ADDITIONAL MATHEMATICS

Secondary Two Streaming Briefing 2021

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FREQUENTLY ASKED QUESTIONS

WHAT IS THE PURPOSE OF BRIEFING ON ADDITIONAL MATHEMATICS?

INFORMED DECISION-MAKING

Aspirations

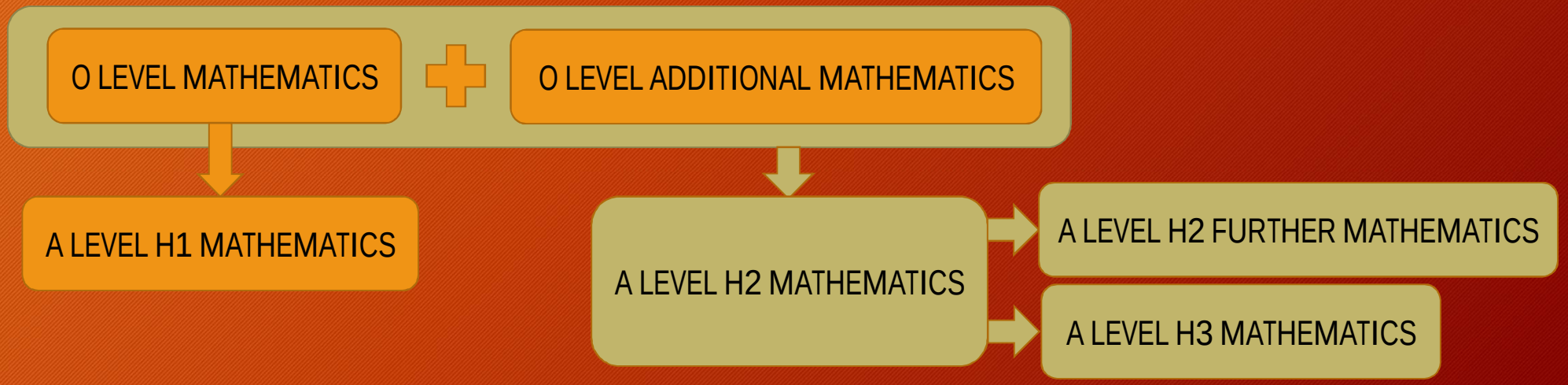
Post-Secondary Options:
Junior Colleges, Polytechnics

Aptitude

Natural Flair, Strength,
Ability in Mathematics

IS ADDITIONAL MATHEMATICS A REQUIREMENT FOR ENTRY TO JUNIOR COLLEGE OR POLYTECHNIC?

- Additional Mathematics can be considered as one of the L1R5 subjects for admission to Junior Colleges (JC).
- In JC, there are three different levels of study for Mathematics: H1 Math, H2 Math, H2 Further Math and H3 Math.



IS ADDITIONAL MATHEMATICS A REQUIREMENT FOR ENTRY TO JUNIOR COLLEGE OR POLYTECHNIC?

- Additional Mathematics can be included as one of two Relevant Subjects for ELR2B2 for Poly Courses under the Aggregate Types ELR2B2-B, C and D.
- Additional Mathematics is **not** compulsory for all Poly Courses, including Engineering courses.

IS ADDITIONAL MATHEMATICS A REQUIREMENT FOR ENTRY TO JUNIOR COLLEGE OR POLYTECHNIC?

- To find out more on the Aggregate Types ELR2B2-B, C and D as well as other criteria for Poly Courses and JC A-Level Courses, you can scan the following QR Code or go to the URL to access the JAE 2020 Booklet:

https://tinyurl.com/MOEJAE2021

You can locate the following information from the JAE 2021 Booklet:

- Aggregate Computation for entry to JC, MI, Poly on pages 26 – 28
- Poly Courses and the corresponding aggregate type ELR2B2-A, B, C & D on pages 17 – 23
- Entry Requirements to JC & MI on pages 30 – 31
- Entry Requirements to various Poly (individual Poly) on pages 32 – 79
- Information on various JC & MI (individual JC) on pages 101 - 135

IS ADDITIONAL MATHEMATICS A REQUIREMENT FOR ENTRY TO HIGHER NITEC COURSES FOR DPP AFTER N LEVELS?

- Additional Mathematics is not a requirement for any of the Higher Nitec Courses for Direct Entry Scheme to Polytechnics (DPP) after N Levels.
- To find out more about Higher Nitec Courses for DPP and how the courses mapped onto Poly Courses, you can scan the following QR Code or go the the URL to access the JIE "N" and "H" 2020 Booklet:

https://tinyurl.com/MOEJIEN2021

You can locate the following information from the JIE "N" and "H" 2021 Booklet:

- Higher Nitec from Page 66 onwards.

INFORMATION ON THE ADDITIONAL MATHEMATICS SYLLABUS

The Additional Mathematics syllabus

- caters to students who have an aptitude and interest in Mathematics,
- prepares students adequately for A Level H2 Mathematics, where a strong foundation in Algebraic Manipulation Skills and Mathematical Reasoning Skills are required,
- assumes knowledge of O Level Mathematics,
- organised along three content strands and development of processes, metacognition and attitudes are embedded in the learning experiences that are associated with the content.

ADDITIONAL MATHEMATICS SYLLABUS ORGANISATION

3 CONTENT STRANDS & SKILLS		
ALGEBRA	GEOMETRY & TRIGONOMETRY	CALCULUS
LEARNING EXPERIENCES embedded with: • PROCESSES • METACOGNITION • ATTITUDES		

CONTENT UNDER EACH STRAND

ALGEBRA

- Quadratic Functions
- Equations and Inequalities
- Surds
- Polynomials and Partial Fractions
- Binomial Expansions
- Exponential and Logarithmic Functions

GEOMETRY AND TRIGONOMETRY

- Trigonometric Functions, Identities and Equations
- Coordinate Geometry in two dimensions
- Proofs in Plane Geometry

CALCULUS

- Differentiation and Integration

TYPES OF ASSESSMENT QUESTIONS

- There is a shift from the routine types of questions that were mainly procedural in National Exams (found in previous years' old syllabuses) to **application types** where candidates are expected to **understand and apply abstract concepts** in order to do well.
- The following Specimen Papers for Additional Math are available in the SEAB website. To find out more on the types of questions that are asked, you can scan the following QR Codes or to the following URLs in the next two slides.

SPECIMEN PAPERS QUESTIONS FOR ADDITIONAL MATHEMATICS O LEVEL SYLLABUS 4049

- Paper 1: https://www.seab.gov.sg/docs/default-source/national-examinations/syllabus/olevel/2021syllabus/4049_y21_sp_1.pdf

- Paper 2: https://www.seab.gov.sg/docs/default-source/national-examinations/syllabus/olevel/2021syllabus/4049_y21_sp_2.pdf

SPECIMEN PAPERS QUESTIONS FOR ADDITIONAL MATHEMATICS NA LEVEL SYLLABUS 4051

- Paper 1: https://www.seab.gov.sg/docs/default-source/national-examinations/syllabus/nlevel/2021syllabus/4051_y21_sp_1.pdf

- Paper 2: https://www.seab.gov.sg/docs/default-source/national-examinations/syllabus/nlevel/2021syllabus/4051_y21_sp_2.pdf

FOUNDATION REQUIRED FOR STUDENTS TO HANDLE THE RIGOUR OF ADDITIONAL MATHEMATICS

DUNMAN SECONDARY SCHOOL SINGAPORE

A strong foundation and proficiency in ALGEBRA is required.

ALGEBRAIC MANIPULATION IN SEC 2 MATH, SEC 3 MATH AND SEC 3 ADD MATH

- Sec 2 Math

Simplify

1. $x^3 \times x^2$

2. $\dfrac{y^8}{y^5}$

- Sec 3 Math

Simplify $\dfrac{6a^4}{a^{-5}b} \times \dfrac{\left(-a^{-3}b\right)^2}{2\sqrt{b}}$, expressing your answer in the form $ka^m b^n$.

- Sec 3 Add Math

Simplify $\dfrac{16^{x+1} + 48\left(4^{2x}\right)}{2^{x+3} \times 8^{x+2}}$.

Variable "*x*" in the power, not just numerical powers.

ALGEBRAIC MANIPULATION AS A BASIC SKILL REQUIRED IN PROVING TRIGONOMETRIC IDENTITIES

Show that $\sin 2x(5\tan x + 2\cot x) = 4 + 6\sin^2 x$.

Solution:

$$\sin 2x(5\tan x + 2\cot x)$$

$$= 2\sin x\cos x\left(5\frac{\sin x}{\cos x} + 2\frac{\cos x}{\sin x}\right)$$

$$= 2\sin x\cos x\left(\frac{5\sin^2 x + 2\cos^2 x}{\cos x\sin x}\right)$$

$$= 10\sin^2 x + 4\cos^2 x$$

$$= 10\sin^2 x + 4\left(1 - \sin^2 x\right)$$

$$= 4 + 6\sin^2 x$$

Algebraic Skill required:
Combining fractions

ALGEBRAIC MANIPULATION AS A BASIC SKILL REQUIRED IN CALCULUS

(a) Find $\frac{d}{dx}\left(x^4 \ln x\right)$.

Solution:

$$\frac{d}{dx}\left(x^4 \ln x\right)$$
$$= x^4\left(\frac{1}{x}\right) + \ln x\left(4x^3\right)$$
$$= x^3 + 4x^3 \ln x$$

(b) Hence find $\int x^3 \ln x \, dx$.

Solution:

$$\int \left(x^3 + 4x^3 \ln x\right) dx = x^4 \ln x + c$$
$$\int x^3 \, dx + \int \left(4x^3 \ln x\right) dx = x^4 \ln x + c$$
$$\left(\frac{x^4}{4}\right) + 4\int \left(x^3 \ln x\right) dx = x^4 \ln x + C$$
$$4\int \left(x^3 \ln x\right) dx = x^4 \ln x - \left(\frac{x^4}{4}\right) + C$$
$$\int \left(x^3 \ln x\right) dx = \frac{1}{4}x^4 \ln x - \frac{x^4}{16} + C$$

Algebraic Skills required:

Simplifying algebraic fractions

Use of brackets and rewriting algebraic expressions

Balancing Equations

WHAT OTHER LOWER SECONDARY SKILLS / CONCEPTS ARE REQUIRED TO HELP STUDENTS MANAGE THE RIGOUR OF ADDITIONAL MATHEMATICS?

ALGEBRA STRAND	
Quadratic Functions	<u>Secondary 1 Topics:</u> • Basic Algebra and Algebraic Manipulation • Linear Equations and Simple Inequalities <u>Secondary 2 Topics:</u> • Linear Graphs and Simultaneous Linear Equations • Expansion and Factorisation of Quadratic Expressions • Further Expansion and Factorisation of Algebraic Expressions • Quadratic Equations and Graphs • Algebraic Fractions and Formulae
Equations & Inequalities	
Surds	
Polynomials & Partial Fractions	
Binomial Expansions	
Exponential and Logarithmic Functions	

WHAT OTHER LOWER SECONDARY SKILLS / CONCEPTS ARE REQUIRED TO HELP STUDENTS MANAGE THE RIGOUR OF ADDITIONAL MATHEMATICS?

GEOMETRY AND TRIGONOMETRY STRAND	
Trigonometric Functions, Identities and Equations	Secondary 1 Topics: • Basic Algebra and Algebraic Manipulation • Linear Equations and Simple Inequalities Secondary 2 Topics: • Trigonometric Ratios • Pythagoras' Theorem
Coordinate Geometry in two dimensions	Secondary 2 Topic: • Linear Graphs
Proofs in Plane Geometry	Secondary 1 Topics: • Basic Geometry • Triangles, Quadrilaterals and Polygons

WHAT OTHER LOWER SECONDARY SKILLS / CONCEPTS ARE REQUIRED TO HELP STUDENTS MANAGE THE RIGOUR OF ADDITIONAL MATHEMATICS?

CALCULUS STRAND	
Differentiation and Integration	<u>Secondary 1 Topics:</u> • Basic Algebra and Algebraic Manipulation • Rate <u>Secondary 2 Topics:</u> • Expansion and Factorisation of Quadratic Expressions • Further Expansion and Factorisation of Algebraic Expressions • Algebraic Fractions and Formulae

Besides having an aptitude in Math, what other qualities is required to be successful in Additional Math?

SELF-DISCIPLINE AND COMMITMENT are very important!

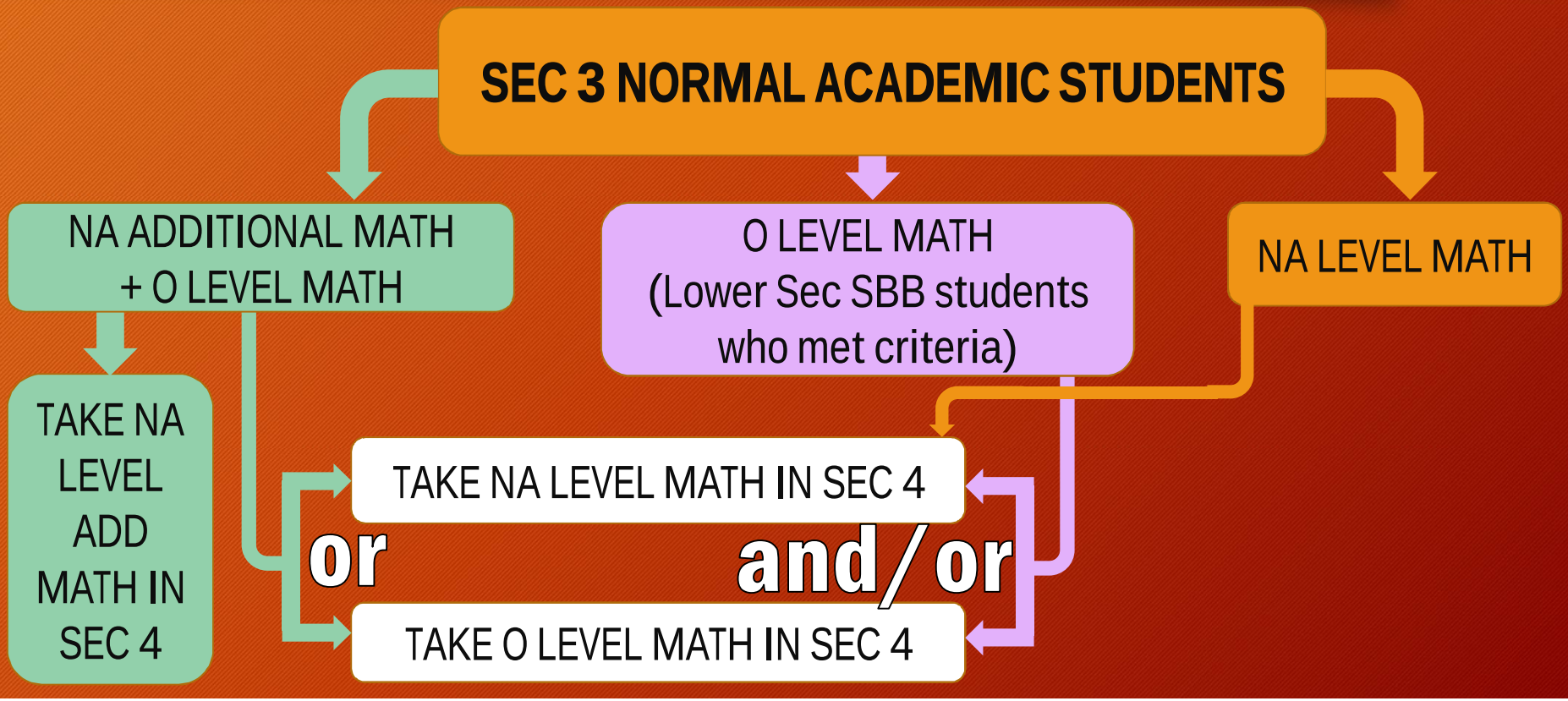
- DILIGENCE – To complete all the work assigned.
- ATTENTIVE – To pay attention in lesson and be on task.
- INDEPENDENT – To practice, practice and practice, do a lot of extra practice to gain exposure to different types of questions and application of conceptual understanding, on top of practicing procedural skills.
- PERSISTENCE – Never give up.
- INITIATIVE – To clarify doubts immediately.

ONLY FOR SEC 3 NORMAL ACADEMIC

Offering of Cross-Stream O Level Mathematics with NA Additional Mathematics

Offering of Cross-Stream O Level Mathematics to Lower Secondary SBB Exp Math students who meet criteria

SEC 3 NORMAL ACADEMIC STUDENTS OFFERING CROSS-STREAM O LEVEL MATHEMATICS



SHOULD YOU REQUIRE MORE INFORMATION OR CLARIFICATION, PLEASE CONTACT MS KOH SWEE KUN (XU RUIJUN) HOD / MATH @ koh_swee_kun@moe.edu.sg or 67862668 (DUNMAN SEC TEL NO)