Wah Yan College Kowloon
F.4 Mathematics M1 Scheme of Work (2017-2018)

Textbook	1. NSS Mathematics in Action Extended Part: Module 1 Volume 1
Other Resources	

◆Repertoire of Self-directed Learning Skills:

1. reading to learn, 2. notes-taking, 3. looking up words in the dictionary, 4. pre-lesson preparation, 5. group discussion, 6. group presentation, 7. initiative to ask questions, 8. setting learning objectives and doing reflection, 9. eLearning platform with instant feedback, 10. flipped classroom, 11. peer assessment, 12. searching for information on the internet, 13. project learning, 14. training of higher-order thinking skills, etc.

SL: Scheduled number of lessons
AL: Actual number of lessons

School Term	Weeks	Topics	Learning Objectives/ Teaching Focus	SL/AL	Teaching and Learning Activities	Consolidation and Assessment	Self-directed Learning Skills◆	Values#	Basic Law Education
First Term (3/9/2017-30/12/2017, Weeks 1-17)	1-3	***Chapter 0 Pre-requisite Knowledge***	I. Set Notation • Recognise set notation. • Define different intervals by sets. Teachers may explain to students why they should understand set notations.	1					
			II. Absolute Value • Recognise the definition of	1	Example 1, Teaching Example 1				

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			absolute value. • Recognise the properties of absolute value. Some topics in Chapters 3 and 6 involve the absolute value function.						
			III. Summation Notation • Understand the summation notation. • Understand the properties of the operations of summation notation. Students should be aware of the index of summation, the lower and the upper limits of summation.	1	Example 2, Teaching Example 2, Example 3, Teaching Example 3, Example 4, Teaching Example 4	Exercise (p. 0.10) Level 1: 1 – 5 Level 2: 6 – 9			
	3-5	***Chapter 1 Binomial Expansion***	1.1 The Notations $n!$ and C_r^n • Understand the meaning of $n!$.	0.5	Example 1.1, Teaching Example 1.1, Example 1.2,	Exercise 1A (p. 1.7) Level 1: 1 – 13 Level 2: 14 – 22			

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			• Understand the meaning of ${}^{n}C_{r}$. Teachers may mention why the definition 0! = 1 is made.		Teaching Example 1.2, Example 1.3, Teaching Example 1.3, Example 1.4, Teaching Example1.4, Teaching Example 1.4 (Extra), Example 1.5, Teaching Example 1.5 **5-Minute Lecture:** Idea of ${}^{n}C_{r}$	Rev. Ex.1 (p. 1.20) Level 1: 1 – 8 Level 2: 18 – 21			
			1.2 Pascal's Triangle • Explore the pattern in the Pascal's triangle. • Understand how to use the Pascal's triangle to find the expansion of $(a + b)^n$, where	1	Example 1.6, Teaching Example 1.6, Example 1.7, Teaching Example 1.7 **Exploration:** 1.1	Exercise 1B (p. 1.11) Level 1: 1 – 6 Level 2: 7 – 12			

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			n is a non-negative integer.						
			1.3 The Binomial Theorem • Apply the binomial theorem to find the expansion of $(a + b)^n$, where *n* is a non-negative integer. • Find the coefficients of terms in binomial expansions. The following contents are **not** required: ◆ expansion of trinomials ◆ the greatest coefficient, the greatest term and the properties of binomial coefficients applications to numerical approximation	2	Example 1.8, Teaching Example 1.8, Example 1.9, Teaching Example 1.9, Teaching Example 1.9 (Extra), Example 1.10, Teaching Example 1.10, Example 1.11, Teaching Example 1.11, **5-Minute Lecture:** Coefficients of terms in binomial expansions **Animation:** Idea of Binomial	Exercise 1C (p. 1.16) Level 1: 1 – 13 Level 2: 14 – 20 Rev. Ex. 1 (p. 1.20) Level 1: 9 – 17 Level 2: 22 – 28			

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					Theorem				
	6-13	***Chapter 2 Exponential Functions and Logarithmic Functions***	2.1 Exponential Functions • Recognise the definition of the number e. • Learn the characteristics of the graphs of $y = e^x$ and $y = e^{-x}$. • Recognise the exponential series $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \ldots$ Teachers should illustrate the concept of a limit by some simple examples, e.g. the value of $\frac{1}{n}$, where n tends to positive infinity.	3	Example 2.1, Teaching Example 2.1, Example 2.2, Teaching Example 2.2 **Exploration:** 2.1 **5-Minute Lecture:** The Number e **5-Minute Lecture:** Exponential Functions and Exponential Series	Exercise 2A (p. 2.8) Level 1: 1 – 13 Level 2: 14 – 21 Rev. Ex. 2 (p. 2.44) Level 1: 1 – 2 Level 2: 15 – 17			
			2.2 Natural Logarithmic Functions • Understand the definition	2	Example 2.3, Teaching Example 2.3, Example 2.4, Teaching	Exercise 2B (p. 2.15) Level 1: 1 – 13 Level 2: 14 – 26 Rev. Ex. 2 (p.			

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			of the natural logarithm. • Apply the properties of natural logarithm to simplify logarithmic expressions. • Learn the characteristics of the graph of $y = \ln x$. • Learn how to solve equations involving e and natural logarithms. Teachers may remind students of the logarithmic function which is discussed in Compulsory part book 4A chapter 5.		Example 2.4, Example 2.5, Teaching Example 2.5, Example 2.6, Teaching Example 2.6, Example 2.7, Teaching Example 2.7, Example 2.8, Teaching Example 2.8 **5-Minute Lecture:** Natural Logarithms	2.44) Level 1: 3 – 5 Level 2: 18 – 19			
			2.3 Applications of Exponential Functions and Logarithmic Functions • Learn how to solve problems involving	3	Example 2.9, Teaching Example 2.9, Example 2.10, Teaching Example 2.10, Example 2.11,	Exercise 2C (p. 2.25) Level 1: 1 – 10 Level 2: 11 – 16 Rev. Ex. 2 (p. 2.44) Level 1: 6 – 9			

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			compound interest. • Learn how to solve problems involving exponential growth and exponential decay. Teachers may introduce different daily examples, other than those in the textbook.		Teaching Example 2.11, Teaching Example 2.11 (Extra), Example 2.12, Teaching Example 2.12, Teaching Example 2.12 (Extra), Example 2.13, Teaching Example 2.13, Teaching Example 2.13 (Extra), Example 2.14, Teaching Example 2.14 **5-Minute Lecture:** Interest Compounded Continuously	Level 2: 20 – 21			

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			2.4 Logarithmic Transformation Learn how to transform $y = kx^n$ and $y = ka^x$ to linear functions by taking logarithms.	3	Example 2.15, Teaching Example 2.15, Example 2.16, Teaching Example 2.16, Example 2.17, Teaching Example 2.17 **Teaching Tools:** Logarithmic Transformation **5-Minute Lecture:** Model of Power Function **5-Minute Lecture:** Model of Exponential Function	Exercise 2D (p. 2.36) Level 1: 1 – 10 Level 2: 11 – 17 Rev. Ex. 2 (p. 2.44) Level 1: 10 – 14 Level 2: 22 – 26			
Second Term (31/12/2017-18/7/2018,	19-26	***Chapter 3 Limits and Derivatives***	3.1 Functions	1	Example 3.1, Teaching Example 3.1	Exercise 3A (p. 3.5) Level 1: 1 – 8			

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Weeks 18-46)			• Understand the concept of functions. • Understand the concept of composite functions. Concepts of functions, domains, co-domains, dependent variables and independent variables are taught in the Compulsory Part Book 4A Chapter 3.		**5-Minute Lecture:** Composite Functions	Level 2: 9 – 15 Rev. Ex.3 (p. 3.33) Level 1: 1 – 6 Level 2: 28 – 30			
			3.2 Limits of Functions • Understand the intuitive concept of the limit of a function. • Understand the concepts of continuous functions and discontinuous functions. • Learn how to distinguish continuous functions and discontinuous functions from their graphs. • Recognise some common	4	Example 3.2, Teaching Example 3.2, Example 3.3, Teaching Example 3.3, Example 3.4, Teaching Example 3.4, Example 3.5, Teaching Example 3.5, Teaching	Exercise 3B (p. 3.16) Level 1: 1 – 30 Level 2: 31 – 47 Rev. Ex.3 (p. 3.33) Level 1: 7 – 19 Level 2: 31 – 38 Exercise 3C (p. 3.23) Level 1: 1 – 18 Level 2: 19 – 31			

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			continuous functions and discontinuous functions. • Learn how to evaluate limits of continuous functions. • Understand and apply theorems relating to limits of functions. • Understand the concept of limits at infinity. • Learn how to evaluate limits of functions at infinity. • Recognise infinity as a limit. • The proof of the existence of a limit is beyond the scope of the curriculum. • The formal proof of continuity of functions is not needed.		Example 3.5 (Extra), Example 3.6, Teaching Example 3.6, Example 3.7, Teaching Example 3.7, Example 3.8, Teaching Example 3.8, Example 3.9, Teaching Example 3.9, Teaching Example 3.9 (Extra), Example 3.10, Teaching Example 3.10 **5-Minute Lecture:** Concept of Limits **5-Minute**	Rev. Ex.3 (p. 3.33) Level 1: 20 – 25 Level 2: 39 – 42			

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					Lecture: Continuous Functions **5-Minute Lecture:** Limits at Infinity **5-Minute Lecture:** Infinity as a Limit				
			3.3 Derivatives • Understand the meanings of the tangent to a curve and the slope of a curve. • Find the slope of the tangent to a curve at a given point. • Recognise the definition of derivatives of functions. • Understand the geometric meaning of derivatives of functions. • Recognise the notations for the derivative of a function.	4	Example 3.11, Teaching Example 3.11, Example 3.12, Teaching Example 3.12, Example 3.13, Teaching Example 3.13, **5-Minute Lecture:** Concept of Derivatives **Teaching Tools:** Tangent to a	Exercise 3D (p. 3.29) Level 1: 1 – 8 Level 2: 9 – 13 Rev. Ex. 3 (p. 3.33) Level 1: 26 – 27 Level 2: 43 – 45			

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			In module 1, finding the derivatives of functions from first principles is not required.		curve at a point **Inquiry and Investigation:** Intuition and Limit				
	27-39	***Chapter 4 Differentiation***	4.1 Basic Rules of Differentiation • Learn theorems to differentiate power functions, sum and difference of functions. • Understand product rule and quotient rule. Teachers may show the proofs of the basic rules using first principles.	4	Example 4.1, Teaching Example 4.1, Example 4.2, Teaching Example 4.2, Example 4.3, Teaching Example 4.3, Example 4.4, Teaching Example 4.4, Example 4.5, Teaching Example 4.5, Teaching Example 4.5 (Extra), Example 4.6, Teaching	Exercise 4A (p. 4.8) Level 1: 1 – 22 Level 2: 23 – 41 Rev. Ex. 4 (p. 4.44) Level 1: 1 – 3 Level 2: 48 Exercise 4B (p.4.14) Level 1: 1 – 22 Level 2: 23 – 39 Rev. Ex. 4 (p. 4.44) Level 1: 4 – 5, 11 – 12			

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					Example 4.6, Example 4.7, Teaching Example 4.7 **Discussion:** 4.1 **5-Minute Lecture:** Basic Rules of Differentiation				
			4.2 Differentiation of Composite Functions • Recognise the concept of composite function. • Understand the chain rule. Teachers may show the proof of the chain rule, given in the appendix.	3	Example 4.8, Teaching Example 4.8, Example 4.9, Teaching Example 4.9, Example 4.10, Teaching Example 4.10, Example 4.11, Teaching Example 4.11 **5-Minute Lecture:** Differentiation	Exercise 4C (p. 4.20) Level 1: 1 – 18 Level 2: 19 – 35 Rev. Ex. 4 (p. 4.44) Level 1: 6 – 10 Level 2: 33 – 34, 47			

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					of Composite Functions				
			4.3 Differentiation of Inverse Functions • Recognise the concept of inverse function. • Understand the inverse function rule. Teachers may prove the inverse function rule by the chain rule.	1	Example 4.12, Teaching Example 4.12, Example 4.13, Teaching Example 4.13 **5-Minute Lecture:** Differentiation of Inverse Functions	Exercise 4D (p. 4.24) Level 1: 1 – 10 Level 2: 11 – 16 Rev. Ex. 4 (p. 4.44) Level 1: 21 – 24 Level 2: 39 – 41, 49			
			4.4 Differentiation of Exponential Functions Learn theorems to differentiate exponential functions. The proof of $\frac{d}{dx}(e^x) = e^x$ is beyond the scope of this book.	2	Example 4.14, Teaching Example 4.14, Example 4.15, Teaching Example 4.15, Example 4.16, Teaching Example 4.16, Teaching Example 4.16 (Extra),	Exercise 4E (p. 4.28) Level 1: 1 – 23 Level 2: 24 – 35 Rev. Ex. 4 (p. 4.44) Level 1: 13, 15 – 16, 19			

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					Example 4.17, Teaching Example 4.17 **5-Minute Lecture:** Differentiation of Exponential Functions				
			4.5 Differentiation of Logarithmic Functions • Learn theorems to differentiate logarithmic functions. • Find $\frac{dy}{dx}$ by the method of logarithmic differentiation. • Teachers may prove $\frac{d}{dx}(\ln x) = \frac{1}{x}$ by the inverse function rule. • Implicit differentiation is not required.	3	Example 4.18, Teaching Example 4.18, Example 4.19, Teaching Example 4.19, Example 4.20, Teaching Example 4.20, Example 4.21, Teaching Example 4.21, Example 4.22, Teaching Example 4.22, Example 4.23, Teaching	Exercise 4F (p. 4.35) Level 1: 1 – 26 Level 2: 27 – 54 Rev. Ex. 4 (p. 4.44) Level 1: 14, 17 – 18, 20 Level 2: 35 – 38, 42 – 46, 50, 55			

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					Example 4.23, Example 4.24, Teaching Example 4.24 **5-Minute Lecture:** Differentiation of Logarithmic Functions				
			4.6 Second Derivatives • Recognise the concept of the second derivative of a function. • Find the second derivatives of explicit functions. • Third and higher order derivatives are not required. • Students are not required to find the second derivatives of inverse functions.	2	Example 4.25, Teaching Example 4.25, Example 4.26, Teaching Example 4.26, Example 4.27, Teaching Example 4.27 **Discussion:** 4.2 **5-Minute Lecture:** Second Derivatives	Exercise 4G (p. 4.40) Level 1: 1 – 18 Level 2: 19 – 37 Rev. Ex. 4 (p. 4.44) Level 1: 25 – 32 Level 2: 51 – 54			

Core Values of Wah Yan College, Kowloon

I. Love and care	1. Accept & feel positive about himself 2. Appreciation & Gratitude 3. Empathy & Compassion	4. Forgiveness & Reconciliation 5. Service 6. Family as a basic unit of society; marriage is the foundation of a family
II. Strive for excellence	7. Reflective 8. Commitment 9. Perseverance	10. Curiosity & willingness to learn 11. Value imagination and creativity
III. Respect and Justice	12. Life is valuable and respectable 13. Openness to good in all things 14. Respect for himself & others	15. Integrity 16. Faithfulness
IV. Responsibility	17. Freedom & Self-discipline 18. Care for the environment	19. Social Identities: citizen identity, national identity and global citizen identity
V. Faith	20. Experience of God 21. Explore & practise one's faith	22. Appreciate religious liturgies