

A comparative analysis of the assessment and grades of IB DP and GCSE mathematics

EXECUTIVE SUMMARY

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A demand-focused comparative analysis of mathematics in the International Baccalaureate Diploma Programme (DP) and GCSE concluded:

- The specifications and assessments for DP mathematics subjects at standard level (SL) are significantly more demanding than those for GCSE mathematics, exceeding both the Higher tier and, to an even greater extent, the Foundation tier.¹
- As an extension of SL, the higher level (HL) specifications and assessments pose an even greater level of demand compared to those of GCSE mathematics.
- A DP mathematics grade 2 (for either SL or HL) demonstrates a level of mathematics achievement which is sufficient to meet the requirements of the GCSE grades examined in this study (6 to 4).

GCSE Grade	IB DP Mathematics Standard Level Grade	IB DP Mathematics Higher Level Grade
6	2	2
5		
4		

GCSE mathematics is graded 9 to 1 and DP mathematics is graded 7 to 1 (highest to lowest).

These conclusions apply to both mathematics subjects offered in the DP, namely 'Mathematics: analysis and approaches' and 'Mathematics: applications and interpretation'.

Context

The International Baccalaureate (IB) is a non-profit educational foundation offering four programmes across the world, namely the Primary Years Programme (PYP), Middle Years Programme (MYP), Diploma Programme (DP), and the Career-related Programme (CP). The DP is an upper-secondary programme leading to the IB diploma qualification. Students in this programme complete the DP core alongside subjects from studies in language and literature, language acquisition, mathematics, science, individuals and societies, and the arts. The IB diploma is pursued by many students worldwide, with over 100,000 candidates in 2023.²

A significant number of these international students seek to gain entry to higher education institutions (HEIs) in the UK. In addition to Level 3 qualifications, such as A levels and the IB diploma, UK universities sometimes require a Level 2 qualification in mathematics, such as the GCSE or MYP. Common entry requirements are GCSE mathematics grades 4, 5 and 6 (or equivalent).

However, many DP students do not hold a GCSE or MYP qualification and therefore need to meet the equivalent requirements institutions set. Therefore, it is important for institutions to

¹ The GCSE Foundation tier does not aim to award the higher grades of 6-9, and as a result, its syllabus and assessments are overall less demanding than those of the GCSE Higher tier. However, this does not mean that achieving one of the overlapping GCSE grades (3, 4, and 5) on the Foundation tier is any less demanding than on the Higher tier. Indeed, measures are taken to ensure that these grades are equivalent across both tiers.

² IB. (2023). *The IB Diploma Programme and Career-Related Programme. Final Statistical Bulletin. May 2023 Assessment Section*. Available from: [dp-cp-final-statistical-bulletin-may-2023.pdf](https://www.ibo.org/dp-cp-final-statistical-bulletin-may-2023.pdf) (ibo.org)

understand how mathematics achievement in the DP compares to that of GCSE and which IB diploma grades meet their Level 2 mathematics requirements.

In this context, Ecctis was commissioned to conduct a demand-focused comparative analysis of the mathematics assessment in the DP and GCSE. To support the recognition of mathematics achievement in the DP, the analysis culminated in the development of grade comparisons. The analysis considered all subjects and levels offered in DP mathematics, namely:

- Mathematics: analysis and approaches at SL
- Mathematics: analysis and approaches at HL
- Mathematics: applications and interpretation at SL
- Mathematics: applications and interpretation at HL.

The analysis also considered both tiers of GCSE: Higher and Foundation. The Higher tier awards GCSE grades 9 to 3, while the Foundation tier awards the grades 5 to 1. Therefore grades 3, 4 and 5 are available in both tiers of entry.

Methodological approach

Ecctis applied a bespoke methodology to undertake a comparative analysis of the mathematics assessment and grades of the DP and GCSE. The methodology included a review of specifications and recent assessment samples. For assessment objectives and syllabus content, Ecctis used a mapping method to identify similarities and differences in demand. To analyse the demand of items, Ecctis used an expert panel approach, whereby each expert conducted a review and comparison of items from an assessment sample and subsequently took part in a panel to discuss and reach a consensus on the judgements.³

For grade comparisons, Ecctis drew upon grade descriptors and used an assessment sample to develop 'grade profiles'. These grade profiles provided insight into the knowledge and skills required to achieve specific grades in the DP and GCSE assessment, enabling a comparison between them. After reviewing and comparing the grade profiles independently, a panel of experts met to discuss and finalise the grade comparison conclusions.

Comparative analysis summary

The demand-focused comparative analysis examined the methods and structure of assessment, assessment objectives, content, assessment components and items, as well as the marking approaches of DP and GCSE mathematics. The table below summarises the key findings of the comparative analysis, using a colour code to highlight the areas in which the DP demonstrated greater demand.

³ Experts consisted of individuals with diverse mathematics teaching and mathematics curriculum review experience at appropriate levels and in international contexts.

Table: Summary of key findings from the comparative analysis.

Area	Key findings and conclusions
Assessment methods and structure	Both DP and GCSE mathematics are primarily assessed through external written exams, divided into 2-3 different papers. The duration of GCSE's external assessment is longer than SL but shorter than HL. The only key difference is that the DP also uses internal assessment, weighted at 20%. The assessment methods alone do not pose a difference in demand; this is determined by the following areas.
Assessment objectives	DP and GCSE mathematics assessment objectives share several similarities. Both assess students' ability to demonstrate knowledge and understanding, apply knowledge to various contexts, communicate mathematically, use reasoning, interpret information, and solve problems. However, the DP's objectives also emphasise technology and inquiry approaches, adding an extra layer of demand. The technology used in DP mathematics is more advanced than in GCSE and a higher proficiency is expected. Additionally, the DP's inquiry approaches objective particularly emphasises higher-order skills such as analysis and critical and creative thinking skills. Moreover, lower-order skills such as knowledge and application are weighted significantly higher in the GCSE compared to the DP, particularly in the Foundation tier. Overall, assessment objectives are an area of some difference in demand between DP and GCSE mathematics.
Syllabus content	The syllabus for both DP subjects, at each level, is significantly more demanding than the GCSE syllabus, surpassing the Higher tier content and, to a greater extent, the Foundation tier content. A considerable amount of content assessed in GCSE is assumed knowledge for the DP. While there is some shared content between DP and GCSE—more so with the Higher tier—this constitutes only a small proportion of the SL syllabus and an even smaller proportion of the HL syllabus. The remaining content in SL, and especially in HL, is significantly more demanding than that of GCSE, requiring substantially more prior knowledge.
Assessment components and items	Most DP assessment items are significantly more demanding than the items on the GCSE assessments. DP items assess content in considerably more depth and more frequently require sustained reasoning. Additionally, the content assessed by DP items is typically considerably more complex than that assessed by GCSE items, exceeding the complexity of those on the Higher tier and, to an even greater extent, the Foundation tier assessment. Moreover, the DP items are more rigorously defined and use more complex contexts, thus requiring stronger skills in interpretation and problem-solving. Lastly, the internally assessed mathematical exploration in the DP adds another element of demand, as it involves an extended, independent piece of work that emphasises mathematical communication, as well as the higher-order skills of reflection and creativity.
Marking approaches	The marking approaches used for external assessment are largely similar between DP and GCSE mathematics.

Key:

	An area of similarity which does not constitute a significant difference in demand between DP and GCSE mathematics.
	An area with some similarities, though DP mathematics poses greater demand.
	An area with considerable differences, with DP mathematics posing significantly more demand than GCSE. The degree of difference to GCSE increases from SL to HL.

Grade comparison summary

As demonstrated by the comparative analysis, GCSE and DP mathematics are pitched at different levels, with the DP mathematics specifications and assessments for SL, and especially for HL, exceeding the demands of GCSE. Consequently, GCSE and DP grades are not directly comparable or equivalent. **Therefore, the analysis determined the lowest DP grade that demonstrated a level of mathematics achievement sufficient to meet the requirements of GCSE grades 4 to 6. A panel of experts concluded that a grade 2 at**

either SL or HL satisfied these requirements. Consequently, any higher DP mathematics grade (3 to 7) also meets their requirements.

Several key considerations informed this conclusion. The panel determined that grade descriptors alone could not provide clear comparisons between DP and GCSE grades, given the differences in their specifications and assessments. Therefore, analysis of assessment samples and their grade boundaries were essential to understand the requirements of the grades and establishing comparisons. Discussions initially focused on comparing a grade 2 at SL and then expanded to other grades.

Compared to the GCSE grades, a lower proportion of assessment is required to attain a DP grade 2. However, the panel agreed that answering a small number of DP items, or even partial responses, could demonstrate skills and knowledge equivalent to, or beyond, those needed for GCSE grades 4 to 6. Indeed, the demand of the SL and HL assessments is significantly higher, and a single DP item or question can encompass the knowledge and skills tested by multiple GCSE items. Therefore, achieving enough marks to gain a grade 2 demonstrates mathematical knowledge and skills that would satisfy GCSE grades 4, 5 and 6. By similar reasoning, it followed that a grade 2 at HL, and higher grades, were also sufficient to meet the requirements of GCSE grades 4 to 6.

To maintain consistent grading standards, boundaries are set for each GCSE and DP exam series. Although one DP exam series had unusually low grade boundaries, making it unsuitable for comparisons, analysis of grade boundary trends confirmed this as an isolated case. Other exam series provided evidence supporting the conclusion that the mathematics achievement demonstrated by a DP grade 2 at SL is sufficient to meet the requirements of GCSE grades 4, 5 and 6.

Finally, the grades students receive from their assessment capture just one picture of their mathematical knowledge and skills. DP students will have studied a higher level of mathematics than GCSE over their two-year programme, regardless of the subject and level chosen. Institutions or professional bodies using grade comparison information should consider the different knowledge and skills demonstrated by DP and GCSE grades.