Mathematics, Further Mathematics and Pure Mathematics Aggregation Rules – Guidance for Centres

Introduction

This document has been updated to reflect the name change and split of Core Mathematics (C12) into Pure Mathematics P1 and P2 and Core Mathematics (C34) into Pure Mathematics P3 and P4.

The International Advanced Level specification contains six qualifications. The following three titles are each available at both International Advanced Subsidiary (IAS) level and International Advanced level (IAL):

- Mathematics
- Further Mathematics
- Pure Mathematics

The IAL Mathematics specification contains fourteen units:

P1, P2, FP1, M1, S1 and D1 are AS units,
P3, P4, FP2, FP3, M2, M3, S2 and S3 are A2 units.

A student may certificate IAS Mathematics with any one of the following combinations of units:

P1, P2, S1
P1, P2, M1
P1, P2, D1

A student may certificate IAL Mathematics with any of the following combinations of units:

P1, P2, P3, P4, S1, S2
P1, P2, P3, P4, M1, M2
P1, P2, P3, P4, S1, M1
P1, P2, P3, P4, S1, D1
P1, P2, P3, P4, M1, D1

A student may certificate IAS Further Mathematics with any combination of three units which does not include P1, P2, P3 or P4 and does include FP1.

A student may certificate IAL Further Mathematics with any combination of six units which does not include P1, P2, P3 or P4 and does include FP1 and at least one of FP2 and FP3.

Certification of IAL Mathematics and IAS Further Mathematics requires nine different units (six units for IAL Mathematics and three different units for IAS Further Mathematics), even if certification of IAS Further Mathematics is in a later series and a unit is re-taken.

Similarly, certification of IAL Mathematics and IAL Further Mathematics requires twelve different units.

A student may certificate IAS Pure Mathematics with units P1, P2 and FP1.

A student may certificate IAL Pure Mathematics with units P1, P2, P3, P4, FP1 and one of FP2 or FP3.

Note: unit results for P1, P2, P3 and P4 used to certificate IAL Mathematics cannot be used towards certification of IAL Pure Mathematics or vice versa (see appendix)

Likewise, unit results for FP1, FP2 and FP3 used to certificate IAL Further Mathematics cannot be used towards certification of IAL Pure Mathematics or vice versa (see appendix)

In rules 1 to 11 overleaf, any reference to **units**, whether explicit or implicit, is to the **units themselves**, not **unit results**. This means that if a student has two results on the bank for the same unit, for instance, they can't use one result towards one cash-in and then use the other result towards another cash-in.

Example 1:

Consider a student with the following unit results:

Unit	P1	P2	P3	P4	M1	M2	FP1	FP2	M3	S1	S2	D1
UMS	90	90	80	80	85	75	90	80	60	85	95	80

The unit results would be aggregated as follows:

Maths	P1	P2	P3	P4	M1	S1	Total	Grade
UMS	90	90	80	80	85	85	510	A

F. Maths	FP1	FP2	M2	M3	D1	S2	Total	Grade
UMS	90	80	75	60	80	95	480	A

Thus two A grades are awarded with the IAL Mathematics having a total UMS of 510. Use of unit S2 instead of M1 in IAL Mathematics would result in a greater UMS total but would also result in a grade B for IAL Further Mathematics which fails to meet the requirement of step (i)

Example 2:

Consider a student with the following seven unit results:

Unit	P1	P2	P3	P4	M1	M2	S1
UMS	75	75	69	69	74	70	82

This student will be awarded a grade B with a total of 444 UMS, leaving the result for M2 in the bank.

If an IAS was requested at the same time, we would award it for P1, P2 and S1, grade B with 232 UMS.

Rule 2

The maximisation of grading and uniform mark totals for qualifications will be determined using the sequence:

IAL Mathematics; IAL Further Mathematics; IAS Mathematics/IAS Pure Mathematics; IAS Further Mathematics.

That is, the highest possible grade will be awarded for the first qualification requested in the above sequence, followed by the highest possible grade for the second qualification requested in the above sequence, etc.

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 a U grade** to an arithmetically possible alternative will be granted. No other requests to change grading combinations will normally be allowed.

What does this mean for students?

This means that, for instance, given the appropriate unit results we would award Mathematics at grade A and Further Mathematics at grade B, rather than the other way round.

If a student awarded A and U feels they would be better off with B and E, he or she will be able to request such a change. This option will **not** apply, however, to any other combinations which do not contain a U grade. A student who, for instance, would prefer to have C and C rather than B and D will have to accept the B and D grades awarded.

Example:

Consider a student with the following unit results:

Unit	P1	P2	P3	P4	M1	M2	FP1	FP2	FP3	S1	S2	D1
UMS	90	90	80	80	85	85	40	30	25	35	45	20

Awards will now be made on the basis of these two unit totals:

Maths	P1	P2	P3	P4	M1	M2	Total	Grade
UMS	90	90	80	80	85	85	510	A

F. Maths	FP1	FP2	FP3	S1	S2	D1	Total	Grade
UMS	40	30	25	35	45	20	195	U

This method maximises the result to award two grades, A and U.

It would also be possible to make these two awards on the basis of the same unit results:

Maths	P1	P2	P3	P4	S1	S2	Total	Grade
UMS	90	90	80	80	35	45	420	B

F. Maths	FP1	FP2	FP3	M1	M2	D1	Total	Grade
UMS	40	30	25	85	85	20	285	D

Since this award results in two pass grades, B and D, a request to change to this unit combination would be granted.

Rule 3

Once grades have been issued, units used towards a qualification will become 'locked' to that qualification's group. This means that such a unit can only subsequently be used towards qualifications in the same 'qualification group' (as defined below); the unit cannot be used towards a qualification in a different qualification group.

The groups/levels are as follows:

Group	Level	Qualification
A	1	IAS Mathematics/Pure Mathematics[†]
	2	IAL Mathematics
B	1	IAS Further Mathematics
	2	IAL Further Mathematics

[†]Pure mathematics units will not be locked when used to certificate any IAS award, see Appendix.

(IAL Pure Mathematics is not included in the above table since it cannot be awarded in combination with any qualifications in the GCE Mathematics suite.)

Note that if a unit has been used towards both qualifications in a qualification group it will be locked to both qualifications accordingly. Units cannot be used to count towards qualifications in two qualification groups (e.g. IAS Mathematics and IAL Further Mathematics) for awards within the same series but can be used in a different qualification group in a later series provided that the necessary awards are re-entered in order to trigger unlocking (see rule 6).

What does this mean for students?

It means that students who use a unit towards an IAS or IAL Mathematics result will not be able to use that unit towards IAS or IAL Further Mathematics if the units remain 'locked' – however, we would hope that units are always 'unlocked' when re-sits are being considered. See Rules 6 and 7 for more on this.

See Appendix 1 for examples of Mathematics and Pure Mathematics.

Rule 4

With the exception of IAS Further Mathematics (see rule 5), the **IAL qualification** in each group must have been awarded before (or be awarded concurrently with) a qualification in a subsequent group can be awarded.

What does this mean for students?

A student cannot be awarded IAL Further Mathematics until they have been awarded IAL Mathematics (either previously or concurrently).

Rule 5

Students will be allowed to certificate IAS Further Mathematics before they certificate IAL Mathematics.

IAS Further Mathematics will not be awarded unless IAS Mathematics has already been awarded or is being awarded concurrently with IAS Further Mathematics.

Rule 6

Locking

A unit may have been '**single-locked**' by being used towards the award of only one of the qualifications in the group.

OR

A unit may have been '**double-locked**' by being used for the awards of both the IAS and the IAL in the qualification group.

A unit that has been 'single-locked' will become 'unlocked' from a qualification group by re-entering the qualification for which it was used.

If a unit is 'double-locked', it will become unlocked by re-entering the IAL qualification only.

Unlocking is the term for making a previously used unit available for use towards a qualification in any qualification group. If a unit is not unlocked it is only available for re-use towards qualifications within the group to which it is locked.

(It is only necessary to re-enter the IAS qualification if a new grade for the IAS is required. If a unit has been locked to just the IAS qualification then re-entering the IAL qualification only will not unlock the unit.)

Advice: When applying for certification of any IAS or IAL qualification in Mathematics or Further Mathematics, students should always reapply for certification of any previously entered Mathematics or Further Mathematics IAS or IAL qualifications. This allows grade maximisation to take place and does not lead to any disadvantage.

What does this mean for students?

This rule is best understood in conjunction with Rule 7 where unlocking and re-sitting is dealt with.

(The qualification grade combination maximisation applies to the higher qualification requested in each group. This follows from rule 2 (the sequence in which grades are maximised); for example, for a student entered for IAS and IAL Mathematics and Further Mathematics, a unit will become locked to group B (Further Mathematics) before it is considered for use towards the award of IAS Mathematics.)

If students want to use their unit results again towards a re-sit, they need to be entered for the cash-in codes of the qualifications that might be affected. For instance, in the cases of students re-sitting to improve their Further Mathematics results – they ought to be re-entered also for Mathematics in case a re-arrangement of the twelve units leads to a better pair of grades than if they had just re-entered for Further Mathematics (and thus using only six units – their Mathematics units would be considered to be locked).

Example 1

Consider a student who achieved the following results in their first attempt at Mathematics and Further Mathematics:

Maths	P1	P2	P3	P4	M1	M2	Total	Grade
UMS	82	82	80	75	83	69	471	B

F. Maths	FP1	FP2	FP3	S1	S2	D1	Total	Grade
UMS	72	70	64	82	68	62	418	C

This student was hoping for a B at Further Mathematics and so decides to re-sit only D1, while being re-entered for Further Mathematics. On achieving 79 UMS for D1 the second time, a grade B for Further Mathematics is achieved and awarded.

Maths	P1	P2	P3	P4	M1	M2	Total	Grade
UMS	82	82	80	75	83	69	471	B

F. Maths	FP1	FP2	FP3	S1	S2	D1	Total	Grade
UMS	72	70	64	82	68	79	435	B

However, if this student had been re-entered for the cash-in for Mathematics as well as the cash-in for Further Mathematics, all units would have been unlocked and the twelve could have been rearranged in such a way to give a grade A for Mathematics and a grade B for Further Mathematics:

Maths	P1	P2	P3	P4	M1	D1	Total	Grade
UMS	82	82	80	75	83	79	481	A

F. Maths	FP1	FP2	FP3	S1	S2	M2	Total	Grade
UMS	72	70	64	82	68	69	425	B

Example 2 below shows how grades are affected depending on what entry is made at what session and if units are not unlocked.

Table 1- Previous qualifications <u>not</u> re-entered

Cash-in series 1

Unit	Score	IAS Maths Lock	IAL Maths Lock
P1	80	No Lock	**M**aths
P2	80	No Lock	**M**aths
P3	65	-	**M**aths
P4	65	-	**M**aths
M1	75	**M**aths	**M**aths
S1	65	-	**M**aths

	UM Total	Grade
IAS Maths	235	B
IAL Maths	430	B

Cash-in series 2

Unit	Score	IAS F Maths Lock	IAL F Maths Lock
FP1	70	**F M**aths	-
M2	70	**F M**aths	-
S2	65	**F M**aths	-

	UM Total	Grade
IAS Further Maths	205	C

In Table 1 the student cashes in IAS and IAL Mathematics in series 1 and IAS Further Mathematics in series 2.

Only the newly-taken units can be used for IAS Further Mathematics, because the student has not re-entered IAL Mathematics (and thus has not unlocked the units used in series 1).

Note that P1 and P2 are locked to only the IAL Mathematics whereas M1 is locked to both IAS and IAL Mathematics; M1 is 'double-locked', whereas P1 and P2 are only locked to IAL Mathematics; they are 'single locked' (see appendix for more details).

Table 2 - All previous qualifications re-entered

Cash-in series 2

Unit	Result Series	Score	IAS Maths Lock	IAL Maths Lock	IAS F Maths Lock	IAL F Maths Lock			
P1	1	80	No Lock	**M**aths					
P2	1	80	No Lock	**M**aths					
S1	1	65	**M**aths	**M**aths			225	B	IAS Mathematics
P3	1	65		**M**aths					
P4	1	65		**M**aths					
S2	2	65		**M**aths			420	B	IAL Mathematics
FP1	2	70			**FM**aths				
M1	1	75			**FM**aths				
M2	2	70			**FM**aths		215	B	IAS Further Mathematics

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          = change between group A (Mathematics) and group B (Further Mathematics).
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In Table 2 the student cashes in all three qualifications in series 2. Irrespective of what has previously been cashed in, all units are now available for aggregation to IAS and IAL Mathematics and IAS Further Mathematics. The IAS Further Mathematics grade improves from C to B when compared with table 1. However, it should be noted that, whilst the grades are unchanged, the uniform mark totals for IAS and IAL Mathematics are lower.

Example 3

An example with 7 units locked to group A: Mathematics

Unit	Result Series	Score	IAS Maths Lock	IAL Maths Lock
P1	1	70	No Lock	**M**aths
P2	1	70	No Lock	**M**aths
S1	1	60	**M**aths	
P3	2	65		**M**aths
P4	2	65		**M**aths
M1	2	65		**M**aths
M2	2	70		**M**aths
FP1	3	60		
S2	3	60		

Series 1 - IAS Mathematics is cashed-in. The grade awarded is C (200 um), using P1, P2 and S1. S1 is locked to IAS Mathematics.

Series 2 – IAL Mathematics is cashed-in. The grade awarded is C (405 um), using P1, P2, P3, P4, M1 and M2. These 6 units are locked to IAL Mathematics.

Series 3 – Two further units, FP1 and S2 are entered. If a cash-in for IAS Further Mathematics only is entered then the student will not be awarded a grade since there are only 2 units not locked to group A (Mathematics). The unlocking rule (rule 6) requires both the IAS and IAL Mathematics to be re-cashed-in to unlock all units locked to group A (Mathematics) since only the IAS can unlock S1.

What does this mean for students?

This means that students looking to re-sit any units should also be re-entered for all previously entered cash-in codes to make sure unlocked units can be combined in the best possible way.
Thus a Maths and Further Maths student re-sitting just, say, D1 should be re-entered also for the cash-in codes for Mathematics and Further Mathematics in case their twelve units can be rearranged to give a better pair of grades.

Example 1:

The following discussion uses the example used to illustrate Rules 6 and 7, above.

In table 1, the request, in series 2, is for IAS Further Mathematics only. As table 2 illustrates, a request to re-cash-in IAL Mathematics would have resulted in an improved grade combination of BB for IAL Mathematics and IAS Further Mathematics, rather than BC.

Can a student make a subsequent request for IAL Mathematics so that this improved grade combination can be awarded?

Yes – if this is a late request made before the specified deadline for late cash-ins within the current series.

No – if a request is made in a subsequent examination series. Reason – the student has no longer an entitlement to request cash-ins; all units are locked to mathematics groups. (This answer assumes that the student has not (re-)entered units in a subsequent series since if he/she has then the entitlement to request re-cash-ins is satisfied.)

IAS/IAL Pure Mathematics – Rules 8–10

Since Pure Mathematics shares some units with the IAL Mathematics and Further Mathematics qualifications, the rules governing the use of these common units has to be at the level of **unit results** (otherwise, once a student had certificated Mathematics, he/she could never certificate Pure Mathematics, or vice-versa).

Rule 8

Certificating IAL Pure Mathematics locks unit results, **not** units. That is, unit results used to certificate IAL Pure Mathematics can never be used for any qualifications in the GCE Mathematics suite and vice-versa.

Certificating IAS Pure Mathematics does not lock anything; neither units nor unit results.

What does this mean for students?

This means that students who cash-in for IAL Pure Mathematics cannot subsequently use their P1, P2, P3 and P4 results to cash-in for IAL Mathematics.

Students can certificate P1, P2 and FP1 for IAS Pure Mathematics and still go on to use those P1 and P2 units to gain an IAL in Mathematics (perhaps by adding P3, P4, S1, M1).

Rule 9

IAS Pure Mathematics is available within both the IAL Mathematics and the IAL Pure Mathematics qualification routes.

If the **only** previously awarded cash-in is IAS Pure Mathematics then these units are available for subsequent use towards either IAL Mathematics and Further Mathematics or IAL Pure Mathematics.

What does this mean for students?

Students can certificate P1, P2 and FP1 for IAS Pure Mathematics and still go on to use those units to gain an IAL in Mathematics (perhaps by adding P3, P4, S1, M1) or an IAL in Pure Mathematics (perhaps by adding P3, P4 and FP2 or FP3).

Rule 10

All results for units in Core and Further Pure Mathematics that are available for consideration in the grading of IAL Pure Mathematics will be locked to IAL Pure Mathematics.

Likewise, all results for units in Core and Further Pure Mathematics that are available for consideration in the grading of IAL Mathematics/IAL Further Mathematics will be locked to IAL Mathematics or IAL Further Mathematics.

What does this mean for students?

It means students have to opt for one or the other: Pure Mathematics or Mathematics/Further Mathematics.

Appendix

Pure mathematics units do not need to be locked when used to award IAS qualifications

Pure mathematics units will not be locked following the award of IAS Mathematics, IAS Pure Mathematics and IAS Further Mathematics but they will be locked when subsequently used for IAL Mathematics, IAL Further Mathematics or IAL Pure Mathematics. Since the pure mathematics units that contribute to these IAS qualifications are a subset of both IAL Mathematics and IAL Pure Mathematics or IAL Further Mathematics and IAL Pure Mathematics, the locking of unit results only needs to happen when the IAL cash-in is requested.

The reason for the above rule is to reduce unnecessary administration for both centres and awarding bodies. For example, if in an examination series only IAS Pure Mathematics is certificated then one cannot know if the student is intending to follow the Mathematics (and possibly Further Mathematics) route or the Pure Mathematics route. Therefore, one cannot know whether a Mathematics lock or a Pure Mathematics lock should be applied to each of the units.

The non-locking of these pure mathematics units does not complicate the programming required to ensure the units of study requirement is satisfied – e.g. 12 units of study being required for the award of IAL Mathematics and IAL Further Mathematics.

Example:

(i)   A student who requests IAL Pure Mathematics

Cash-in series 1 — Student requests IAS Pure Mathematics only				Cash-in series 2 — Student requests IAL Pure Mathematics			
Unit	Score	IAS Lock	IAL Lock	Unit	Score	IAS Lock (carried forward)	IAL Lock
P1	80	No	N/A			No	Pure
P2	80	No	N/A			No	Pure
FP1	70	No	N/A			No	Pure
M1	65	-	N/A			-	-
				P3	69		Pure
				P4	69		Pure
				FP2	60		Pure

These P and FP unit results are now locked to Pure Mathematics and cannot be used for IAS/IAL Mathematics or IAS/IAL Further Mathematics qualifications.

(ii)   A student who requests IAL Mathematics

Cash-in series 1 Student requests IAS Pure Mathematics only				Cash-in series 2 Student requests IAL Mathematics			
Unit	Score	IAS Lock	IAL Lock	Unit	Score	IAS Lock (carried forward)	IAL Lock
P1	80	No	N/A			No	Maths
P2	80	No	N/A			No	Maths
FP1	70	No	N/A			No	Maths
M1	65	-	N/A			-	Maths
				P3	69		Maths
				P4	69		Maths
				S1	60		Maths

The P units results are now locked to IAL Mathematics and cannot be used for IAL Pure Mathematics. Also, within the IAL Mathematics suite, units M1 and S1 have now been locked to group A: IAL Mathematics and cannot be used in group B, Further Mathematics unless, under the unlocking rule, IAL Mathematics is re-cashed-in.

The purpose of the above example is to illustrate that the fundamental requirements:

Within the IAL Mathematics suite, a student's entitlement to awards is based upon the number of units studied. For example, the award of IAL Mathematics and IAS Further Mathematics must use 9 different units of study;

Unit results cannot be used towards both IAL Pure Mathematics and IAL awards in Mathematics and/or Further Mathematics;

Unit results are not compromised if the units that contribute to IAS Pure Mathematics are not locked when used for IAS Pure Mathematics.

(iii)   A student who requests IAL Mathematics

Cash-in series 1 Student requests IAS Mathematics only				Cash-in series 2 Student requests IAL Mathematics			
Unit	Score	IAS Lock	IAL Lock	Unit	Score	IAS Lock (carried forward)	IAL Lock
P1	80	No	N/A			No	Maths
P2	80	No	N/A			No	Maths
FP1	70	No	N/A			No	Maths
M1	65	Maths	N/A			Maths	Maths
				P3	69		Maths
				P4	69		Maths
				S1	60		Maths

The purpose of the above example is to illustrate that it is only the pure mathematics units that are not locked at IAS. Since M1 can only be used within the Mathematics/Further Mathematics route then it has been locked to group A (Mathematics).