香港科技大學
THE HONG KONG
UNIVERSITY OF SCIENCE
AND TECHNOLOGY

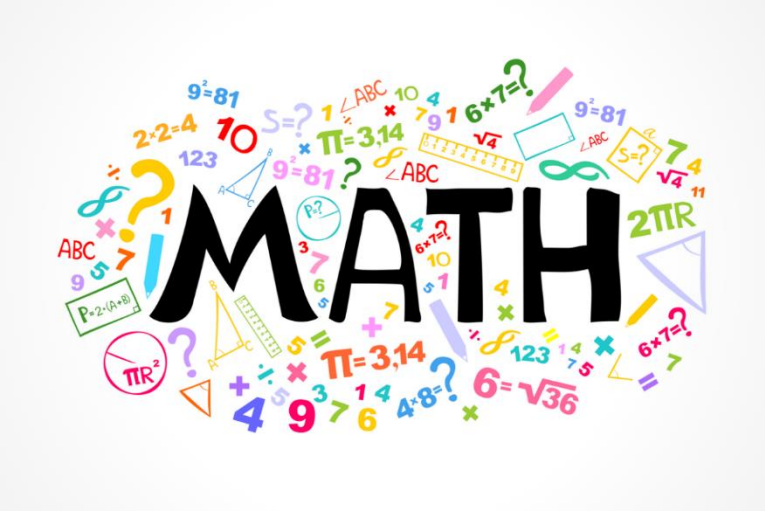
HKUST Dual Program 2024
(Introduction to Pre-stage Level: Mathematics)

7 September 2024 (Sat)

Introduction of Dual Program (Mathematics) Structure

Aims of Pre-stage Level

- Equip students with basic and fundamental **mathematics knowledge and techniques** (mostly in **Algebra**) for learning elementary Calculus
- Build up **good foundation** of mathematics for “Level 1” onwards
- Develop **appreciation of mathematics** from different perspectives
- Present mathematical ideas **logically**



About Pre-stage (MATH) Course

Content:

Mainly based on selected topics of **HKDSE Core Mathematics**, with some **additional topics and applications** delivered

Course Instructors:

Dr. Kwun Lun Alan CHU (Class A, English)

Mr. Hoi Sang KONG (Class B, Chinese)

Common Lecture Notes (in English) will be used for all classes

Duration:

16 **"3-hour lectures"** plus 2 **"3-hour tutorials"**, **Saturdays** of **Nov 2024 – May 2025 (2:00 pm – 5:00 pm)**

Pre-requisites*:

Basic understanding of **elementary Algebra**

Certain **mathematical maturity / related experience** will be a bonus

**** From 2022/23 onwards, all Pre-stage applicants are required to sit for a screening test.***

About Pre-stage Course

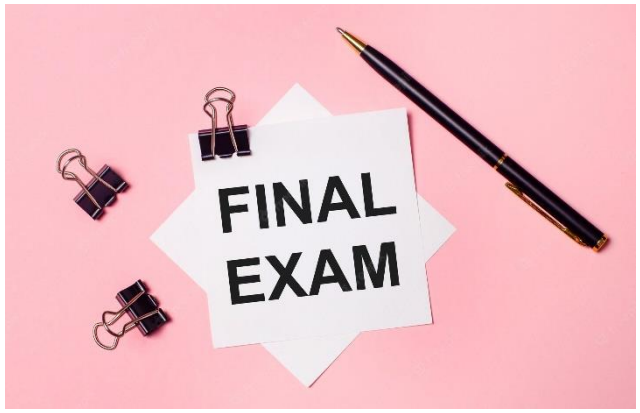
Assessment:

Several HWs (30%)

1 Midterm Examination (30%)

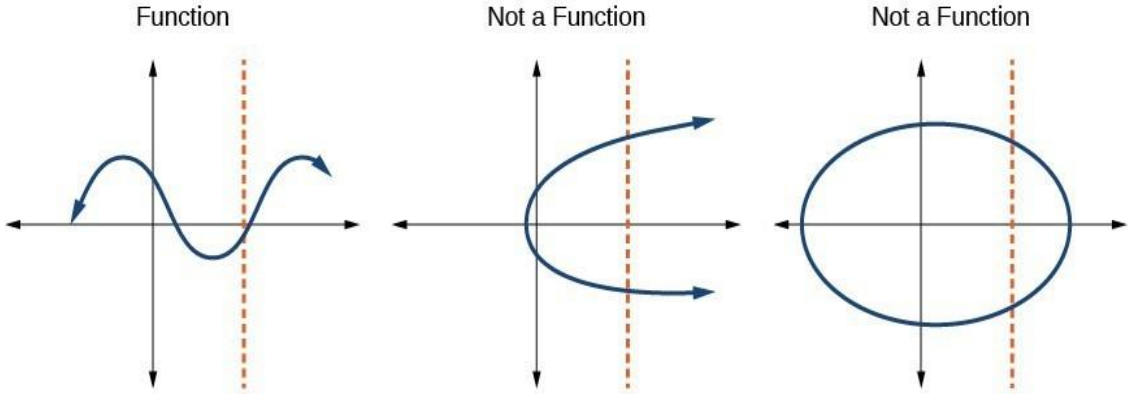
1 Final Examination (40%)

***Outstanding students will be promoted to DP Level 1.**



Topics Covered:

- Numbers and Basic Algebra
- Polynomials and Binomial Theorem
- Functions and its Geometric Representations
- Coordinate Geometry
- Trigonometric Formulae
- Sequences and Series



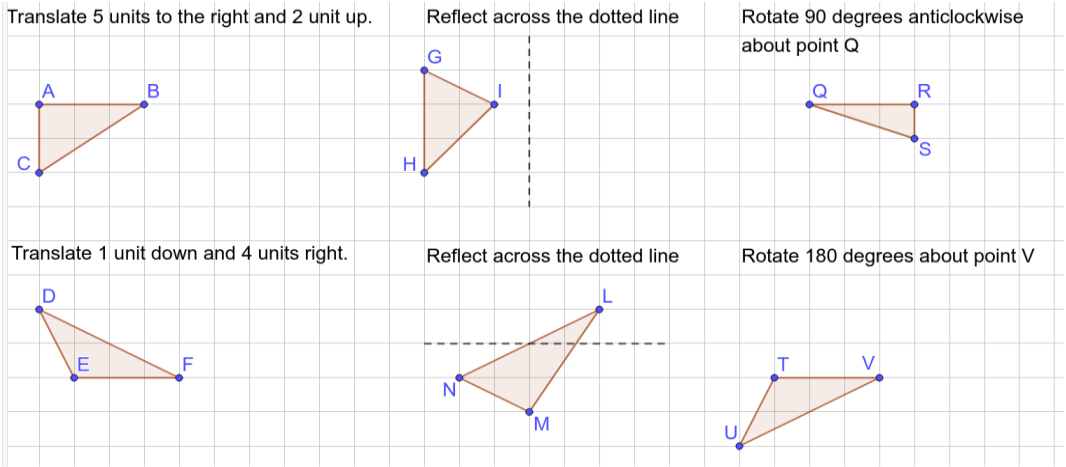
Brief Descriptions of Topics

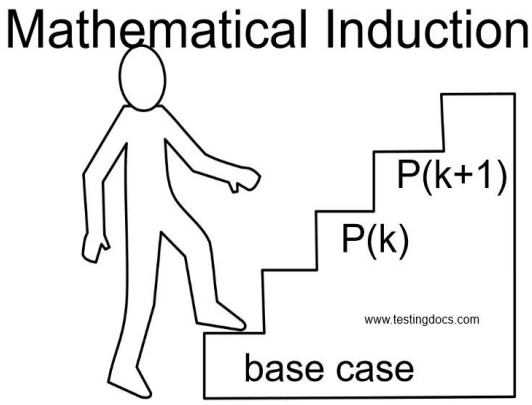
Numbers and Basic Algebra: Basic Set Theory and Number System, Division Algorithm, Mathematical Induction, Proof by Contradiction etc.

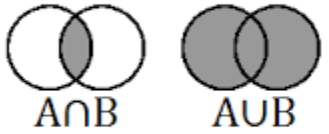
Polynomials and Binomial Theorem: Algebra of Polynomials, Partial Fraction Decomposition, Factor and Remainder Theorem, Binomial Theorem

Functions and its Geometric Representations: Definition of a Function, Graphs of a Function, Trigonometric Functions and some Geometric applications

Coordinate Geometry: Coordinate System, Geometric Transformation (e.g., Translation and Rotation)

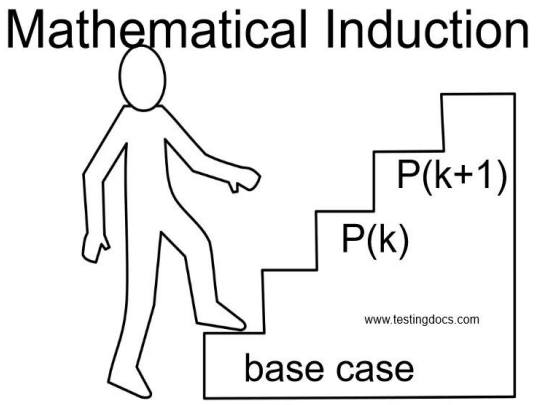






Brief Descriptions of Topics

- 1=1
- 1+3=4=2^2
- 1+3+5=9=3^2
- 1+3+5+11+13+15=36=6^2
- …
- 1+3+5+…+(2k-1) =$(k)^2$?
- How to prove it ?



Brief Descriptions of Topics

Trigonometric Formulae: Trigonometric Functions on the Coordinate Plane, Compound Angle Formula, Sum to Product / Product to Sum, Half Angle Formula

Sequences and Series:
Arithmetic Sequence and Series
Geometric Sequence and Series
Daily Life Applications and Usage

Sum to Product Formulas

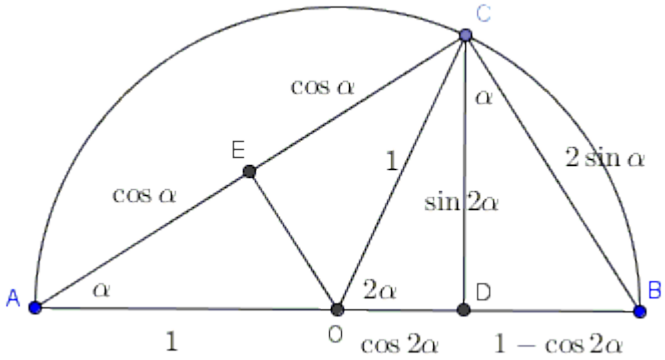
cuemath
THE MATH EXPERT

$$\sin A + \sin B = 2 \sin\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right)$$

$$\sin A - \sin B = 2 \sin\left(\frac{A-B}{2}\right) \cos\left(\frac{A+B}{2}\right)$$

$$\cos A - \cos B = -2 \sin\left(\frac{A+B}{2}\right) \sin\left(\frac{A-B}{2}\right)$$

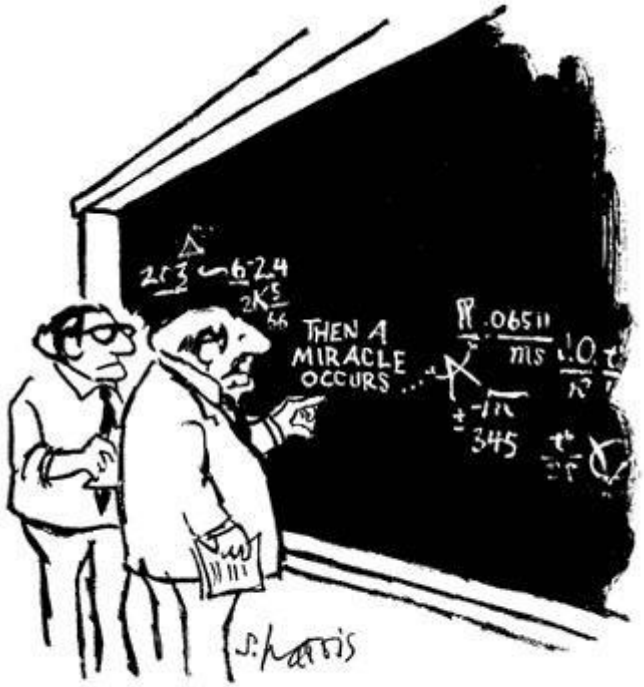
$$\cos A + \cos B = 2 \cos\left(\frac{A+B}{2}\right) \cos\left(\frac{A-B}{2}\right)$$



Focus of Pre-stage Level (MATH)

Although we will have a lot of **computations** during this course, we also emphasize on the followings:

1. Logical **Thinking** and **Mathematical Derivation**
2. The ways of presenting proper **mathematical proofs** and **explanations** in a more professional manner



"I think you should be more explicit here in step two."