Calculators guidance for examinations booklet 2023

Diploma Programme

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International Baccalaureate
Baccalauréat International
Bachillerato Internacional

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IB mission statement

The International Baccalaureate aims to develop inquiring, knowledgeable and caring young people who help to create a better and more peaceful world through intercultural understanding and respect.

To this end the organization works with schools, governments and international organizations to develop challenging programmes of international education and rigorous assessment.

These programmes encourage students across the world to become active, compassionate and lifelong learners who understand that other people, with their differences, can also be right.

IB learner profile

The aim of all IB programmes is to develop internationally minded people who, recognizing their common humanity and shared guardianship of the planet, help to create a better and more peaceful world.

As IB learners we strive to be:

INQUIRERS
We nurture our curiosity, developing skills for inquiry and research. We know how to learn independently and with others. We learn with enthusiasm and sustain our love of learning throughout life.

KNOWLEDGEABLE
We develop and use conceptual understanding, exploring knowledge across a range of disciplines. We engage with issues and ideas that have local and global significance.

THINKERS
We use critical and creative thinking skills to analyse and take responsible action on complex problems. We exercise initiative in making reasoned, ethical decisions.

COMMUNICATORS
We express ourselves confidently and creatively in more than one language and in many ways. We collaborate effectively, listening carefully to the perspectives of other individuals and groups.

PRINCIPLED
We act with integrity and honesty, with a strong sense of fairness and justice, and with respect for the dignity and rights of people everywhere. We take responsibility for our actions and their consequences.

OPEN-MINDED
We critically appreciate our own cultures and personal histories, as well as the values and traditions of others. We seek and evaluate a range of points of view, and we are willing to grow from the experience.

CARING
We show empathy, compassion and respect. We have a commitment to service, and we act to make a positive difference in the lives of others and in the world around us.

RISK-TAKERS
We approach uncertainty with forethought and determination; we work independently and cooperatively to explore new ideas and innovative strategies. We are resourceful and resilient in the face of challenges and change.

BALANCED
We understand the importance of balancing different aspects of our lives—intellectual, physical, and emotional—to achieve well-being for ourselves and others. We recognize our interdependence with other people and with the world in which we live.

REFLECTIVE
We thoughtfully consider the world and our own ideas and experience. We work to understand our strengths and weaknesses in order to support our learning and personal development.

The IB learner profile represents 10 attributes valued by IB World Schools. We believe these attributes, and others like them, can help individuals and groups become responsible members of local, national and global communities.

Contents

1.0 Introduction

This publication contains an overview of the use of calculators in IB examinations.

A graphic display calculator (GDC) is a calculator that is capable of displaying tabular, matrix, list, geometrical and graphical representations, in addition to having functions found on scientific calculators. GDCs can run programs and flash ROM applications (apps).

Not all programs or apps are suitable for use in examinations. Not all GDCs are suitable for use in examinations that require GDCs. The document *Use of calculators in examinations* is updated annually in February for the May and November sessions and may be found on the Programme Resource Centre, on the home pages of subjects that require calculators. This document contains a list of recommended and prohibited GDCs, along with required examination settings and approved apps. It is essential that invigilators have a copy of this document.

It is strongly recommended that candidates have access throughout the subject course(s) to a single GDC from the list of recommended models.

2.0 Groups and subjects

Calculators of the types indicated as suitable are allowed only in the subjects listed in the table below.

Subjects	Calculators
Business management Environmental systems and societies	A four-function (plus, minus, multiply, divide) calculator, scientific calculator or GDC is required for all examinations.
Economics	Calculators are **not** allowed for paper 1. For paper 2 and paper 3, while all questions requiring a calculator can be answered fully using a four-function calculator (plus, minus, multiply, divide), GDCs are allowed during the examination. The graphing functions on these calculators may assist students and it is therefore recommended that all students are familiar with the use of GDCs.
Astronomy Marine science Nature of science	A calculator with the following minimum functionalities is required for all examinations (a GDC is recommended). • Decimal logarithms • Values of xy and $x1/y$ • Value of π (pi) • Trigonometric functions • Inverse trigonometric functions • Natural logarithms • Values of e^x • Scientific notation
Biology Chemistry Physics Sports, exercise and health science	Calculators are **not** allowed for paper 1. On paper 2 and paper 3, a calculator with the following minimum functionalities is required (a GDC is recommended). • Decimal logarithms • Values of xy and $x1/y$ • Value of π (pi) • Trigonometric functions • Inverse trigonometric functions • Natural logarithms • Values of e^x • Scientific notation
Design technology	Calculators are **not** allowed for paper 1. A four-function calculator (plus, minus, multiply, divide), scientific calculator or GDC is required for SL/HL paper 2 and HL paper 3 examinations.

Subjects	Calculators

Mathematics: analysis and approaches
 	
Mathematics: applications and interpretation
	Calculators are **not** allowed for *Mathematics: analysis and approaches* paper 1.
	
	On *Mathematics: analysis and approaches* paper 2 and paper 3 and *Mathematics: applications and interpretation* paper 1, paper 2 and paper 3, a GDC with the following minimum functionalities is required:
	
	• plot graphs with any viewing window and identify key features
	
	• solve equations, graphically and numerically (real and complex solutions)
	
	• solve systems of equations, graphically and numerically (real and complex solutions)
	
	• find a numerical derivative at a point
	
	• find a numerical definite integral
	
	• financial (TVM) solver
	
	• add and multiply matrices, find determinant and inverse matrices
	
	• convert between Cartesian and modulus-argument (polar) form
	
	• operations with complex numbers
	
	• probability distribution functionality:
	    normal distribution
	    binomial distribution
	    Poisson distribution
	    t-distribution
	    confidence intervals (for normal and t-distributions)
	
	• find statistical values including:
	    binomial coefficient ^nC_r, ^nP_r
	    1 and 2 variable statistical values
	    Pearson's product-moment correlation coefficient and coefficient of determination
	    regression equations (linear, quadratic, cubic, exponential, power and sinusoidal)
	    X^2 test for independence (X^2 values and p values)
	    X^2 goodness of fit test (X^2 values and p values), varying the degree of freedom
	    t-test (t values and p values)
	
	• spreadsheets or recursion tools to find approximate solutions using Euler's method
	
	• plot phase portraits for two numeric sequences

Different courses have different requirements, but the minimum requirements listed above are for all the mathematics courses. Some of these may not be relevant to every course. Statistical tables are not allowed in mathematics subject examinations. Candidates must have access to calculators that are able to find relevant statistical values.

3.0 General restrictions applying to all calculators used in examinations

Restrictions on the use of certain technology are in place to discourage malpractice and maintain fair and reasonable access to technology that is generally required in the good practice of teaching and assessment.

- Telephones, smart phones, smart watches, tablets, calculator watches, personal computers (PCs) and any other device that enables internet access are not allowed in any subject examinations.
- Only the manufacturer's operating system may be used.
- Computer algebra systems (CAS)-equipped calculators (symbolic manipulation, whether in-built or programmed) are not allowed in any subject examinations.
- Calculators with wireless/infrared communication are not allowed in any subject examinations.
- Examination questions must not be stored in, or recorded into, the memory of a calculator.
- Peripheral hardware must not be taken into the examination room (for example, keyboards, link cables and so on).
- Calculators must not be shared or exchanged during examinations.
- Calculator manuals must not be taken into the examination room.
- More than one calculator per candidate may be brought into the examination room. However, a spare set of batteries is a preferable alternative to several calculators.

4.0 Responsibilities

4.1 Coordinators and invigilators

The coordinator must ensure that these requirements are understood and are being followed by all candidates, teachers and invigilators. Schools are responsible for monitoring the use of calculators by candidates on a continuous basis.

During the examination, if a coordinator/invigilator finds that a candidate has used unauthorized material or technology, the matter should be reported in the same way as any other breach of examination regulations. During any inspection, the coordinator should expect to show visiting IB representatives that this checking procedure is being followed.

4.2 Teachers and candidates

Teachers of all Diploma Programme (DP) subjects that permit or require the use of calculators in examinations should make candidates aware of both the requirements and restrictions of use before the relevant examinations take place. The potential consequences of breaches of these requirements by candidates would be similar to consequences of any other breaches of examination regulations.

Teachers are responsible for monitoring the use of calculators by candidates throughout the course by informal conversation and by spot-checking calculators. Methods of monitoring individual calculators include manually checking, transferring memory to a PC or using tools provided by the calculator manufacturer, such as TestGuard®.