

Wah Yan College Kowloon
F.4 Mathematics M2 Scheme of Work (2016-2017)

Textbook	1. NSS Mathematics in Action Extended Part: Module 2 Volume 1
Other Resources	

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	Values [#]
First Term (1/9/2016- 1/2/2017, Weeks 1 to 17)	1-4	Chapter 0 Pre-requisite Knowledge	I. Set Notation <ul style="list-style-type: none"> • Recognise set notation. • Define different intervals by sets. Teachers may explain to students why they should understand set notations.	1			
			II. Absolute Value <ul style="list-style-type: none"> • Recognise the definition of absolute value. • Recognise the properties of absolute value. The absolute value function will be further discussed in Volume	1	Example 1, Teaching Example 1		

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			2 Chapter 7.				
			<p>III.</p> <p>Summation Notation</p> <ul style="list-style-type: none"> • Understand the summation notation. • Understand the properties of the operations of summation notation. <p>Students should be aware of the index of summation, the lower and the upper limits of summation.</p>	1	<p>Example 2, Teaching Example 2, Example 3, Teaching Example 3, Example 4, Teaching Example 4</p>	<p>Exercise A (p. 0.10)</p> <p>Level 1: 1 – 5</p> <p>Level 2: 6 – 9</p>	
			<p>IV.</p> <p>Methods of Proof</p> <ul style="list-style-type: none"> • Understand the concepts of proposition, conditional proposition, biconditional proposition, sufficient condition, necessary condition and necessary and sufficient condition. • Learn how to perform direct proof, and indirect proof including proof by contrapositive and proof by 	2	<p>Example 5, Teaching Example 5, Example 6, Teaching Example 6, Example 7, Teaching Example 7, Example 8, Teaching Example 8</p>	<p>Exercise B (p. 0.17)</p> <p>Level 1: 1 – 8</p> <p>Level 2: 9 – 13</p>	

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			contradiction. For average or less-able students, teachers may skip this section.				
	4-6	Chapter 1 Surds	1.1. Basic Knowledge of Surds • Learn the definition and the properties of surds. • Simplify an expression involving surds by addition, subtraction and multiplication. When teaching addition and subtraction of like surds, teachers may remind students of some similar mathematical manipulations, e.g. combining like terms of polynomials.	1	Example 1.1, Teaching Example 1.1, Example 1.2, Teaching Example 1.2, Example 1.3, Teaching Example 1.3, Example 1.4, Teaching Example 1.4, Teaching Example 1.4 (Extra)	Exercise 1A (p. 1.7) Level 1: 1 – 13 Level 2: 14 – 27 Rev. Ex. 1 (p. 1.14) Level 1: 1 – 8 Level 2: 19 – 22	
			1.2. Rationalization • Rationalization of surds in the form $\frac{k}{\sqrt{a}}$. • Rationalization of surds in the	2	Example 1.5, Teaching Example 1.5, Example 1.6, Teaching Example 1.6, Example 1.7, Teaching Example 1.7,	Exercise 1B (p. 1.11) Level 1: 1 – 16 Level 2: 17 – 28 Rev. Ex. 1 (p. 1.14) Level 1: 9 – 18 Level 2: 23 – 33	

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			form $\frac{k}{\sqrt{a \pm \sqrt{b}}}$. Teachers can remind students of the identity $a^2 - b^2 \equiv (a + b)(a - b)$ before introducing rationalization of surds.		Example 1.8, Teaching Example 1.8, Teaching Example 1.8 (Extra) 5-Minute Lecture: Surds in the form $\frac{k}{\sqrt{a \pm \sqrt{b}}}$		
	7-12	Chapter 2 Mathematical Induction	2.1. Principle of Mathematical Induction Understand the principle of mathematical induction. Teachers should introduce the domino effect and compare it with the mechanism of mathematical induction.	1	5-Minute Lecture: Principle of mathematical induction		
			2.2. Performing Proofs by mathematical Induction <ul style="list-style-type: none"> • Learn to prove propositions involving summation of finite sequences. • Learn to prove propositions involving divisibility of 	7	Example 2.1, Teaching Example 2.1, Example 2.2, Teaching Example 2.2, Example 2.3, Teaching Example 2.3, Example 2.4, Teaching Example 2.4, Example 2.5,	Exercise 2A (p. 2.12) Level 1: 1 – 11 Level 2: 12 – 25 Exercise 2B (p. 2.20) Level 1: 1 – 10 Level 2: 11 – 24 Rev. Ex. 2 (p. 2.22) Level 1: 1 – 10 Level 2: 11 – 27	

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			<p>integers.</p> <p>Teachers should emphasize the correct steps of using the principle of mathematical induction.</p>		<p>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, Example 2.9, Teaching Example 2.9, Teaching Example 2.9 (Extra), Example 2.10, Teaching Example 2.10</p> <p>5-Minute Lecture: Prove propositions involving summation of finite sequences</p> <p>5-Minute Lecture: Prove propositions involving divisibility</p>		
	12-14	Chapter 3 Binomial Theorem	<p>3.1 The Notations $n!$ and C_r^n</p> <ul style="list-style-type: none"> • Understand the meaning of $n!$. • Understand the meaning of C_r^n. <p>Teachers may mention why the</p>	0.5	<p>Example 3.1, Teaching Example 3.1, Example 3.2, Teaching Example 3.2, Example 3.3, Teaching Example 3.3, Example 3.4, Teaching Example 3.4,</p>	<p>Exercise 3A (p. 3.8) Level 1: 1 – 13 Level 2: 14 – 22 Rev. Ex.3 (p. 3.24) Level 1: 1 – 8 Level 2: 20 – 23</p>	

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			definition $0! = 1$ is made.		Teaching Example 3.4 (Extra), Example 3.5, Teaching Example 3.5, Teaching Example 3.5 (Extra), Example 3.6, Teaching Example 3.6 5-Minute Lecture: The idea of C_r^n		
			3.2 Pascal's Triangle <ul style="list-style-type: none"> • 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 n is a non-negative integer. 	1	Example 3.7, Teaching Example 3.7, Example 3.8, Teaching Example 3.8 Exploration: 3.1	Exercise 3B (p. 3.12) Level 1: 1 – 8 Level 2: 9 – 15	
			3.3 The Binomial Theorem <ul style="list-style-type: none"> • Prove 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 	2	Example 3.9, Teaching Example 3.9, Example 3.10, Teaching Example 3.10, Teaching Example 3.10 (Extra), Example 3.11, Teaching Example 3.11, Example 3.12,	Exercise 3C (p. 3.19) Level 1: 1 – 15 Level 2: 16 – 26 Rev. Ex. 3 (p. 3.24) Level 1: 9 – 19 Level 2: 24 – 35	

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			<p>in binomial expansions.</p> <p>The following contents are not required:</p> <ul style="list-style-type: none"> ◆ expansion of trinomials ◆ the greatest coefficient, the greatest term and the properties of binomial coefficients <p>applications to numerical approximation</p>		<p>Teaching Example 3.12, Example 3.13, Teaching Example 3.13</p> <p>Discussion: 3.1</p> <p>5-Minute Lecture: Coefficients of terms in binomial expansions</p> <p>Animation: Idea of Binomial Theorem</p>		
<p>Second Term (2/1/2017-17/7/2017, Weeks 19 to 47)</p>	19-26	<p>Chapter 4 More about Trigonometric Functions (I)</p>	<p>4.1 Radian Measure</p> <ul style="list-style-type: none"> • Learn the concept of radian measure. • Learn the conversion between degrees and radians. • Learn to find arc lengths and areas of sectors using radian measure. • Students should understand that the relationship between the degree measure and the radian measure is given by $\pi \text{ rad} = 180^\circ$. 	2	<p>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</p> <p>5-Minute Lecture: Radian Measure</p>	<p>Exercise 4A (p. 4.10) Level 1: 1 – 12 Level 2: 13 – 18 Rev. Ex. 4 (p. 4.41) Level 1: 1 – 4 Level 2: 23 – 24, 35 – 36</p>	

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			<ul style="list-style-type: none"> Students should know how to apply the formulas $s = r\theta$ and $A = \frac{1}{2}r^2\theta$, where θ is in radian measure. 				
			<p>4.2 Trigonometric Functions</p> <ul style="list-style-type: none"> Recognise the definitions of the six trigonometric functions of angles of any magnitude. Understand the trigonometric relations. Learn the concept of a periodic function. Recognise the graphs of the six trigonometric functions and their characteristics. Students should know how to apply the trigonometric relations when they simplify trigonometric expressions. Teachers should discuss the period, the maximum value, the minimum value and the range 	4	<p>Example 4.6, Teaching Example 4.6, Example 4.7, Teaching Example 4.7, 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, Example 4.12, Teaching Example 4.12, Example 4.13, Teaching Example 4.13, Example 4.14, Teaching Example 4.14, Example 4.15, Teaching Example 4.15</p>	<p>Exercise 4B (p. 4.30) Level 1: 1 – 23 Level 2: 24 – 39 Rev. Ex. 4 (p. 4.41) Level 1: 5 – 16 Level 2: 25 – 27</p>	

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			from the graph of each of trigonometric functions.		5-Minute Lecture: Definitions of Trigonometric Functions 5-Minute Lecture: Trigonometric Relations 5-Minute Lecture: Trigonometric Graphs		
			4.3 Solving Simple Trigonometric Equations Learn different techniques to solve trigonometric equations for solutions in the interval from 0 to 2π . <ul style="list-style-type: none"> • Students should know how to apply the trigonometric relations when they solve trigonometric equations. • Students should pay attention to the interval of the solutions when they solve equations like $\sin nx = k$, where $n \neq 1$. 	2	Example 4.16, Teaching Example 4.16, Example 4.17, Teaching Example 4.17, Example 4.18, Teaching Example 4.18	Exercise 4C (p. 4.37) Level 1: 1 – 10 Level 2: 11 – 19 Rev. Ex. 4 (p. 4.41) Level 1: 17 – 22 Level 2: 28 – 34	
	27-32	Chapter 5 More about Trigonometric Functions (II)	5.1 Compound Angle Formulas <ul style="list-style-type: none"> • Learn and prove the 	3	Example 5.1, Teaching Example 5.1, Example 5.2, Teaching Example 5.2,	Exercise 5A (p. 5.12) Level 1: 1 – 19 Level 2: 20 – 29 Rev. Ex. 5 (p. 5.34)	

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			<p>compound angle formulas of sine, cosine and tangent functions.</p> <ul style="list-style-type: none"> • Apply the compound angle formulas to solve trigonometric problems. • Students should understand the proofs of compound angle formulas. 		<p>Example 5.3, Teaching Example 5.3, Example 5.4, Teaching Example 5.4, Teaching Example 5.4 (Extra), Example 5.5, Teaching Example 5.5, Example 5.6, Teaching Example 5.6, Example 5.7, Teaching Example 5.7</p> <p>5-Minute Lecture: Compound Angle Formulas</p>	<p>Level 1: 1, 3, 5 – 6, 8, 11 – 12 Level 2: 20, 22, 26 – 27</p>	
			<p>5.2 Double Angle Formulas</p> <ul style="list-style-type: none"> • Learn and prove the double angle formulas of sine, cosine and tangent functions. • Apply the double angle formulas to solve trigonometric problems. • Students should understand the proofs of double angle formulas. 	2	<p>Example 5.8, Teaching Example 5.8, Example 5.9, Teaching Example 5.9, Example 5.10, Teaching Example 5.10, Example 5.11, Teaching Example 5.11</p> <p>Exploration: 5.1</p> <p>5-Minute Lecture: Double Angle Formulas</p>	<p>Exercise 5B (p. 5.20) Level 1: 1 – 24 Level 2: 25 – 30 Rev. Ex. 5 (p. 5.34) Level 1: 2, 4, 7, 15, 17 Level 2: 19</p>	

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			5.3 Product to Sum and Sum to Product Formulas <ul style="list-style-type: none"> • Learn and prove the sum to product and product to sum formulas of sine and cosine functions. • Apply the product to sum and sum to product formulas of trigonometric functions to solve trigonometric problems. • Students should understand the proofs of product to sum and sum to product formulas. 	3.5	Example 5.12, Teaching Example 5.12, Example 5.13, Teaching Example 5.13, Example 5.14, Teaching Example 5.14, Example 5.15, Teaching Example 5.15, Example 5.16, Teaching Example 5.16 (Extra), Example 5.17, Teaching Example 5.17, Example 5.18, Teaching Example 5.18 5-Minute Lecture: Product to Sum and Sum to Product Formulas	Exercise 5C (p. 5.30) Level 1: 1 – 14 Level 2: 15 – 22 Rev. Ex. 5 (p. 5.34) Level 1: 9 – 10, 13 – 14, 16 Level 2: 18, 21, 23 – 25, 28 – 29	
	35-40	Chapter 6 Introduction to Number e and Natural Logarithms	6.1 Introduction to Number e <ul style="list-style-type: none"> • Recognise the definition of the number e. • Learn the characteristics of the graphs of $y = e^x$ and $y = e^{-x}$. • Recognise the exponential 	3	Example 6.1, Teaching Example 6.1, Exploration: 6.1 5-Minute Lecture: The Number e Teaching Tools: The Limiting Value of $\left(1 + \frac{1}{n}\right)^n$	Exercise 6A (p. 6.8) Level 1: 1 – 6 Level 2: 7 – 9 Rev. Ex. 6 (p. 6.17) Level 1: 4 – 5	

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			<p>series $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots$</p> <p>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.</p>		<p>5-Minute Lecture: Exponential Functions and Series</p>		
			<p>6.2 Natural Logarithms</p> <ul style="list-style-type: none"> • Understand the definition 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. <p>Teachers may remind students of the logarithmic function which is discussed in Compulsory part book 4A</p>	2	<p>Example 6.2, Teaching Example 6.2, Example 6.3, Teaching Example 6.3, Example 6.4, Teaching Example 6.4, Example 6.5, Teaching Example 6.5, Example 6.6, Teaching Example 6.6, Example 6.7, Teaching Example 6.7</p> <p>5-Minute Lecture: Natural Logarithms</p>	<p>Exercise 6B (p. 6.13) Level 1: 1 – 13 Level 2: 14 – 26 Rev. Ex. 6 (p. 6.17) Level 1: 1 – 3, 6 – 10 Level 2: 11 – 15</p>	

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			chapter 5.				

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