

Diploma Programme subject outline—Group 5: mathematics			
School name	Spojená škola Pankúchova		School code
Name of the DP subject <i>(indicate language)</i>	Mathematics Analysis and Approaches		
Level <i>(indicate with X)</i>	Higher <input checked="" type="checkbox"/>	Standard completed in two years <input checked="" type="checkbox"/>	Standard completed in one year * <input type="checkbox"/>
Name of the teacher who completed this outline	Monika Saganova	Date of IB training	August 2021
Date when outline was completed	28 th August 2021 Last update 7 th January 2022	Name of workshop <i>(indicate name of subject and workshop category)</i>	Mathematics: Analysis and approaches (Cat.1)

* All Diploma Programme courses are designed as two-year learning experiences. However, up to two standard level subjects, excluding languages ab initio and pilot subjects, can be completed in one year, according to conditions established in the *Handbook of procedures for the Diploma Programme*.

1. Course outline

- Use the following table to organize the topics to be taught in the course. If you need to include topics that cover other requirements you have to teach (for example, national syllabus), make sure that you do so in an integrated way, but also differentiate them using italics. Add as many rows as you need.
- This document should not be a day-by-day accounting of each unit. It is an outline showing how you will distribute the topics and the time to ensure that students are prepared to comply with the requirements of the subject.
- This outline should show how you will develop the teaching of the subject. It should reflect the individual nature of the course in your classroom and should not just be a “copy and paste” from the subject guide.
- If you will teach both higher and standard level, make sure that this is clearly identified in your outline.

	Topic/unit (as identified in the IB subject guide) <i>State the topics/units in the order you are planning to teach them.</i>	Contents	Allocated time		Assessment instruments to be used	Resources <i>List the main resources to be used, including information technology if applicable.</i>
			One class is <input type="text" value="45"/> minutes.	In one week there are <input type="text"/> classes.		
Year 1	Exponent and Logarithms Chapter 1 and 12	Laws of Exponents Operations with numbers in standard form Logarithms	7 lessons		FA: Homeworks – exercises from book set for home learning. Self and peer-marking in lessons afterwards. Class quizzes: Multiple choice quizzes on current learning at least once a week. Resources such as diagnosticquestions.com will be used to identify student misconceptions. Unit tests: After each Unit students will be given a written in class test	Hodder Book Past papers Geogebra/Desmos Graphic calculators
	Sequences and series Chapter 2 and 13	Arithmetic sequences and series Geometric sequences and series Financial applications of geometric sequences and series The sum of infinite convergent geometric sequence The binomial expansion	9 lessons			
	Complex Numbers	Cartesian Form Modulus-argument and Euler form Complex conjugate roots of quadratic and polynomial equations with real coefficients Powers and roots of complex numbers Trigonometric identities	15 lessons			
	Functions Chapter 3 and 13	Concept of a function Sketching graphs Composite functions Inverse functions Rational functions Inequalities with function notation analytically and graphically Graphs of functions with absolute value Properties of functions	7 lessons 5 lessons			

	<p>Coordinate Geometry Chapter 4</p>	<p>Equations of a straight line in 2D 3D coordinate geometry Introduction to vectors Vectors and geometry Scalar product and angles Equation of a line in 3D Intersection of lines Vector product and areas Equation of a plane Angles and intersections between lines and planes.</p>	<p>5 lessons</p> <p>7 lessons</p>	<p>with exam-style questions. These will be cumulative. So after Unit 1 students take a test on Unit 1. After Unit 2 the test will be on both Unit 1 and 2. After unit 3 the test will be on all three previous units and so on.</p>	
	<p>Geometry and Trigonometry Chapter 5 and 18</p>	<p>Volume and surface areas of 3D solids Rules of trigonometry Applications of trigonometry Radian measure of angles Trigonometric functions Trigonometric identities Graphs of trigonometric functions Trigonometric equations Further trigonometric functions Compound angle identities</p>	<p>21 lessons</p> <p>6 lessons</p>	<p>Mock exam each half-year (January and June) - past papers will be used for the mock examinations. These will be altered to</p>	

	<p>Graphs and Equations Chapter 15,16,17</p>	<p>Graphs of quadratic functions Solving quadratic equations and inequalities The discriminant Transformations of graphs Rational Functions Exponential and logarithmic functions Solving equations analytically Solving equations graphically Applications of equations * 8 lessons for Exploration Extension of the Binomial theorem Partial Fractions Solutions of the systems of the linear equations Graphs and Equations of polynomials The factor and remainder theorems Sum and product of roots of polynomial equations</p>	<p>25 lessons</p> <p>8 lessons</p>	<p>learning. Self and peer-marking in lessons afterwards.</p> <p>Class quizzes: Multiple choice quizzes on current learning at least once a week. Resources such as diagnosticquestions.com will be used to identify student misconceptions.</p> <p>Unit tests: After each Unit students will be given a written in class test with exam-style questions. These will be cumulative. So after Unit 1 students take a test on Unit 1. After Unit 2 the test will be on both Unit 1 and 2. After unit 3 the test will be on all three previous units and so on.</p>	
	<p>Differentiation Chapter 9 and 20</p>	<p>Limits and derivatives Graphical interpretations of derivatives Finding an expression for the derivative Tangents and normals at a given point and their equations Extending differentiation The chain rule for composite functions The product and quotient rules The second derivative Local maximum and minimum Point of inflection *8 lessons for Exploration Fundamentals of Calculus L'Hopital's rule Implicit differentiation Related rates of change Optimization Calculus applied to more functions</p>	<p>24 lessons</p> <p>10 lessons</p>	<p>Mock exam January</p>	

	Integration Chapter 10 and 21	Anti-differentiation Define integration and the area under a curve Further indefinite integration Further links between area and integrals Kinematics Integration by substitution Integration by parts Further geometric interpretation of integrals	10 lessons 7 lessons	- past papers will be used for the mock examinations. All topics to be included	
	Series and Differential Equations	First order differential equations and Euler's method Separating variables and homogeneous DE Integrating factors Maclaurin Series Using Maclaurin Series to solve differential equations			
	Revision	All content	44 lessons		

2. IB internal assessment requirement to be completed during the course

Briefly explain how and when you will work on it. Include the date when you will first introduce the internal assessment requirement to your students, the different stages and when the internal assessment requirement will be due.

May 2024 (DP1) - Introduce the exploration and give students some stimuli to start thinking about possible topics and focus. (1-2 hours)

June – October 2024 (DP1/DP2) - Allocate 6-7 Hours for exploration in lesson time

November 2024 (DP2) - Submission date for the choice of topic with a brief outline description

December 2024 (DP2) - Allocate 6-7 Hours for exploration in lesson time + consultations with students

January 2024 (DP2) - Draft Submission (early –mid January)

February 2025 (DP2) - Final Submission would be set for Monday after Spring Holiday (usually mid-late February)

Overall 15 hours pf teaching time are planned to be spent on internal assessment

3. Links to TOK

You are expected to explore links between the topics of your subject and TOK. As an example of how you would do this, choose one topic from your course outline that would allow your students to make links with TOK. Describe how you would plan the lesson.

Topic	Link with TOK (including description of lesson plan)
Sequences	Is all knowledge concerned with the identification and use of patterns? Lesson Plan Starter: Given sequence 1,1,2,3,5,8,13,21... can you find next 3 terms and define the rule? Introduction: Introduction to Fibonacci sequence and golden ratio Main Task: Investigation of all 4 Hodder books for IB Diploma Mathematics and how they exhibit Fibonacci sequence and golden ratio Plenary: Reflection on the initial question

4. Approaches to learning

Every IB course should contribute to the development of students' approaches to learning skills. As an example of how you would do this, choose one topic from your outline that would allow your students to specifically develop one or more of these skill categories (thinking, communication, social, self-management or research).

Topic	Contribution to the development of students' approaches to learning skills (including one or more skill category)
Statistics and Probability	Thinking, communication and research TASK: Create or find an arbitrary set of data. Find the gradients of the y-on-x and x-on-y lines of best fit. Which line is closer to the x-axis? Find the Pearson's correlation coefficient, r , and also r^2 . Can you hypothesize any link between the gradients of the two lines and r^2 ? To prove your hypotheses you might want to research the questions for the r and the gradients of the regression lines.

5. International mindedness

Every IB course should contribute to the development of international-mindedness in students. As an example of how you would do this, choose one topic from your outline that would allow your students to analyse it from different cultural perspectives. Briefly explain the reason for your choice and what resources you will use to achieve this goal.

Topic	Contribution to the development of international mindedness (including resources you will use)
Trigonometry	<p>Use of different units for angle measuring</p> <p>During the French Revolution there was a move towards decimalization, including the introduction of a new unit called the gradian (or shortly grad). This unit split right angle into 100 subdivisions. It is still used in some areas of surveying today.</p> <p>Task 1: Research other names and abbreviation for this unit Task 2: Which countries legally use gradian as a measurement unit Task 3: Create a conversion table between radians, gradians and degrees Task 4: Discuss advantages and disadvantages of using gradian</p> <p>Resources: Students conduct their own research</p>

6. Development of the IB learner profile

Through the course it is also expected that students will develop the attributes of the IB learner profile. As an example of how you would do this, choose one topic from your course outline and explain how the contents and related skills would pursue the development of any attribute(s) of the IB learner profile that you will identify.

Topic	Contribution to the development of the attribute(s) of the IB learner profile
Coordinate geometry	Open-minded Is mathematics a universal language? Why is mathematical notation so similar in different countries when other aspects of language differ so widely? Why are there still differences? What does 1,245 mean in Slovakia? What does it mean in other countries such as UK or the USA? Is one convention better than another?

7. Resources

Describe the resources that you and your student will have to support the subject. Indicate whether they are sufficient in terms of quality, quantity and variety. Briefly describe what plans are in place if changes are needed.

<p>Hodder Mathematics Analysis and Approaches SL and HL will be the two main books used both in and outside of the lesson Teacher has an acces to other publications as well (Oxford, Pearson, Hease and Harris) Use of online resources and tools such as: Geogebra, desmos, wolfram alpha, khan academy, Past papers and questions banks</p> <p>The Hodder mathematics textbooks cover all of the required content and are written well and easy to follow, hence are a good resource to start with. Where the teacher believe's another approach is needed a resource from other textbook or online question banks will be used. Students will work a lot with online softwere and graphic calculator when the subject content requires it.</p>
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