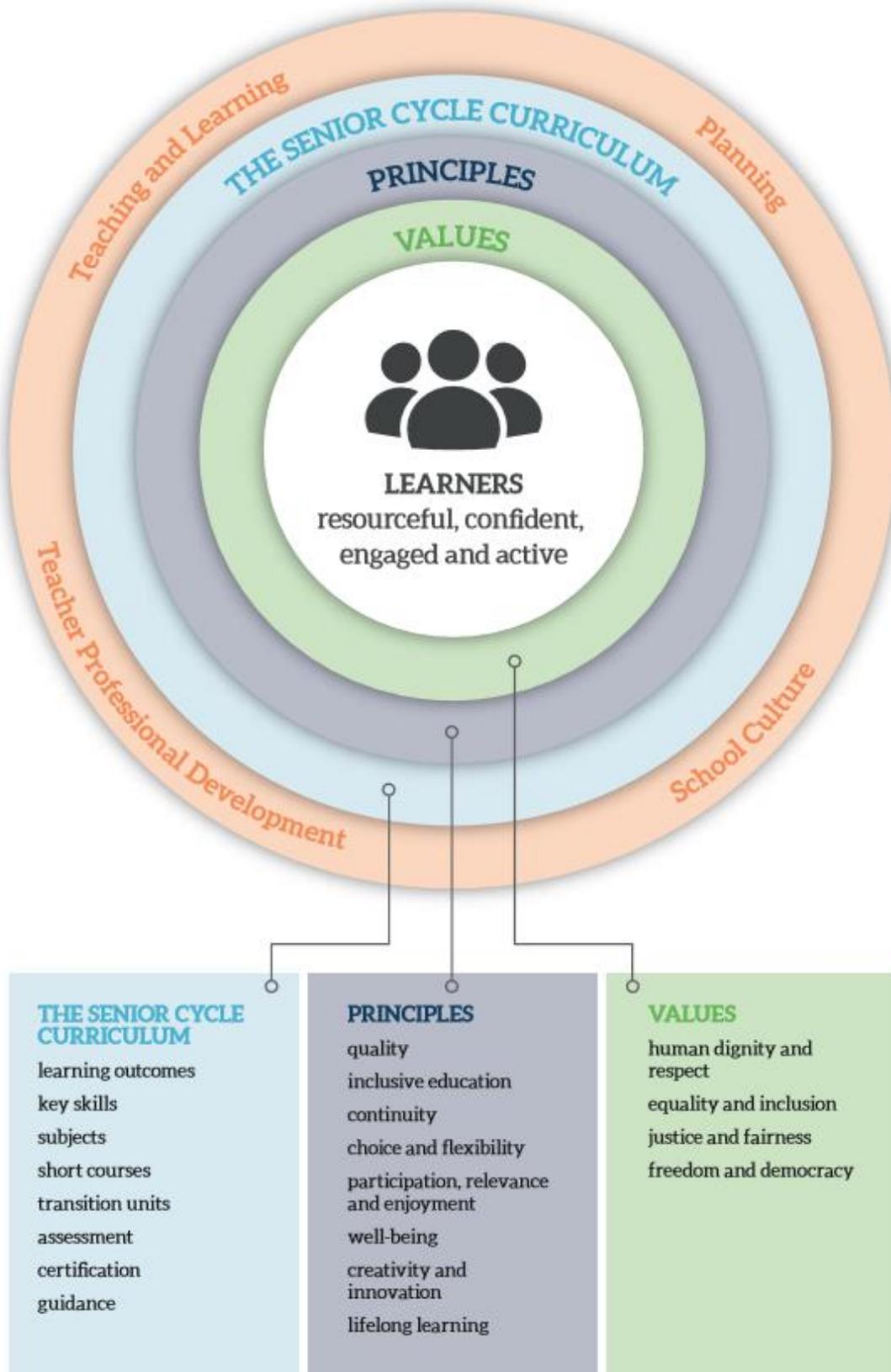
This vision of the learner is underpinned by the values on which senior cycle is based and it is realised through the principles that inform the curriculum as it is experienced by students in schools. The

module descriptor has embedded key skills, clearly expressed learning outcomes, and is supported by a range of approaches to assessment; it is the vehicle through which the vision becomes a reality for the learner.

At a practical level, the provision of a high-quality educational experience in senior cycle is supported by:

- effective curriculum planning, development, organisation and evaluation
- teaching and learning approaches that motivate and interest students, that enable them to progress, that deepen and apply their learning, and that develop their capacity to reflect on their learning
- professional development for teachers and school management that enables them to lead curriculum development and change in their schools
- a school culture that respects students, that encourages them to take responsibility for their own learning over time, and that promotes a love of learning.

Senior cycle education is situated in the context of a broader education policy that focuses on the contribution that education can make to the development of the learner as a person and as a citizen. It is an education policy that emphasises the promotion of social cohesion, the growth of society and the economy, and the principle of sustainability in all aspects of development.



RESOURCEFUL

they show their imagination, intelligence, intuition and other talents through

curiosity
enquiry
open-mindedness
reflection
connecting learning
innovation
problem solving
creativity

CONFIDENT

they develop their physical and mental well-being and

become self-aware
have high self-efficacy
engage with ethics, values and beliefs
welcome opportunities
can cope with setbacks
can effect positive change



LEARNERS

resourceful, confident,
engaged and active

ENGAGED

they participate in the social, community, national and international dimensions of their lives by

showing respect for others
forming and sustaining caring relationships
making informed decisions
building practical know-how
taking interest in and responsibility for their social and physical environment
developing moral/ethical and political understanding
making lifestyle choices that are sustainable
contributing to their own material well-being and the material well-being of society

ACTIVE LEARNERS

they pursue excellence in learning to the best of their ability and develop a love of learning by

seeking and using knowledge, and understanding how knowledge is created
experiencing passion for, rigour in and commitment to learning
developing intellectual and critical thinking skills
exercising autonomy and independence in learning
managing their learning and making learning choices
setting and achieving learning goals
pursuing learning qualifications

Rationale

Mathematical Applications for the Leaving Certificate Applied is intended to prepare students for life, work, further education and a world where skills and knowledge require constant updating. The course seeks to consolidate and improve students' mathematical knowledge, skills and concepts through practical, analytical, problem solving applications and through integration with other modules. The modules reflect the applied nature of the Leaving Certificate Applied programme. They start with the students' experiences and seek to raise their enthusiasm for mathematics through the achievements and the skills they develop in dealing with mathematics in everyday life, work and leisure. Students are encouraged to develop a work ethic where quality, accuracy and dependability are important.

The module descriptor is broadly aligned with the requirements for progression into further education through the students' engagement with practical, problem-solving classroom activities. The course seeks to encourage a positive disposition towards mathematics through the grounding of all activities in concrete contexts and settings that are relevant and recognisable to the students. In this way the course will enable the students to develop confidence in contemplating a range of pathways to pursue a challenge, engage in flexible mathematical thinking and take learning risks. The development of numeracy in this way recognises the multi-faceted nature of numeracy where the numerate person must not only have mathematical knowledge but also be able to utilise a range of tools in a variety of contexts in order to be able to act in and on the world (Goos, 2012).

Aims

The aim of this course is to develop the students' ability to solve quantitative problems that they encounter in the world around them so that they can

- represent authentic situations using mathematics
- analyse their mathematical representation of authentic situations
- interpret and communicate the results of their analysis

Number and sequence of modules

Modules are designed to be taken sequentially and student progression through the modules should enable the development of skills and understanding through encountering similar concepts in different contexts. However, when planning the sequence of modules other elements of the LCA framework, such as the selection and timing of vocational education tasks, should be taken into account to ensure that the students are equipped to utilise the necessary skills in the fulfilment of the task requirements.

Module 1: Mathematics and Money

Module 2: Mathematics and the World around me

Module 3: Mathematics and Life skills

Module 4: Mathematics and Work

General recommendations

Within each module, the order of units is discretionary to facilitate integration with other courses, tasks and current events.

Active learning methodologies, including practical work, group work and out of school activities are essential. Integration with other modules is part of the philosophy of the programme. All tasks are cross-curricular in nature and afford opportunities for the application of Mathematical Applications.

Furthermore, in the case of the Vocational Education Tasks, Mathematical Applications is a specific requirement.

Teachers should recognise the importance of contexts as a distinguishing feature of numeracy and incorporate numeracy rich contexts into their lessons and take advantage of unplanned numeracy opportunities as they arise. Students should work with real documents whenever possible (bills, pay slips, invoices, credit notes, lodgement forms, brochures, catalogues, timetables etc.) The Mathematical Applications course has many areas which can be effectively delivered through I.C.T. The Mathematical Applications and I.C.T. teachers should liaise to maximise this potential.

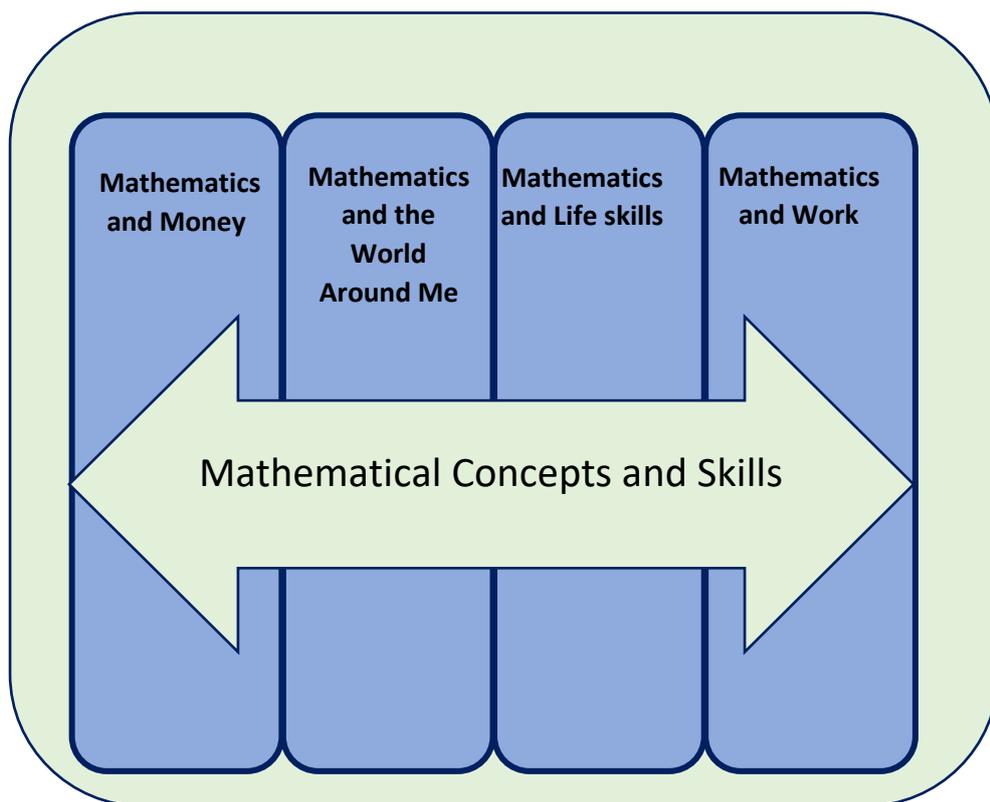
Students should become familiar with and utilise the appropriate digital technology, including calculators, to facilitate their learning in each module.

Students will keep a portfolio of learning throughout the modules. This portfolio may be digital or hard copy but should incorporate the elements of learning experienced and investigated by the student as part of the coursework and will form the basis for the key assignment for each module.

Overview and structure of the course

Mathematical Applications for Leaving Certificate Applied is designed to provide a natural progression for students from junior cycle mathematics while allowing students the opportunity to strengthen their conceptual knowledge in the application of principles to practical, contextual situations. Learners will be assessed by means of problems set in meaningful contexts.

The following summary outlines the progression from junior cycle mathematics and the learning outcomes that are central to the course. It is through mediation of the suggested subject matter that the learning outcomes for students are achieved.



Mathematical Concepts and Skills

Underpinning Learning Outcomes

Students should be able to:

MCS.1. reason mathematically about problems so that they can:

- a) make sense of a given problem and represent it using mathematics
- b) apply their knowledge and skills to solve a problem, including decomposing it into manageable parts and/or simplifying it using appropriate assumptions
- c) interpret and justify their solution in terms of the original problem and communicate their findings mathematically.

MCS.2. investigate numbers so that they can:

- a) perform calculations on positive and negative numbers involving addition, subtraction, multiplication, division, square roots (positive numbers only), and positive whole number powers
- b) use the order of arithmetic operations, including the use of brackets
- c) present answers to the degree of accuracy required, for example to the nearest whole number, to the nearest thousand, to two decimal places
- d) use appropriate units and convert between them, including mm, cm, m, km, seconds, minutes, hours, days, €k (i.e. thousands), €million, degrees
- e) flexibly convert between fractions, decimals, and percentages
- f) use and understand ratio and proportion.

MCS.3. investigate 2D and 3D shapes so that they can:

- a) draw and interpret scaled diagrams, using appropriate geometric tools (ruler, straight edge, set square, protractor, compass)
- b) draw and interpret nets, including those of rectangular solids and cylinders
- c) find the perimeter and area of 2D shapes made from combinations of discs, triangles, and rectangles

- d) find the volume and surface area of 3D shapes, including those made from combinations of rectangular solids and cylinders
- e) recognise and use the important facts regarding angles at a point, on a straight line, and in squares, rectangles, parallelograms, and triangles
- f) apply the theorem of Pythagoras to solve simple problems.

MCS.4. explore certain types of relationships and expressions so that they can:

- a) evaluate expressions given the value of variables
- b) represent linear relationships in tables, graphs, and generalised expressions (expressed in words)
- c) select and use suitable strategies (including graphic, numeric, trial and improvement, and working backwards) for finding solutions to problems involving linear relationships.

MCS.5. carry out a statistical investigation so that they can:

- a) generate a statistical question
- b) plan and implement a method to generate and/or source unbiased, representative data
- c) select, draw, and interpret appropriate graphical displays of data, including bar charts, pie charts, trend graphs, and histograms (equal intervals)
- d) select, calculate, and interpret appropriate summary statistics to describe aspects of univariate data, including measures of central tendency (mean, median, and mode) and of spread (range)
- e) evaluate the effectiveness of different graphical displays in representing data
- f) discuss misconceptions and misuses of statistics.

Module 1: Mathematics and Money

Purpose

Through their engagement with relevant and engaging topics students will gain experience in representing issues relating to mathematics and money, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of LCA.

Aims

This module aims to provide students opportunity

- to represent real life situations with mathematics
- to consolidate and reinforce students' mathematical knowledge and skills
- to make and justify decisions with mathematics
- to see the relevance of mathematics in students' everyday lives.

Units

Unit 1: Research and planning

Unit 2: Budgeting

Note: While the learning outcomes are divided into two units it is recognised that the activities undertaken to fulfil the learning will be iterative by nature and therefore will cover both unit 1 and unit 2 within a body of work.

Unit 1: Researching and planning

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5.

Students should be able to

- conduct market research to gather, source and interpret data
- interpret relevant information communicated in tables/charts or graphs
- present findings and draw conclusions

Unit 2: Budgeting

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5

Students should be able to

- investigate and cost a leisure/home or work space for a particular purpose
- prepare a project budget
- research, compare and contrast data about costings
- make value for money judgements and justify judgements with mathematics

Teacher Guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may fulfil the learning outcomes outlined above.

Students may undertake or plan and budget for a project such as decorating a room in their home or the school, building a set for the school play, renovating an outdoor space, designing a playground, building a doll's house /model house etc. The purpose of the project is decided with the students and should incorporate real authentic data as far as practicable. The project will provide rich contexts in which students can apply the mathematics from MCS 1-5.

Students may measure space, make scale drawings or models, compare pricing for materials based on weight/volume/quantity, survey potential users, examine data represented in various ways as they fulfil the learning outcomes listed overleaf.

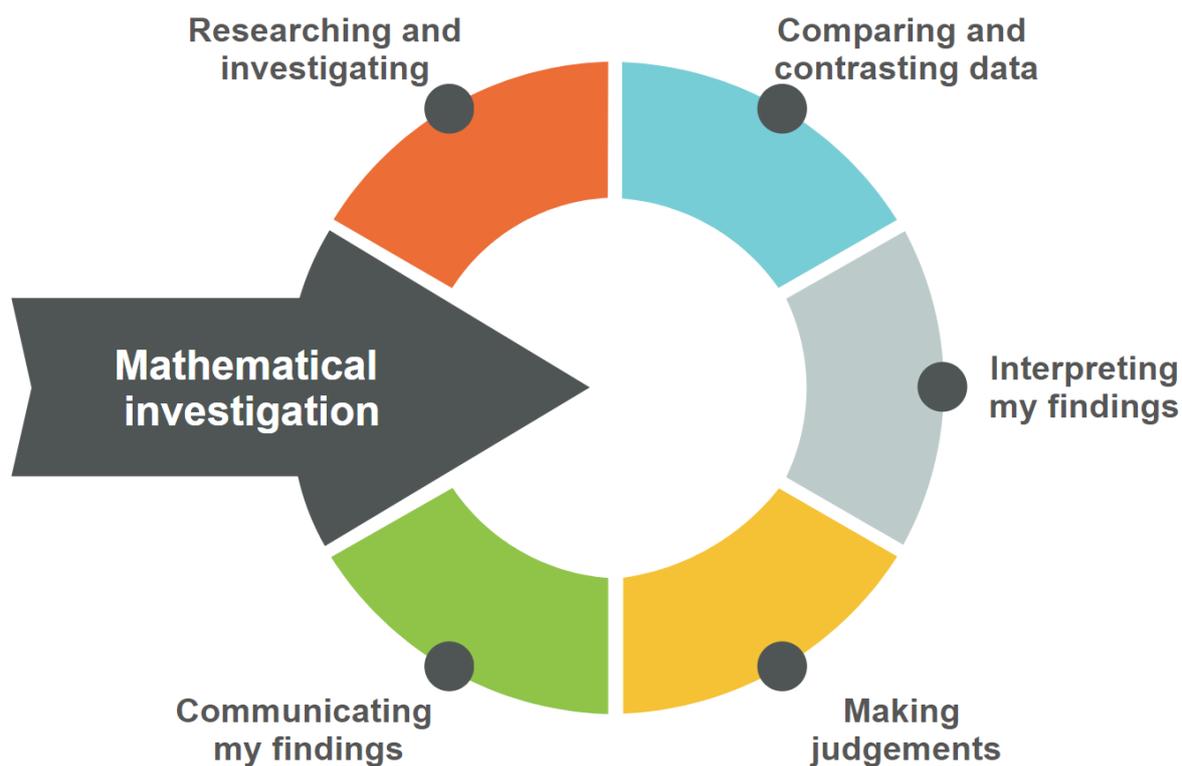
Key assignment

I have carried out a mathematical investigation into a relevant area of **mathematics and money**.

I have

- represented the situations using mathematics
- analysed the mathematical representation of situation
- interpreted and communicated the results of the analysis

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical investigation in my specified area.



Module 2: Mathematics and the World

Around Me

Purpose

Through their engagement with relevant and engaging topics students will gain experience in representing issues relating to the world around them with mathematics, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of LCA.

Aims

This module aims to provide students opportunity to

- see the relevance of mathematics to issues encountered by them in their everyday lives
- consolidate and reinforce students' mathematical knowledge and skills
- make and justify decisions with mathematics
- develop confidence in using mathematics to solve problems.

Units

Unit 1: Personal Finance

Unit 2: Travel and Recreation

Unit 1: Personal Finance

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5

Students should be able to

- compare and contrast interest rates on different loans and banking products and justify decisions made with mathematics
- interpret relevant information communicated in words/tables/charts or graphs
- investigate the financial impact of a large financial commitment

Unit 2: Travel and Recreation

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5.

Students should be able to

- research and plan a holiday to suit a particular budget
- interpret relevant information communicated in words/tables/charts and graphs
- prepare a written itinerary including costs and timings
- communicate mathematics in words/equations/calculations /graphs or charts.

Teacher Guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may fulfil the learning outcomes outlined above.

The students may investigate the financial impact of commitments such as renting accommodation, buying a car, or comparing and contrasting the financial options available to them.

The personal finance options that will provide context for the mathematics set out in MCS 1-5 might include comparison of products from various financial institutions such as post-office, credit union or bank. Rental considerations may include location comparisons, sharing options or living at home and commuting.

Car ownership may be investigated through comparisons such as new vs used, petrol vs diesel, hire purchase vs PCP. Other cost implications would include insurance and car tax rates.

When considering holidays, relevant information could include weather data, exchange rates, package deal details and special offers. Other considerations that provide context for the mathematical concepts and skills 1-5 are

- considerations of travel insurance options; yearly vs single trip cover
- timetables and the convenience afforded by different modes of transportation such as plane vs boat, car hire vs public transport
- accommodation options such as self-catering vs full board; hotel vs house rental/camping or Airbnb
- payment options such as credit card, credit union loan, save in advance and pay off in full.

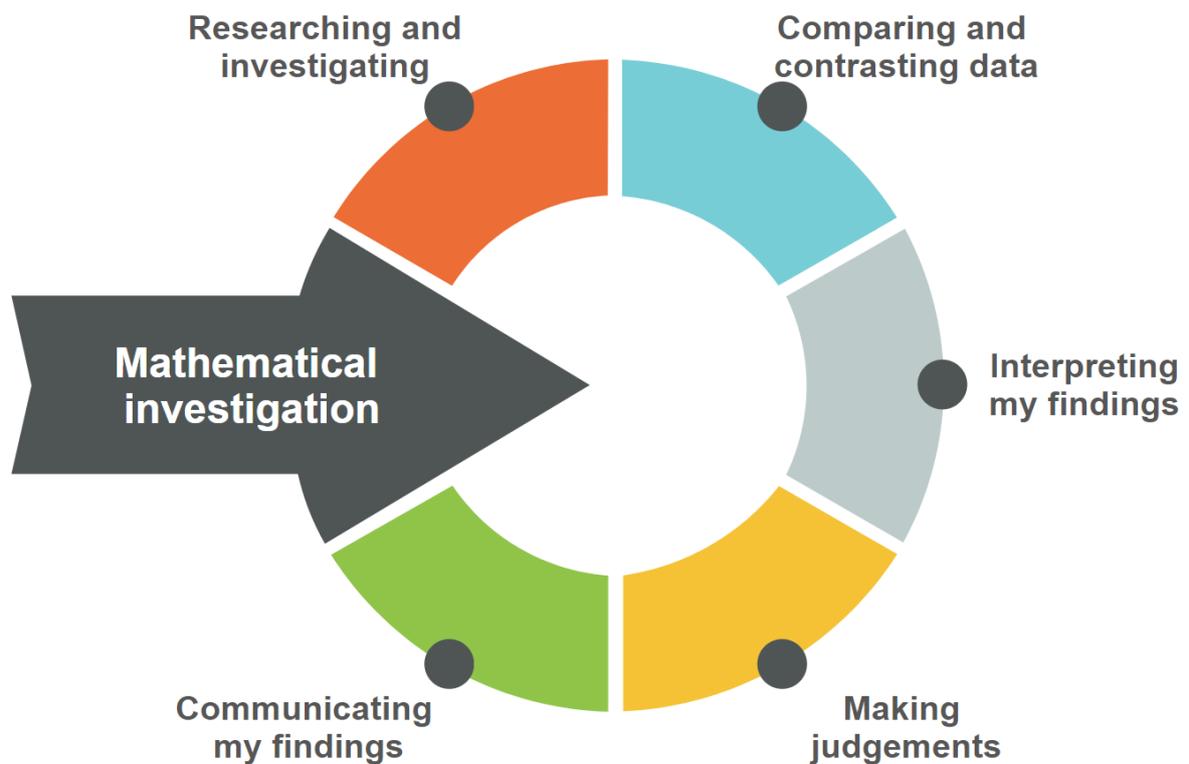
Key Assignment

I have carried out a mathematical investigation into a relevant area of **mathematics and the world around me**.

I have

- represented the situations using mathematics
- analysed the mathematical representation of situation
- interpreted and communicated the results of the analysis

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical investigation in my specified area.



Module 3: Mathematics and Life skills

Purpose

Through their engagement with relevant and engaging topics students will gain experience in representing issues relating to their local community and relevant social issues and also their leisure time, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of LCA.

Aims

This module aims to provide students opportunity to

- see the relevance of mathematics to current affairs and local issues
- see the relevance of mathematics to issues such as health management, travel and recreation.
- consolidate and reinforce students' mathematical knowledge and skills
- make and justify decisions with mathematics
- develop confidence in using mathematics to solve problems.

Units

Unit 1: Current Affairs

Unit 2: Health and Fitness

Unit 1: Current Affairs

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5.

Students should be able to

- create and interpret opinion polls or surveys
- analyse and interpret relevant information including voting data communicated in words/tables/charts or graphs
- investigate an issue and use mathematics to communicate findings.

Unit 2: Health and Fitness

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5

Students should be able to

- research and plan a healthy lifestyle choice
- interpret relevant information communicated in tables/charts or graphs
- compare and contrast different options and justify decisions made with mathematics
- use mathematical models related to health and fitness
- communicate mathematics in words/calculations /graphs or charts.

Teacher Guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may fulfil the learning outcomes outlined above.

Investigations of local, national or global issues that are timely or relevant and that provide context for the mathematics in MCS1-5 may include waste management, homelessness, shortages of commodities, hospital waiting times, the closure of a local amenity /library, hospital etc., service by public transport or school based issues such as uniform opinion polls/canteen survey/council election.

Healthy lifestyle choices that may also provide context for the mathematics set out in MCS 1-5 might include

Diet to support

- a healthy heart
- sports person
- diabetic/asthmatic

Training plan for a sporting target such as

- couch to 5k
- 5k,10k etc. run
- cycle
- triathlon
- team selection

Students may access data such as heart rate, nutrition facts, height and weight, waist-to-hip ratio, fitness app output, glycaemic index and daily nutritional information. Mathematical models they may consider include, Karvonen formula, BMI and RM-1 Muscle strength formula.

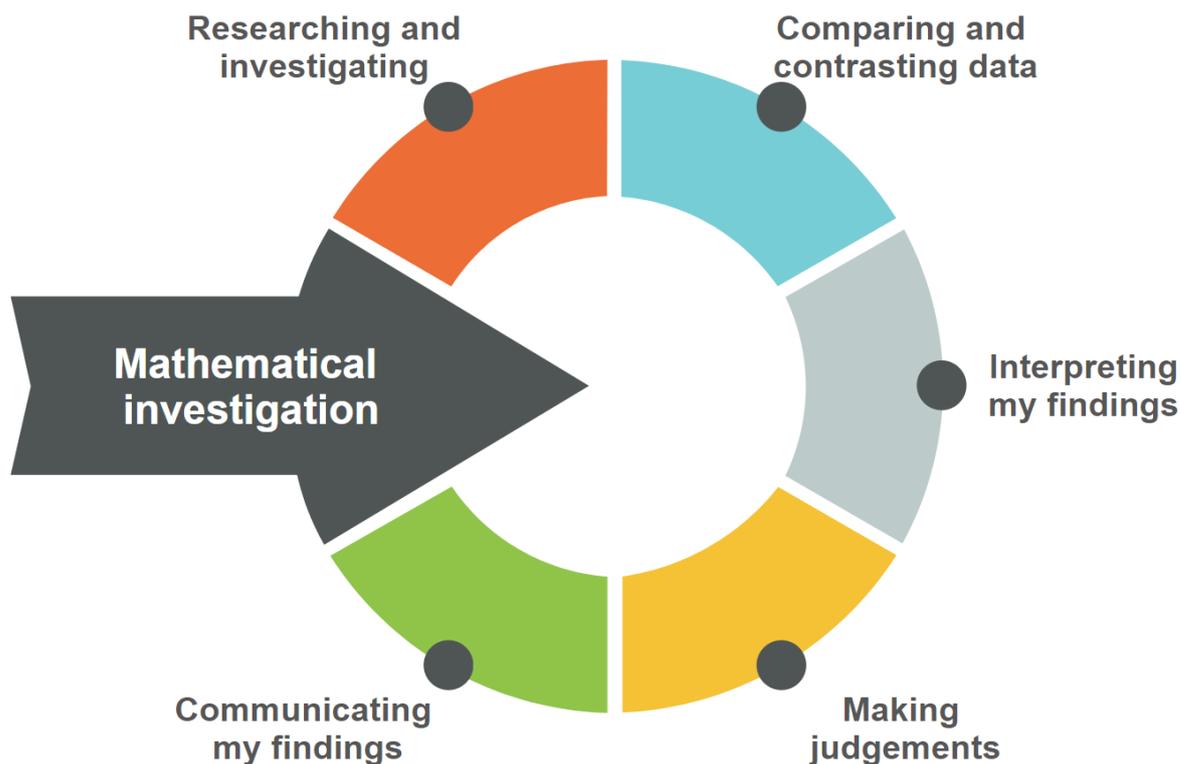
Key Assignment

I have carried out a mathematical investigation into a relevant area of **mathematics and life skills**.

I have

- represented the situations using mathematics
- analysed the mathematical representation of situation
- interpreted and communicated the results of the analysis

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical investigation in my specified area.



Module 4: Mathematics and Work

Purpose

Through their engagement with relevant and engaging topics students will gain experience in representing issues encountered by people in self-employment and small enterprises, analysing the mathematics and communicating the findings in appropriate ways. It is envisaged that this would be integrated with the mathematical work required for other tasks and assignments across the three elements of LCA.

Aims

This module aims to provide students opportunity to

- see the relevance of mathematics to issues encountered by people in self-employment and small enterprises
- consolidate and reinforce their mathematical knowledge and skills
- make and justify decisions with mathematics
- see the relevance of mathematics in their everyday lives
- develop confidence in using mathematics to solve problems

Units

Unit 1: Income and expenditure

Unit 2: Running a business

Unit 1: Income and Expenditure

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5.

Students should be able to

- analyse and interpret information about income and expenditure represented in words/equations/tables /graphs or charts
- analyse and interpret budgets and justify decisions with mathematics
- investigate the business and enterprise task and communicate their findings with mathematics
- use contextual information to calculate costs
- create an estimate for a job, including costings such as materials, labour, taxes and profit margin.

Unit 2: Running a business

Learning Outcomes

The learning in this unit is underpinned by the mathematics specified in MCS1-5

Students should be able to

- investigate the requirements for setting up a small enterprise in an area of business
- create and interpret invoices for a particular job
- analyse and interpret budgets and justify decisions with mathematics
- investigate concepts involved in running a business
- research the requirements of employers in relation to wages, time worked and holidays
- interpret relevant information communicated in words/tables/charts or graphs
- compare and contrast different job contracts and justify decisions made with mathematics
- create and interpret payslips given contextual information

- communicate mathematics in words/equations/calculations /graphs or charts.
- Investigate business issues and use data represented in words/equations/diagrams/ tables/graphs/ spreadsheets and/or charts to justify decisions with mathematics.

Teacher Guidelines

The students should have access to authentic, relevant data that allows for differentiation in the classroom (see the resources section at the end of this document for some suggestions). The following activities may fulfil the learning outcomes outlined above.

Investigations that might provide context for the mathematics in MCS 1-5 may include

Decorating a space, repairing an object, making a product or delivering a service. Information they may need access to include

- labour costs /hourly rate/ overtime rate/ salary scale
- time sheet
- tax credits / rates/other deductions
- overheads such as utilities / rent / insurance / bills etc.
- cash flow
- transport costs
- cost price / VAT
- P45/P60
- information from revenueonline.ie

There is an opportunity to link with the vocational specialism when students consider an area of business relevant for investigation.

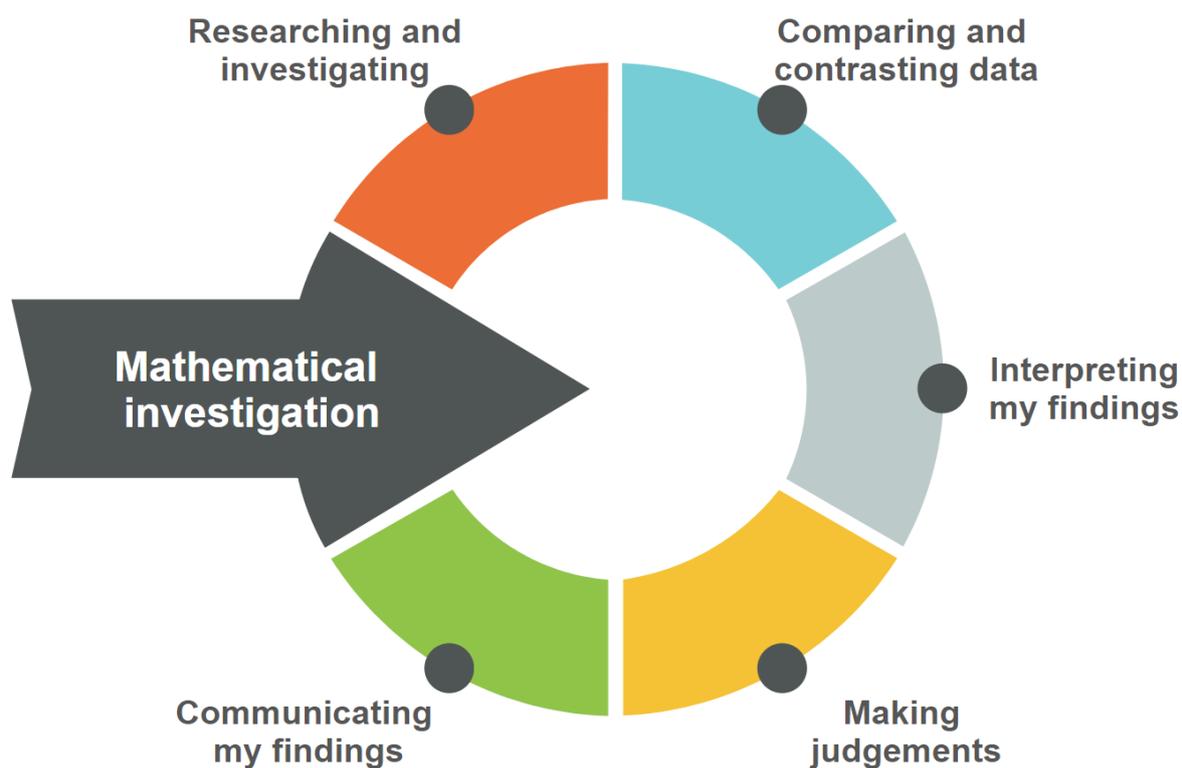
Key Assignment

I have carried out a mathematical investigation into a relevant area of **mathematics and work**.

I have

- represented the situations using mathematics
- analysed the mathematical representation of situation
- interpreted and communicated the results of the analysis.

I have collected and selected the relevant examples from my portfolio of learning to exemplify the following areas of the mathematical investigation in my specified area.



Assessment Guidelines

Assessment for Mathematical Applications is based on the aims, objectives and learning outcomes in this module descriptor. There are two assessment components:

1. Credits achieved due to attendance and completion of the key assignments for each module. (4 credits)
2. Written examination. (10 credits)

The written examination will examine the skills, knowledge and aptitude of the student on completion of the course. The written examination will be two hours long. The number of questions may vary from year to year.

Resources

The following links may be useful in sourcing authentic, relevant data for use with students:

For government datasets: <https://data.gov.ie/>

Revenue information: <https://www.revenue.ie/en/online-services/index.aspx>