



Lite Regal International School

Advanced Maths

Syllabus Content Summer 2018/2019

Course Syllabus Ref : MathsLRIS/2411

Credits 3.5

MATHS FOR 16-18 YEAR OLDS

SYLLABUS

OVERVIEW

Intended for 16-18 year olds who want to make the most out of their summer, Lite Regal's Mathematics program is one that helps prepare determined students for University. The two weeks under the program will help students to grow holistically and help develop one's potential and make students the best they can be.

The course is aimed at cementing the fundamental concepts of mathematics that are required to be mastered by a student before they delve into calculus. At the end of the program, students are to take introductory lessons in differential calculus. To help students get a jump start in their mathematics career, supplementary lessons are added to the coursework in making papers and presentations in the same fashion that is used in Cambridge University and London University.

Students who plan to take the program are encouraged to think the industrial and real-life significance of their lessons. Field trips are designed to let students be aware of what mathematicians do after graduation.

To succeed in this program, students must be dedicated, have critical thinking, and perseverance to make the most out of the program. Students who are looking for a challenge, or want to learn more about mathematics are enjoined to take this program.

LEARNING OBJECTIVES

By the end of two weeks, this course aims to achieve the following outcomes:

- Solve equations involving radicals and exponents.
- Solve problems involving trigonometric functions.
- Write a paper critique and presentation.
- Relate course topics with real-life situations and industrial applications.
- Understand derivatives and how they are acquired, including their implication in a situation.

The course aims to foster a positive attitude towards the subject matter, and to inspire students to pursue higher studies on the field.

ACADEMIC LEARNING

The bulk of the program will deal with topics regarding algebra and pre-calculus, with additional introductory topics on differential calculus for later lessons. Topics are based on lessons that are typically taught in regular school semesters, with additional lessons to broaden the students' perspectives.

Each day of the program will be composed of a morning and an afternoon session. The morning sessions will focus on lectures, while those in the afternoon will be workshops related to the said lectures. Workshop activities may either be done in groups or individually, depending on the nature of the activity. Debates, class reports, and group brainstorming sessions are some of the activities that may occur during the afternoon sessions.

Lite Regal's Mathematics Summer School Program bridges learning within the classroom and real life by letting students take field trips. These field trips will let those enrolled in the program have a glimpse of some of the future careers in the UK if one pursues the field.

HOW WILL I BENEFIT

Lite Regal not only provides academic opportunities for students, but cultural ones are present as well. Our classes are taught by esteemed professionals who have a strong grasp of the subject matter. The program gives several personal and academic benefits for those who choose to enroll:

- Develop critical thinking and scientific reasoning.
- Broaden current knowledge on mathematics.
- Develop interpersonal skills in different social settings.
- Interact with peers of varying cultural and ethnic backgrounds.
- Improve study skills in various stimulating situations.
- Become more competitive in learning with challenging workshops and activities.
- Experience possible careers for mathematicians in London through field trips.
- Get a glimpse of life in University at one of London's most prestigious colleges
- Experience first-hand studying within one of the colleges of either Cambridge University or London University.
- Learn additional tips on the basics of scientific writing that is used in Cambridge University or London University.

ELIGIBILITY

Students must fulfill the following requirements before acceptance to the program:

- Must be proficient in basic algebraic operations.
- Must have a strong understanding of the fundamental lessons in algebra,

- Must have a natural curiosity towards mathematics.
- Must have critical thinking and reasoning.
- Must persevere and work diligently on lectures and workshop activities.
- Must show enthusiasm in participating with a group—whether it be for workshop activities or for social events.

TIMETABLE

FIRST WEEK		
Monday	Morning	Algebra: Inverses and radical functions and relations, rational relations and functions
	Afternoon	Workshop: Students are to answer worksheets, where the worksheet questions are supplementary to the lessons discussed in the morning session.
Tuesday	Morning	Algebra: Patterns and sequences, sequence rules, linear sequences, quadratic sequences, special sequences, Fibonacci sequences
	Afternoon	Workshop: The students are divided into groups. Each group are then asked to create Haiku-like poetry or stories based upon syllables. The number of syllables per line are dictated by a given sequence (e.g. Fibonacci). The stories or poetry created are then presented in front.
Wednesday	Morning	Algebra: Function notation, trapezium rule, finding the area under a graph, gradients and tangents, gradient of a graph
	Afternoon	Outdoor activity: Students are to go on a field trip in a company that has industrial mathematicians. Students are encouraged to ask questions about the types of problem solving they do at work and ask questions pertaining to the application of some of the lessons they have learned in class.
Thursday	Morning	Algebra: Finding the root of an equation through open-methods (Method of Successive Substitution and Newton-Rhapson method), finding the root of an equation through closed methods (Bisection Method and False Position Method)
	Afternoon	Workshop activity: Students are given a worksheet in which they are to answer questions that are related to the lessons discussed in the morning session.
Friday	Morning	Trigonometry: Sine, cosine, tangent, inverse trigonometric functions, finding angles and lengths
	Afternoon :	Workshop: The students are divided into groups. They are also to be provided by calculators with both trigonometric and inverse trigonometric capabilities. A game master will hold a game show where he/she presents different triangles with all lengths and angles given. The students are then asked whether the triangles can exist.

		The group with most correct answers win.
SECOND WEEK		
Monday	Morning	Trigonometry: Reading the sine graph, cosine graph, tangent graph
	Afternoon	Outdoor activity: Students are to go on a field trip in a London company, preferably one that deals with electronics. Students are then encouraged to learn about frequencies and the importance of acquiring a sine, cosine, and tangent wave and their implication in the industry.
Tuesday	Morning	Pre-calculus: Vectors and vector properties, addition of vectors, subtraction of vectors, magnitude of vectors, multiplication of vectors
	Afternoon	Workshop: The whole class is given a situation in which they are at sea, and are to calculate how far they should travel to get to land. Students can perform this activity in groups or pairs, depending on the availability of time. The situation should let students take into consideration the effect of wind in arriving in their desired location, and the appropriate vector path for the ship to move. Students are then to discuss their findings to the whole class or debate with a different group regarding the results if the findings are different.
Wednesday	Morning	Calculus: Limits from tables and graphs, one-sided limits, formal definition of limits, continuity at a point, limits of combined and composite functions, intermediate value theorem, squeeze theorem, how to write a scientific paper and how to present your paper in Cambridge University or London University fashion
	Afternoon	Workshop activity: Students are given a short paper regarding limits and are asked to write a critique using the tips they learned from the morning lessons. They are to create a power point presentation as well. This activity is encouraged to be finished after the class hours.
Thursday	Morning	Calculus: limits from trigonometric functions, limits of piecewise functions, removable discontinuities, vertical asymptotes, horizontal asymptotes
	Afternoon	Workshop activity: Students are to present their critique on their papers in class, using the tips they have learned from yesterday's session. Students are encouraged to ask the presenter questions regarding their report.
Friday	Morning	Calculus: Introduction to basic differential calculus, derivative as a slope of a tangent line, derivative as instantaneous rate of change, derivative as a limit, definition of a derivative
	Afternoon	Workshop: Students are to be divided into two groups. One group of students is to be given a set of cards containing derivatives of functions, while another group is given a set of cards containing the original function. Students are then asked to find their match, They are then required to provide the solution of how the derivative of the function was acquired, and report the finding to the class.

Maths Group Trips 2019 and Workshops

Trips planned for 2019 will include

Lite Regal is keen to get students out of the classroom to show the how the Maths they have learn in the classroom is put into practical use by incorporating trips of Interest to all students within this group.

1/ Mathematics – The Winton Gallery Zara Hadid London - Maths as used in Building and Design and in infamous objects past and present to present the abstract nature in which mathematicians must think.

A visit to the provoking Gallery in London designed by architect Zara Hadid and how the design or her infamous building were determined by maths. An insight into the machines past and present within the gallery exhibition will give our Mathematician students plenty to think about and calculate as they learn to think and speak in Math. Mathematical Concepts and Workshops and calculating will be required in these active outing given real life observations.

2/ London Mathematical Society since 1856 London– visit the infamous society to listen to guest speaker (TBC)

3/ Bletchley Park Milton Keynes – Maths as used in www and Internet Security Protocol as used in the IP layer to encrypt messages

Home to the code Breakers – Learn the maths behind code breaking and the enigma machine and the Maths behind encrypting and decryption messages that is now so relevant in secure message delivery used in every internet transaction.

4/Astronomy and the Multi Universe at the Royal Observatory Greenwich – Maths as used in Astronomy and Space Exploration

Explore and learn how maths and physics are one into calculating the distances to stars and how wide galaxies are and how stars are born and die.

University and College Trips

There will trips to other major London and Cambridge College Campuses to include Imperial, Kings, UCL and The Cambridge Colleges – Trinity which infamous for maths, Kings College and others