都立国際高校　年間授業計画／Tokyo Metropolitan Kokusai High School　Course Syllabus

○ 科目基礎情報 (Course information)

開講年度	(Academic year)	令和5年度 (2023 年度)
開講学科	(Department)	国際学科国際バカロレアコース／IBDP(International Baccalaureate Diploma Programme)
教科	(Subject Area)	Mathematics
科目	(Subject)	Mathematics: analysis and approaches　Higher Level
学年･クラス	(Grade･Class)	DP1
単位数	(Number of units)	5
使用教科書	(Text Books)	Peason Mathematics Analysis and Approaces for the IB Diploma
校外学習	(Field trip)	-

○ 教科の目標 (Goals of the subject area)

【知　識　及　び　技　能】　(Knowledge and Skills)
Understand the basic concepts, principles and laws in mathematics, as well as the skills to mathematically interpret and express events.

【思考力、判断力、表現力等】　(Ability to think, make judgements, express themselves)
Develop the ability to examine events logically using mathematics, to recognize the essence of events and their relationships with other events and to examine them in an integrated and developed manner, and to express events concisely, clearly, and precisely using mathematical expressions.

【学びに向かう力、人間性等】　(Motivation to learn, Humanity)
Develop an attitude to recognize the advantages of mathematics and actively utilize mathematics, an attitude to think tenaciously and make judgments based on mathematical arguments, an attitude to reflect on the process of problem solving and to deepen consideration, evaluation and improvement, and a basis for creativity.

○ 科目の目標 (Goals of the subject)

【知識及び技能】 (Knowledge and Skills)	【思考力、判断力、表現力等】 (Ability to think, make judgements, express themselves)	【学びに向かう力、人間性等】 (Motivation to learn, Humanity)
Understand the basic concepts, principles and laws in mathematics, as well as the skills to mathematically interpret and express events.	Develop the ability to examine events logically using mathematics, to recognize the essence of events and their relationships with other events and to examine them in an integrated and developed manner, and to express events concisely, clearly, and precisely using mathematical expressions.	Develop an attitude to recognize the advantages of mathematics and to make use of mathematics, an attitude to think tenaciously and to make judgments based on mathematical arguments, and an attitude to deepen consideration, evaluation, and improvement by looking back on the process of problem solving, as well as a basis for creativity.

○ 授業計画 (Course schedule)

	単元の具体的な指導目標 Unit Objectives	指導項目・内容 Topic / Contents	評価規準 Evaluation Criteria	知 ❶	思 ❷	態 ❸	Alotted hours 配当時数
1学期 (1st semester)	Students will distinguish different types of functions and draw appropriate graphs both by hand and using a GDC. Students will compare and contrast different types of functions and verify results. Students will learn polynomial functions and roots of polynomials. Students will understand the difference between an arithmetic and geometric sequence (and series) and, after comparing the two, apply the appropriate formulae to each. Students will develop connections between Pascal's triangle, nCk, and the coefficients of a binomial expansion and prove results based upon these connections. Students will be able to identify, graph, and manipulate logarithmic functions and their graphs. Students will understand the skills essential to read and practise abstract mathematical concepts: logic basics for proofs such as statements, negations of statements, and compound statements. Students will demonstrate understanding in the concept of proof and several proof procedure: direct proofs, proofs with the contrapositive, contradiction or counter examples. Students will write and understand proof by mathematical induction.	･Functions and their Graphs ･Sequence and Series (including binomial theorem) ･Exponential and Logarithmic Functions ･Logic and Proofs	❶【Knowledge/Skills】 ･Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts. ･Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems. ❷【Ability to think/make judgements/express themselves】 ･Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems. ･Transform common realistic contexts into mathematics; comment on the context; sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology; record methods, solutions and conclusions using standardized notation; use appropriate notation and teminology. ･Construct mathematical arguments through use of precise statements, logical deduction and interference and by the manipulation of mathematical expressions. ･Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity. ❸【Attitude towards learning proactively】 ･Be interested in mathematics, recognize the advantages of mathematics, and try to apply them to both abstract and real-world contexts to solve problems.	○	○	○	88
	定期考査 Examination			○	○		2

	単元の具体的な指導目標 Unit Objectives	指導項目・内容 Topic / Contents	評価規準 Evaluation Criteria	知 ❶	思 ❷	態 ❸	配当 時数
2学期（2nd semester）	Students will convert between radians and degrees for angle measure. Students will use trigonometric identities to prove important trigonometric results. Students will learn reciprocal trigonometric ratios. Students will learn the unit circle and about trigonometric identities, particularly double-angle and Pythagorean identities. Students will solve composite functions, including ones with restricted intervals. Students wil find the midpoint and distance of points on lines in 3D space and also use the trigonometric functions to find angles. Students will compute the area of a triangle using the formula 0.5*ab*sin C and solve right-angled and non right-angled geometric problems using trigonometry. Students will apply the different differentiation techniques to find the key points in a graph and then draw an appropriate function graph either by hand or with the use of a GDC.	・Trigonometry including reciprocal ratios, the unit circle, and area of a triangle ・Introduction to Differential Calculus ・Rules and Applications of Differentiation ・Integration Including techniques, area, and volume ・Techniques for Integration ・Complex Numbers	❶【Knowledge/Skills】 ・Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts. ・Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems. ❷【Ability to think/make judgements/express themselves】 ・Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems. ・Transform common realistic contexts into mathematics; comment on the context; sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology; record methods, solutions and conclusions using standardized notation; use appropriate notation and teminology. ・Construct mathematical arguments through use of precise statements, logical deduction and interference and by the manipulation of mathematical expressions. ・Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity. ❸【Attitude towards learning proactively】 ・Be interested in mathematics, recognize the advantages of mathematics, and try to apply them to both abstract and real-world contexts to solve problems.	○	○	○	90
		・Internal Assesment (IA)		○	○	○	
	定期考査 Examination			○	○		2

	単元の具体的な指導目標 Unit Objectives	指導項目・内容 Topic / Contents	評価規準 Evaluation Criteria	知 ❶	思 ❷	態 ❸	配当 時数
3学期（3rd semester）	Students will use the integration techniques learnt earlier to solve a range of real world applications, especially involving kinematics. Students will learn about vectors in two and three dimentions. Students will learn vector equation of a line and solve problems with lines. Students will apply vectors to applications in kinematics. Students will confirm their knowledge and understanding of statistics and apply this knowledge to calculate various examination style questions, both with and without a GDC. Students will practice various questions from a cumulative mix of topics.	・Integration and kinematics ・Vectors including applications to kinematics ・Bivariate Statistics	❶【Knowledge/Skills】 ・Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts. ・Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems. ❷【Ability to think/make judgements/express themselves】 ・Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems. ・Transform common realistic contexts into mathematics; comment on the context; sketch or draw mathematical diagrams, graphs or constructions both on paper and using technology; record methods, solutions and conclusions using standardized notation; use appropriate notation and teminology. ・Construct mathematical arguments through use of precise statements, logical deduction and interference and by the manipulation of mathematical expressions. ・Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity. ❸【Attitude towards learning proactively】 ・Be interested in mathematics, recognize the advantages of mathematics, and try to apply them to both abstract and real-world contexts to solve problems.	○	○	○	50
		・Internal Assesment (IA)		○	○	○	
	定期考査 Examination			○	○		2

総授業時数 Total hours	234