This Subject will no longer be offered for Certification after 2025

L-Università ta' Malta

MATSEC
Examinations Board

SEAC 12 Syllabus

Mathematics

2025

Updated February 2024

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Introduction

This syllabus is based on the curriculum principles outlined in *The National Curriculum Framework for All* (NCF) which was translated into law in 2012 and designed using the *Learning Outcomes Framework* that identify what students should know and be able to achieve by the end of their compulsory education.

As a learning outcomes-based syllabus, it addresses the holistic development of all learners and advocates a quality education for all as part of a coherent strategy for lifelong learning. It ensures that all children can obtain the necessary skills and attitudes to be future active citizens and to succeed at work and in society irrespective of socio-economic, cultural, racial, ethnic, religious, gender and sexual status. This syllabus provides equitable opportunities for all learners to achieve educational outcomes at the end of their schooling which will enable them to participate in lifelong and adult learning, reduce the high incidence of early school leaving and ensure that all learners attain key twenty-first century competences.

This programme also embeds learning outcomes related to cross-curricular themes, namely digital literacy; diversity; entrepreneurship creativity and innovation; sustainable development; learning to learn and cooperative learning and literacy. In this way students will be fully equipped with the skills, knowledge, attitudes and values needed to further learning, work, life and citizenship.

What is Mathematics?

Mathematics is the exploration and use of patterns and relationships among quantities, together with the study of space, shape, measure, data and chance. It allows for ways of thinking and of solving problems. It provides us with effective means for investigating, interpreting, communicating, and making sense of the world in which we live. Mathematics relies on logical thinking and has universal applicability.

While the nature of mathematics is universal, the teaching approach to mathematics needs to mirror the learning styles and interests of different students. SEAC Mathematics, in particular, aims to engage students in mathematical learning through hands-on activities that are related to real life contexts. Ideally, the learning of mathematics within this approach should be linked to other curricular areas.

What does the study of Mathematics entail?

The study of mathematics does not only entail the acquisition of a body of knowledge and skills, but requires the students to engage in processes that are fundamental to mathematics.

Mathematics knowledge and skills are based on the following main strands:

1. Number: Number work enables students to develop number sense and computational fluency by understanding the way numbers are represented and the quantities they represent. It helps students to develop the ability to calculate mentally and on paper, make estimates and approximations and check the reasonableness of their results.

2. Algebra: Through Algebra students recognise patterns and relationships in mathematics and in the real world. They learn to use symbols, notation, graphs and diagrams to represent and communicate mathematical relationships and concepts.

3. Shapes, Space and Measures: Students acquire knowledge of the geometrical properties of 2-D and 3-D shapes. They develop spatial awareness and are able to recognise the geometrical properties of everyday objects. They gain knowledge and understanding of systems of measurement.

4. Data Handling and Chance: Students learn to gather, organise and analyse data and present it in tables, charts and a variety of graphs. They learn to use data to estimate the likelihood of an event occurring.

Mathematical Processes (see National Council of Teachers of Mathematics, 2000) for engaging in meaningful mathematics include:

1. Problem Solving: Students build new mathematical knowledge through problem solving. It involves applying and adapting a variety of appropriate strategies to solve problems that arise in mathematics and in other contexts.

2. Reasoning: Reasoning enables students to make and investigate mathematical conjectures. It enables students to develop mathematical arguments and appropriate justifications to support their conclusions.

3. Communication: Communication involves using the language of mathematics to express mathematical ideas precisely and coherently. It further enables students to organize and consolidate their mathematical thinking.

4. Connections: This involves understanding how mathematical ideas interconnect and build on one another. It also includes recognizing and applying mathematics in contexts outside of mathematics.

5. Representations: This includes the creation and use of representations to organize, record, and communicate mathematical ideas. Representations also serve to model and interpret physical, social, and mathematical phenomena.

Furthermore, mathematics entails developing an appreciation of the relevance of mathematics in making informed decisions in real life, and making efficient, creative and effective use of appropriate technology.

How is the subject related to candidates' lives, to Malta, and/or to the world?

Over the centuries, mathematics has contributed immensely to the fields of science, technology, architecture, engineering, commerce and art. Therefore, it is considered as an indispensable factor for the progress of humanity. Mathematics also plays a predominant role in our everyday life, as it equips us with the necessary knowledge and skills to understand and interact with the world around us.

The study of mathematics helps us develop the ability to think logically, creatively, critically and strategically. Mathematics allows us to structure and to organise, to carry out procedures flexibly, efficiently and accurately, to process and communicate information and to make informed decisions. Mathematics serves to create models, predict outcomes and assess risks, to conjecture, to justify and verify, and to seek patterns and generalisations. Mathematics is also essential to make reasonable estimates and approximations and to calculate with precision, using the most suitable degree of accuracy.

References:

National Council of Teachers of Mathematics (NCTM) (2000) *Principles and Standards for School Mathematics*. Reston, VA: NCTM.

List of Learning Outcomes

Unit 1 – Everyday Calculations
At the end of the unit, I can:

LO 1. Perform calculations related to supplies and costings.

LO 2. Work through mathematical applications related to personal care.

LO 3. Use mathematical applications in money matters.

LO 4. Apply mathematical skills in decorating spaces.

Unit 2 – Leisure
At the end of the unit, I can:

LO 1. Use mathematical applications related to travel.

LO 2. Relate statistical applications to different sport events and sport related activities.

LO 3. Work with angles in identifying geometrical shapes.

LO 4. Apply principles of probability to making predictions.

Unit 3 – Work and the Community
At the end of the unit, I can:

LO 1. Use appropriate formulae to work on packaging, labelling and storing products.

LO 2. Apply ratios to planning space.

LO 3. Apply calculations to manage finance.

LO 4. Use graphical representations to represent and interpret data arising from real life situations.

List of Subject Foci

Unit 1: Everyday Calculations

1. Material Preparation
2. Personal Care
3. Money Matters
4. Decorating Spaces

Unit 2: Leisure

1. Travel
2. Sport
3. Geometric Designs
4. Making Predictions

Unit 3: Work and the Community

1. Packaging
2. Planning Space
3. Managing Finance
4. Data Representation

Programme Level Descriptors

This syllabus sets out the content and assessment arrangements for the award of Secondary Education Applied Certificate in **MATHEMATICS** at MQF Level 1, 2 or 3. Level 3 is the highest level which can be obtained for this qualification.

Table 1 overleaf refers to the qualification levels on the Malta Qualifications Framework (MQF) with minor modifications to reflect specific **MATHEMATICS** descriptors. These are generic statements that describe the depth and complexity of each MQF level of study and outline the knowledge, skills and competences required to achieve an award at Level 1, 2 or 3 in **MATHEMATICS**.

Knowledge involves the acquisition of basic, factual and theoretical information. Skills involve the application of the acquired knowledge and understanding to different contexts. Competences indicate sufficiency of knowledge and skills that enable someone to act in a wide variety of situations, such as whether one is competent to exercise skills with or without supervision, autonomy or responsibility.

MQF Level 1	MQF Level 2	MQF Level 3
Basic general Mathematics related **knowledge** 1. Acquires basic general knowledge related to the immediate Mathematics environment and expressed through a variety of simple tools and context as an entry point to lifelong learning; 2. Knows and understands the steps needed to complete simple tasks and activities in a Mathematics environment; 3. Is aware and understands basic Mathematics tasks and instructions; 4. Understands basic Mathematics textbooks and instruction guides.	Basic factual **knowledge** of the Mathematics field of work or study. 1. Possess good knowledge of the Mathematics field of work or study; 2. Is aware and interprets Mathematics related information and ideas; 3. Understands facts and procedures in the application of basic Mathematics related tasks and instructions; 4. Selects and uses relevant Mathematics knowledge to accomplish specific actions for self and others.	**Knowledge** of facts, principles, processes and general concepts in the Mathematics field of work or study. 1. Understands the relevancy of theoretical knowledge and information related to the Mathematics field of work or study; 2. Assesses, evaluates and interprets facts, establishing basic principles and concepts in the Mathematics field of work or study; 3. Understands facts and procedures in the application of more complex Mathematics tasks and instructions; 4. Selects and uses relevant Mathematics knowledge acquired on one's own initiative to accomplish specific actions for self and others.
Basic **skills** required to carry out simple Mathematics related tasks. 1. Has the ability to apply basic Mathematics knowledge and carry out a limited range of simple tasks; 2. Has basic repetitive communication skills to complete well defined Mathematics routine tasks and identifies whether actions have been accomplished; 3. Follows instructions and be aware of consequences of basic actions for self and others.	Basic cognitive and practical **skills** required to use relevant Mathematics information in order to carry out tasks and to solve Mathematics related routine problems using simple rules and tools. 1. Has the ability to demonstrate a range of skills by carrying out a range of complex Mathematics related tasks within the Mathematics field of work or study; 2. Communicates basic Mathematics related information; 3. Ensures Mathematics related tasks are carried out effectively.	A range of cognitive and practical **skills** required to accomplish Mathematics related tasks and solve Mathematics related problems by selecting and applying basic methods, tools, materials and information. 1. Demonstrates a range of developed Mathematics skills to carry out more than one complex Mathematics related task effectively and in unfamiliar and unpredictable Mathematics contexts; 2. Communicates more complex Mathematics information; 3. Solves basic Mathematics related problems by applying basic methods, tools, materials and information given in a restricted learning environment.

MQF Level 1	MQF Level 2	MQF Level 3
Work out or study under Direct Supervision in a structured Mathematics context. 1. Applies basic Mathematics knowledge and skills to do simple, repetitive and familiar tasks; 2. Participates in and takes basic responsibility for the action of simple Mathematics tasks; 3. Activities are carried out under guidance and within simple defined timeframes; 4. Acquires and applies basic Mathematics key competences at this level.	Work or study under supervision with some autonomy. 1. Applies factual Mathematics knowledge and practical skills to do some structured tasks; 2. Ensures one acts pro-actively; 3. Carries out Mathematics related activities under limited supervision and with limited responsibility in a quality controlled Mathematics context; 4. Acquires and applies basic Mathematics key competences at this level.	Take responsibility for completion of Mathematics related tasks in work or study and adapt own behaviour to circumstances in solving Mathematics problems. 1. Applies Mathematics knowledge and skills to do some Mathematics tasks systematically; 2. Adapts own behaviour to circumstances in solving Mathematics related problems by participating pro-actively in structured Mathematics learning environments; 3. Uses own initiative with established responsibility and autonomy, but is supervised in quality controlled learning environments, normally in a Mathematics environment; 4. Acquires Mathematics key competences at this level as a basis for lifelong learning.

Learning Outcomes and Assessment Criteria

Unit 1:	**Everyday Calculations**
Subject Focus 1:	Material Preparation
Learning Outcome 1: (Coursework and Controlled)	I can perform calculations related to supplies and costings. ***Mathematics Topics:*** *Measures, Fractions, Proportion, Time Intervals, Four Rules, Finance, Rounding*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1a State the units of measure for length (m, cm, mm), mass (kg, g, mg) and/or capacity (l, ml). *E.g. dimensions of a baking tray; mass of ingredients; measuring capacity of liquid detergents; dimensions of a door, width of a walker; length of cable; measure field and crop spacing.*	1.2a Convert metric units of length (m, cm, mm), mass (kg, g, mg) and/or capacity (l, ml) to a smaller unit. *E.g. convert the dimensions of a baking tray; convert the mass of ingredients; convert the capacity of liquid ingredients; convert dimensions of a window.*	1.3a Convert metric units of length (m, cm, mm), mass (kg, g, mg) and/or capacity (l, ml) to a larger unit. *E.g. convert the dimensions of a baking tray; convert the mass of ingredients; convert the capacity of liquid ingredients; convert dimensions of a window.*
1.1b Identify the best unit of measure for length, mass and/or capacity in material preparation. *E.g. thickness of marzipan in cake covering measured in millimetres; cake dimensions measured in centimetres; width of elastic band measured in centimetres; width of a bandage in centimetres; recommended amount of water per packet of dye; identify correct size of bed sheet to the bed; weighing mass of animal feed in grams per animal.*		
1.1c Identify appropriate measuring instrument to measure length, mass and/or capacity in material preparation. *E.g. ruler; pastry chart; cups, scales; measuring jug; measuring tape.*		

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1d Use measuring instruments to measure length, mass and/or capacity in half, quarter and three quarter quantities. *E.g. 250 g of sugar; 500 g flour.*	1.2d Use measuring instruments to measure length, mass and/or capacity. *E.g. measure the dimensions of a pan; measure 70 ml of milk; measure dimensions of a window/door; measure length of a cable; measure the dimensions of tables to be set in a restaurant; weigh 300 g of rabbit concentrate pellets.*	
	1.2e Convert units of measure related to food preparation such as teaspoon, tablespoon, cups to equivalent metric measure. *E.g. 1 cup of flour is equivalent to 150 g; ½ cup of water is equivalent to 125 ml.*	
1.1f Estimate the number of items. *E.g. estimate the number of cherry tomatoes in a container; estimate the number of apples in a kilogram; estimate the number of curtain hooks on a curtain; estimate the number of seedlings per furrow.*		
1.1g Compare the length, mass and/or capacity of two objects. *E.g. compare the mass of a bag of sugar to the mass of a bag of flour; compare the mass of single bed sheets to that of double bed sheets.*	1.2g Compare the length, mass and/or capacity of an object to a specified quantity. *E.g. compare the mass of a Maltese loaf of bread to 1 kg.*	1.3g Estimate the length, mass and/or capacity of an object. *E.g. estimate the dimensions of a cake; estimate the mass of ingredients; estimate liquid amounts; estimation of the length of fabric needed for a curtain or a garment; estimate the length of a piece of wood cut from a plank.*
1.1h Equate ½, ¼, and ¾ to the corresponding decimal number. *E.g. ½ litre = 0.5 litre; ¼ kg = 0.25 kg; ½ m = 0.5 m of fabric.*	1.2h Change a fraction into a decimal number and/or vice versa, restricted to fractions with denominators that are factors of 100. *E.g. 1/5 litre = 0.2 litre; 1/10 kg = 0.1 kg.*	1.3h Change a fraction into a decimal number and/or vice versa. *E.g. 1/8 kg = 0.125 kg*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1i Find fractions of a quantity restricted to ½, ¼, and ¾. *E.g. ½ litre = ½ of 1000 ml = 500 ml.*	1.2i Find unit fractions of a quantity resulting in an integral quantity. *E.g. 1/5 of 800 g; 1/3 of 600 ml.*	1.3i Find fractions of a quantity. *E.g. 2/3 of 1200 g; 1/3 of 1 kg*
1.1j Reduce a fraction to its simplest form. *E.g. 4/6 of a pizza is equivalent to 2/3 of the pizza.*		
1.1k Find equivalent fractions of a given fraction. *E.g. ½ a crate of dozen eggs is equivalent to 6/12 of the crate.*		
1.1l Add two fractions with same denominators. E.g. *3/8 pizza + 1/8 pizza.*	1.2l Add two fractions with denominators that are multiples of each other, using equivalent fractions. *E.g. 1/4 pie + 1/8 pie.*	1.3l Add two fractions with different denominators using equivalent fractions. *E.g. 1/4 pizza + 1/3 pizza*.
1.1m Subtract two fractions with same denominators. E.g. *5/8 pizza – 3/8 pizza.*	1.2m Subtract two fractions with denominators that are multiples of each other, using equivalent fractions. *E.g. 3/4 pie – 1/8 pie.*	1.3m Subtract two fractions with different denominators using equivalent fractions. *E.g. 5/8 pizza – 1/3 pizza.*
1.1n Change an improper fraction into a mixed number and/or vice versa. *E.g. 3/2 kg = 1½ kg*	1.2n Change a mixed number into a decimal number and/or vice versa. *E.g. 5/4 litre = 1.25 litre*	
1.1o Discuss situations that involve direct proportion or non-proportionality. E.g. preparing a recipe for double the amount of people vs time required to bake two cakes of the same dimensions simultaneously; purchasing of vaccine vials for multiple animals.	1.2o Work through simple situations that involve direct proportion using the unitary method. *E.g. calculate the quantity of ingredients required for a recipe; the number of calories in a portion.*	1.3o Work through simple situations that involve direct proportion. *E.g. calculate the quantity of ingredients required for a recipe; the number of calories in a portion;* preparing a baby bottle solution for twins; *comparison of protein content amongst different animal feeds.*
1.1p Know that 60*n* minutes make up *n* hours for time intervals of up to 300 minutes.		

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1q Work out the duration of activities that start on the hour and last less than an hour. *E.g. calculate the time taken to cook pasta that is put in boiling water at 12.00 p.m. and is ready by 12.11 p.m.; work out the time a fabric is soaked in a dye.*	1.2q Work out the duration of an activity. *E.g. calculate the time taken to bake a cake that is put in the oven at 9.10 a.m. and is ready at 10.57 a.m.; Calculate time needed to complete a task involving soldering or work on a particular machine.*	
1.1r Work out the starting time and/or the finishing time using hour and/or half hour time intervals. *E.g. determine the time when baking is ready and/or the starting time.*	1.2r Work out the starting time and/or the finishing time using quarter hour time intervals. *E.g. determine the time when baking is ready and/or the starting time; determine the time when a laundry cycle is complete.*	1.3r Work out the starting time and/or the finishing time using time intervals. *E.g. determine the time when baking is ready and/or the starting time.*
1.1s Work through simple situations involving addition and/or subtraction of numbers up to three decimal places. *E.g. add ingredients of varying mass to form a mixture of a cake; calculate remaining amount of an ingredient; cost of ingredients used in preparing a meal; calculate remaining fabric left after a piece of fabric is used; cost of upgrading a computer system.*		
1.1t Work through simple situations involving multiplication or division of numbers (up to three decimal places) by integral values. *E.g. share costs of a meal.*	1.2t Work through simple situations involving a combination of any of the four operations. *E.g. find the total cost of ingredients required to prepare a meal; find the total cost of making a cushion; production cost of crop involving seedlings, fertiliser and water.*	1.3t Work through situations, consisting of more than one operation, involving best value for money and/or best buy. *E.g. calculating which item is the best value for money; calculate which item is the best buy.*
1.1u Round any quantity to the nearest ten, hundred and/or thousand. *E.g. round mass of an ingredient to identify the most appropriate product size to be bought.*	1.2u Round any decimal number up to three decimal places to the nearest hundredth or to the nearest whole number. *E.g. round lengths to the nearest whole; round monetary values to two decimal places; round the amount of fabric needed to the nearest whole metre, taking into consideration less waste of material.*	1.3u Round numbers to make approximations. *E.g. round the cost of individual products to make an approximation of the total cost; round the lengths of fabric needed and the cost per metre to make an approximation of the total cost.*

Unit 1:	**Everyday Calculations**
Subject Focus 2:	Personal Care
Learning Outcome 2: (Coursework and Controlled)	I can work through mathematical applications related to personal care. ***Mathematics Topics:*** *Measures, Comparing Numbers, Time Intervals, Proportion, Four Rules, Frequency Tables, Pictographs, Line Graphs*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
2.1a State the units of measure for length (km, m, cm) mass (kg, g, mg), capacity (l, ml) and/or temperature (°C, °F). *E.g. distance covered in a fun run; the mass of a person in kg; medicine dosages in mg and ml.*	2.2a Convert metric units of length (m, cm), mass (kg, g, mg) and/or capacity (l, ml) to a smaller unit. *E.g. the height of a person; medicine dosages.*	2.3a Convert metric units of length (km, m, cm, mm), mass (kg, g, mg) and/or capacity (l, ml) to a larger unit. *E.g. the height of a person, medicine dosages in mg and ml.*
2.1b Identify the best unit of measure for height, mass, capacity and/or temperature. *E.g. recommended amount of drinking water per day in litres; recommended medication dosage for a baby given in ml; body temperature measured in degrees Celsius or Fahrenheit.*	2.2a Convert metric units of length (m, cm), mass (kg, g, mg) and/or capacity (l, ml) to a smaller unit. *E.g. the height of a person; medicine dosages.*	2.3a Convert metric units of length (km, m, cm, mm), mass (kg, g, mg) and/or capacity (l, ml) to a larger unit. *E.g. the height of a person, medicine dosages in mg and ml.*
2.1c Identify appropriate measuring instrument to measure height, mass, capacity and/or temperature. *E.g. measuring tape; bathroom scales; measuring cylinder; thermometer.*		
2.1d Use measuring instruments to measure height, mass and/or capacity in half, quarter and three quarter measures. *E.g. use bathroom scales to measure mass of a person; use a medicine spoon to measure medicine dosage.*	2.2d Use measuring instruments to measure the height, mass, capacity and/or temperature. *E.g. use a measuring tape to measure height of a person; use a thermometer to measure the body temperature.*	
	2.2e Compare the height, mass and/or capacity of a person/object to a specified quantity. *E.g. compare the height of a person to 1.5 m.*	2.3e Estimate height, mass and/or capacity. *E.g. estimate the height of a person; estimate the mass of a baby, teenager or adult; estimate the capacity of a water bottle; estimate the temperature of a body.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
2.1f Compare whole numbers using symbols <, > or =. *E.g. compare the mass of a person with his ideal mass.*	2.2f Compare decimal numbers up to 2 decimal places using symbols <, >, ≤, ≥ or =. *E.g. compare blood glucose level with a previous record; compare readings read by a sensor.*	2.3f Compare a decimal number up to 2 decimal places with a recommended range of values. *E.g. compare a blood glucose level with a recommended range of values.*
2.1g Work through situations that involve hour and/or half hour intervals. *E.g. work out medication times.*	2.2g Work through situations that involve quarter and/or three quarter hour time intervals. *E.g. determine the time taken to apply successively two beauty treatments of three quarter hours each.*	2.3g Work through situations that involve time intervals. *E.g. work out medication times.*
	2.2h Work through situations that involve direct proportion using the unitary method. *E.g. calculate the nutritional value of a quantity of a food product.*	2.3h Work through situations that involve direct proportion. *E.g. calculate exercise time required to burn an amount of calories; calculate the nutritional value of a quantity of a food product.*
2.1i Work through simple situations involving addition and/or subtraction of numbers up to three decimal places. *E.g. calculate total calorie intake; calculate loss in mass.*		
2.1j Work through simple situations involving multiplication or division of numbers (up to three decimal places) by integral values. *E.g. work out the medicine dosage required for 7 days.*	2.2j Work through simple situations involving a combination of any of the four operations. *E.g. find the amount of tablets remaining from a box of 24 tablets after taking 3 tablets daily for 7 days.*	2.3j Work through situations, consisting of more than one operation, involving best value for money and/or best buy. *E.g. compare the cost of different gym packages; compare the cost of upgrading a computer system.*
2.1k Interpret data from frequency tables with ungrouped discrete data. *E.g. interpret a frequency table representing the number of people visiting different clinics on a particular day.*	2.2k Interpret data from frequency tables with grouped discrete data. *E.g. interpret a frequency table representing the number of people in wards in a hospital.*	2.3k Interpret data from frequency tables with grouped continuous data. *E.g. interpret a frequency table representing the number of people by height, grouped in 10 cm intervals.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
2.1l Construct a frequency table with ungrouped discrete data. *E.g. construct a frequency table representing the number of people visiting different clinics on a particular day; construct a table representing the types of food customers select at a particular restaurant.*	2.2l Construct a frequency table with grouped discrete data. *E.g. construct a frequency table representing the number of people in wards in a hospital.*	2.3l Construct a frequency table with grouped continuous data. *E.g. construct a frequency table representing the number of people by height, grouped in 10 cm intervals.*
2.1m Interpret a pictograph where the symbol represents any number of units. *E.g. interpret a pictograph representing the number of people visiting different clinics on a particular* ***day.***		
2.1n Draw a pictograph where the symbol represents 1, 2 or 10 units. *E.g. draw a pictograph representing the number of people visiting different clinics on a particular day.*	2.2n Draw a pictograph where the symbol represents a number of units. *E.g. draw a pictograph representing the number of people visiting different clinics on a particular day.*	2.3n Draw a pictograph where the symbol represents any number of units, and the categories represent intervals. *E.g. draw a pictograph representing the number of people entering a health shop over a period of time in 15 minutes intervals.*
2.1o Read a line graph. *E.g. indicate the number of people visiting a gym in a particular month from a line graph.*	2.2o Interpret a line graph. *E.g. interpret a line graph representing the number of people visiting a gym over twelve months.*	2.3o Interpret a line graph consisting of two line graphs. *E.g. interpret a line graph representing the number of males and the number of females visiting a gym over twelve months.*
2.1p Label the scales of a line graph. *E.g. label the scales of a line graph representing the number of people visiting a gym over a number of months.*	2.2p Draw a line graph. *E.g. draw a line graph representing the number of people visiting a gym over twelve months.*	2.3p Draw two line graphs on the same diagram. *E.g. on the same diagram, draw a line graph representing the number of males and a line graph representing the number of females visiting a gym over twelve months.*

Unit 1:	**Everyday Calculations**
Subject Focus 3:	Money matters
Learning Outcome 3: (Coursework and Controlled)	I can use mathematical applications in money matters. ***Mathematics Topics:*** *Writing numbers in words, Percentages, Percentage Increase and Decrease, Bills, Selling Price and Cost Price, VAT, Utility Bills.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
3.1a Convert euro to cent and/or vice versa. *E.g. convert price of a hardware materials to cents.*		
3.1b Work through situations that involve finding the correct change. *E.g. giving the correct change at a restaurant.*		
3.1c Recognise the place value of any digit in a whole number up to one million.		
3.1d Read whole numbers up to 1000 in figures and words. *E.g. read amounts on a cheque book; read amounts of stock on a stock list in a laundry; read numbers found on a requisition form*	3.2d Read numbers in figures and/or words up to one hundred thousand. *E.g. read amounts on a cheque book.*	
3.1e Write whole numbers up to 1000 in figures and words. *E.g. fill in a cheque book; fill in a requisition form; fill in a housekeeping checklist*	3.2e Write numbers in figures and/or words up to one hundred thousand. *E.g. fill in a cheque book.*	
3.1f Associate 25% to a quarter, 50% to one half, 75% to three quarters and/or vice versa. *E.g. apply to a financial context such as discounts.*		
	3.2g Convert a fraction, which has a denominator which is a factor of 100, to an integral percentage and/or vice versa.	3.3g Convert a fraction to a percentage and/or vice versa.
	3.2h Convert a decimal number to an integral percentage and/or vice versa.	3.3h Convert a decimal number to a percentage and/or vice versa.

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	3.2i Find the percentage of a quantity resulting in an integral quantity. *E.g. calculate the deposit paid on a purchase.*	3.3i Find the percentage of a quantity. *E.g. calculate the VAT paid on a purchase.*
		3.3j Express a quantity as a percentage of a larger quantity. *E.g. calculate the discount as a percentage of the original price.*
	3.2k Find percentage increase and/or percentage decrease. E.g. *calculate the VAT paid on purchasing an item.*	3.3k Work through situations, related to everyday calculations, involving percentage increase and/or decrease. *E.g. calculate the price including VAT; calculate the discounted price.*
3.1l Work through situations related to budgeting. *E.g. calculate the cost of paying for an item in instalments; work out bills related to online shopping; work out costs including material and labour.*	3.2l Work through situations related to budgeting that involve percentages. *E.g. calculate the cost of paying for an item in instalments with an initial percentage deposit; work out invoices for a number of items including VAT.*	3.3l Work through situations related to best value for money and/or best buy that involve percentages. *E.g. compare costs when paying in full for an item vs paying in instalments with an initial percentage deposit; compare electricity consumption of different brands of the same product.*
	3.2m Work out calculations related to utility bills.	
3.1n Discuss the reasonableness of an answer when working through situations. *E.g. discuss the reasonableness of the answer obtained from working out a bill.*		

Unit 1:	**Everyday Calculations**
Subject Focus 4:	Decorating Space
Learning Outcome 4: (Coursework and Controlled)	I can apply the skills of mathematics to decorating space. ***Mathematics Topics:*** *Measure, Square Numbers, Formulae (related to perimeter and area), Perimeter, Area, Tessellations, Finance*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
4.1a State the units of measure for length (m, cm, mm), mass (kg, g) and/or area (cm^2, m^2). *E.g. units used for length of curtain material, units used for area to be developed into a garden.*	4.2a Convert metric units of length (m, cm, mm) to a smaller unit. *E.g. convert dimensions of a room from metres to centimetres.*	4.3a Convert metric units of length (m, cm, mm) to a larger unit. *E.g. convert the dimensions of a tile from millimetres to centimetres.*
4.1b Identify the best unit of measure for length mass and/or area. *E.g. measure the dimensions of a room, the thickness of table top, and amount of cement.*		
4.1c Identify appropriate measuring instrument to measure length and/or mass. *E.g. instrument to measure different lengths such as the dimensions of a garden, width of water pipes; width of wall trunking.*		
4.1d Generate the first ten square numbers. *E.g. calculate the area of a square shaped room of side 4 m.*	4.2d Work out the square of any number using a calculator. *E.g. calculate the area of a square shaped flower bed given the length of its side.*	
	4.2e State without the use of a calculator the square root of squares up to 100. *E.g. calculate the length of one side of a square shaped plot having an area of 81 square metres.*	

	4.2f Find the square root of any number using a calculator. *E.g. calculate the length of one side of a square carpet given its area.*	
	4.2g Simplify linear algebraic expressions by collecting like terms. *E.g.* $l + l + l + l = 4l$ or $l + l + b + b = 2l + 2b$ *in the context of finding the perimeter*	
	4.2h Simplify linear algebraic expressions by multiplying a variable with an integer. *E.g.* perimeter of a square is represented by the expression 4 × length or $4l$.	
4.1i Calculate the perimeter of regular and/or irregular shapes by adding lengths of sides. *E.g. calculate the length of cornice required for an irregularly shaped room.*	4.2i Calculate the perimeter of squares and other regular polygons, by multiplying the length of side by the number sides. *E.g. calculate the length of edge binding of a hexagonal carpet.*	
	4.2j Calculate the perimeter of a rectangle using an appropriate formula. *E.g. calculate the length of coving required for a room.*	
4.1k Find the area of squares and/or rectangles by counting unit squares on a grid. *E.g. find the area of a rectangular room on a plan; find the area of restaurant tables.*	4.2k Estimate the area of regular and/or irregular shapes by counting unit squares on a grid. *E.g. find the area of an irregularly shaped garden on a plan.*	
4.1l Work out the area of squares and/or rectangles by using the formula: Area = length × breadth. *E.g. calculate the area of carpet required.*		

4.1m Work out the area of a right-angled triangle by considering it as half a rectangle. *E.g. calculate the area of a triangular space in a garden.*	4.2m Work out the area of a triangle, using the formula: Area = ½ (base × height) *E.g. calculate the area of a triangular space in a garden.*	
	4.2n Work out the area of compound shapes limited to squares and/or rectangles. *E.g. calculate the area of an L-shaped corridor.*	4.3n Work out the area of compound shapes that include squares, rectangles and/or right-angled triangles. *E.g. calculate the area of a space.*
		4.3o Calculate a missing quantity through substitution and/or manipulation of values in a formula. *E.g. find the length of a plot given the area and breadth or given the perimeter and breadth.*
	4.2p Change the subject of a formula using one operation. *E.g. make the length subject of the formula in the formula for the area of a rectangle.*	4.3p Change the subject of a formula using one or two operations. *E.g. make the length subject of the formula in the formula for the perimeter of a rectangle.*
		4.3q Create tessellating shapes. *E.g. design the shape of a tile that can tessellate; design the background of a game using tessellating shapes.*
		4.3r Draw a tessellation using one or two given shapes. *E.g. apply tessellations to tile arrangement; apply tessellations to a game background.*

4.1s Work through simple situations involving addition and/or subtraction of numbers up to three decimal places. *E.g. calculate the total cost of paving a yard, given the cost of material and the cost of labour.*		
4.1t Work through simple situations involving multiplication or division of numbers (up to three decimal places) by integral values. *E.g. calculate the cost of electrical cables needed given the length of cable and its price per metre; calculate the cost of one socket given the total cost of 8 sockets.*	4.2t Work through simple situations involving a combination of any of the four operations. *E.g. calculate the total cost of paving a yard, given the cost of material (cost of tiling quoted per square metre) and the cost of labour (quoted per hour); calculate the total cost of electrical conduit, fittings and wires needed to install electricity in a room.*	4.3t Work through situations, consisting of more than one operation, involving best value for money and/or best buy. *E.g. compare the cost (material and labour) of tiling a room using 30 cm X 30 cm tiles to the cost of using 60 cm x 60 cm tiles.*

Unit 2:	Leisure
Subject Focus 1:	Travel
Learning Outcome 1: (Coursework and Controlled)	I can use mathematical applications related to travel. **Mathematics Topics:** *Time, Time-tables, Currency Conversion, Finance, Angles, Three-figure bearings, Directed Numbers.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1a Convert between larger and smaller units of time (hours, minutes and seconds) limited to half and quarter units. *E.g. convert 2 hours to minutes; convert 75 seconds to minutes and seconds.*	1.2a Convert between larger and smaller units of time (days, hours, minutes and seconds). *E.g. convert 2.4 hours to minutes.*	
1.1b Read time to the hour/half hour/quarter hour using terms 'o'clock', 'half past', 'quarter past', and/or 'quarter to'. *E.g. read the flight departure time.*		
1.1c Write time to the hour/half hour/quarter hour using terms 'o'clock', 'half past', 'quarter past', and/or 'quarter to'. *E.g. write the flight departure time.*		
1.1d Read the time using the 12-hour time format (analogue and/or digital) to 1 minute using the terms 'past' and/or 'to'. *E.g. read the flight departure time in analogue or digital.*		
1.1e Write the time using the 12-hour time format (analogue and/or digital) to 1 minute using the terms 'past' and/or 'to'. *E.g. write the flight departure time in analogue or digital.*	1.2e Use the 12-hour time format (digital and/or analogue). *E.g. use the 12-hour time format to calculate the time spent at a museum; use the 12-hour time format to take reservations at a restaurant.*	

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1f Convert time in 24-hour format to 12-hour format and/or vice versa. *E.g. read the departure time of a flight given in 24-hour time format.*	1.2f Use the 24-hour time format. *E.g. order departure times of flights given in 24-hour time format; use the 24-hour time format to take reservations at a restaurant.*	
1.1g Interpret a time table and/or a timeline. *E.g. use airport departures/arrivals time table, bus schedules, etc.; interpret a travel itinerary.*	1.2g Interpret a calendar. *E.g. identify the departure date for a holiday abroad and the return date; use a calendar to take bookings at a venue.*	
1.1h Work out the duration of a time interval, the starting time and/or the finishing time. *E.g. calculate the waiting time between flights; calculate the duration of a train journey.*		1.3h Determine time intervals in hours and minutes that involve different time zones. *E.g. calculate the duration of a flight between different time zones.*
1.1i Estimate time using seconds, minutes and/or hours. *E.g. estimate time taken to drive from one country to another.*	1.2i Determine time intervals in minutes, hours and/or days. *E.g. work out the number of days on holiday; work out travelling time in hours and minutes.*	
1.1j Solve word problems involving addition and subtraction of time given in hours and minutes. *E.g. calculate the total travelling and waiting time taken when boarding two flights.*	1.2j Solve word problems involving addition and subtraction of time given in days, hours, minutes and seconds. *E.g. calculate the remaining time to reach a destination.*	
	1.2k Use published exchange rates to convert from one currency to another. *E.g. convert the price of an item from one currency to another.*	
1.1l Work through situations related to travel involving, addition, subtraction, multiplication and/or division of numbers. *E.g. calculate the shortest route when travelling between different cities; calculate the total cost of a holiday using a brochure.*	1.2l Work through situations related to travel involving proportion. *E.g. calculate the cost of accommodation for a number of people staying in a single/twin/triple room.*	1.3l Work through situations related to costs involved in travel. *E.g. calculate the cheapest and/or the more feasible mode of travelling between different cities; compare costs of different holiday packages or travel offers.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1m Distinguish between right, left, up and down in giving directions.		
1.1n Define an angle as a measure of turn.		
1.1o Describe a whole turn in terms of 4 right angles, half a turn in terms of 2 right angles and/or a quarter turn in terms of 1 right angle.		
1.1p Describe clockwise and anti-clockwise turns.		
1.1q Use whole turns, half turns and/or quarter turns in giving directions. *E.g. give the directions from one place to another on a map using whole, half and quarter turns.*		
1.1r Identify acute, right and/or obtuse angles.	1.2r Identify reflex angles.	1.3r Identify angles that go beyond one rotation. *E.g. the angle the minute hand turns in two and a half hours.*
1.1s Estimate angles up to 180°. *E.g. estimate angle of turn in indicating the direction of sail of a boat.*	1.2s Estimate angles up to 360°. *E.g. estimate angle of turn in indicating the direction of sail of a boat.*	
1.1t Sketch angles up to 180°. *E.g. sketch an angle to indicate direction.*	1.2t Sketch angles up to 360°. *E.g. sketch an angle to indicate direction.*	
1.1u Measure angles up to 180° with a protractor with a margin of error of $\pm$ 5°. *E.g. estimate angle of turn in indicating the direction of sail of a boat.*	1.2u Measure angles up to 360° with a protractor. *E.g. estimate angle of turn in indicating the change in the direction of sail of a boat.*	
1.1v Draw angles up to 180° with a protractor with a margin of error of $\pm$ 5°.	1.2v Draw angles up to 360° with a protractor.	

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1w Label the eight compass points. *E.g. label the compass point that indicates the direction in which a ship is sailing; label the wind direction.*		
1.1x Use the angle between the different eight compass directions to indicate change in direction. *E.g. find the angle a person turns through when facing NE from facing NW; indicate the new direction a person is facing when making a half turn from facing SE.*		
		1.3y Interpret three-figure bearings. *E.g. identify the location of a city with respect to another city using three-figure bearings.*
		1.3z Use three-figure bearings. *E.g. use three-figure bearings to describe the position of a ship with respect to a landmark on land.*
	1.2aa Associate a directed number to a real life situation such as temperature, floor level, etc.	
	1.2ab Represent directed numbers on a number line. *E.g. represent temperatures (involving below zero temperatures) in different countries on a number line.*	
	1.2ac Add directed numbers. *E.g. The temperature in Moscow is -10°C. The temperature in Paris is 14°C higher. What is the temperature in Paris?*	
	1.2ad Subtract directed numbers. *E.g. calculate the difference between the temperatures (involving below zero temperatures) of two cities.*	

Unit 2:	**Leisure**
Subject Focus 2:	Sport
Learning Outcome 2: (Coursework and Controlled)	I can relate statistical applications to different sport events and sport related activities. ***Mathematics Topics:*** *Measure, Ordering Numbers, Measures of Central Tendency, Speed.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
2.1a Identify the best unit of measure for length, mass and/or time related to different sporting events. *E.g. the length of an Olympic-size swimming pool; the distance covered in a marathon; time taken to run a 100 metre race; time taken to run a 10K marathon.*		
2.1b Identify appropriate measuring instrument to measure length, mass and/or time in different sporting events. *E.g. measure the length of the ground using a trundle wheel; measuring time using a stopwatch.*		
2.1c Use measuring instrument to measure time using minutes and/or seconds. *E.g. using a stopwatch.*		
		2.3d Estimate length, mass and/or time related to different sporting events. *E.g. estimate the jump length in long jump; estimate the time taken to run around a running track once.*
2.1e Order whole numbers. *E.g. order scores obtained by a football team; order results of a weightlifting event.*		
2.1f Recognise the place value of tenths and hundredths written in decimal form.	2.2f Recognise the place value of tenths, hundredths and thousandths written in decimal form.	

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
2.1g Order decimal numbers of up to 3 decimal places. *E.g. order results of a swimming event.*		
2.1h Find the mean of a set of ungrouped data. *E.g. calculate the mean time for an athlete to complete a 100 m race, given a number of recorded times.*	2.2h Find the mean of a set of ungrouped data given the occurrence of outliers (including within a sport context). *E.g. finding the mean of time measurements after removing outlier value/s.* *E.g. (sport context) calculate the mean of an athlete's score in diving, after dismissing the highest and lowest scores.*	2.3h Find the mean of a set of ungrouped data from a frequency table. *E.g. calculate the mean number of goals a team scores per game in a tournament.*
	2.2i Differentiate between mean, mode and median of a set of ungrouped data.	
	2.2j Find the median of a set of ungrouped data. *E.g. find the median leap of an athlete from a set of recorded leaps in long jump*	2.3j Find the median of a set of ungrouped data from a frequency table. *E.g. find the median height of a group of athletes*
	2.2k Find the mode of a set of ungrouped data. *E.g. find the most commonly sold size from a set of sportswear sizes sold at a sportswear shop.*	2.3k Find the mode of a set of ungrouped data from a frequency table. *E.g. find the most commonly sold size from a set of sportswear sizes represented in a frequency table.*
		2.3l Identify the best measure of central tendency to use in different situations. *E.g. decide whether it is better to use mean or median in the occurrence of outliers; decide on the best measure of central tendency when stocking sportswear.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	2.2m Find the range of a set of ungrouped data. *E.g. calculate the range of sizes of a particular sportswear; calculate the range of ages of players in a team.*	
2.1n Formulate a simple linear formula in words related to sport. *E.g. write the formula for speed in words i.e. speed = distance/time*	2.2n Formulate a simple linear algebraic formula related to sport. *E.g. write the algebraic formula for speed i.e. s = d/t.*	
2.1o Substitute positive values in a simple formula in words. *E.g. calculate the speed by substituting values for distance and time in the formula for speed in words.*	2.2o Substitute positive values in a simple algebraic formula. *E.g. calculate the speed by substituting values for distance and time in the formula for speed.*	
	2.2p Solve linear equations related to sport involving one unknown on one side. *E.g. find the time taken to run a given distance at a particular speed using the formula for speed.*	
	2.2q Change the subject of a formula using one operation. *E.g. make t (time) the subject of the formula s= d/t.*	2.3q Change the subject of a formula that uses one or two operations. *E.g. finding the number of games won (w) by a football team using the formula P = 3w + d, given the total number of points (P) and the number of games drawn (d).*

Unit 2:	**Leisure**
Subject Focus 3:	Geometrical Designs
Learning Outcome 3: (Coursework and Controlled)	I can work with angles in identifying geometrical shapes. ***Mathematics Topics:*** *Angles, Angles in Parallel Lines, Symmetry, Triangles, Quadrilaterals, Polygon.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
3.1a Explain why angles on a straight line add up to 180°.		
3.1b Work out the size of missing angle/s in a diagram showing angles on a straight line.		
3.1c Work out the size of missing angle/s in a right angle.		
3.1d Explain why the angles around a point add up to 360°.		
3.1e Work out the size of missing angle/s in diagrams showing angles at a point.		
3.1f Recognise examples of horizontal and/or vertical lines in a geometrical design.		
3.1g Distinguish between horizontal and/or vertical lines.		

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
3.1h Recognise examples of parallel lines in a geometrical design.		
3.1i Draw examples of parallel lines on a square grid. *E.g. create geometric designs using parallel lines.*	3.2i Draw examples of parallel lines in a number of different orientations. *E.g. create geometric designs using parallel lines.*	
3.1j Recognise examples of perpendicular lines in a geometrical design.		
3.1k Draw examples of perpendicular lines on a square grid. *E.g. create geometric designs using perpendicular lines.*	3.2k Draw examples of perpendicular lines in a number of different orientations. *E.g. create geometric designs using perpendicular lines.*	
	3.2l Explain what a transversal is in relation to a set of parallel lines.	
	3.2m Recognise examples of transversals drawn across a set of parallel lines in a geometric design.	
	3.2n Draw examples of transversals across a set of parallel lines. *E.g. create geometric designs using parallel lines and transversals.*	
	3.2o Recognise vertically opposite angles within a pair of intersecting lines in a geometrical design.	3.3o Work out the size of missing angles in geometric designs involving vertically opposite angles.

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	3.2p Recognise alternate angles within sets of parallel lines and transversals in a geometrical design.	3.3p Work out the size of missing angles in geometric designs involving alternate angles.
	3.2q Recognise corresponding angles within sets of parallel lines and transversals in a geometrical design.	3.3q Work out the size of missing angles in geometric designs involving corresponding angles.
	3.2r Recognise interior angles within sets of parallel lines and transversals in a geometrical design.	3.3r Work out the size of missing angles in geometric designs involving interior angles within sets of parallel lines and transversals.
3.1s Identify lines of symmetry in simple 2D shapes and pictures.	3.2s Identify lines of symmetry in 2D shapes, pictures and geometric designs.	
3.1t Draw lines of symmetry in simple 2D shapes and pictures.	3.2t Draw lines of symmetry in 2D shapes, pictures and geometric designs.	
3.1u Complete symmetrical patterns given one line of symmetry.	3.2u Complete symmetrical patterns given two lines of symmetry at right angles.	
3.1v Recognise that any 2D shape with three sides is a triangle. *E.g. recognise triangles in a geometric design.*		
3.1w Translate a simple 2D shape left, right, up and down on a grid.		
3.1x Describe a translation of a simple 2D shape using the terms left, right, up and down on a grid.		

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	3.2y Draw the rotation of a simple 2D shape about any vertex of the shape and/or about the origin by angles of 90° and/or 180° using transparency or otherwise.	
	3.2z Describe the rotation of a simple 2D shape about any vertex of the shape and/or about the origin by angles of 90° and/or 180°.	
3.1aa Classify a triangle as being either a scalene triangle, or an isosceles triangle, or an equilateral triangle, or a right-angled triangle according to the length of its sides and/or the size of its angles. *E.g. identify different types of triangles in a geometric design.*		3.3aa Justify that a triangle is either scalene, isosceles or equilateral making reference to its reflective symmetry properties. *E.g. provide reason/s to classify the type of triangles used in a geometric design.*
3.1ab State that the sum of the interior angles of a triangle is 180˚.		
3.1ac Work out the size of missing interior angles in a triangle.		
3.1ad Recognise that any 2D shape with four sides is a quadrilateral. *E.g. recognise quadrilaterals in a geometric design.*		
3.1ae Classify a four-sided shape as being either a square, or a rectangle according to the length of its sides. *E.g. identify squares and rectangles in a geometric design.*	3.2ae Classify a four-sided shape as being either a square, or a rectangle, or a rhombus, or a parallelogram, or a trapezium, or a kite, or none of these, according to the length of its sides and the size of its angles. *E.g. identify different types of quadrilaterals in a geometric design.*	3.3ae Classify a four-sided shape as being either a square, or a rectangle, or a rhombus, or a parallelogram, or a trapezium, or a kite according to its reflective symmetry properties. *E.g. identify different types of quadrilaterals in a geometric design.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	3.2af State that the sum of the interior angles of a quadrilateral is 360˚.	
	3.2ag Work out the size of missing interior angles in a quadrilateral.	
3.1ah Name a polygon using the number of sides (from 3 to 10 sides).		
3.1ai Classify polygons using properties linked to the number of sides and/or the number of interior angles. *E.g. identify different polygons in a geometric design.*		
3.1aj Distinguish between a regular and irregular polygon in a geometric design.	3.2aj Define a regular polygon as a polygon with all sides equal and all interior angles equal.	
		3.3ak State the symmetrical properties of a regular polygon in terms of reflective symmetry.
		3.3al Find the sum of the interior angles of any polygon by dividing the shape in a number of triangles and/or quadrilaterals.
		3.3am Find the missing interior angles using the sum of the interior angles of a polygon.
		3.3an State that the sum of the exterior angles of any polygon is 360°.
		3.3ao Find the missing exterior angles using the sum of the exterior angles of a polygon.
		3.3ap Investigate whether one or two polygons can be used to create a tessellation.

Unit 2:	**Leisure**
Subject Focus 4:	Making Predictions
Learning Outcome 4: (Coursework and Controlled)	I can apply principles of probability to making predictions. ***Mathematics Topics:*** *Probability*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	4.2a Mention events that are certain to happen and others that will not. *E.g. Wednesday follows Tuesday is an event that its certain to happen; getting 7 when throwing a die numbered from 1 to 6 is an impossible event.*	
	4.2b Describe events as certain, very likely, likely, equally likely (even chance), unlikely, very unlikely and/or impossible. *E.g. it is very unlikely to win a lottery if I buy one ticket from one thousand tickets on sale.*	
	4.2c Deduce that the probability of a certain event is 1 and the probability of an impossible event is 0.	
	4.2d Estimate the probability of an event by experiment. *E.g. the probability of getting a 6 when throwing a die by throwing a die 50 times.*	
	4.2e Identifying the set of all possible outcomes of a single event. *E.g. the possible outcomes that arise from throwing a six-sided die with the numbers 1, 1, 2, 3, 3, 3 on its sides is 1, 2 and 3.*	

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	4.2f Determine the probability of a single event happening and/or not happening. *E.g. the probability of getting 4 when throwing a die; the probability of not getting 4 when throwing a die.*	
	4.2g Mark the probability on a probability scale.	
	4.2h Distinguish between experimental and theoretical probability.	
	4.2i Identify the set of all possible outcomes of two independent events. *E.g. the possible outcomes when tossing a coin and throwing a die are twelve: H1, H2, H3, H4, H5, H6, T1, T2, T3, T4, T5, and T6.*	
	4.2j Construct a possibility space of two independent events. *E.g. throwing a die and tossing a coin.*	
	4.2k Work out the probability of two independent events using a possibility space. *E.g. the probability of getting a 3 and a tail when throwing a die and tossing a coin.*	

Unit 3:	**Work and the Community**
Subject Focus 1:	Packaging
Learning Outcome 1: **(Coursework and Controlled)**	I can use appropriate formulae to work on packaging, labelling and storing products. ***Mathematics Topics:*** *Cubes and Cube roots, 3D Shapes, Volume, Surface Area**,** Parts of a Circle, Circumference and Area of Circle, Area of Compound Shapes (including circles), Volume of a Cylinder, Surface Area of a Cylinder, Constructions, Nets of 3D shapes.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1a Generate the first five cube numbers. *E.g. work out the volume a cube given the length of the side.*	1.2a Work out the cube of any number using a calculator. *E.g. work out the volume of a cube given the length of the side is 3.2 cm.*	
	1.2b State without using a calculator the cube root of numbers of the form n^3 where n is an integer, $1 \leq n \leq 5$. *E.g. calculate the length of one side of a cube having a volume of 27 cubic metres.*	
	1.2c Work out the cube root of any number using a calculator. *E.g. calculate the length of one side of a cube given its volume.*	
1.1d Recognise a simple 3D shape (i.e. cube, cuboid, triangular prism, cylinder, square-based pyramid).		
1.1e Name a simple 3D shape (i.e. cube, cuboid, triangular prism, cylinder, square-based pyramid).		
1.1f Formulate, in words, simple linear formulae related to packaging. *E.g. develop the formula for the surface area of a cube.*	1.2f Formulate a simple linear algebraic formula related to packaging. *E.g. develop the algebraic formula for the surface area of a cube.*	

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
1.1g Substitute positive numbers in a simple linear formula, given in words, related to packaging. *E.g. substitute values for length, breadth and height in the formula for volume of a cuboid.*	1.2g Substitute positive numbers in a simple algebraic formula related to packaging. *E.g. substitute values for length, breadth and height in the formula for volume of a cuboid.*	
	1.2h Calculate the volume of cubes and cuboids. *E.g. calculate the volume of different food packages*	
	1.2i Solve equations related to volume involving one unknown on one side. *E.g. find the length of a cuboid given its breadth, height and volume.*	
	1.2j Calculate the volume of compound shapes made of cubes and cuboids.	
1.1k Identify a net as being either that of a closed cube, or that of an open cube, or of neither.	1.2k Identify a net as being either that of a cuboid, or that of a triangular prism, or that of a square-based pyramid, or of neither.	
1.1l Calculate the area of one of the faces of a 3D solid (cube and/or cuboid). *E.g. find the area of one rectangular face of a product.*	1.2l Calculate the surface area of cubes, cuboids and/or triangular prism. *E.g. find the area of the packaging of a product.*	
	1.2m Identify the main components of a circle (i.e. centre, radius, diameter, and/or circumference). *E.g. identify the diameter of a circular lid.*	1.3m Identify semicircle and quadrant as parts of a circle.
	1.2n Name the main components of a circle (i.e. centre, radius, diameter, and/or circumference).	
	1.2o Draw the main components of a circle (i.e. centre, radius, diameter, and/or circumference).	

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	1.2p Construct a circle of a given radius using pencil, a ruler, and a pair of compasses.	
	1.2q Define π as the ratio of the circumference to the diameter.	
	1.2r Calculate the circumference of a circle using the appropriate formula. *E.g. calculate the length of a label round a jam jar.*	1.3r Calculate the perimeter of a semicircle and/or a quadrant.
	1.2s Calculate the area of a circle using the appropriate formula. *E.g. calculate the area of the base of a biscuit tin.*	1.3s Calculate the area of a semicircle and/or a quadrant. *E.g. calculate the area of material required to create a logo in shop signage.*
	1.2t Solve linear equations related to circles involving one unknown on one side. *E.g. calculate the radius or diameter given the circumference and/or area of a circle.*	
	1.2u Change the subject of a formula related to circles using one operation. *E.g. make the radius subject of the formula in the formula for the circumference of a circle.*	1.3u Change the subject of a formula related to circles using one or two operations. *E.g. make the radius subject of the formula in the formula for the area of a circle.*
		1.3v Calculate the area of compound shapes that include semicircles and/or quadrants. *E.g. calculate the area of material required to create a logo in shop signage.*
		1.3w Calculate the volume and/or capacity of a cylinder. *E.g. calculating the capacity of a can of food.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
		1.3x Calculate the curved surface area and/or total surface area of a cylinder. *E.g. calculate the area of a label around a can; calculate the surface area of a tin.*
1.1y Work through situations involving, addition, subtraction, multiplication and/or division of numbers related to packaging. *E.g. calculate the number of tennis balls that can fit in a tube of given length; calculate the number of pasta boxes that can be placed next to each other on a shelf.*	1.2y Work through simple situations, involving proportion and related to packaging. *E.g. calculate the dimensions of a large box that will be used to transport a number of cereal boxes.*	1.3y Work through situations related to packaging. *E.g. calculate the number of boxes that can fit in a large box when placed in a particular arrangement or in different arrangements; work out the total area of cardboard needed to make a number of boxes.*
	1.2z Draw triangles given the length of one side and two angles using ruler and protractor. *E.g. create designs involving triangles.*	
	1.2aa Draw triangles given the length of two sides and the included angle using ruler and protractor. *E.g. create designs involving triangles.*	
	1.2ab Construct triangles given three sides using ruler and a pair of compasses only. *E.g. construct an equilateral triangle given the length of one side; create designs involving triangles.*	
	1.2ac Construct regular hexagons using ruler and compasses only. *E.g. construct hexagons to create a geometric design for a logo.*	
		1.3ad Draw the net of a cube, a cuboid and/or a triangular prism with precision. *E.g. draw the net of a package.*

Unit 3:	**Work and the Community**
Subject Focus 2:	Planning Space
Learning Outcome 2: (Coursework and Controlled)	I can apply ratios to planning space. ***Mathematics Topics:*** *Ratios, Scale Drawing, Pythagoras Theorem, Trigonometric Ratios, Side Elevations*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
2.1a Write ratios in their simplest form, limited to two integral quantities. *E.g. planted area to paved area in a garden given by 15 : 20 is simplified to 3 : 4*	2.2a Write ratios in their simplest form (including decimal numbers and numbers with different units). *E.g. the area occupied by furniture to the total area of an office given by 2.5 : 4.5 is simplified to 5 : 9*	
	2.2b Find one quantity of a ratio given the other quantity.	
	2.2c Divide a quantity in a given ratio. *E.g. use ratios to divide a retail space to accommodate a reception and waiting area.*	
	2.2d Solve problems involving ratios. *E.g. find the actual length of a space using information from a model.* *E.g. use map ratios to find the distance between two cities.*	
		2.3e Draw simple scale drawings. *E.g. draw 2D plans of a room, retail outlet or garden.*
		2.3f Interpret simple scale drawings *E.g. interpret 2D plans of a room, retail outlet or garden.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
		2.3g State Pythagoras Theorem.
		2.3h Apply Pythagoras' Theorem in 2D shapes to find the length of missing sides. *E.g. use Pythagoras Theorem to find the dimensions of a space.*
		2.3i Apply Pythagoras' Theorem to right-angled triangles whose sides are in the ratio of 3 : 4 : 5 or in the ratio of 5 : 12 : 13. *E.g. use Pythagoras Theorem to find the dimensions of a space.*
		2.3j Define the trigonometric ratios (sine, cosine and tangent) as the ratios of sides in a right-angled triangle.
		2.3k Find unknown lengths in right angled triangles using trigonometric ratios. *E.g. use trigonometric ratios to find the dimensions of a space.*
		2.3l Find unknown angles in right angled triangles using trigonometric ratios.
		2.3m Draw different views (side elevations) *E.g. draw a side elevation of room or a retail outlet.*

Unit 3:	**Work and the Community**
Subject Focus 3:	Managing Finance
Learning Outcome 3: **(Coursework and Controlled)**	I can apply calculations to manage finance. ***Mathematics Topics:*** *Percentage Increase and Decrease, Salary calculations, Overtime, Social Security Contribution, Income Tax, Utility Bills, Simple Interest.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	3.2a Find the percentage of a quantity. *E.g. calculate the profit; calculate the rise in pay.*	
		3.3b Express profit and/or loss as a percentage of the original investment.
	3.2c Find percentage increase and/or percentage decrease, in situations related to finance. E.g. *calculate the percentage rise in pay.*	3.3c Work through situations, related to finance, involving percentage increase and/or decrease. *E.g. cost and selling price; profit and loss; appreciation and/or depreciation.*
		3.3d Work out reverse percentage calculations in situations related to finance. *E.g. calculate the original pay before a percentage rise; calculate the expenditure before a rise in costs; calculate the cost price; calculate the price of an item excluding VAT.*
		3.3e Work through situations involving successive percentage changes. *E.g. calculate the new pay following a rise in pay over two successive years.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
3.1f Work through situations related to salary calculations, involving addition, subtraction, multiplication and/or division of numbers. *E.g. calculate total salary by adding overtime payment/allowance/bonus to the basic pay; calculate the net salary following deduction of the income tax and Social Security Contribution.*	3.2f Work through situations related to salary calculations, involving proportion. *E.g. calculate the overtime paid given the overtime rate per hour; calculate the overtime rate given the overtime paid and the number of hours of work.*	3.3f Work through situations related to personal finance, involving percentages. E.g. *tax calculations; calculation of Social Security Contribution; gross and net salary; loans; insurance.*
	3.2g Work through simple situations related to utility bills, involving proportion. *E.g. calculate the bill for the consumption of a number of electricity units given the rate per unit.*	3.3g Work through complex situations related to utility bills. *E.g. calculate the total electricity bill including the service charge, the consumption tariff rates corresponding to tariff bands depending on consumption and any applicable reductions.*
		3.3h Work out the simple interest, the principal, the rate, the time, or the amount using the simple interest formula.

Unit 3:	**Work and the Community**
Subject Focus 4:	Data Representations
Learning Outcome 4: (Coursework and Controlled)	I can use graphical representations to represent and interpret data arising from real life situations. ***Mathematics Topics:*** *Linear and non-linear Graphs, Standard Form, Bar charts (stacked/clustered/population pyramids), Pie charts.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	4.2a Substitute directed numbers in linear expressions.	
4.1b Read coordinates from a grid in the first quadrant.	4.2b Read coordinates from a grid in all four quadrants.	
4.1c Plot points on a grid in the first quadrant given their coordinates.	4.2c Plot points on a grid in all four quadrants given their coordinates.	
	4.2d Write the coordinates of a set of points for equations of the form y = mx + c, where x and y represent values from a real life context. *E.g. x represents number of working hours and y represents the pay received.*	
	4.2e Construct tables of values for linear functions that represent real life contexts.	
	4.2f Plot the graph of a linear function, from a table of values, which represents a real life context.	

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
	4.2g Explain what the gradient of a line represents, given a real life context. *E.g. gradient represents the rate of exchange in a currency conversion graph; if x represents number of working hours and y represents the pay received, then the gradient represents the pay rate.*	
	4.2h Recall that the y-intercept represents the point where a line cuts the y-axis.	
	4.2i Explain what the y-intercept of a line represents in a real life context. *E.g. In a graph representing a TV technician's service charge (y) against time taken for repairs (x), the y-intercept represents the basic charge.*	
	4.2j Recall that for the equation y = mx + c, the value of m determines the gradient of the graph and the value of c determines the y-intercept.	
	4.2k Use straight line graphs that represent a real life context, to find the value of one coordinate given the other. *E.g. convert a value from one currency to another.*	
	4.2l Interpret straight line graphs arising from real life situations. *E.g. a graph representing pay against hours of work indicates that the longer the hours of work the higher the pay received, for a job paid by the hour.*	4.3l Compare information from two straight line graphs concerning real life situations. *E.g. compare the cost of a service provided by two service providers.*
		4.3m Interpret non-linear graphs arising from real life situations. *E.g. a graph representing the value of a car over a number of years.*

Assessment Criteria (MQF 1)	Assessment Criteria (MQF 2)	Assessment Criteria (MQF 3)
		4.3n Write an expression in exponential form. *E.g.* $2 \times 2 \times 2 \times 2 = 2^4$ *E.g.* $2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$
		4.3o Convert a number in ordinary form to standard form. *E.g. write the population of a country in standard form.*
		4.3p Convert a number in standard form to ordinary form. *E.g. convert the population of a country from standard notation to ordinary form.*
4.1q Read a bar chart for ungrouped discrete data. *E.g. read a bar chart representing the number of children attending different extra-curricular activities at a particular school.*	4.2q Interpret bar charts for grouped and/or ungrouped discrete data. *E.g. interpret a bar chart representing the number of car thefts reported over a number of months.*	4.3q Interpret stacked and/or clustered bar chart. *E.g. interpret bar charts that represent the number of unemployed males and females over a number of years.*
		4.3r Interpret population pyramids.
4.1s Construct a bar chart for ungrouped discrete data. *E.g. construct a bar chart representing the number of children using different forms of transport.*	4.2s Construct a bar chart using grouped and/or ungrouped discrete data from a frequency table. *E.g. construct a bar chart representing the percentage of the workforce by basic annual salary.*	
	4.2t Interpret pie charts. *E.g. interpret a pie chart illustrating the main sources of greenhouse gas emissions.*	
	4.2u Draw pie charts. *E.g. draw a pie chart to represent data on amount and type of waste generated.*	

Scheme of Assessment

School candidates

The assessment consists of:

Coursework: 60% of the total marks; comprising five assignments of equal weighting (i.e. 12% each) set during the three-year course programme.

Coursework can be pegged at either of two categories:

- A coursework at MQF level categories 1-2 must identify assessment criteria from these two MQF levels. The ACs are to be weighted within the assignment's scheme of work and marking scheme at a ratio of 40% at Level 1 and 60% at Level 2.
- A coursework at MQF level categories 1-2-3 must identify assessment criteria from each of Levels 1, 2, and 3. These ACs are to be weighted within the assignment’s scheme of work and marking scheme at a ratio of 30% at each of Levels 1 and 2 and 40% at Level 3.

The mark for assignments at level categories 1-2 presented for a qualification at level categories 2-3 is to be recalculated to 60% of the original mark. The mark stands in all other cases.

Controlled assessments: 40% of the total marks; comprising of a two-hour written exam; set at the end of the programme and differentiated between two tiers:

- MQF levels 1 and 2;
- MQF levels 2 and 3.

Candidates can obtain a level higher than Level 1 if they satisfy the examiners in both coursework and controlled assessments, irrespective of the total marks obtained.

The **coursework** will be based on **all** Learning Outcomes. An overview of the suggested coursework assignments is shown in the table below:

Part 1: Coursework – Category Levels 1-2-3 (60 %)			
Assignment 1 (12 %)	**Assignment 2** (12 %)	**Assignment 3** (12 %)	**Assignment 4** (12 %)
Design Project	Survey	Fieldwork	Non-Calculator

Figure 1: Suggested Coursework Assignments for School Candidates

- Candidates will be assessed through 5 assignments carried out during this three-year programme - 2 assignments in Year 9, 2 assignments in Year 10 and 1 assignment in Year 11.
- Coursework Assignment 4 can be carried out up to a maximum of **TWO times** during the three-year programme and in different years. No restrictions apply regarding the number of times that Assignment 1, Assignment 2 and Assignment 3 can be carried out throughout the three-year programme and within one scholastic year as long as the indications in the previous bullet are adhered to.
- All assignment tasks shall be marked out of 100 according to guidelines and rubrics available with this syllabus.

Controlled Assessment

Part 2: Controlled Assessment (2 hours) (40 %)
Paper consisting of 3 sections which include items of graded difficulty at Level 1 – 2. **OR** Paper consisting of 3 sections which consists of items of graded difficulty at Level 2 – 3.

Figure 2: Part 2 Controlled assessment for School Candidates

Controlled Assessment will:

- cover most learning outcomes;
- have 3 sections:
  - Section A: 10 multiple choice questions (10%);
  - Section B: 10 – 15 graded questions (65%);
  - Section C: A Real Life Situation, consisting of a long structured question based on a real life scenario targeting different assessment criteria (25%).
- be marked out of 100.

Coursework Modes

This section presents sample assessments with respective marking schemes. It should be reminded that a marking scheme is not a list of model answers. Teachers may use these guiding documents to develop an assignment based on one of the modes presented in this syllabus as specimen. Otherwise, teachers may develop their own assignment and select an appropriate mode for assessment as long as this assignment is sent to MATSEC for approval before being given to students.

SEAC Mathematics Coursework

Mathematical tasks can serve many purposes, foremost among which the promotion of mathematical understanding (Liljedahl et al., 2007). Schoenfeld (1982) argues in fact that one of the characteristics of a good task is that it should introduce students to important mathematical ideas. Moreover, tasks should create opportunities for students to develop competencies, interests and dispositions. To achieve this, teachers are encouraged to refer to the notion of 'worthwhile mathematical tasks' (see NCTM, 1991) when designing the activities related to the five modes of assessment. These are tasks that:

- engage students' intellect;
- develop students' mathematical understandings and skills;
- stimulate students to make connections and develop a coherent framework for mathematical ideas;
- call for problem formulation, problem solving, and mathematical reasoning;
- promote communication about mathematics;
- represent mathematics as an ongoing human activity;
- display sensitivity to, and draw on, students' diverse background experiences and dispositions;
- promote the development of all students' dispositions to do mathematics.

By engaging on such tasks, students build their 'mathematical power' (see NCTM, 1991). This includes their ability "to explore, conjecture, and reason logically; to solve nonroutine problems; to communicate about and through mathematics; and to connect ideas within mathematics and between mathematics and other intellectual activity" (p. 1). Mathematical power, moreover, helps students develop their self-confidence and a disposition to seek, evaluate and use information when solving problems and making decisions.

References:

Liljedahl, P., Chernoff, E., & Zazkis, R. (2007) Interweaving mathematics and pedagogy in task design: A tale of one task. *Journal of Mathematics Teacher Education*, *10*(4), 239–249.

National Council of Teachers of Mathematics (NCTM) (1991) *Professional Standards for Teaching Mathematics*. Reston, VA: NCTM.

Schoenfeld, A. (1982) Some thoughts on problem-solving research and mathematics education. In F.K. Lester & J. Garofalo (Eds.), *Mathematical Problem Solving: Issues in Research* (pp. 27–37). Philadelphia: Franklin Institute Press.

Coursework Mode 1: Design Project

Design Project	
100 marks internally-assessed externally-moderated 12% of total marks	**Defining a Design Project** It is generally recognised that students' understanding of mathematics benefits when they participate in meaningful learning activities and are encouraged to reflect on what they are doing. This emphasis on student activity and engagement in the learning process contrasts with the traditional approach in which students are positioned as passive recipients of the information imparted by their teacher (Prince, 2004). In response to the desire for students to engage in 'active learning', the teacher's role has to change from imparting knowledge to supporting the self-generation of learning by students (Kokko et al., 2015). This learning process can be facilitated by providing students with open-ended design tasks that are embedded within a real-world context (Kokko et al., 2015). The idea is to go for meaningful activities that require students to take risks, find information and collaborate as they learn how to solve problems (see Kangas et al., 2013). This approach draws on the notion of project-based learning, which is basically a model that organises learning around projects. These projects are based on challenging questions or problems that typically involve students in design, problem-solving, decision making and investigative activities (Thomas, 2000). Moreover, such projects offer students the opportunity to work in relative autonomy over an extended period of time (Thomas, 2000). ***Examples of Design Projects*** • Design a room or garden • Plan a holiday • Plan a fund-raising event or sport activity • Design the packaging of an item/s • Design the layout of a magazine or poster • Design a tent • Design a shelving unit • Plan a parking area **The Aim of a Design Project** The aim of a design project is to provide experiential and contextual opportunities that enhance classroom learning. Applying mathematical concepts and processes in practical contexts enables students to improve their understanding, knowledge, skills and competences. This leads to the development of meaningful connections. Design projects expose students to situations that require them to plan, carry out and produce a design either on their own or in collaboration with other students. These projects facilitate the development of skills such as the ability to collect data, analyse information, practice problem solving, explore creative solutions and reach a conclusion. Moreover, they provide students with opportunities to acquire and demonstrate skills which they would not have previously learned (E.g. designing aisles in a supermarket). Design projects have to be aligned with the curriculum and target specific learning outcomes and assessment criteria. They should explore a context that is relevant to the subject content and/or processes being assessed.

The Design Project

The design project presents students with a situation leading to a product that is characterised by a design of, for example, a floor plan, a schedule, a model etc. The design project may be open or guided. In addition, it should be carried out either over a number of consecutive lessons or over a number of weeks with a lesson per week dedicated to the project. In total, work on the design project should take between four and five lessons.

The design project is carried out through four components: *Groundwork*, *Action Plan, Journal* and *Output*.

Groundwork

Adequate preparation for design project maximises learning. As part of this preparation, the teacher is expected to:

1. inform the students on the nature of the design project;
2. explain what is expected in the final design project report and the criteria that will be used for marking;
3. provide, when necessary, specifications and data sheets.

Action Plan

Each student presents an action plan, which may be developed individually or in groups, based on instructions given by the teacher. The action plan outlines the work, in the form of a list of tasks, which the student intends to cover during the lessons dedicated to the project. This list consists of a sequence of steps or activities that need to be performed. The action plan may be revised as the task progresses.

Journal

The journal consists of all the student work leading to the final design. It should therefore reflect the steps outlined in the action plan. This journal may include a compilation of estimates, measurements, tables, diagrams, sketches, photographs, calculations, etc. Moreover, the journal should include the rationale for decisions taken by students as they work towards the final product.

Any data sheets provided by the teacher should also be included.

Output

The output refers to the final product designed by the student (E.g. a diagram, schedule, model).

Design projects may be coupled with other disciplines in order to increase the relevance of the subject and enhance its applied nature. The design project report needs to be compiled and submitted separately by each student for each subject.

The Design Project Report

A design project report, consisting of sections as indicated below, has to be presented by each student. The *Introduction* is to be provided by the teacher. The *Action Plan, Journal* and *Output* are to be compiled by the student.

Guidelines for the Design Project Report

Section	Details
Introduction	This section should include: • The title of the design project. This should be short and clearly indicates the nature of work being conducted. • A brief description of the design project. This may include specifications and/or other relevant information. • Date of submission of report.
Action Plan	This section should include a list consisting of a sequence of steps or activities that are planned to be performed. In case of revisions, the final version of the list should be included.
Journal	This section should include the materials and work related to the steps outlined in the action plan: • a compilation of student work (E.g. estimates, measurements, tables, diagrams, sketches, photographs, calculations); • rationale for decisions; • data sheets provided by the teacher.
Output	This section should consist of the final product designed by the student in the form of a diagram, schedule, model, etc.

Marking the Design Project

Marks (100 marks) are assigned as follows:

- Mathematical processes are assessed through a rubric (20 marks). Refer to Appendix I for the rubric.
- The *Action Plan, Journal* and *Output* are assessed through a rubric (80 marks, of which up to 30 marks may be obtained through group collaboration). Refer to Appendix II for the scoring rubric.

References:

Kangas, K., Seitamaa-Hakkarainen, P., & Hakkarainen, K. (2013) Design thinking in elementary students' collaborative lamp designing process. *Design and Technology Education: An International Journal*, *18*(1), 30–43.

Kokko, S., Eronen, L., & Sormunen, K. (2015) Crafting maths: Exploring mathematics learning through crafts. *Design and Technology Education: An International Journal*, *20*(2), 22–31.

Prince, M. (2004) Does active learning work? A review of the research. *Journal of Engineering Education, 93*(3), 223–231.

Thomas, J.W. (2000) *A Review of Research on Project-based Learning*. Available: www.bobpearlman.org/BestPractices/PBL_Research.pdf (accessed 31st March 2019)

Design Project exemplar	**Design Project** **Exemplar** **Designing a Waiting Room** **Name:** ______________________________ **Class:** ___________________

	Design Project Assignment: Design a waiting room. **The Design Project:** Design a waiting room taking into account the following: a. The waiting room should include a reception area, a waiting area and another space reserved for a particular purpose. b. Focus your floor plan and costings on flooring, furniture and/or equipment. c. Your expenditure must not exceed €12 000. **Instructions:** • Formulate an action plan. • Select a room to be used as a waiting room. Measure and record its dimensions and the dimensions of any features such as doors, windows, etc. • Sketch a plan of the room. Identify spaces in the room that will be used for particular functions. Insert the required measurements and/or estimates. • Use data provided to identify appropriate type of flooring for each space and work out the costs involved. • Use data provided to work out which furniture and/or equipment is required for each space and work out the costs involved. • Design a floor plan of the waiting room. **Date of Submission of Design Project Report:** ______________________

Action Plan

In this space the student will formulate an action plan.
An example of a student's action plan follows:

- *Measure the classroom to be used as a waiting area.*
- *Measure the door/s and window/s.*
- *Sketch a plan of the room.*
- *Identify spaces on the sketch that are to be reserved for reception area, waiting area, coffee making services (or play area, library corner, etc.).*
- *Estimate dimensions of the spaces reserved for reception, waiting area, coffee making services.*
- *Flooring – Work out the costs of flooring different areas of the waiting room. Identify type of flooring to be used.*
- *Furniture/Equipment – Work out the costs of furniture and/or equipment needed for each space. List furniture/equipment that needs to be bought.*
- *Calculate the total cost and check it is within budget.*
- *Design a floor plan of the waiting room that includes measurements, door, windows and furniture.*

Journal

In this space the student will:

- *record the measurements of the room, door/s, window/s or any other features in the room;*
- *draw a sketch of the room and insert relevant measurements;*
- *identify spaces to be used as a reception area, waiting area, coffee making services (or play area, library corner, etc.);*
- *write down (or mark on sketch) estimates of the dimensions of the spaces identified;*
- *calculate and compare costings for covering the floor of different spaces in the waiting room, using quotations (researched or provided by the teacher), and present conclusions related to the type of flooring that will be installed in the different areas;*
- *calculate and compare costings for different furniture and/or equipment, using quotations (researched or provided by the teacher), and present conclusions related to the type of furniture and/or equipment that will be used in the different areas;*
- *calculate the total cost for flooring, furniture and/or equipment and compare to the given budget.*

Output

In this space the student will draw the final design of the waiting room.

Coursework Mode 2: Survey

Survey	
100 marks internally-assessed externally-moderated 12% of total marks	**Defining a Survey** Traditional lessons characterised by teachers demonstrating a process or procedure that is then followed by student practice do not prepare students to use mathematics beyond the confines of their current classroom (Sullivan et al., 2015). Opportunities thus need to be created for students to learn mathematics in a way that is useful in real life. This can be done, for instance, through surveys that, as Gray (2004) points out, are one of today's most popular research tools and are widely used in the business and commercial worlds. Fink (1995) describes surveys as a system for collecting information to describe, compare or explain knowledge, attitudes and behaviour. As such, surveys fall under two broad categories: (i) they are 'descriptive' when designed to present or measure 'what' happened; and (ii) they are 'analytical' when they are designed to delve into the 'why' of what happened (Gray, 2004). While the descriptive element can either refer to a point in time or to make comparisons over time, the survey can only serve an analytical purpose if it also contains a descriptive element. ***Examples of Surveys*** • A survey on the type of products advertised on TV/radio/magazine • A survey on preferred TV programmes • A survey on the use of plastic • A survey on the type of lunch students bring to school • A survey on the amount of money spent by students at the school tuck shop • A survey on the use of computer • A survey on the preferred form of social media • A survey on food preferences **The Aim of a Survey** The aim of a survey is to provide experiential and contextual opportunities that enhance classroom learning. Surveys provide students with the opportunity to explore ways of collecting and organising data, create representations to communicate results, compare findings and analyse conclusions. Applying statistical concepts and processes in practical contexts enables students to improve their understanding and knowledge of how statistical data works and develop skills and competences in data handling. Moreover, engaging in a survey enables students to develop meaningful connections between data and its representation. Surveys have to be aligned with the curriculum and target specific learning outcomes and assessment criteria. They should explore a context that is relevant to the subject content and/or processes being assessed.

Surveys

Doing a survey requires the students to plan and carry out a survey on their own or in collaboration with other students and produce representations of the results obtained. The survey should be carried out either over a number of consecutive lessons or over a number of weeks with a lesson per week dedicated to the work involved. In total, work on the survey should take between four and five lessons.

The survey is carried out through four components: *Groundwork*, *Action Plan*, *Survey,* and *Output*.

Groundwork

As part of the preparation required for a survey, the teacher is expected to:

- inform the students on the nature of the survey;
- explain what is expected in the final survey report and the criteria that will be used for marking;
- provide, when necessary, specifications of the survey and rules to be adhered to when conducting the survey.

Action Plan

During this phase the students, individually or in a group, have to:

1. identify a real context and develop their own survey question/s related to it.
2. make a hypothesis as to the outcome;
3. design a method for collecting data (i.e. observation/interview/questionnaire);
4. determine the sample size;
5. plan ways of organizing data collected.

Survey Tasks

During this phase each student collects data, either through observation (E.g. observing number of cars passing through a street, or observing the type of products advertised on TV at particular times during day) or through questioning individuals at or outside school. Students may collect data individually and then share the data collected with their peers so as to increase the sample size of the survey. Each student has to organise all the data collected in a table or tables, E.g. a tally chart or frequency table.

Output

Each student has to design a mode or modes of presenting data collected by himself and/or the other group members. This may take the form of pictorial and/or graphical representations the student is familiar with (E.g. pictograph, a bar chart, pie chart) and may be carried out with and/or without the use of technology. Data representation should be carried out by each student individually. The output of the survey consists of the data representation/s described above. Furthermore, each student has to analyse the results obtained and evaluate whether the data collected supports the original hypothesis.

The survey may be coupled with other disciplines in order to increase the relevance of the subject and enhance its applied nature. The survey report needs to be compiled and submitted separately by each student for each subject.

The Survey Report

A survey report, consisting of sections as indicated below, has to be presented by each student. The *Introduction* is to be provided by the teacher. The *Action Plan*, *Survey* and *Output* are to be compiled by the student.

Guidelines for the Survey Report

Section	Details
Introduction	This section should include: • the context on which the survey will be based; • specifications of the survey and rules to be adhered to when conducting the survey; • date of submission of report.
Action Plan	This section should include: • the context on which the survey question/s will be based; • the survey question/s; • the hypothesis; • method to be used for data collection; • the sample size of the survey.
Survey Tasks	This section should include: • the data collected by the student; • table/s that represent all data collected by the student and other group members (where applicable).
Output	This section should consist of: • pictorial and/or graphical representations of the results; • conclusions that indicate whether the hypothesis was correct.

Marking the Survey

Marks (100 marks) are assigned as follows:

- Mathematical processes are assessed through a rubric (20 marks). Refer to Appendix I for the rubric.
- The *Action Plan*, *Survey* and *Output* are assessed through a marking scheme (80 marks, of which up to 30 marks may be obtained through group collaboration). Refer to Appendix II for the scoring rubric.

References:

Fink, A. (1995) *The Survey Handbook*. Thousand Oaks, CA: SAGE.

Gray, D.E. (2004) *Doing Research in the Real World*. London: SAGE.

Sullivan, P., Askew, M., Cheeseman, J., Clarke, D., Mornane, A., Roche, A., & Walker, N. (2015) Supporting teachers in structuring mathematics lessons involving challenging tasks, *Journal of Mathematics Teacher Education*, *18*(2), 123–140.

Survey exemplar	# Survey Exemplar # Survey on Advertisements **Name:** ______________________________ **Class:** _____________

	Survey Assignment: Conduct a survey on advertisements. **The Survey:** Conduct a survey on products advertised on TV. Your results should: a. identify the type of products advertised on three TV stations during the same time frame; b. analyse the impact of advertisements on people preferences. **Instructions:** • Formulate an action plan. • Select the time frame to be studied and the TV stations to be observed. • Collect your data over a number of days. • Interview people on their preferences of products advertised during the time frame selected. • Draw charts/graphs to represent data gathered. **Date of Submission of Survey Report:** ______________________

Action Plan

In this space the student will formulate an action plan.

An example of a student's action plan follows:

- *Group work:*
  - a. *Select the time frame to be studied.*
  - b. *Select three TV stations for the study.*
  - c. *Hypothesis: People who watch TV between 7.00 p.m. and 8.30 p.m. prefer to buy products advertised during this time frame over products that are not advertised.*
  - d. *Determine the number of people to be interviewed.*
  - e. *Write questions to be used for the questionnaire regarding people preferences.*
- *Collect data from one TV station over one week (Monday to Friday).*
- *Classify products in categories, E.g. food, drinks, cars, perfumes, services.*
- *Draw a table of the products advertised and the number of times advertised.*
- *Group work: Share with and collect information on products advertised from other group members.*
- *Draw a bar chart on the products advertised during this time frame.*
- *Interview 10 people on their preferences of products advertised during the time frame selected.*
- *Group work: Collect information on people preferences from other group members.*
- *Analyse information on people preferences.*
- *Present information on people preferences in a Carroll diagram.*
- *Check hypothesis.*

Survey

In this space the student will:

- *record all the introductory planning such as the time frame selected, the TV stations to be observed, the number of people to be interviewed and the questions to be asked;*
- *write the hypothesis of the study;*
- *record data collected by self and by the other group members;*
- *classify products in categories and present information in an table;*
- *insert a copy of the interview questions to asked to 10 people;*
- *analyse data about people preferences.*

Output

In this space the student will:

- *draw the bar chart and the Carroll diagram;*
- *conclude whether the hypothesis was correct.*

Coursework Mode 3: Fieldwork

Fieldwork	
100 marks internally-assessed externally-moderated 12% of total marks	**Defining Fieldwork** In relation to Mathematics, the term 'fieldwork' refers to a curricular element during which students, under the guidance of their teacher, leave the four walls of their classroom to immerse themselves in learning through first-hand experiences (see Boyle et al., 2007). As such, fieldwork can take place either within the confines of the school (E.g. the school playing field or the school multipurpose hall) or outside these confines (E.g. a shopping mall). The idea is to promote the use of out-of-classroom spaces where students can actively engage in practical situations. The use of fieldwork thus offers students the opportunity to experience mathematics away from traditional notions of teaching and learning that, as Romberg (1992) points out, present mathematics as a static collection of facts, rules and procedures that are passively learned by students through drill and practice. On the contrary, the application of fieldwork aligns the teaching and learning of mathematics to the current reform movement in school mathematics that seeks to promote a conception of the subject as a dynamic, socially constructed and inquiry-driven field (National Council of Teachers of Mathematics, 1989). ***Examples of Fieldwork Sites*** • A historical location/site • The village where the school is located • Interactive sites • Supermarket • A shopping Mall • A public garden • The school grounds • The school library **The Aim of Fieldwork** The aim of fieldwork is to provide experiential and contextual opportunities that enhance classroom learning. Applying mathematical concepts and processes in practical contexts enables students to improve their understanding, knowledge, skills and competences. This leads to the development of meaningful connections. Fieldwork exposes students to outside classroom situations that require them to plan and carry out an assignment either on their own or in collaboration with other students. It facilitates the development of skills such as the ability to collect data, analyse information, practise problem solving, present creative solutions and reach conclusions. Moreover, it provides students with opportunities to demonstrate skills which are difficult to be assessed in the classroom. Fieldwork has to be aligned with the curriculum and target specific learning outcomes and assessment criteria. It should take place in a context that is relevant to the subject content and/or processes being assessed. **Fieldwork** The fieldwork is carried out through four components: *Groundwork*, *Pre-fieldwork*, *Field Tasks* and *Follow-up*. ***Groundwork*** Adequate preparation for fieldwork maximises learning taking place during the outside classroom activity. As part of this preparation, the teacher is expected to: 1. inform the students on the nature of the assignment; 2. explain what is expected in the final fieldwork report and the criteria that will be used for marking; 3. familiarise students with the required instruments and their use; 4. provide the information about the site, the rules to be adhered to while on site and expected behaviour during the field visit.

Prior to fieldwork, communication with the authorities in charge of the site is advisable to discuss the logistics of the visit. The provision of resources needed during fieldwork is to be organised beforehand.

Pre-fieldwork Tasks

Pre-fieldwork tasks refer to any preparatory activities that may be prerequisites for the field visit. These tasks are not mandatory.

Field Tasks

Students will carry out a number of tasks on the selected site. These tasks should take about two hours to complete. Tasks may take the form of group task/s, individual task/s, or a combination of both. Groups should consist of not more than four students.

The mathematics fieldwork may be coupled with other disciplines in order to increase the relevance of the subject and enhance its applied nature. This cross-curricular approach may further facilitate the logistics of the visit. The fieldwork report needs to be compiled and submitted separately by each student for each subject.

Follow-up

The follow-up aims at reinforcing the work initiated during the field visit. The students are given the opportunity to demonstrate skills related to measurement, analysis and interpretation of data, calculations, drawing diagrams and sketches and/or reaching conclusions through task/s carried out individually. The follow-up may be based on data collected during the field visit or data provided by the teacher and should take up to two lessons.

The Fieldwork Report

A fieldwork report, consisting of sections as indicated below, has to be presented by each student. The *Introduction* is to be provided by the teacher. The *Pre-fieldwork* (when applicable), *Field Tasks* and *Follow-up* are to be compiled by the student and may be presented in the form of a set of handouts and/or booklet.

Guidelines for the Fieldwork Report

Section	**Details**
Introduction	This section should include: • The title of the fieldwork. This should be short and clearly indicates the nature of work being conducted. • The name of the site where the field visit is conducted. • A brief description of the site. This may consist of 2-3 sentences about the location, use, size, and other characteristics of the site. • Date of field visit. • Date of submission of report.
Pre-fieldwork Tasks	When applicable, this section should include preparatory task/s undertaken in class.
Field Tasks	This section consists of a number of tasks undertaken on site. Each task should include the following: • Title of the task. • Workings and conclusions: any estimates, measurements, information tables, calculations, diagrams, sketches, photographs and/or conclusions carried out.
Follow-up Tasks	This section should include follow-up task/s based on data collected on site or additional information provided by the teacher.

Marking the Fieldwork Report

Marks (100 marks) are assigned as follows:

- *Pre-fieldwork Task/s, Field Tasks* and *Follow-up Task/s* are assessed through a marking scheme (100 marks, of which up to 30 marks may be obtained through group collaboration). Refer to Appendix III for the marking scheme guidelines.
- The global mark for the Maths Trail is 100. If the total mark of all the set tasks for a Maths Trail is different, it should be recalculated and presented as a mark out of 100.

References:

Boyle, A., Maguire, S., Martin, A., Milsom, C., Nash, R., Rawlinson, S., Turner, A., Wurthmann, S. & Conchie, S. (2007) Fieldwork is good: the student perception and the affective domain, *Journal of Geography in Higher Education*, *31*(2), 299–317.

National Council of Teachers of Mathematics (NCTM) (1989) *Curriculum and Evaluation Standards for School Mathematics*. Reston, VA: NCTM.

- Romberg, T.A. (1992) Problematic features of the school mathematics curriculum. In P.W. Jackson (ed.), *Handbook of Research on Curriculum* (pp. 749–788). New York: Macmillan.

Fieldwork exemplar

The following Fieldwork exemplar is set Level 1-2-3 and follows the required 30:30:40 ratios.
This exemplar follows these ratios when taken as a complete set and the marks add up to 80. In this case, since the total mark adds up to 80, the mark obtained by the candidate should be recalculated out of 100.

Fieldwork Exemplar

Ta’ Qali National Park Fieldwork

	Task 1	Task 2	Task 3	Task 4	Task 5	Total
Maximum Mark	15	15	15	15	20	80
Mark						
						%

Name: ________________________________

Class: ______________

Fieldwork Site: Ta' Qali National Park

Description of Site:
The Ta' Qali National Park is a green space close to Attard.

During the Second World War this space was used as an airfield. Today it is a very popular recreation area with plenty of space for children to roam around. It is also very popular area for picnics especially during weekends and public holidays. The park is also used for several activities throughout the year such as concerts and fairs.

The park was inaugurated in 1990 and an extension to the park was built in 2009 to accommodate and attract more people.

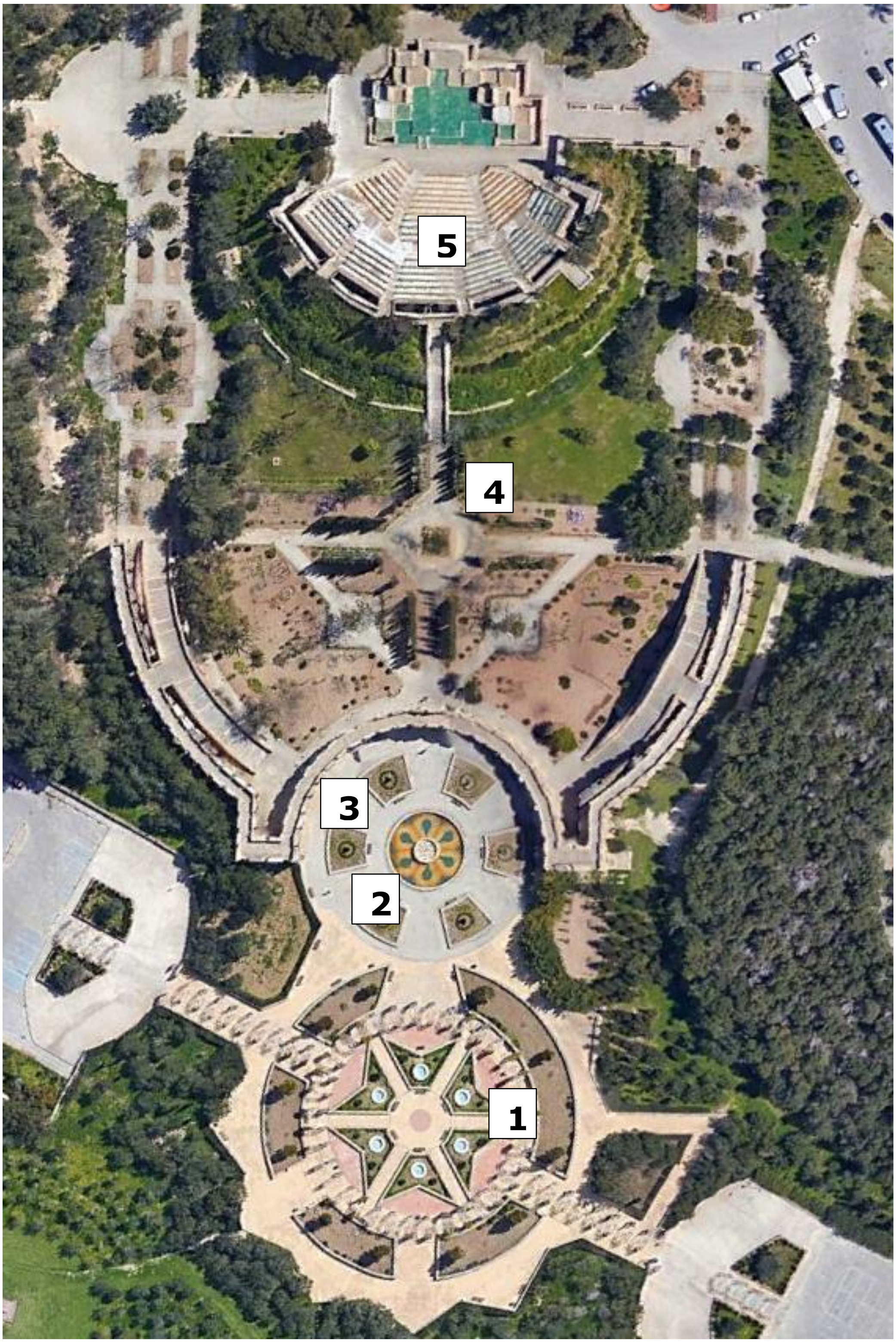
Date of Fieldwork: ________________________

Date of Submission of Fieldwork: ________________________

Only questions marked with this icon may be worked out in collaboration with the other team members. All other questions have to be worked out individually.

The follow-up task (Task 5) should be worked out individually.

Ta' Qali National Park Map

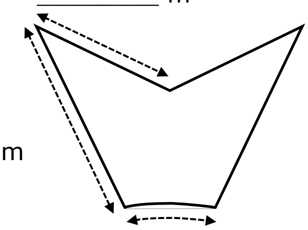


Task 1 – The Star

1. The star is made up of six flower beds. Each flower bed is symmetrical and has five sides.

(a) Measure the lengths of the sides shown in the diagram below.

__________ m



__________ m

__________ m

(1)

(b) Calculate the perimeter of one flower bed.

(1)

(c) A wire fencing will be placed around each of the six flower beds.
Wire fencing costs €8.50 per metre.
Calculate the total cost of fencing the six flower beds.

(3)

2. Martin uses 350 ml of black paint to paint one of the dustbins in the passageway around the star.

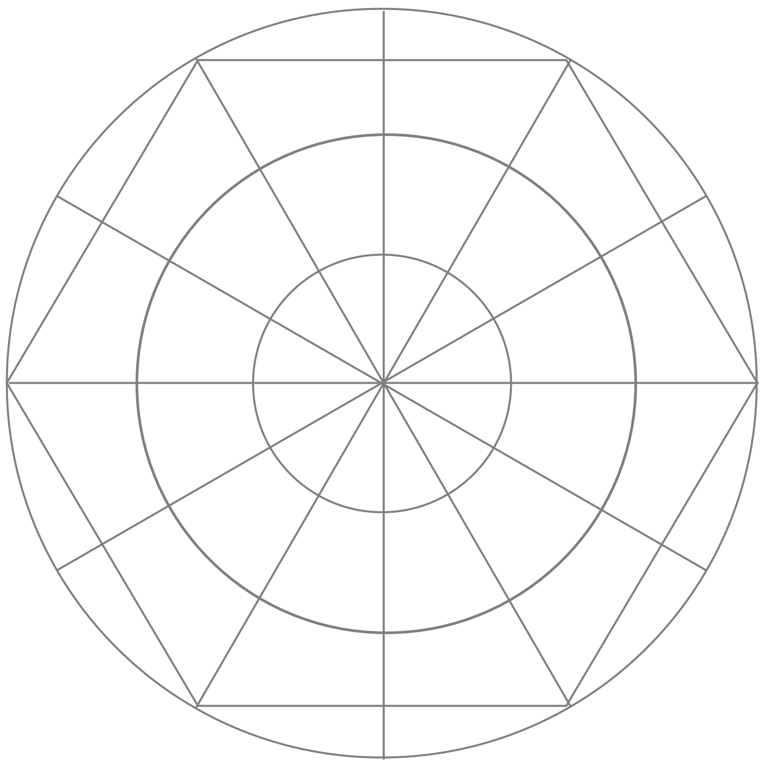
   (a) Calculate the total amount of paint needed to paint all the dustbins in the passageway. Give your answer in litres.

   (2)

   (b) Martin is provided with 750 ml cans. How many cans does he need to paint all the dustbins in this passageway?

   (3)

3. Create a pattern similar to the one shown in the flower beds picture on the grid below.



(5)

(Total: 15 marks)

Task 2 - The Benches

Benches in the inner circle

The wood of the benches in the inner circle is going to be replaced by new wood.

1. How many wooden strips are used for one bench? _________

(1)

2. Measure the length of one wooden strip used for the bench. _________

(1)

3. The wood used for the benches is made from **wooden rods** of length 4 m.

   (a) How many wooden strips can be cut from one rod?

   (1)

   (b) How many rods are needed to refurbish the benches in the inner circle?

   (3)

4. Each **wooden rod** costs €12.
   Calculate the cost of wood needed to refurbish the benches.

(2)

5. Joe charges €35 for each bench he refurbishes.
   What is the total cost of refurbishing the benches?

(3)

6. In the area of the fountain you may notice a number of mathematical shapes.
   Write the names of the different shapes (2D and 3D) that you can see.
   Describe the object and its shape, draw a diagram or take a picture of one of the objects you identify.

(4)

(Total: 15 marks)

Task 3 - The Arches

1. On the wall of one of the arches, there is a plaque commemorating the inauguration of the Ta' Qali National Park.

(a) When was the park inaugurated?

(1)

(b) How many years and months have passed since the inauguration?

(3)

2. Underline two sensible measures for the height of the arches.

millimetres, centimetres, metres, kilometres

(2)

3. Estimate the height of the arches. ____________

(1)

4. Measure the height of one stone block. __________

(1)

5. (a) Work out the approximate height of the arch.

(2)

(b) Work out the difference between your estimate in question 3 and your answer to part (a).

(1)

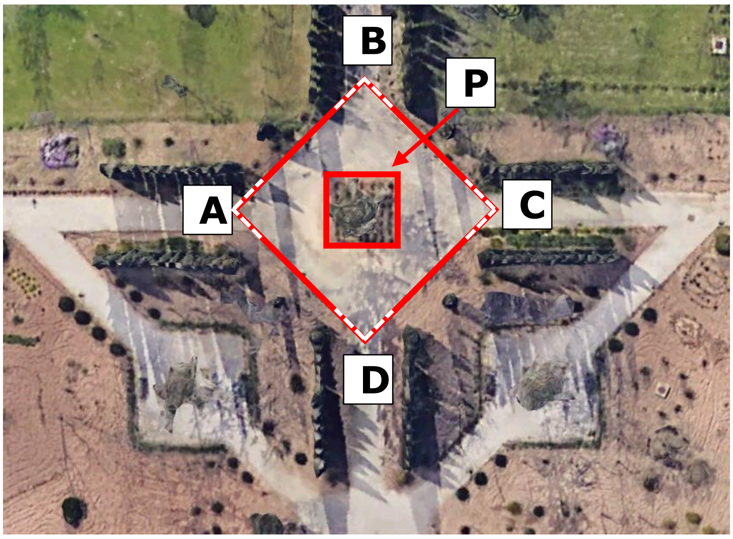
6. The arches in this space form an arc (part of a circle) as shown in the diagram below.

Take the necessary measurements and work out the length of the arc.
Show all your working.

(4)

(Total: 15 marks)

Task 4 – Behind the Arches



1. (a) Measure the lengths of the sides of shape P.
Note: Measure along the line where the soil touches the stone slabs.

___________ ___________ ___________ ___________

(1)

(b) Underline the correct answer and fill in.
Shape P is approximately (a triangle, a rectangle, a square) of side

_________ m.

(2)

(c) Calculate the area covered by soil in Shape P.

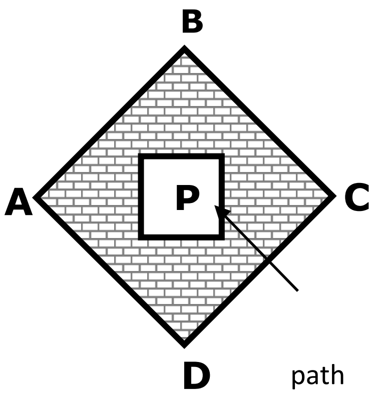
(2)

2. (a) Mark the points A and D with chalk on the floor so that ABCD forms a square. Measure the length of AD.

AD = __________

(1)

(b) Work out the area of Shape ABCD.



(2)

3. Calculate the area of the shaded path shown in the diagram.

(2)

4. On the diagram below draw the outline of:

(a) Two squares of the same size. Label them S.

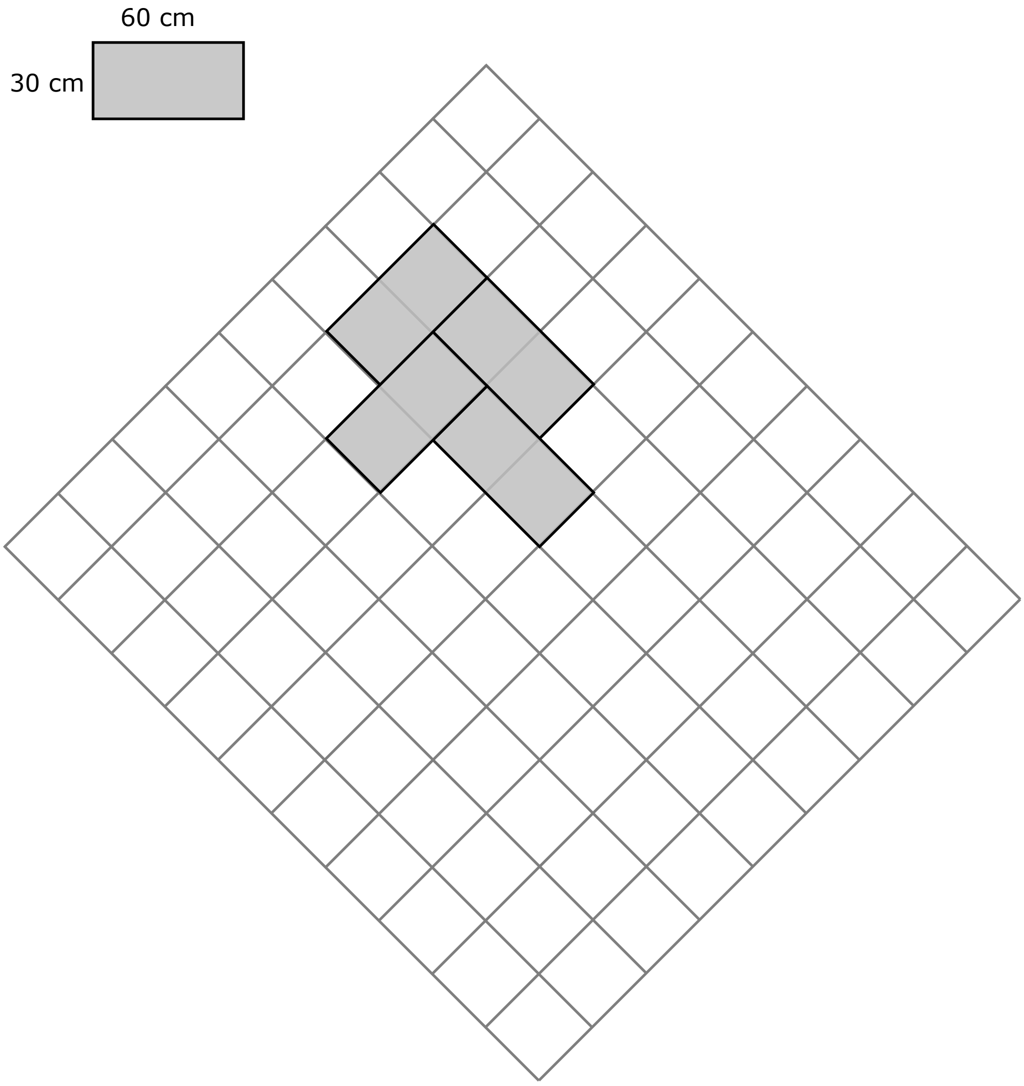
(b) A right-angled triangle. Label it T.

(2)

5. New rectangular flagstones, each 60 cm long and 30 cm wide, will be used to pave another square space.

Each square in the grid below represents a 30 cm by 30 cm square.

Use the grid below to create a tessellating pattern using at least 4 rectangular flagstones.



(3)

(Total: 15 marks)

Follow-up Task
Task 5 – The Greek Theatre

The Greek Theatre has 1163 seats.
A concert will be held at the Greek Theatre.
Tickets for the concert are available for sale online.

1. Six hundred and fifty four tickets have already been sold.
   (a) Write the number of tickets sold in figures.

   ____ (1)

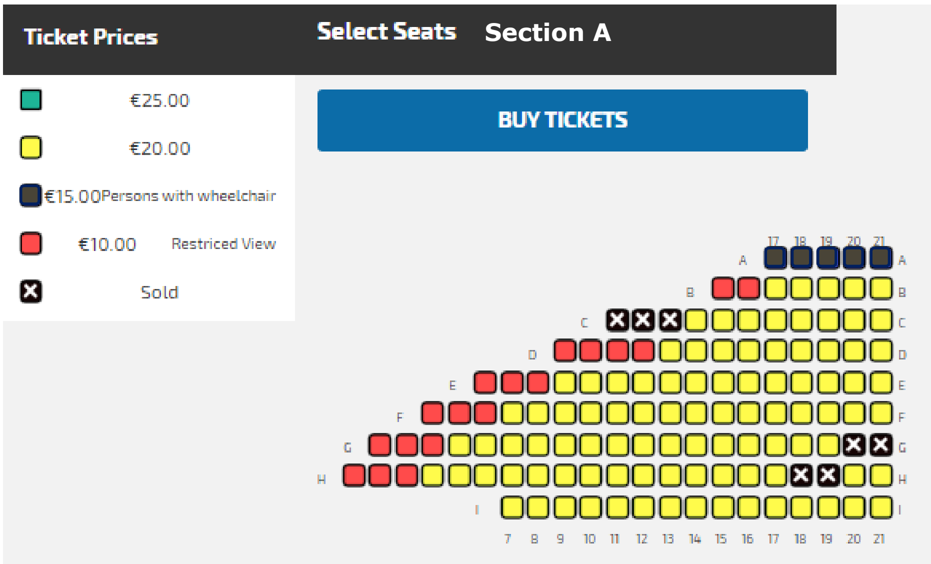
   (b) How many tickets are still unsold?

   (2)

2. Martina wants to buy five tickets for the concert through an online ticket company.
   She wants to buy three tickets at €20 each and two tickets at €10 each.
   (a) Calculate the total cost of the five tickets that Martina buys.

   (2)

   (b) The diagram below represents the seats in Section A of the theatre as shown on the online booking site. The colour represents different prices for the seats.
   On the diagram below, draw a cross (×) on five seats Martina can book when she is buying her tickets through the online booking site.



(1)

3. The table below shows the number of seats available from each category and the price of each seat.

Seating	Number of Seats	Ticket Prices
Blue seats	349	€25
Yellow seats	675	€20
Red seats	134	€10
Wheelchair spaces	5	€15

(a) What percentage of the available seats are yellow?

(2)

(b) Calculate the total income from the concert if all the tickets are sold.

(3)

4. (a) The organising team of the concert decides to donate 10% of the income to charity. How much is donated to charity?

(2)

(b) The organising team calculates that expenses amount to €12 500.
After the donation and the expenses have been paid, the remaining money is divided equally among the five members of the organising team.
How much does each member receive?

(4)

	5. In 2019, money collected from yellow tickets amounted to €13 500. In 2018, the money collected from yellow tickets was 8% less than in 2019. Calculate the amount collected from yellow tickets in 2018? (3)  **(Total: 20 marks)**

Coursework Mode 4: Non-Calculator Assignment

<table>
<tr><th colspan="2">Non-Calculator Assignment</th></tr>
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100 marks

internally-assessed

externally-moderated

12% of total marks

</td><td>

Defining a Non-Calculator Assignment

The use of calculators in mathematics classrooms has two main benefits: (i) it is an efficiency tool when used to help learners do mathematics more efficiently; and (ii) it is a conceptual construction tool when used to provide learners with access to new understandings of mathematical relations, processes and purposes (Olive & Makar, 2010). While both are important, the second benefit is markedly more crucial. For it has the potential to engage learners in more active mathematical practices (E.g. experimenting, investigating, problem solving, conjecturing, justifying and generalising) that stir classroom practices away from the traditional reliance on memorising and reproducing learned procedures (Goos, 2010). Notwithstanding these benefits, there are also important considerations, related to both employment and further studies, as to why non-calculator work remains an essential component of learning mathematics. Employers report, for instance, that employees who had engaged in non-calculator work at school are more likely to feel at ease in the workplace, are less reliant on calculators and are more likely to appreciate the reasonableness of a calculated answer (Diall & Burghes, 2000). Moreover, students' dependence on the calculator comes at an additional price: They embark on further studies with poor mental mathematical skills and an inability to reason and analyse things without the use of a calculator (McNaught & Hoyne, 2013).

The Aim of a Non-Calculator Assignment

The aim of a non-calculator assignment is to provide students with opportunities to engage in calculations and computations that are linked to real life situations without the use of a calculator. In general, calculations are associated with arithmetic processes and computations are associated with algorithmic processes. It is widely recognised that students' ability to operate in real life, whenever necessary, without the use of a calculator is as an essential everyday skill. Consequently, students should also experience non-calculator work during lessons as part of helping them to develop meaningful connections between school mathematics and everyday life.

The non-calculator assignment facilitates the development of a number of processes and skills. These include the ability to select and analyse information; practise problem solving; carry out computations and calculations using only pencil and paper methods; and present creative solutions. Moreover, it provides students with opportunities to demonstrate skills that are not normally assessed in the controlled assignment.

The non-calculator assignment has to be aligned with the curriculum and needs to target specific learning outcomes and assessment criteria. It should explore a context, set in real life, which is relevant to the subject content being assessed.

The Non-Calculator Assignment

The non-calculator assignment consists of four tests, each carrying 25 marks. All four tests may be carried out at different intervals during one scholastic year. Students will work individually during the tests.
Each test, which should take about one lesson to complete, should consists of 7 to 10 compulsory questions. The questions in a test should be linked to one real life context and target assessment criteria in one or two learning outcomes. It is recommended that the context varies from one test to another.
A test can be pegged at either of these two categories:

- A test set at level 1-2 should include questions based on assessment criteria from MQF 1 (40%) and questions based on assessment criteria from MQF 2 (60%).
- A test set at level 1-2-3 should include questions based on assessment criteria from MQF 1 (30%), MQF 2 (30%) and MQF 3 (40%).

The questions should involve computations and calculations that can either be done quickly by inspection, mentally or using paper and pencil methods. These question should be such that the use of calculator might facilitate the working of the questions set. The use of calculator is not allowed during the test.

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Guidelines for a Non-Calculator Assignment

Section	Details
The first 6-9 Questions	The first 6 to 9 questions should target situations that require limited computations and calculations. These questions carry a total of 20 marks.
Last Question	The last question should engage students in situations that require higher order thinking. It should present situations that can be solved through a number of known methods and procedures that lead to a unique solution. This question carries a total of 5 marks.

Marking the Non-Calculator Test

Tests are marked through a marking scheme. Each of the four tests assigned carries 25 marks, accumulating to a total of 100 marks.

Refer to Appendix III for the marking scheme guidelines.

References:

Diall, R., & Burghes, D. (2000) Mathematical needs of young employees. *Teaching Mathematics and Its Applications*, *19(3),* 104–113.

Goos, M. (2010) Using technology to support effective mathematics teaching and learning: What counts? In C. Glascodine & K-A. Hoad (eds.), *Teaching Mathematics? Make it Count (ACER Conference Proceedings 2010)* (pp. 67–70). Melbourne: ACER.

McNaught, K., & Hoyne, G. (2013) Testing program reveals deficient mathematics for health science students commencing university. *Issues in Educational Research*, *23(2),* 180–195.

Olive, J., & Makar, K. (with V. Hoyos, L.K. Kor, O. Kosheleva & R. Straesser) (2010) Mathematical knowledge and practices resulting from access to digital technologies. In C. Hoyles & J. Lagrange (eds.), *Mathematics Education and Technology: Rethinking the Terrain (The 17th ICMI Study)* (pp. 133–177). New York: Springer.

Non-Calculator Assignment Exemplar Level 1-2	# Non-Calculator Assignment # Level 1-2 *Task: Decorating a House* **Instructions:** Attempt **all** questions. Write your answers in the space available on the test paper. The use of calculators is **not** allowed. Show all the necessary working. This paper carries a total of 25 marks. **Name:** ______________________________ **Class:** _____________

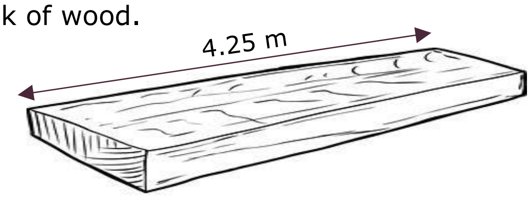
1. Julian buys:
    - wallpaper at €128
    - wallpaper glue at €11.70
    - a measuring tape at 1.85

   How much did Julian spend in all?

   (*2 marks*)

---

2. Luke cuts 1.87 m from this plank of wood.
   What length of the plank is left?



© Can Stock Photo

   (*2 marks*)

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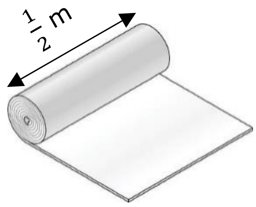
3. Underline the correct answer:



   (a) $\frac{1}{2}$ m is equal to:

   5 cm,   1.2 m,   0.5 m,   500 cm

   (*1 mark*)

   (b) $\frac{3}{4}$ kg is equal to:

   340 g,   0.34 kg,   7.5 kg,   750 g

   (*1 mark*)

---

4. Kenneth has 37.94 m of wire.
   He cuts the wire into 7 equal pieces.
   What is the length of each piece of wire?

   (*2 marks*)

---

5. 2 m of curtain material costs €24.90.
What is the cost of 5 m of curtain material?

(*3 marks*)

---

6. Find the cost of three switches and four plugs.

Jim's Ironmongery 

	Price per item
Switch	€4.25
Plug	€2.50

(*3 marks*)

---

7. (a) Diane starts painting the walls of her bedroom at 9.30 am.
She spends 1 hour 30 minutes painting.
At what time does she finish?

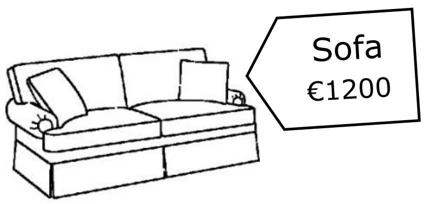
(*1 mark*)

(b) Diane starts cleaning her bedroom at 11.50 am and finishes at 1.15 pm.
How long does it take her to clean the room?

(*2 marks*)

---

8. Three friends buy this sofa.
Carl pays $\frac{1}{8}$ of the cost.
Jill pays $\frac{3}{8}$ of the cost.
Ben pays the rest.



(a) What fraction of the cost do Carl and Jill pay altogether?

(*1 mark*)

(b) How much does Carl pay?

(*2 marks*)

---

9. David buys paint from the three sizes of tins shown below.

Tin A	Tin B	Tin C

5 litres €7.95	2 litres €3.25	1 litre €2.10

(a) He buys four tins of paint.
How many tins from Tin A, Tin B and Tin C does he buy to have 11 litres?

(3 *marks*)

(b) Using answer of part (a), calculate the total cost of the four tins David buys.

(2 *marks*)

End of Paper

Non-Calculator Assignment Exemplar Level 1-2-3

Non-Calculator Assignment
Level 1-2-3

Task: Decorating a House

Instructions:

Attempt **all** questions.
Write your answers in the space available on the test paper.
The use of calculators is **not** allowed.
Show all the necessary working.
This paper carries a total of 25 marks.

Name: ______________________________

Class: _____________

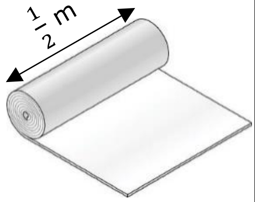
1. Julian wants to cover a wall with wall paper and buys:
   - wallpaper at €128
   - wallpaper glue at €8.70
   - a tool kit at €12.87
   - a measuring tape at €1.85

   How much did Julian spend in all?

(*2 marks*)

---

2. Underline the correct answer:



(a) $\frac{1}{2}$ m is equal to:

5 cm, 1.2 m, 0.5 m, 500 cm

(*1 mark*)

(b) $\frac{3}{4}$ kg is equal to:

340g, 0.34 kg, 7.5 kg, 750 g

(*1 mark*)

---

3. Fill in:

1350 ml = _________ litres.

(1 *mark*)

---

4. Kenneth has 37.94 m of wire.
   He cuts the wire into 7 equal pieces.
   What is the length of each piece of wire?

(*2 marks*)

---

5. 2 m of curtain material costs €24.90.
What is the cost of 5 m of curtain material?

(*3 marks*)

---

6. Find the cost of three switches and four plugs.

Jim's Ironmongery 

	Price per item
Switch	€4.25
Plug	€2.50

(3 *marks*)

---

7. (a) Diane starts painting the walls of her bedroom at 9.30 am.
She spends 1 hour 30 minutes painting.
At what time does she finish?

(1 *mark*)

(b) Diane starts cleaning her bedroom at 11.50 am and finishes at 1.15 pm.
How long does it take her to clean the room?

(*2 marks*)

---

8. Carl wants to buy this sofa.
He pays $\frac{1}{4}$ of the cost from his salary.
Carl's mum gives him $\frac{3}{5}$ of the cost.
He pays the rest from his savings.

(a) How much does Carl's mum give him?

(*2 marks*)

(b) What fraction of the cost of the sofa is paid from Carl's savings?

(*2 marks*)

9. David needs 5.5 litres of paint.
He buys paint from the three sizes of tins shown below.

Tin A

2.5 litres
€7.95

Tin B

1 litre
€3.25

Tin C

$\frac{1}{2}$ litre
€2.10

How many tins of paint from Tin A, Tin B and Tin C does David buy so that:

- he spends the least possible; and
- there is the least amount of leftover paint?

(*5 marks*)

End of Paper

Appendices

Appendix I – Rubric to assess Mathematical Processes as evidenced in the report

Mathematical Processes*	**No evidence**	**Not achieved**	**Working towards achievement**	**Achieved**	**Mastered**
	0	**1**	**2**	**3**	**4**
A. Problem Solving Appropriate mathematical strategies are applied to solve problems in an efficient manner.					
B. Reasoning Mathematical arguments are developed and appropriate justifications are provided to support conclusions.					
C. Communication Mathematical ideas are communicated coherently and clearly through the use of correct mathematical language.					
D. Connections The links between the concepts and processes of mathematics and real life are recognized and applied.					
E. Representations Appropriate representations are created and used to organize, record, and/or communicate mathematical ideas.					
				Total Mark out of 20	

* Based on: National Council of Teachers of Mathematics (NCTM) (2000) *Principles and Standards for School Mathematics*. Reston, VA: NCTM.

Appendix II – Scoring Rubric for the Design Project Report and the Survey Report

[1] Action Plan (16 marks)
Marks awarded in this section are based on the *Action Plan* produced by the student.
Select two *planning skills* from the list below. Up to one *planning skill*, not listed below, may be added at the discretion of the teacher:
■ *appropriate strategy* ■ *comprehensive list* ■ *avoidance of superfluous steps* ■ *correct sequence* ■ *manageable*

Planning Skills	0	1 - 2	3 - 5	6 - 8	Mark out of 16
1. Select a Planning Skill					
2. Select a Planning Skill					

[2] Working (40 marks)
Marks awarded in this section are based on work produced by the student in the *Journal* section of the Design Project Report or the *Survey* section of the Survey Report.
Select five *mathematical skills* from the list below. Up to two *mathematical skills*, not listed below, may be added at the discretion of the teacher:
■ *estimation and approximation* ■ *measurement* ■ *conversions* ■ *symbols* ■ *terminology* ■ *factual knowledge* ■ *categorizing and grouping* ■ *substitutions* ■ *algebraic manipulation* ■ *procedures* ■ *computations* ■ *rounding* ■ *reasonableness of result* ■ *pictorial representations*

Mathematical Skills	0	1 - 2	3 - 5	6 - 8	Mark out of 40
1. Select a Mathematical Skill					
2. Select a Mathematical Skill					
3. Select a Mathematical Skill					
4. Select a Mathematical Skill					
5. Select a Mathematical Skill					

[3] Output (24 marks)
Marks awarded in this section are based on work produced by the student in the *Output* section.

Quality Indicators	0	1 - 2	3 - 5	6 - 8	Mark out of 24
1. Addresses assignment					
2. Neatness and clarity					
3. Originality and creativity					
				Total Mark out of 80	

Appendix III – Marking Scheme Guidelines

Types of Marks
Method Marks Method marks (denoted by **M**) are awarded for knowing a correct method of solution and attempting to apply it. Method marks cannot be lost for non-method related mistakes. They can only be awarded if the method used would have led to the correct answer had a non-method mistake not been made. Unless otherwise stated, any valid method, even if not specified in the marking scheme, is to be accepted and marked accordingly. ***Accuracy Marks*** There are two types of Accuracy marks: **A** marks and **B** marks. i. **A** marks are accuracy marks given for correct answer only. • Incorrect answers, even though nearly correct, score no marks. • Accuracy marks are also awarded for incorrect answers which are correctly followed through (denoted by **A** f.t.) from a previous incorrect answer, provided that f.t. is indicated in the marking scheme. ii. **B** marks are accuracy marks awarded for specific results or statements independent of the method used. ***Note*** No Method marks (**M**) or Accuracy marks (**A**) are awarded when a wrong method leads to a correct answer.

Specimen Assessments

Specimen Assessments: Controlled Paper MQF 1-2

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION APPLIED CERTIFICATE LEVEL

SAMPLE CONTROLLED PAPER

SUBJECT:	**Mathematics**
PAPER NUMBER:	**Level 1 – 2**
DATE:	
TIME:	2 hours

Answer **ALL** questions.

Show clearly all the necessary steps, explanations and construction lines in your working.

Unless otherwise stated, diagrams are drawn to scale.

The use of non-programmable electronic calculators with statistical functions and mathematical instruments is allowed.

Candidates are allowed to use transparencies for drawing transformations.

This paper carries a total of 100 marks.

Section A													
Section B Mark	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	
Section C Mark	Q1		Q2		Q3		Q4		Q5		Q6		
												Total	

Section A – Multiple Choice Questions

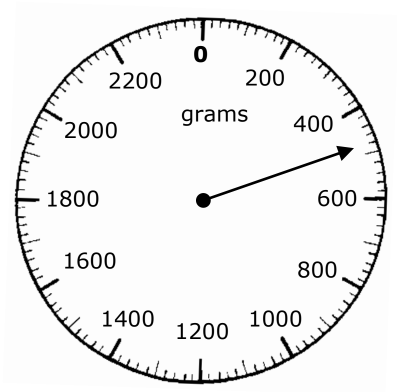
Circle the letter representing the correct answer.
Each question carries one mark.
This section carries a total of 10 marks.

Questions and Answers

1 Write one hundred thirty-seven euro fifty cents in figures.

A) €137.50 B) €13750 C) €137.50c D) 1375c

2 The weighing scales reads:



A) 450 g B) 440 g C) 480 g D) 500 g

3 A triangular flag has three sides equal. The flag has the shape of:

A) a right-angled triangle

B) a scalene triangle

C) an isosceles triangle

D) an equilateral triangle

4 Calculate the surface area of a cube of side 5 cm.

A) 150 cm^2 B) 125 cm^2 C) 50 cm^2 D) 25 cm^2

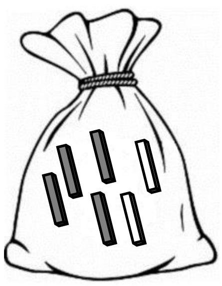
5 Write ¼ litre in decimal form.

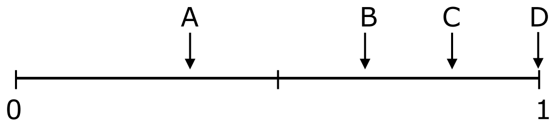
A) 0.4 litre B) 2.5 litre C) 0.040 litre D) 0.250 litre

6 The lid of a jar has a diameter of 5 cm.
The jar has a radius of:

A) 10 cm B) 5 cm C) 2.5 cm D) 6 cm

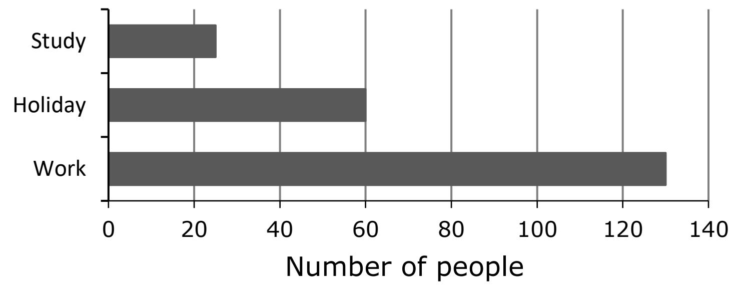
7 The probability of picking a black stick from the bag is shown by:





A) arrow A B) arrow B C) arrow C D) arrow D

8 The chart shows the purpose of travel of a number of people on a flight to Brussels.



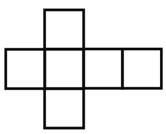
The difference between the number of people visiting Brussels for work and the number of people visiting for a holiday is:

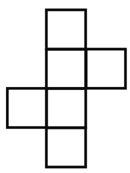
A) 70 B) 130 C) 60 D) 80

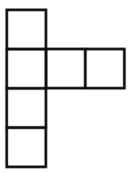
9 Juanita drives a distance of 315 km. The journey takes 4.5 hours.
Calculate her average speed.

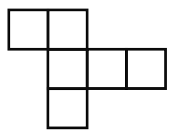
A) 7 km/h B) 2.5 km/h C) 5 km/h D) 70 km/h

10 Which one of the following is **NOT** the net of a closed cube?

A) 

B) 

C) 

D) 

Section B

Write your answers in the available space on the examination paper.
This section carries a total of 65 marks.

1) Sandra has these coins in her purse.

(a) How much money does Sandra have? _________

(1)

(b) (i) Sandra buys a packet of rice for €2.29.
She gives two €2 coins to the cashier. What change does she get?

(2)

(ii) What coins must Sandra give to the cashier to get the least possible change?

(1)

(Total: 4 marks)

2) The pictograph shows the number of teeth pulled out at a dental clinic.

 represents 4 teeth.

Monday	
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	

Fill in:

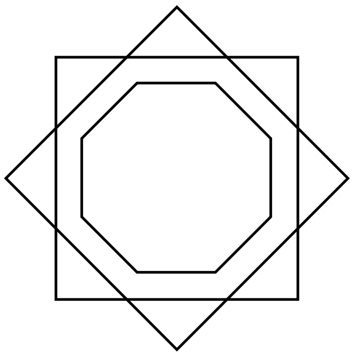
(a) The number of teeth pulled out on Wednesday was ___________. (1)

(b) The number of teeth pulled out on Saturday was _____________. (1)

(c) Dentists at the clinic pulled out _________ more teeth on Friday than on Monday. (2)

(Total: 4 marks)

3) Draw **all** the lines of symmetry of this design.



(Total: 2 marks)

4) This is the floor plan of an office.

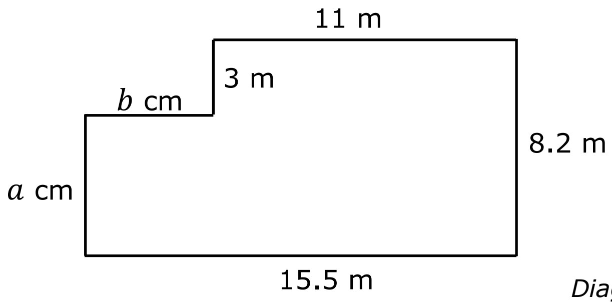


Diagram not drawn to scale

(a) Find the value of:

(i) Length a

(1)

(ii) Length b

(1)

(b) Calculate the perimeter of the floor plan.

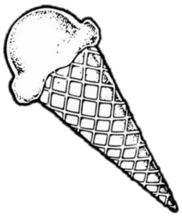
(2)

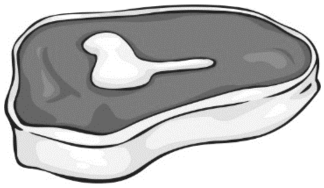
(c) Calculate the area of the floor plan.

(4)

(Total: 8 marks)

5) (a) The items below are stored in different freezers.





Ice-cream	Meat	Frozen vegetables
–5°C	–12°C	–7°C

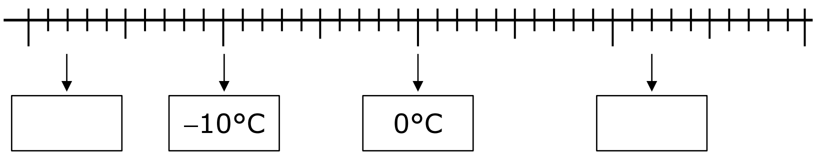
(i) Which temperature is the coldest?

(1)

(ii) The meat is taken out of the freezer.
It is placed in a temperature of 22°C.
Calculate the difference in temperature.

(2)

(b) Fill in the missing temperatures on the number line below:



(2)

(Total: 5 marks)

6) Daniel receives a wage of €450 per week.
He is paid overtime at €14 per hour.

Last week Daniel worked the following overtime hours:

Day	Monday	Tuesday	Wednesday	Thursday	Friday
Hours of overtime	1	2.5	0	3	1.5

Calculate Daniel's total wage last week.

(Total 4 marks)

7) (a) A restaurant has two main sections: the fine dining area and the pizzeria area.
The ratio of their areas is given by:

fine dining area : pizzeria space

$72\ \text{m}^2 : 36\ \text{m}^2$

Simplify the ratio of the two areas.

(2)

(b) The restaurant has a garden with a pool.
The ratio of the garden area to the pool area is given by:

garden : pool

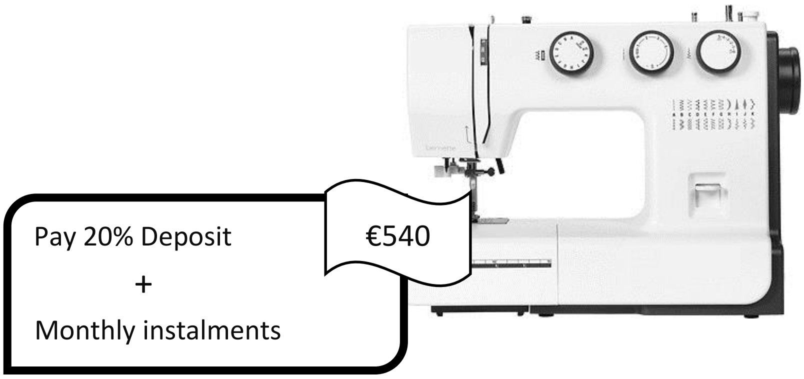
4 : 1

The total area of the garden and pool is 30 m^2. Work out the area of the garden.

(3)

(Total: 5 marks)

8) Martin wants to buy this sewing machine.



(a) Calculate the deposit Martin pays for the sewing machine.

(2)

(b) Calculate the remaining money to be paid in instalments.

(2)

(c) Martin will pay €54 each month in instalments.

How many instalments does he pay?

(2)

(Total: 6 marks)

9) x, y and z are the measurements of a box that holds eight modem boxes placed as shown in the diagram. Work out the values of x, y and z.

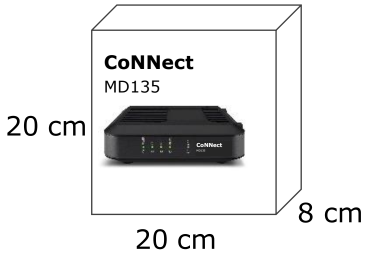
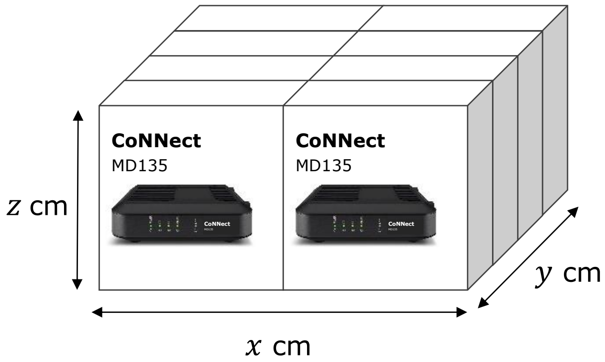


Diagram not drawn to scale



x = _________ cm y = _________ cm z = _________ cm

(Total: 3 marks)

---

10) The diagram shows a rectangle.

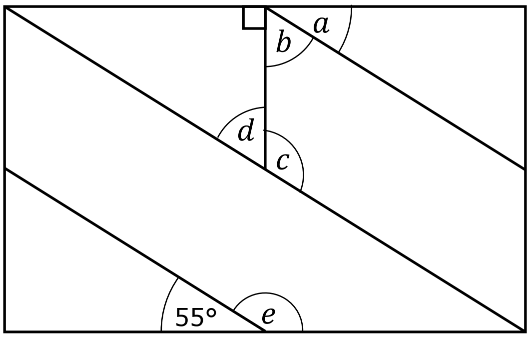


Diagram not drawn to scale

(a) Use the diagram above to fill in:

(i) Angle _______ and angle _______ together make 180°. (1)

(ii) Angle _______ and angle _______ are alternate angles. (1)

(iii) Angle _______ and angle _______ are interior angles. (1)

(b) Angle a = 55°. Work out the size of angle b.

(2)

(c) Work out the size of angle e.

(2)

(Total: 7 marks)

11) Carl lists some of the ingredients needed to make 15 cookies.

Amount	Ingredient
150 grams	unsalted butter
125 grams	brown sugar
100 grams	caster sugar
300 grams	flour
½ teaspoon	bicarbonate of soda
330 grams	chocolate chips

(a) Calculate the total amount of sugar needed to make 15 cookies.

(1)

(b) Calculate the amount of chocolate chips needed for:

(i) one cookie;

(2)

(ii) 45 cookies.

(2)

(c) One teaspoon bicarbonate of soda weighs 4.8 g.
How many grams of bicarbonate of soda does Carl use to make 15 cookies?

(2)

(Total: 7 marks)

12) (a) This packet of washing powder has the shape of a __________________.

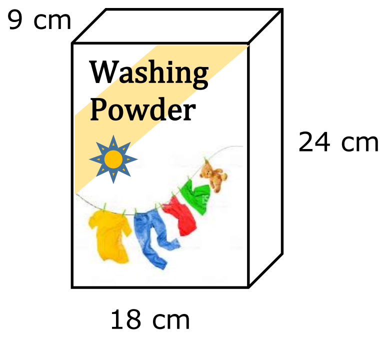


Diagram is not drawn to scale

(1)

(b) Work out the volume of the packet.

(2)

(c) Fill in the measurements of the packet on the net shown below:

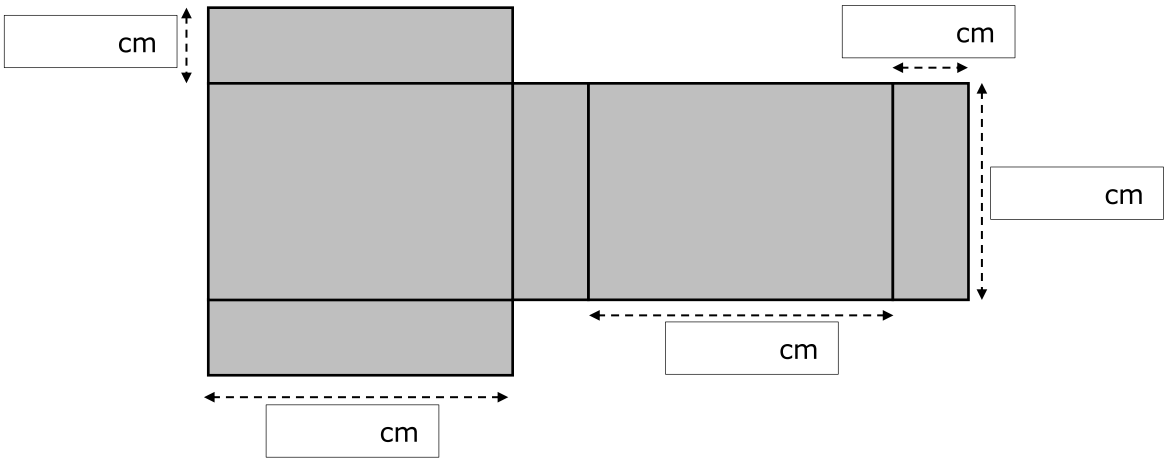


Diagram is not drawn to scale

(2)

(d) Calculate the surface area of the packet of washing powder.

(5)

(Total: 10 marks)

Section C
Real Life Situation – A Holiday In Sicily

Write your answers in the available space on the examination paper.
This section carries a total of 25 marks.

John, Paul, Gemma and Jane are four friends. They go for a short holiday in Catania, Sicily.

1. The table below shows the cost of the flight tickets.

Ticket	Cost
Malta to Catania	€45.25
Catania to Malta	€34.75

Calculate the total cost of **FOUR** tickets from Malta to Catania and back.

(Total: 3 marks)

2. The flight from Malta to Catania takes 30 minutes.
The scheduled departure times are shown below.

Malta International Airport - *Departures*

AIRLINE	FLIGHT	TO	SCHEDULED
Vamos	VS 1122	Madrid	01:05
Aero Med	MA 640	Catania	06:15
Bestair	BA 201	Berlin	07:10

The flight from Malta to Catania will leave 45 minutes late.
At what time will the four friends arrive in Catania?

(Total: 3 marks)

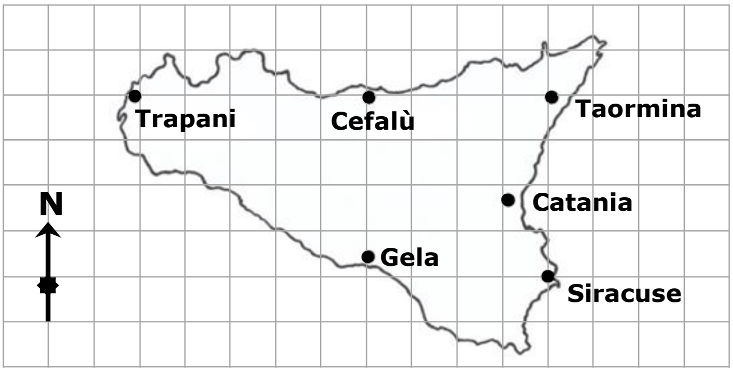
3. The table shows the prices for snacks and drinks on flight.

Snacks			Drinks	
Chocolate bar	€2.90		Mineral water	€1.50
Sandwich	€4.00		Soft drink	€2.10
Croissant	€3.20		Coffee	€2.80
Packet of crisps	€2.40		Tea	€2.90

Gemma wants to buy two drinks and two snacks during the flight.
She wants to spend up to €10.
Suggest **TWO** drinks and **TWO** snacks that she can buy.

(Total: 3 marks)

4. This is a map of Sicily.



Use compass directions and the names of the cities shown in the map to fill in the missing information:

(a) Cefalù is north of _______________.

(1)

(b) Trapani is to the _____________ of Cefalù and Taormina is to the _____________ of Cefalù.

(2)

(c) Siracuse is to the _______________ of Taormina.

(1)

(d) Cefalu is to the ______________________ of Siracuse.

(1)

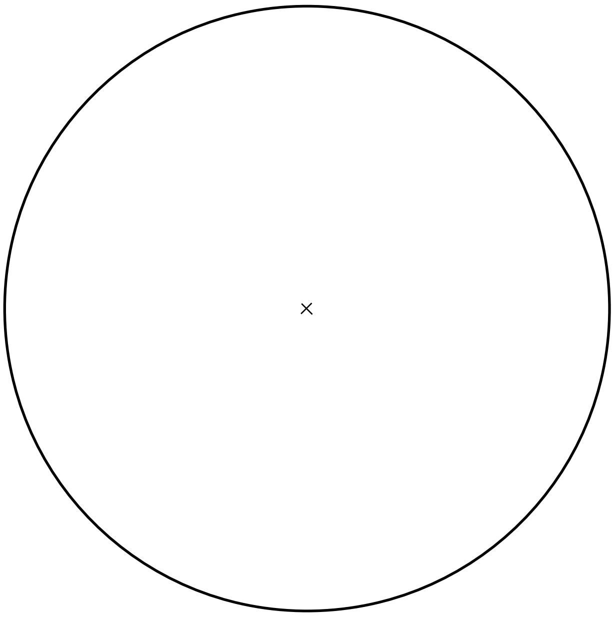
(Total: 5 marks)

5. The four friends visit a museum that has paintings, sculptures and ceramics.
There are 160 ceramics, 220 sculptures and 340 paintings.

(a) Calculate the total number of items in the museum.

(1)

(b) Draw a pie chart to represent this data.



(5)

(Total: 6 marks)

6. The four friends visit the Greek temple shown below.

The temple has a rectangular base on which stand 36 columns. There are 6 columns at the front and back, and 14 columns on each side. The diameter of each column is 2 m and the distance between the columns is 2 m.

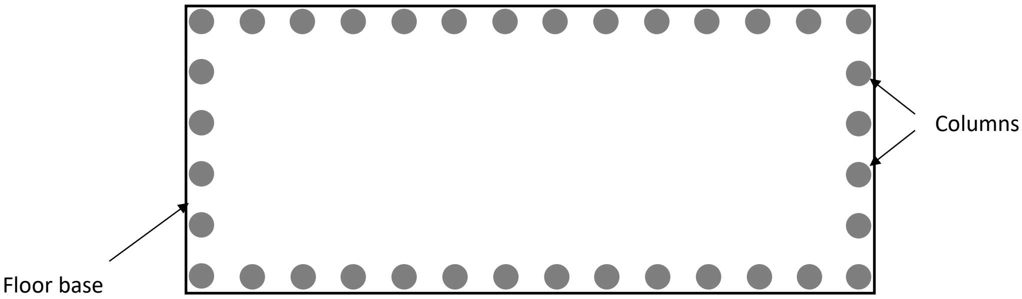


Diagram not drawn to scale

Calculate the area of the rectangular floor base of this temple.

(Total: 5 marks)

END OF PAPER

Specimen Assessments: Marking Scheme for Controlled Paper MQF 1-2

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION APPLIED CERTIFICATE LEVEL

SAMPLE MARKING SCHEME

SUBJECT:	**Mathematics**
PAPER NUMBER:	**Level 1 – 2**
DATE:	
TIME:	2 hours

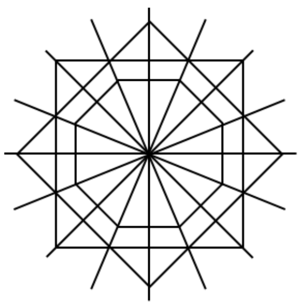
Section A (Total 10 marks)

Award B1 for each correct answer.

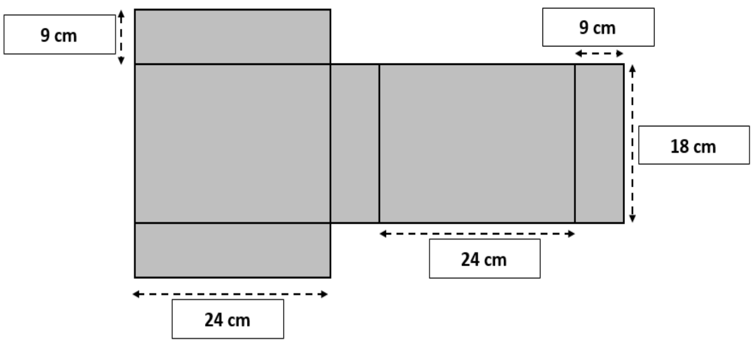
Q1	A	**Q2**	C	**Q3**	D	**Q4**	A	**Q5**	D
Q6	C	**Q7**	B	**Q8**	A	**Q9**	D	**Q10**	C

Section B (Total 65 marks)

Unless otherwise stated, accept any other correct method.

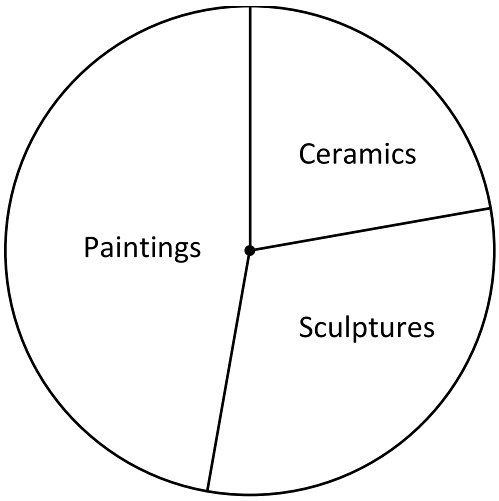
Qn	Solution	Criteria	Marks	
1(a)	€6.40		B1	**4**
1(b)	(i) €4 – €2.29		M1	
	change = €1.71		A1	
	(ii) one 2 euro coin and two 20c coins		B1	
2(a)	12		B1	**4**
2(b)	10		B1	
2(c)	12 – 6	seen or implied	M1	
	= 6		A1	
3		one line of symmetry drawn all 8 lines of symmetry drawn	M1 A1	**2**

Qn	Solution	Criteria	Marks	
4(a)	(i) a = 5.2 m (ii) b = 4.5 m		B1 B1	**8**
4(b)	Perimeter = 15.5 + 8.2 + 11 + 3 + 4.5 + 5.2 Perimeter = 47.4 m		M1 A1 ft	
4(c)	Area = (5.2 × 4.5) + (11 × 8.2) Area = 23.4 + 90.2 Area = 113.6 m^2	Award M1 for correct dimensions of each part	M2 M1 A1 ft	
5(a)	(i) –12°C		B1	**5**
	(ii) 22 – (–12) = 22 + 12 = 34°C		M1 A1	
5(b)	–18°C 12°C		B1 B1	
6	1 + 1.5 + 3 + 1.5 = 8 hours 8 × €14 = €112 €450 + €112 = €562		M1 M1 M1 A1	**4**
7(a)	36: 18 or equivalent 2 : 1	Award for any one intermediate simplification (seen or implied)	M1 A1	**5**
7(b)	4 + 1 = 5 $\frac{4}{5} \times 30$ = 24 m^2		M1 M1 A1	
8(a)	$\frac{20}{100} \times 540$ = €108		M1 A1	**6**
8(b)	€540 – €108 = €432		M1 A1 ft	
8(c)	€432 ÷ €54 = 8 instalments		M1 A1 ft	
9	x = 40 cm y = 32 cm z = 20 cm		B1 B1 B1	**3**

Qn	Solution	Criteria	Marks	
10(a)	(i) b and c **OR** c and d **OR** e and 55° (ii) b and d (iii) b and c		B1 B1 B1	**7**
10(b)	b = 180 – (55 + 90) b = 180 – 145 b = 35°		 M1 A1	
10(c)	e = 180 – 55 e = 125°		M1 A1	
11(a)	125 + 100 = 225 g		B1	**7**
11(b)	(i) 330 ÷ 15 = 22 g		M1 A1	
	(ii) 45 × 22 = 990 g		M1 A1	
11(c)	$\frac{1}{2}$ × 4.8 = 2.4 g		M1 A1	
12(a)	cuboid		B1	**10**
12(b)	9 × 18 × 24 = 3888 cm^3		M1 A1	
12(c)	 Award B1 for any two correct entries		B2	
12(d)	9 × 24 × 2 = 432 cm^2 24 × 18 × 2 = 864 cm^2 9 × 18 × 2 = 324 cm^2 Total surface area = 432 + 864 + 324 = 1620 cm^2		M1 M1 M1 M1 A1	

Section C (Total 25 marks)

Unless otherwise stated, accept any other correct method.

Qn	Solution	Criteria	Marks	
1	Cost of flight for one = 45.25 + 34.75 = €80 Cost of flight for four = 4 × €80 = €320		M1 M1 A1	**3**
2	06:15 + 45 minutes = 07:00 07:00 + 30 minutes = 07:30	Adding delay time Adding travelling time	M1 M1 A1	**3**
3	Award for attempting a correct strategy Award for working total that is less than €10 Award for listing items whose total is less than €10		M1 M1 A1	**3**
4(a)	Gela		B1	**5**
4(b)	West; East (in this order)	Award B1 for each correct answer	B2	
4(c)	South		B1	
4(d)	North West		B1	
5(a)	160 + 220 + 340 = 720 items		B1	**6**
5(b)	$\frac{160}{720} \times 360 = 80°$ $\frac{220}{720} \times 360 = 110°$ $\frac{340}{720} \times 360 = 170°$	Award M1 for one correct angle	M2	
		Award M1 for one correct angle Correct Labelling	M2 A1	

Qn	Solution	Criteria	Marks	
6	length = (2 m × 14 columns) + (2 m × 13 spaces)	Award first M1 for correct working of length of any **one** side of the base of temple	M1	**5**
	length = 28 + 26 = 54 m	i.e. (2 × *n* columns) + (2 × (*n* – 1) spaces)	M1	
	width = (2 m × 6 columns) + (2 m × 5 spaces)			
	length = 12 + 10 = 22 m		M1	
	Area = 54 × 22		M1	
	= 1188 m^2		A1	

Specimen Assessments: Controlled Paper MQF 2-3

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION APPLIED CERTIFICATE LEVEL

SAMPLE CONTROLLED PAPER

SUBJECT:	**Mathematics**
PAPER NUMBER:	**Level 2 – 3**
DATE:	
TIME:	2 hours

Answer **ALL** questions.

Show clearly all the necessary steps, explanations and construction lines in your working.

Unless otherwise stated, diagrams are drawn to scale.

The use of non-programmable electronic calculators with statistical functions and mathematical instruments is allowed.

Candidates are allowed to use transparencies for drawing transformations.

This paper carries a total of 100 marks.

<table>
<tr><td>Section A</td><td colspan="12"></td><td></td></tr>
<tr><td colspan="14"></td></tr>
<tr><td>Section B
Mark</td><td>Q1</td><td>Q2</td><td>Q3</td><td>Q4</td><td>Q5</td><td>Q6</td><td>Q7</td><td>Q8</td><td>Q9</td><td>Q10</td><td>Q11</td><td>Q12</td><td></td></tr>
<tr><td colspan="14"></td></tr>
<tr><td>Section C
Mark</td><td colspan="2">Q1</td><td colspan="2">Q2</td><td colspan="2">Q3</td><td colspan="2">Q4</td><td colspan="2">Q5</td><td colspan="2">Q6</td><td></td></tr>
<tr><td colspan="13" align="right">Total</td><td></td></tr>
</table>

Section A – Multiple Choice Questions

Circle the letter representing the correct answer.
Each question carries one mark.
This section carries a total of 10 marks.

Questions and Answers

1 Write one hundred thirty-seven euro fifty cents in figures.

A) €137.50 B) €13750 C) €137.50c D) 1375c

2 Convert 5 m 7 cm to centimetres.

A) 570 cm B) 5700 cm C) 507 cm D) 5007 cm

3 Which triangle has three lines of symmetry?

A) Scalene B) Equilateral C) Right-angled D) Isosceles

4 Calculate the surface area of a cube of side 5 cm.

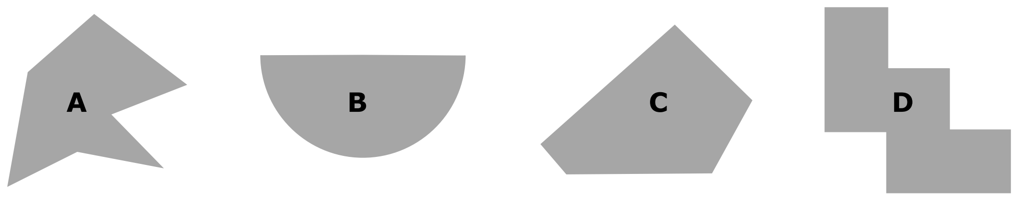
A) 150 cm^2 B) 125 cm^2 C) 50 cm^2 D) 25 cm^2

5 Which one of the following is the most reasonable height from the floor for a basketball loop?

A) 150 cm B) 300 cm C) 500 cm D) 3000 cm

6 A designer wants to create a tessellating pattern for a feature wall.

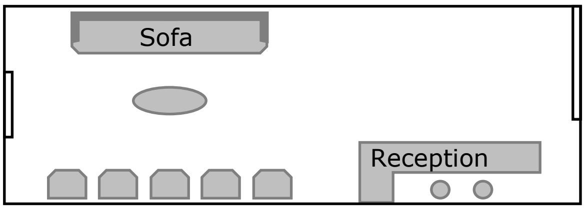
Which **ONE** of the following shapes tessellates?



7 The plan shows a waiting area.

The sofa is 3 m long.

Estimate the length of the room.



A) 15 m B) 9 m C) 12 m D) 6 m

8 A fasting blood sugar level is considered prediabetes if it lies in the range:

$$5.6 \text{ mmol/L} \leq \text{blood sugar level} \leq 6.9 \text{ mmol/L}$$

Which blood sugar level is **NOT** within the prediabetes range?

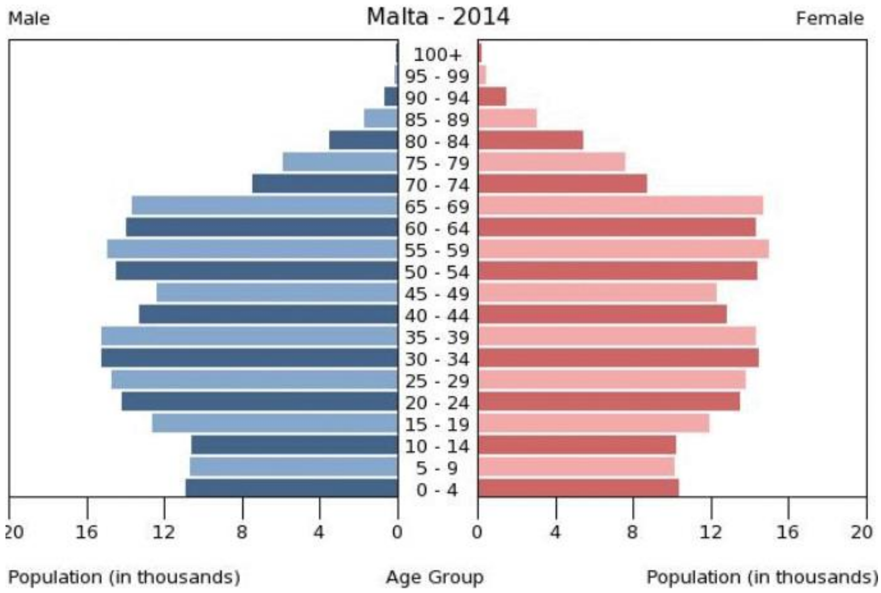
A) 5.6 mmol/L B) 6.5 mmol/L C) 4.7 mmol/L D) 5.9 mmol/L

9 A laptop costs €1000. Pamela bought the laptop for €800 during a sale.

The percentage discount was:

A) 25% B) 200% C) 8% D) 20%

10 In 2014, the number of people aged between 20 and 24 was about:



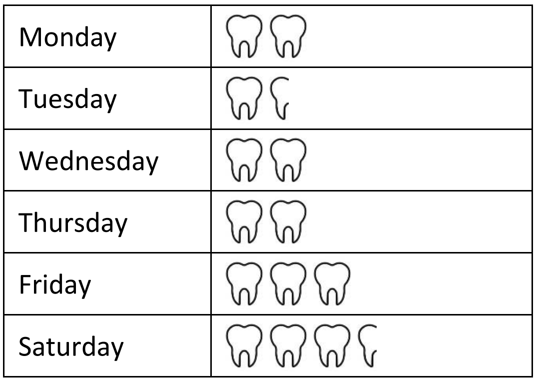
A) 27 B) 27 500 C) 16 D) 14 000

Section B

Write your answers in the available space on the examination paper.
This section carries a total of 65 marks.

1) The pictograph shows the number of teeth pulled out at a dental clinic over a week.

 represents 8 teeth.



Fill in:

(a) The number of teeth pulled out on Saturday was ________.

(1)

(b) Write and simplify the ratio of the number of teeth pulled out on Saturday to the number of teeth pulled out on Wednesday.

Saturday : Wednesday

________ : ________

(1)

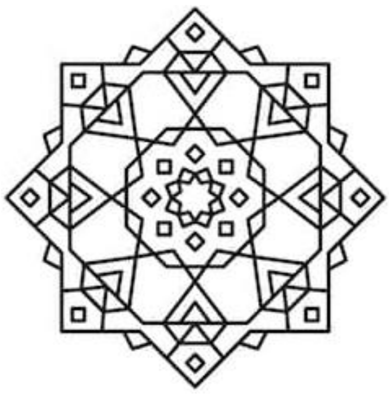
(c) Write the number of teeth pulled out on Saturday as a percentage of total number of teeth pulled out during the whole week.

(2)

(Total: 4 marks)

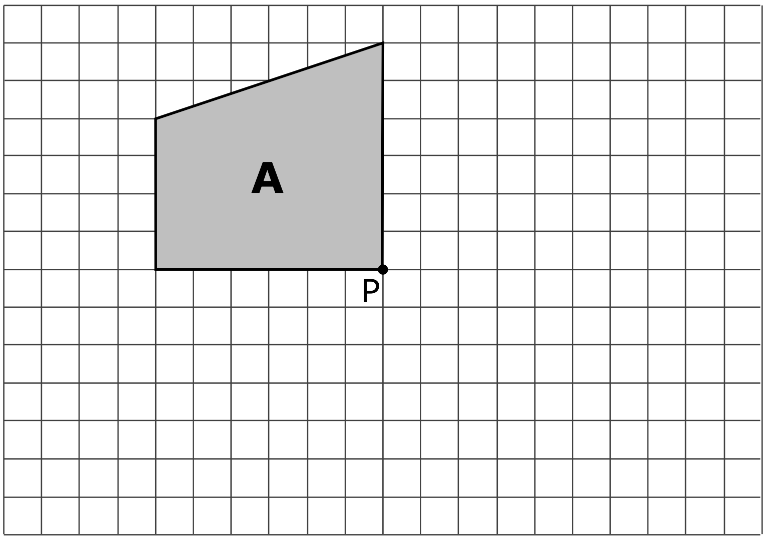
---

2) (a) The following is a design for a tile.
Draw **all** the lines of symmetry on the design.



(2)

(b) Rotate shape A by 180° about point P.



(2)

(Total: 4 marks)

3) A vending machine dispenses coffee (C), tea (T), orange juice (O) and water (W).
Georgia and Sarah buy a drink each from the machine.

(a) Complete the table to show all the possible outcomes.

		Georgia's Drink			
		Coffee (C)	Tea (T)	Orange Juice (O)	Water (W)
Sarah's Drink	Coffee (C)	C, C	T, C		
	Tea (T)				
	Orange Juice (O)				
	Water (W)				

(3)

(b) Find the probability that they both buy the same kind of drink.

(1)

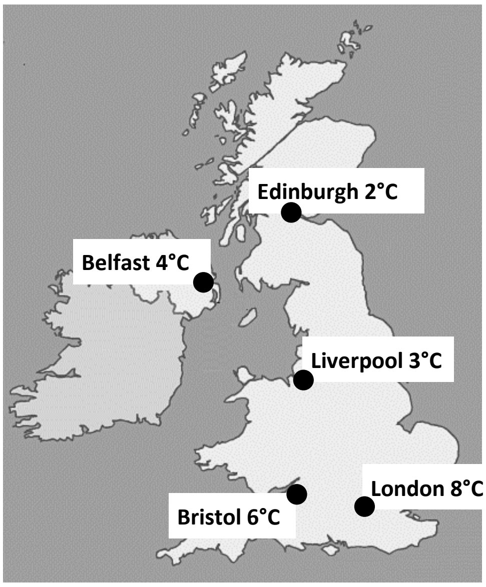
(c) Find the probability that at least one of them buys water.

(1)

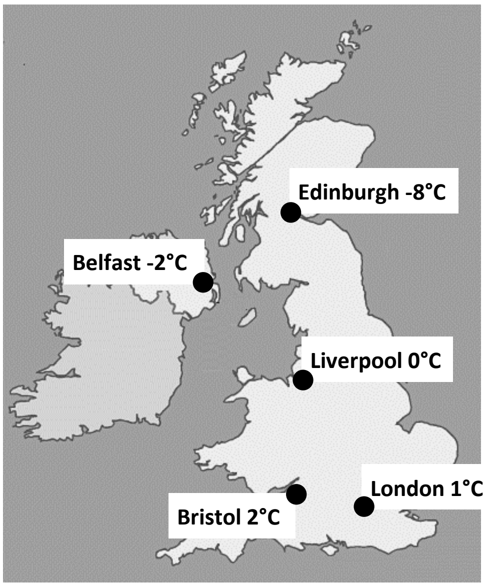
(Total: 5 marks)

4) The maps below show the temperatures at midday and at midnight on 29 December in five different cities in the United Kingdom.

Midday Temperatures



Midnight Temperatures



(a) Which city was the coldest at midnight?

(1)

(b) How much colder was Edinburgh than Belfast at midnight?

(2)

(c) Which city had the greatest drop in temperature from midday to midnight?

(2)

(Total: 5 marks)

---

5) An office has a floor area of 112 m^2. The area is divided in two spaces as follows:

work space : leisure space = 5 : 2

Work out the area of the work space.

(Total: 3 marks)

6) Christine receives a basic pay of €15 360 per year.

(a) Christine pays 15% of her basic pay in Social Security Contribution.
Calculate the remaining amount of Christine's basic pay per year after her Social Security Contribution has been deducted.

(2)

(b) Christine also receives an allowance of €65 per month.
Calculate Christine's gross income per year.

(2)

(c) Christine pays €3459 income tax per year on her gross income.
Calculate Christine's income tax rate.

(2)

(Total: 6 marks)

7) A box containing a modem measures 20 cm by 20 cm by 8 cm. What is the greatest number of modem boxes that can fit in a box measuring 34 cm by 42 cm by 22 cm?

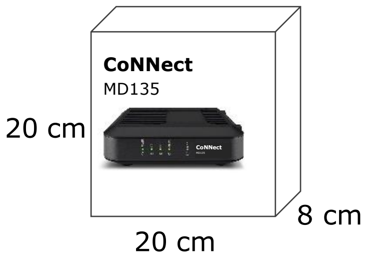


Diagram not drawn to scale

(Total: 3 marks)

8) The diagram shows the cross-section of a flight of steps.
Find the size of the angles marked a, b, c and d. Give reasons for your answers.

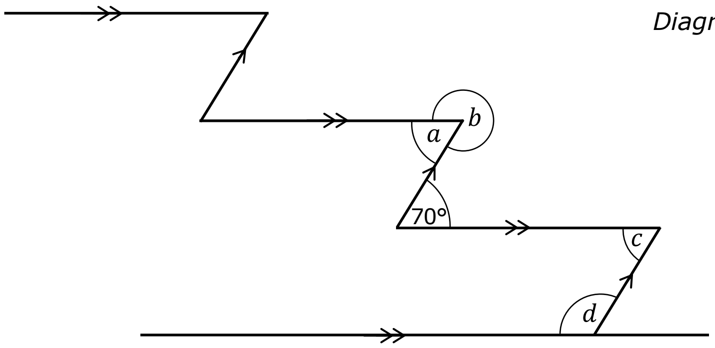


Diagram not drawn to scale

(Total: 8 marks)

9) The following are some of the ingredients needed to make 15 cookies.

Amount	**Ingredient**
150 grams	unsalted butter
225 grams	brown sugar
300 grams	flour
½ teaspoon	bicarbonate of soda
320 grams	chocolate chips

(a) One teaspoon bicarbonate of soda weighs 4.8 g. How many grams of bicarbonate of soda does Carl use to make 60 cookies?

(3)

(b) Carl has only 750 g of chocolate chips and 500 g of brown sugar left. He has an unlimited amount of all the other ingredients.
What is the greatest number of cookies that he can bake?

(3)

(Total: 6 marks)

10) The table below shows the distribution by age of tourists arriving to Malta in 2017.

Age Group (years)	**Number of tourists** (in thousands)
0 to 24	432
25 to 44	760
45 to 64	720
65+	246

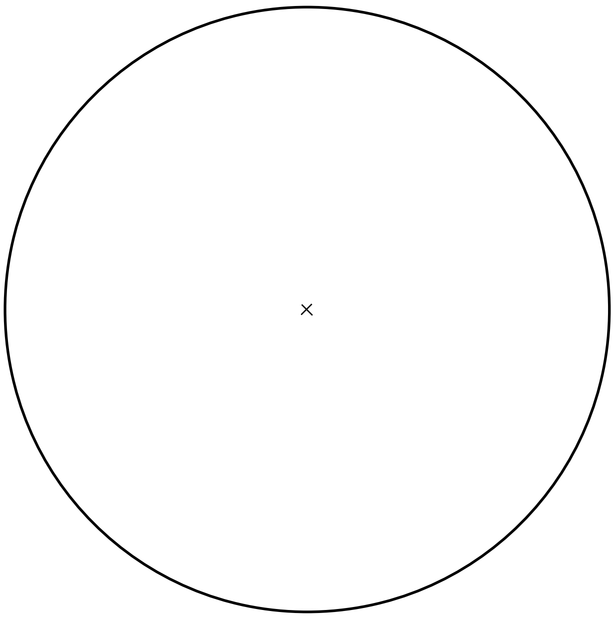
(a) (i) Work out the total number of tourists coming to Malta in 2017.

(2)

(ii) Write this number in standard form.

(1)

(b) Draw a pie chart to represent this data.



(4)

(Total: 7 marks)

11) A can of tomatoes, in the shape of a cylinder, is 12 cm high and has a radius of 4 cm.

(a) Work out the volume of the can.

(3)

(b) A label is fixed around the can.
Calculate the length x of the label if it has a 1 cm overlap.

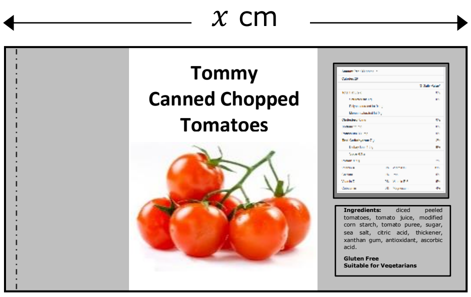
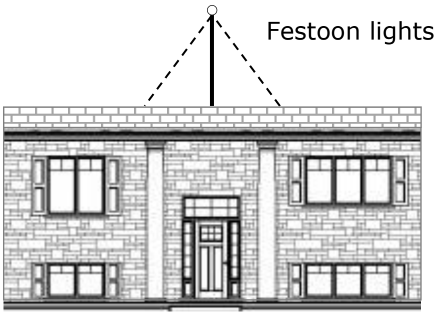


Diagram not drawn to scale

(3)

(Total: 6 marks)

12) The diagram shows festoon lights on the roof of a house. The festoon is made of a string of light bulbs that is pulled tight from A to B and from B to C as shown in the diagram.



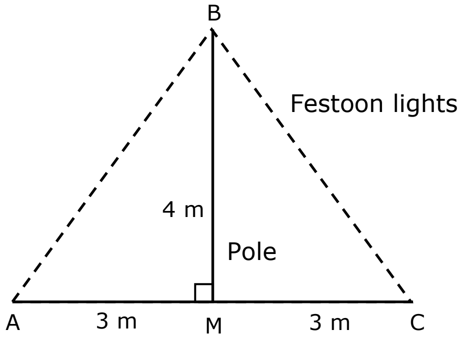


Diagram not drawn to scale

(a) (i) Calculate the total length of the festoon of lights needed.

(2)

(ii) The distance between one bulb and another on the festoon is 30 cm.
What is the maximum number of bulbs that can be placed along the whole festoon of lights, if the first bulb is placed 15 cm from A?

(3)

(b) Calculate the size of angle $A\hat{B}C$.

(3)

(Total: 8 marks)

Section C
Real Life Situation – A Holiday In Sicily

Write your answers in the available space on the examination paper.
This section carries a total of 25 marks.

John, Paul, Gemma and Jane are four friends. They go for a short holiday in Catania, Sicily.

1. The four friends buy the flight tickets from a travel agency. Tickets cost as follows:

Ticket	Cost
Malta to Catania	€45.25
Catania to Malta	€34.75

The travel agency charges an extra €5 for each ticket sold.
Calculate the total amount paid by the four friends to travel from Malta to Catania and back.

(Total: 3 marks)

2. The four friends book the hotel accommodation for three nights.

Single rooms cost €80 per night and double rooms cost €105 per night. In addition, there is a city tax of €3 per night for each room.

John and Paul stay in single rooms. Gemma and Jane share a double room.

Calculate the total amount paid by the four friends for their hotel accommodation.

(Total: 4 marks)

3. The flight from Malta to Catania takes 25 minutes.
The scheduled departure times are shown below.

Malta International Airport - *Departures*

AIRLINE	FLIGHT	TO	SCHEDULED
Vamos	VS 1122	Madrid	01:05
AeroMed	MA 640	Catania	06:25
Bestair	BA 201	Berlin	07:10
AIRfly	AF 620	Hamburg	07:20
Vamos	VS1122	Seville	07:45

The flight from Malta to Catania will leave 45 minutes late.
At what time will the four friends arrive in Catania?

(Total: 3 marks)

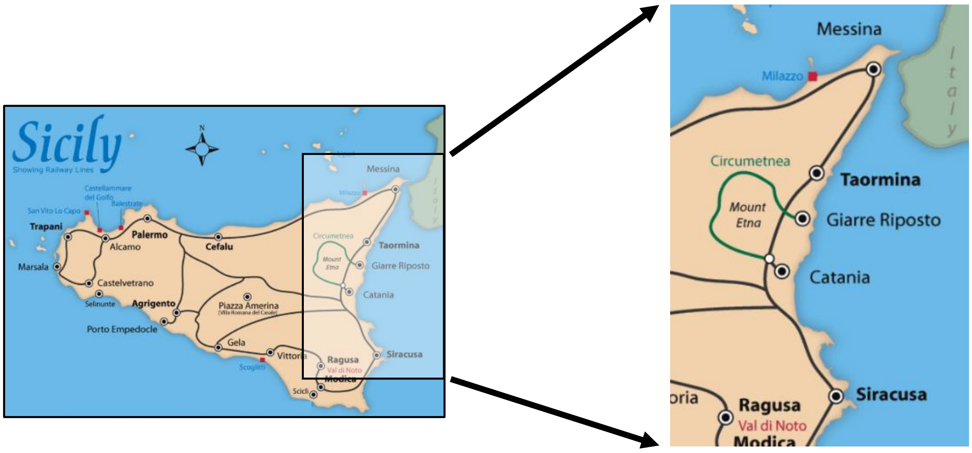
4. The table below shows the prices of snacks and drinks on flight.

Snacks			Drinks	
Chocolate bar	€2.90		Mineral water	€1.60
Sandwich	€4.00		Soft drink	€2.10
Baguette	€3.90		Tea	€2.90
Croissant	€3.20		Coffee	€2.80
Packet of crisps	€2.40		Juice	€2.30

Gemma wants to buy two drinks and two snacks during the flight.
She wants to spend up to €10.
Suggest two drinks and two snacks that she can buy.

(Total: 3 marks)

5. The four friends hire a car and drive from Catania to Taormina.



Scale: 1 cm is to 40 km

(a) Use the above map to estimate the distance they travel to go from Catania to Taormina using the shortest route shown on the map.

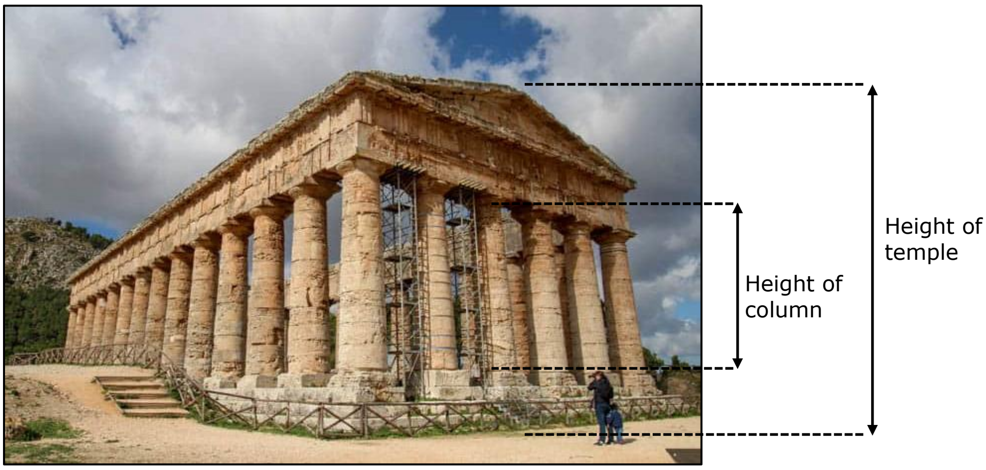
(3)

(b) They take 45 minutes to travel from Catania to Taormina.
Calculate their average speed in kilometres per hour.

(3)

(Total: 6 marks)

6. The four friends visit the Greek temple shown below.



The temple has a rectangular base on which stand 36 columns.
There are 6 columns at the front and back, and 14 columns on each side.
The diameter of each column is 2 m and the distance between the columns is 2 m.

(a) Calculate the area of the rectangular floor base of this temple.

(4)

(b) The columns of the temple are 9 m high.
Work out an estimate for the height of the temple.

(2)

(Total: 6 marks)

END OF PAPER

Specimen Assessments: Marking Scheme for Controlled Paper MQF 2-3

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION APPLIED CERTIFICATE LEVEL
SAMPLE MARKING SCHEME

SUBJECT:	**Mathematics**
PAPER NUMBER:	**Level 2 – 3**
DATE:	
TIME:	2 hours

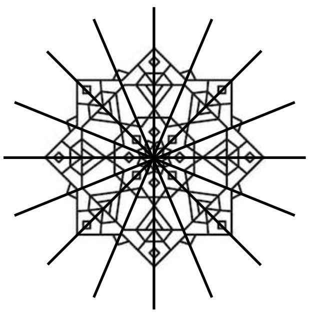
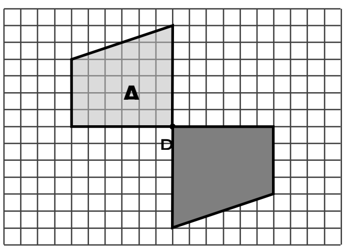
Section A (Total 10 marks)

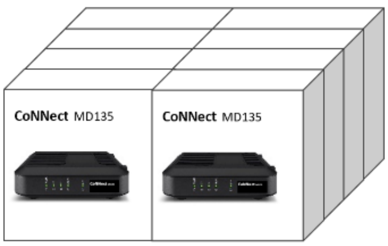
Award B1 for each correct answer.

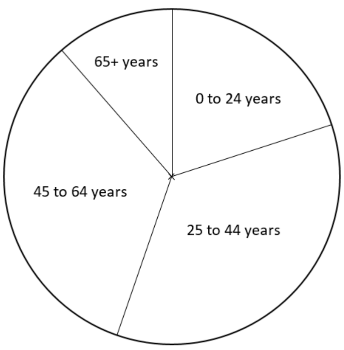
Q1	A	**Q2**	C	**Q3**	D	**Q4**	A	**Q5**	B
Q6	D	**Q7**	B	**Q8**	C	**Q9**	D	**Q10**	B

Section B (Total 65 marks)

Unless otherwise stated, accept any other correct method.

Qn	Solution	Criteria	Marks	
1(a)	28		B1	**4**
1(b)	7 : 4		B1	
1(c)	$\frac{28}{112} \times 100\% = 25\%$		M1 A1	
2(a)		one line of symmetry drawn all 8 lines of symmetry drawn	M1 A1	**4**
2(b)		Award M1 for correct orientation Award A1 for accurate drawing	M1 A1	

<table>
<tr><th>Qn</th><th>Solution</th><th>Criteria</th><th>Marks</th><th></th></tr>
<tr><td>3(a)</td><td>
<table>
<tr><td></td><td></td><td colspan="4">Georgia's Drink</td></tr>
<tr><td></td><td></td><td>Coffee (C)</td><td>Tea (T)</td><td>Orange Juice (O)</td><td>Water (W)</td></tr>
<tr><td rowspan="4">Sarah's Drink</td><td>Coffee (C)</td><td>C, C</td><td>T, C</td><td>O, C</td><td>W, C</td></tr>
<tr><td>Tea (T)</td><td>C, T</td><td>T, T</td><td>O, T</td><td>W, T</td></tr>
<tr><td>Orange Juice (O)</td><td>C, O</td><td>T, O</td><td>O, O</td><td>W, O</td></tr>
<tr><td>Water (W)</td><td>C, W</td><td>T, W</td><td>O, W</td><td>W, W</td></tr>
</table>
</td><td>-1 each error or omission</td><td>B3</td><td rowspan="3">5</td></tr>
<tr><td>3(b)</td><td>$\frac{4}{16}$ OR $\frac{1}{4}$</td><td></td><td>B1</td></tr>
<tr><td>3(c)</td><td>$\frac{7}{16}$</td><td></td><td>B1</td></tr>
<tr><td>4(a)</td><td>Edinburgh</td><td>Ignore incorrect spelling</td><td>B1</td><td rowspan="3">5</td></tr>
<tr><td>4(b)</td><td>$-2-(-8) = -2+8$
$= 6°C$</td><td></td><td>M1
A1</td></tr>
<tr><td>4(c)</td><td>Edinburgh $\Rightarrow$ $2-(-8) = 10°C$
Belfast $\Rightarrow$ $4-(-2) = 6°C$
Liverpool $\Rightarrow$ $3-0 = 3°C$
London $\Rightarrow$ $8-1 = 7°C$
Bristol $\Rightarrow$ $6-2 = 4°C$
Greatest drop in temperature - Edinburgh</td><td>Award for attempt to find drop in temperature in different cities</td><td>M1
A1</td></tr>
<tr><td>5</td><td>$5+2=7$
$\frac{5}{7} \times 112$
$80\ m^2$</td><td></td><td>M1
M1
A1</td><td>3</td></tr>
<tr><td>6(a)</td><td>15 % of 15 360 = €2304
15 360 – 2304 = €13 056</td><td></td><td>M1
A1</td><td rowspan="3">6</td></tr>
<tr><td>6(b)</td><td>15 360 + (65 ×12)
= €16 140</td><td></td><td>M1
A1</td></tr>
<tr><td>6(c)</td><td>$\frac{3459}{16140} \times 100\%$
$= 21.4\%$</td><td>Accept 21% or more accurate</td><td>M1
A1</td></tr>
<tr><td>7</td><td>2 boxes fit in 42 cm side
4 boxes fit in the 34 cm side
1 box fits in the 22 cm side
$2 \times 4 \times 1 = 8$

</td><td>Award M1 for attempt at working out the number of boxes on one side</td><td>M2
A1</td><td>3</td></tr>
</table>

Qn	Solution	Criteria	Marks	
8(a)	a = 70° alternate angles		A1 M1	**8**
8(b)	b = 360 – 70 = 290° angles at a point		A1 M1	
8(c)	c = 70° alternate angles		A1 M1	
8(d)	d = 180 – 70 = 110° interior angles		A1 M1	
9(a)	½ teaspoon = ½ × 4.8 = 2.4 g (60 ÷ 15) × 2.4 = 9.6 g		M1 M1 A1	**6**
9(b)	Chocolate chips ⇒ (750 ÷ 320) × 15 = 35.1 cookies Brown sugar ⇒ (500 ÷ 225) × 15 = 33.3 cookies Carl can make 33 cookies		 M1 M1 A1	
10(a)	(i) 432 + 760 + 246 = 2158 thousand (ii) 2.158 × 10^6	OR 432 000 + 760 000 + 246 000 = 2158 000	M1 A1 B1	**7**
10(b)	$\frac{432\,000}{2158\,000} \times 360 = 72°$ $\frac{760\,000}{2158\,000} \times 360 = 127°$ $\frac{720\,000}{2158\,000} \times 360 = 120°$ $\frac{246\,000}{2158\,000} \times 360 = 41°$  	Award M1 for any one correct calculation Accept working of the form $\frac{432}{2158} \times 360 = 72°$ Award A1 for one correct drawn and labelled sector	M2 A2 ft	

Qn	Solution	Criteria	Marks	
11(a)	Volume = $\pi r^2 h$	Seen or implied	M1	**6**
	$= \pi \times 4^2 \times 12$		M1	
	= 603.1857… cm^3	Award for 603 cm^3 or more accurate	A1	
11(b)	$x = 2\pi r + 1$ cm	Seen or implied	M1	
	$x = (2 \times \pi \times 4) + 1$		M1	
	x = 25.1327….. + 1 = 26.1327….. cm	Award for 26 cm or more accurate	A1	
12(a)	(i) AB = $\sqrt{4^2 + 3^2} = \sqrt{25}$ = 5 cm	**OR** using Pythagorean Triples	M1	**8**
	AB + BC = 5 × 2 = 10 m		A1	
	(ii) length of festoon = 1000cm			
	1000 – 15 = 985		M1	
	985 ÷ 30 = 32.83… bulbs		M1	
	32 + 1 = 33 bulbs		A1 ft	
12(b)	Tan $A\hat{B}M = \frac{3}{4}$		M1	
	$A\hat{B}M$ = 36.869…°		M1	
	$A\hat{B}C$ = 36.869…° × 2 = 73.739…° = 73.7°	Accept 74° or more accurate	A1	

Section C (Total 25 marks)

Unless otherwise stated, accept any other correct method.

Qn	Solution	Criteria	Marks	
1	Cost of flight for one including charges			**3**
	= 45.25 + 34.75 + 5 = €85		M1	
	Cost of flight for four = 4 × €85		M1	
	= €340		A1	
2	Gemma + Jane = (105 + 3) × 3 = €324		M1	**4**
	John + Paul = (80 + 80 + 6) × 3 = €498		M1	
	Total cost = 324 + 498		M1	
	= €822		A1	
3	06:25 + 45 minutes = 07:10	Adding delay time	M1	**3**
	07:10 + 25 minutes	Adding travelling time	M1	
	= 07:35 or 7.35 a.m.		A1	

Qn	Solution	Criteria	Marks	
4	Award for attempting a correct strategy Award for working total that is less than €10 Award for listing items whose total is less than €10		M1 M1 A1	**3**
5(a)	distance on map = 1.4 cm $\pm$ 0.1 cm actual distance = 1.4 × 40 = 56 km $\pm$ 4 km		M1 M1 A1	**6**
5(b)	45 min = 0.75 hr average speed = 56 ÷ 0.75 = 75 km/h or more accurate	Accept answers in the range 69 km/h to 80 km/h	M1 M1 A1	
6(a)	length = (2 m × 14 columns) + (2 m × 13 spaces) length = 28 + 26 = 54 m width = (2 m × 6 columns) + (2 m × 5 spaces) length = 12 + 10 = 22 m Area = 54 × 22 = 1188 m^2	Award first M1 for correct working of length of any **one** side of the base of temple i.e. (2 × n columns) + (2 × (n – 1) spaces)	M1 M1 M1 A1	**6**
6(b)	(4.6 × 9) ÷ 2.2 = 18.8 = 19 m (estimate)	Accept answers in the range 18 m to 20 m	M1 A1	