

GCE Mathematics Aggregation Rules

Guidance for Higher Education Institutions

The following is a guide for Higher Education admissions tutors to aid them when making offers to applicants for first degree courses.

The grading of GCE Mathematics qualifications is complex, particularly when candidates are requesting several mathematics qualifications. JCO urges admissions tutors to make offers that comply with the grading rules which the awarding bodies use.

JCO believes that an understanding of these rules will permit conditional offers to be made that will allow for discrimination between the performances of candidates.

When aggregating units for candidates cashing in both Mathematics and Further Mathematics, it is common that there will be various possible pairs of subject grades and various possible combinations of unit grades within each subject. The rules used by the awarding bodies determine which of the various alternatives will actually be awarded. There will be cases where a different alternative would meet a candidate's HEI offer but where the aggregation under these rules has awarded a different set of grades. Offers which are conditional on unit grades in one particular Mathematics qualification can disadvantage candidates who are taking other Mathematics qualifications. Section 5 provides examples of the candidate outcomes and the evidence for discrimination in performance.

1. Background

In 2008, changes were made to the administration and grading rules for all GCE qualifications. These changes included:

- The introduction of the system whereby unit grades are provided to UCAS
- The withdrawal of the facility to decline a GCE grade and the introduction of the facility to re-use unit results when claiming a second award in the same subject

Given that the GCE Mathematics qualifications are subject to the general GCE grading rules, the additional rules for GCE Mathematics qualifications had to be amended to ensure compliance with the changes above. This paper discusses the implications of these amendments to the grading of GCE Mathematics subjects for the offers made to students by Higher Education Institutions.

Under the new rules candidates will receive the best grade(s) possible for GCE Mathematics qualifications (as under the old rules) **but** with the best possible uniform mark total(s).

In many, but not all cases, this will ensure that a candidate's grade(s) will be awarded using the best possible set of unit grade profiles. For example, where candidates have taken extra units, the best unit scores will be used.

Please note that candidates who have been entered for more than one Mathematics title (e.g. Mathematics and Further Mathematics) will have their grades maximised in combination. This is explored in more detail in later sections of this paper.

2. The structure of the GCE Mathematics qualifications

All awarding bodies' specifications in Mathematics and Further Mathematics have similar structures, although there are some differences in detail. In this paper, the following conventions and units are used:

Pure Mathematics units: C1, C2, C3, C4, FP1, FP2 and FP3

Applications units: M1, M2, M3, S1, S2, S3, D1 and D2

where C refers to core Pure Mathematics, FP to Further Pure Mathematics, M to Mechanics, S to Statistics and D to Decision Mathematics.

(Most awarding body specifications have other units in addition to these but they are not used in the following illustrations. Please check the actual specification for these additional units and how they may be used.)

(i) Unit combinations

For each of the qualifications, a candidate may certificate with one of the following combinations of units:

<u>AS Mathematics</u>	C1, C2, M1 C1, C2, S1 C1, C2, D1
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<u>A Level Mathematics</u>	C1, C2, C3, C4, M1, M2 C1, C2, C3, C4, S1, S2 C1, C2, C3, C4, D1, D2 C1, C2, C3, C4, M1, S1 C1, C2, C3, C4, S1, D1 C1, C2, C3, C4, M1, D1
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<u>AS Further Mathematics</u>	Any combination of three units which <u>does not include</u> C1–C4 but <u>does include</u> at least one Further Pure unit.
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<u>A Level Further Mathematics</u>	Any combination of six units which <u>does not include</u> C1–C4 but <u>does include</u> at least two Further Pure units.
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(ii) Required number of units of study

Certification of:

A Level Mathematics and AS Further Mathematics requires nine different units of study (six units for A Level Mathematics and three different units for AS Further Mathematics).

A Level Mathematics and A Level Further Mathematics requires twelve different units of study.

A Level Mathematics, A Level Further Mathematics and AS Further Mathematics (Additional) requires fifteen different units of study.

A Level Mathematics, A Level Further Mathematics and A Level Further Mathematics (Additional) requires eighteen different units of study.

Please note that 'unit of study' is defined as, for example, C1, C2 or M3; two results for C1 and one result for C2 is classed as two units of study.

These requirements apply irrespective of whether the titles are certificated in the same examination series or in different examination series.

(iii) Certification rules

AS Further Mathematics cannot be certificated unless AS Mathematics or A Level Mathematics has been certificated, or is being concurrently certificated.

A Level Further Mathematics cannot be certificated unless A Level Mathematics has been certificated, or is being concurrently certificated.

AS Further Mathematics (Additional) cannot be certificated unless A Level Mathematics and A Level Further Mathematics have been certificated, or are being concurrently certificated.

A Level Further Mathematics (Additional) cannot be certificated unless A Level Mathematics and A Level Further Mathematics have been certificated, or are being concurrently certificated.

3. Grade combinations

Below is Rule 1 from the full version of the aggregation rules for centres. The other rules are not expected to affect HEI conditional offers.

The full version of the aggregation rules for centres is available on the JCQ website at:

<http://www.jcq.org.uk/Download/exams-office/entries/gce-maths-information/gce-maths-rules---guidance-for-centres>

Rule 1

Grading of qualifications is determined as follows:

Step (i) maximisation of the qualification **grades** (including A*).

Step (ii) for the qualification grades determined under step (i), the maximisation of the **uniform mark totals** for each qualification.

The maximisation of grades and uniform mark totals for qualification titles is determined using the sequence:

Mathematics; Further Mathematics; Additional Further Mathematics

The highest possible grade is awarded for the first qualification title requested in the above sequence, followed by the highest possible grade for the second qualification title requested in the above sequence (if the candidate has entered for two titles), followed by the highest possible grade for the third qualification title requested in the above sequence (if the candidate has entered for three titles). Only one qualification (A Level or AS) is maximised for each title.

For example, if a candidate has entered for AS and A Level Mathematics and AS and A Level Further Mathematics (ie two titles), the highest possible grade is awarded for A Level Mathematics followed by the highest possible grade for A Level Further Mathematics. The uniform mark totals for A Level Mathematics and Further Mathematics (in that order) are maximised before the AS qualification grades are considered.

Please note: the above maximisation process places, for example,

a grade combination of AU above a grade combination of, say, BE

and

a grade combination of BU above a grade combination of, say, CE.

A request to change a grading combination **that includes an unclassified award** to an arithmetically possible alternative will be granted. No other requests to change grading combinations will normally be allowed.

Please note:

For candidates with nine or twelve (or sometimes more) units, step (i) ensures that the units will be distributed in the way which gives the best grades in the order stated. Given the appropriate unit results, Mathematics at Grade A and Further Mathematics at Grade C would be awarded rather than both qualifications at Grade B.

Step (ii) ensures that candidates receive the highest possible UMS total for Mathematics, without lowering the subject grade for Further Mathematics.

The above two steps maximise qualification grades and the uniform mark totals, not the individual unit grades.

4. Awarding A* in the GCE Mathematics Suite of Qualifications

The General Rule

To be awarded a grade A* at GCE A Level, a candidate must:

1. Achieve grade A overall for the A Level. This can be also be described as having to achieve 80% of the maximum uniform mark

AND

2. Achieve 90% of the combined maximum uniform mark for the A2 units.

For example:

For a 4 unit A Level, a candidate must achieve at least 320 of the 400 maximum uniform mark and 180 of the 200 combined maximum uniform mark for the A2 units.

For a 6 unit A Level, a candidate must achieve at least 480 of the 600 maximum uniform mark and 270 of the 300 combined maximum uniform mark for the A2 units.

Please note:

- i) The above rules are applied to the best available result for each AS and A2 unit; for each unit, this best available result may be achieved at the first or subsequent sitting
- ii) Grade A* is not available for AS qualifications

The Application of the General Rule to the GCE Mathematics Suite of Qualifications

Since there is flexibility in the use of units in the grading of A Level Mathematics, A Level Further Mathematics and A Level Additional Further Mathematics, there are supplementary rules for the mathematics suite of qualifications. Please note that A Level Pure Mathematics conforms to the general rule for the award of an A* grade since it does not have this flexibility of unit use.

For A Level Mathematics, A* will be awarded to candidates who have achieved grade A overall (at least 480 of the 600 maximum uniform mark) and at least 180 of the 200 combined maximum uniform mark for the C3 and C4 units¹.

For A Level Further Mathematics, A* will be awarded to candidates who have achieved a grade A overall (at least 480 of the 600 maximum uniform mark) and at least 270 of the 300 combined maximum uniform mark for their **best** three A2 units (whether pure or application units).

For A Level Additional Further Mathematics, A* will be awarded to candidates who have achieved a grade A overall (at least 480 of the 600 maximum uniform mark) and at least 270 of the 300 combined maximum uniform mark for their **best** three A2 units (whether pure or application units).

For reference: AS units are C1, C2, FP1, S1, M1, D1; all other units are designated as A2.

For information: C denotes core pure mathematics, FP denotes further pure mathematics, S denotes statistics, M denotes mechanics and D denotes decision mathematics.

¹ The general rule has to be adapted for A level Mathematics since C3 and C4 are the only A2 units that must be included in the A Level aggregation.

Illustrative Examples

A Level Mathematics

Example 1

C1 = 90, C2 = 79, **C3 = 95, C4 = 94**, M1 = 87, M2 = 89

Total: 534 uniform
marks

C3 + C4 total: 189 uniform
marks

Grade awarded: **A***

Example 2

C1 = 95, C2 = 98, **C3 = 92, C4 = 87**, D1 = 87, D2 = 89

Total: 548 uniform
marks

C3 + C4 total: 179 uniform
marks

Grade awarded: **A**

Example 3

C1 = 90, C2 = 92, **C3 = 91, C4 = 92**, M1 = 56, D1 = 58

Total: 479 uniform
marks

C3 + C4 total: 183 uniform
marks

Grade awarded: **B**

A Level Further Mathematics

Example 4

FP1 = 93, **FP2 = 91**, S1 = 95, **S2 = 91**, D1 = 89, **D2 = 80**

Total: 539 uniform
marks

Best A2 total: 262 uniform
marks

Grade awarded: **A**

Example 5

FP1 = 80, FP2 = 86, **M2 = 94**, M3 = 85, **M4 = 88, M5 = 89**

Total: 522 uniform
marks

Best A2 total: 271 uniform
marks

Grade awarded: **A***

5. Conditional offers

Please note:

All mathematics units have a maximum uniform mark of 100. 80 uniform marks are required for Grade A at unit level.

Six units are required for an A Level award; three for an AS award. The uniform marks needed to achieve each grade are shown in table 1.

Table 1

	A Level²	AS
Maximum uniform mark	600	300
Grade A threshold	480	240
Grade B threshold	420	210
Grade C threshold	360	180
Grade D threshold	300	150
Grade E threshold	240	120

Example 1

Offer:

Applicant has a conditional offer of BB for A Level Mathematics and A Level Further Mathematics.

Comments

- In line with rule 1 (see section 3 above), a candidate will be awarded a grade combination of AC (or even AD or A*E) in preference to BB, i.e. BB will be awarded only if Grade A for Mathematics is not possible.
- Both grade combinations, BB and AC, confirm that the candidate has achieved a minimum uniform mark total of 840. It would not be fair to reject a candidate who has been awarded AC on the grounds that this does not meet the conditional offer, as the candidate may in fact have a valid combination that delivers BB but which was not chosen by the aggregation system.
- To discriminate between candidates with equivalent subject grades, unit grades can be used. If, for example, performance in Pure Mathematics units were the most important consideration for the chosen degree course then one would compare the performances of the two candidates across the C and FP units.

Example 2

Offer:

Applicant has a conditional offer which includes Grade A for A Level Mathematics with all six units at Grade A.

Comments

- A candidate could successfully meet this offer with a UMS total of 480; each unit achieved with 80 uniform marks.
- Another candidate could fail to meet this offer but have a UMS total as high as 579; five of the units achieved with the maximum uniform mark of 100, the sixth unit achieved with 79 uniform marks.

² See Section 4 above for Grade A*.

- The second candidate has clearly outperformed the first candidate on five units. On the sixth unit, the first candidate outperformed the second candidate by one uniform mark.
- The specification of unit grade performance has not identified the more able candidate.

Example 3

Offer:

Two applicants have conditional offers which include Grade A for A Level Mathematics with all six units at Grade A. The offers do not include any requirement for a qualification grade or unit grades for A Level Further Mathematics.

Comments

- Candidate 1 (who just certifies A Level Mathematics) takes six units with results as follows:
C1 (80), C2 (80), C3(80), C4 (80), M1 (80), M2 (80).
- Candidate 2 (who certifies A Level Mathematics and A Level Further Mathematics) takes the same six units with results as follows:
C1, (100), C2 (100), C3 (100), C4 (100), M1 (100), M2 (100)
and a further six units with results as follows:
FP1 (80), FP2 (80), FP3 (80), S1 (79), S2 (80), S3 (80).
- Candidate 2 outperforms Candidate 1 on all of the six units taken by both candidates.

but

- Candidate 1 will be awarded Grade A for A Level Mathematics with all six units at Grade A. Candidate 2 will be awarded Grade A for both A Level Mathematics and A Level Further Mathematics but the A Level Mathematics will include the S1 result, which has a unit Grade B, to allow the M2 result to be included in the award of Grade A for A Level Further Mathematics.
- In this case the awarding body cannot change the aggregation for Candidate 2. There is no way of awarding Grade A for both A Level Mathematics and A Level Further Mathematics without using unit S1 for A Level Mathematics.

Example 4

Offer:

Applicant has a conditional offer which includes Grade A for A Level Mathematics and Grade C for A Level Further Mathematics.

Comments

- The applicant re-entered both A Levels, having obtained BC on the first occasion. (The applicant may in fact have re-taken only one unit in order to re-certificate.) A slight improvement on the results in the re-taken unit(s) may give new grades AD - in line with rule 1 (see section 3 above) a candidate will be awarded AD (or even AE or AU) in preference to BC.
- All results (including grade U), from all examination series, are forwarded to Higher Education Institutions. Admissions tutors should be aware that, in the (rare) example quoted, the applicant should not be considered to have grade A in Mathematics *and* grade C in Further Mathematics. He/she has therefore not met the offer.

Overall conclusions on examples

Offers which are conditional on unit grades in one particular Mathematics qualification can disadvantage candidates who are taking other Mathematics qualifications. In particular, offers conditional on unit grades in A Level Mathematics are likely to disadvantage Further Mathematics candidates.

The situation illustrated in example 3 could be avoided by making the offer conditional on the grades in particular units of specific interest, e.g. the compulsory units C1-C4.