# 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 )

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|---|---|---|
| 開講年度 | ( Academic year ) | 令和7年度 ( 2025 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　Standard Level |
| 学年･クラス | ( Grade･Class ) | DP1 |
| 単位数 | ( Number of units ) | 4 |
| 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 | 配当時数 Allotted hours |
|---|---|---|---|---|---|---|---|
| | Students will be able to be familiar with...<br><br>·concepts of population, sample, random sampling, and frequency distribution of discrete and continuous data<br>·reliability of data sources and bias in sampling<br>·sampling techniques and their effectiveness<br>·interpretation of outliers<br>·presentation of data using frequency tables and diagrams and box-and-whisker plots<br>·working with grouped data: mid-interval values, interval width, upper and lower interval boundaries, and frequency histograms<br>·calculating and interpreting the mean, median, mode, quartiles, and percentiles<br>·calculating and interpreting the range, interquartile range, variance, and standard deviation<br>·calculating and interpreting cumulative frequency graphs and using to find the median, quartiles, and percentiles<br>·Understanding and interpreting linear correlation of bivariate data working with linear regression.<br><br>-different forms of equations of lines | Statistics (expansion from term 3 of FY)<br><br>Algebra and function basics<br><br>Functions, equations, and inequalities<br><br>Exponential and logarithmic functions<br><br>Trigonometric functions and equations | ❶【Knowledge/Skills】<br>･Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.<br>･Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems.<br>❷【Ability to think/make judgements/express themselves】<br>･Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems.<br>･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.<br>･Construct mathematical arguments through use of precise statements, logical deduction and interference and by the manipulation of mathematical expressions.<br>･Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.<br>❸【Attitude towards learning proactively】<br>･Be interested in mathematics, recognize the advantages of mathematics, and try to apply them to both abstract and real-world contexts | | | | |

| | 単元の具体的な指導目標<br>Unit Objectives | 指導項目・内容<br>Topic / Contents | 評価規準<br>Evaluation Criteria | 知<br>❶ | 思<br>❷ | 態<br>❸ | 配当<br>時数 |
|---|---|---|---|---|---|---|---|
| 1学期（1st semester） | andtheir gradients and intercepts<br>-parallel and perpendicular lines<br>-the concept of a function and its domain, range and graph<br>-mathematical notation for functions<br>-composite functions<br>-characteristics of an inverse function and finding the inverse function<br>-transformations of graphs and composite transformations of graphs<br><br>-quadratic functions, and different forms in which to express them<br>-finding characteristics of a parabola: axis of symmetry, x-intercepts, and vertex<br><br>-exponential functions and their graphs<br>-concepts of exponential growth and decay, and applications<br>-the nature and significace of the number e<br>-logarithmic functions and their graphs<br>-propertes of logarithms<br>-solving equations involving exponential expressions<br>-solving equations involving logarithmic expressions<br><br>-the radian measure of angles<br>-fining the length of an arc and area of a sector<br>-the unit circle and definitions of sin, cos, and tan<br>-the exact value of trigonometric rations of spcial angles their multiples<br>-the pythagorean identity<br>-double angle identities for sine and cosine<br>-the graphs for sine, cosine, and tangent<br>-the amplitude and period for the graphs of sine, cosine, and tangent<br>-composite functions of the form asin(b(x+c))+d and acos(b(x+c))+d and their graphs<br>-transformations of the graphs of trigonometric functions and their applications<br>-applying trigonometric functions to real-life problems<br>- solving trigonometric equations in a finite interval | | to solve problems. | ○ | ○ | ○ | 54 |
| | Term-End Exams | | | ○ | ○ | | 2 |
| | Students wil be able to be familiar with…<br><br>-finding the distance between two points in 3-dimensional space<br>-finding the midpoint of a line segment in 3-dimensional space | Geometry and trigonometry<br><br>Differential calculus 1<br><br>Differential calculus 2<br><br>Integral calculus | ❶【Knowledge/Skills】<br>・Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.<br>・Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems. | | | | |

| | 単元の具体的な指導目標<br>Unit Objectives | 指導項目・内容<br>Topic / Contents | 評価規準<br>Evaluation Criteria | 知<br>❶ | 思<br>❷ | 態<br>❸ | 配当<br>時数 |
|---|---|---|---|---|---|---|---|
| 2学期（2nd semester） | -computing the volume and surface area<br><br>of a solid such as a pyramid, cone, sphere, hemisphere or a solid made from a combination of these<br>-determining he size of an angle between two lines<br>-finding the sides and angles of a right-angled triangle using the sine, cosine, and tangent ratios<br>-applying the sine rule and the cosine rule to find an unknown length or an angle<br>-computing the area of a triangle using the formula 1/2 ab sin C<br>-solving problems involving 2-dimenional or 3-dimensional figures by means of right-angled and non-right-angled trigonometry<br>-solving problems involving compass bearings<br><br>-the concept of a limit<br>-the derivative as a gradient (slope) function and as a rate of change<br>-finding the derivative of polynomial functions<br>-the derivatives of sinx and cosx<br>-the relationship between the graphs of a function, its first derivatie and its second derivative<br>-identifying where a function is increasing or decreasing<br>-finding and testing for maximum, minimum, and inflection points<br>-kinematc problems involving displacement, velocity, and acceleration<br>-finding the equation of a tangent or a normal at a given point<br><br>-finding the derivative of a composite function<br>-finding the derivative of a function that is in the form of a product or quotient<br>-finding the derivative of exponential and logarithmic functions<br>-solving problems requiring a solution that is an optimum; that is, a maximum or minimum (optimisation)<br><br>-integration as antidifferentiation of functions<br>-calculating and applying definite integrals<br>-finding areas under curves (between the cure and the x-axis), and areas between curves<br>-antidifferentiation with a boundary condition<br>-solving kinematic problems involving displacement s, velocity v, acceleration a, and total distance travelled<br>-working with integration of polynomial functions, trigonometric functions and their inverses, and exponential functions<br>-integration by inspection (reverse chain rule) and integration by substitution | | ❷【Ability to think/make judgements/express themselves】<br>・Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems.<br>・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.<br>・Construct mathematical arguments through use of precise statements, logical deduction and interference and by the manipulation of mathematical expressions.<br>・Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.<br>❸【Attitude towards learning proactively】<br>・Be interested in mathematics, recognize the advantages of mathematics, and try to apply them to both abstract and real-world contexts to solve problems. | ○ | ○ | ○ | 62 |
| | Term-End Exams | | | ○ | ○ | | 2 |

| | 単元の具体的な指導目標<br>Unit Objectives | 指導項目・内容<br>Topic / Contents | 評価規準<br>Evaluation Criteria | 知<br>❶ | 思<br>❷ | 態<br>❸ | 配当<br>時数 |
|---|---|---|---|---|---|---|---|
| 3学期（3rd semester） | Students will be able to be familiar with…<br><br>-arithmetic sequence and series<br>-sum of finite arithmetic sequences<br>-geometric sequences and series<br>-sum of finite and infinite geometric series<br>-sigma notation<br>-the binomial theorem and the expansion of (a+b)^n where n is a natural number<br><br>-the cncepts of trial, outcome, equally likely outcomes, sample space (U), and event<br>-the probability of an event A as P(A) = nP(A)/n(U)<br>-complementary events A and A' (not A), and the identity P(A)+P(A') = 1<br>-combined events and use of the formula P(A or B) = P(A) + P(B) - P(A and B)<br>-mutually exclusive events and the fact that P(A and B) = 0<br>-contitional probability and the formula P(A\|B) = P(A and B)/P(B)<br>-probabilities of independent events: P(A\|B) = P(A) = P(A\|B')<br>-the use of Venn and tree diagrams and tables of outcomes to solve problems<br><br>-discrete random variables and their probability distributions<br>-the effect of linear transofmrations of X on the values of its parameters<br>-the normal distribution: properties, normal probability calculations, and inverse normal calculations<br>-standardising normal variables (z-values)<br>-inverse normal calculations where mean and standard deviation are unknown<br>-the binomial distribution including its mean and variance<br><br>Internal Assessment (IA) draft feedback/work sessions | Sequence and series<br><br>Probability<br><br>Probability distributions<br><br>Internal Assessment (IA) as needed | ❶【Knowledge/Skills】<br>・Recall, select and use their knowledge of mathematical facts, concepts and techniques in a variety of familiar and unfamiliar contexts.<br>・Use technology accurately, appropriately and efficiently both to explore new ideas and to solve problems.<br>❷【Ability to think/make judgements/express themselves】<br>・Recall, select and use their knowledge of mathematical skills, results and models in both abstract and real-world contexts to solve problems.<br>・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.<br>・Construct mathematical arguments through use of precise statements, logical deduction and interference and by the manipulation of mathematical expressions.<br>・Investigate unfamiliar situations, both abstract and from the real world, involving organizing and analyzing information, making conjectures, drawing conclusions, and testing their validity.<br>❸【Attitude towards learning proactively】<br>・Be interested in mathematics, recognize the advantages of mathematics, and try to apply them to both abstract and real-world contexts to solve problems. | ○ | ○ | ○ | 36 |

| 総授業時数<br>Total hours | 156 |
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