

# International Baccalaureate Diploma Programme Subject Brief

## Mathematics:

### Mathematical studies – Standard level

First assessments 2014 – Last assessments 2020

The IB Diploma Programme (DP) is a rigorous, academically challenging and balanced programme of education designed to prepare students aged 16 to 19 for success at university and life beyond. The DP aims to encourage students to be knowledgeable, inquiring, caring and compassionate, and to develop intercultural understanding, open-mindedness and the attitudes necessary to respect and evaluate a range of viewpoints.

To ensure both breadth and depth of knowledge and understanding, students must choose at least one subject from five groups: 1) their best language, 2) additional language(s), 3) social sciences, 4) experimental sciences, and 5) mathematics. Students may choose either an arts subject from group 6, or a second subject from groups 1 to 5. At least three and not more than four subjects are taken at higher level (240 recommended teaching hours), while the remaining are taken at standard level (150 recommended teaching hours). In addition, three core elements—the extended essay, theory of knowledge and creativity, action, service—are compulsory and central to the philosophy of the programme.

These IB DP subject briefs illustrate four key course components.

- I. Course description and aims
- II. Curriculum model overview



- III. Assessment model
- IV. Sample questions

## I. Course description and aims

The IB DP mathematical studies standard level (SL) course focuses on important interconnected mathematical topics. The syllabus focuses on: placing more emphasis on student understanding of fundamental concepts than on symbolic manipulation and complex manipulative skills; giving greater emphasis to developing students' mathematical reasoning rather than performing routine operations; solving mathematical problems embedded in a wide range of contexts; using the calculator effectively. There is an emphasis on applications of mathematics and statistical techniques. It is designed to offer students with varied mathematical backgrounds and abilities the opportunity to learn important concepts and techniques and to gain an understanding of a wide variety of mathematical topics, preparing them to solve problems in a variety of settings, develop more sophisticated mathematical reasoning and enhance their critical thinking.

The aims of all DP mathematics courses are to enable students to:

- enjoy and develop an appreciation of the elegance and power of mathematics
- develop an understanding of the principles and nature of mathematics
- communicate clearly and confidently in a variety of contexts
- develop logical, critical and creative thinking, and patience and persistence in problem-solving
- employ and refine their powers of abstraction and generalization
- apply and transfer skills to alternative situations, to other areas of knowledge and to future developments
- appreciate how developments in technology and mathematics have influenced each other
- appreciate the moral, social and ethical implications arising from the work of mathematicians and the applications of mathematics

- appreciate the international dimension in mathematics through an awareness of the universality of mathematics and its multicultural and historical perspectives
- appreciate the contribution of mathematics to other disciplines, and as a particular "area of knowledge" in the TOK course.

## II. Curriculum model overview

| Component  | Recommended teaching hours |
|--|----------------------------|
| <b>Topic 1</b><br>Numbers and algebra  | 20                         |
| <b>Topic 2</b><br>Descriptive statistics   | 12                         |
| <b>Topic 3</b><br>Logic, sets and probability  | 20                         |
| <b>Topic 4</b><br>Statistical application  | 17                         |
| <b>Topic 5</b><br>Geometry and trigonometry  | 18                         |
| <b>Topic 6</b><br>Mathematical models  | 20                         |
| <b>Topic 7</b><br>Introduction to different calculus   | 18                         |
| <b>Project</b><br>An individual piece of work involving the collection of information or the generation of measurements, and subsequent the analysis and evaluation. | 25                         |

### III. Assessment model

Having followed the mathematical studies SL course, students will be expected to demonstrate the following:

- Knowledge and understanding: recall, select and use knowledge of mathematical facts, concepts and techniques in a variety of contexts.
- Problem-solving: recall, select and use knowledge of mathematical skills, results and models to solve problems.
- Communication and interpretation: transform common realistic contexts into mathematics; comment on the context; create mathematical diagrams, graphs or constructions; record methods, solutions and conclusions using standardized notation.
- Technology: use technology accurately, appropriately and efficiently to explore new ideas and to solve problems.
- Reasoning: construct mathematical arguments through use of precise statements, logical deduction and inference, and by the manipulation of mathematical expressions.
- Investigative approaches: investigate unfamiliar situations involving organizing and analysing information or measurements, drawing conclusions, testing their validity, and considering their scope and limitations.

### IV. Sample questions

- A liquid is heated so that after 20 seconds of heating its temperature,  $T$ , is  $25^\circ\text{C}$  and after 50 seconds of heating its temperature is  $37^\circ\text{C}$ . The temperature of the liquid at time  $t$  can be modelled by  $T = at + b$ , where  $t$  is the time in seconds after the start of heating.

Using this model one equation that can be formed is  $20a + b = 25$

- A. Using the model, write down a second equation in  $a$  and  $b$ .
  - B. Using your graphic display calculator or otherwise, find the value of  $a$  and of  $b$ .
  - C. Use the model to predict the temperature of the liquid 60 seconds after the start of heating.
- Yun Bin invests 5000 euros in an account which pays a nominal annual interest rate of 6.25 %, compounded monthly. Give all answers correct to two decimal places.

Find

- A. the value of the investment after 3 years;
- B. the difference in the final value of the investment if the interest was compounded quarterly at the same nominal rate.

### Assessment at a glance

| Type of assessment                              | Format of assessment   | Time (hours) | Weighting of final grade (%) |
|---|--|--------------|------------------------------|
| External  |  | 3            | 80                           |
| Paper 1 (graphical display calculator required) | 15 compulsory short-response questions based on the whole syllabus.  | 1.5          | 40                           |
| Paper 2 (graphical display calculator required) | 6 compulsory extended-response questions based on the whole syllabus.  | 1.5          | 40                           |
| Internal  |  |              | 20                           |
| Project   | An individual piece of work involving the collection of information or the generation of measurements, and subsequent analysis and evaluation. |              | 20                           |

About the IB: For over 40 years the IB has built a reputation for high-quality, challenging programmes of education that develop internationally minded young people who are well prepared for the challenges of life in the 21st century and able to contribute to creating a better, more peaceful world.

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To learn more about how the IB Diploma Programme prepares students for success at university, visit: [www.ibo.org/recognition](http://www.ibo.org/recognition) or email: [recognition@ibo.org](mailto:recognition@ibo.org)