



Dear Ciarán,

On behalf of the Irish Mathematics Teachers' Association, I would like to commend you for the excellent examination papers which seemed to strike the right balance at all levels for the 2022 Leaving Certificate, Leaving Certificate Applied and Junior Cycle examinations. 2021/2022 has been another challenging year for students, teachers, schools and parents and the SEC has worked hard to ensure fair papers at all levels. The significant choice at all LC levels is to be welcomed, and something that we would implore the SEC to maintain going forward. This has allowed students the opportunity to spend time on their mathematical skills and procedures and freed them up to think, create and innovate with their solutions, most notably in Section B of all papers.

Mathematics is a subject that requires time and thought for so many students, and we welcome the seriously reduced levels of stress on students and teachers alike, while not compromising the standard or integrity of any of the papers.

There are a few points that the IMTA would like to raise at this point which apply directly to the draft marking schemes.

AT AL P1

Fair. Accessibly and suitably challenging in places. Very functions/calculus heavy paper.

Q3	The diagram on the bottom of page 8 separate to the work-space on page 9 will have to be clipped together in online correcting software. Work show on the diagram should be given full credit if correct.
Q5	Part (a) students should get full credit for correct differentiation in any form as it was not specified.
Q6	Part (b) was poorly spaced with a box on both page 14 and 15 – both will need to be clipped together in online correcting software. 6 (c) was a great 'teaching question' going forward
Q7	Part (c) was guided well so students did not omit an explanation. Part (d) will see many students find the local max and min and not include the min point on the y axis. Perhaps the wording should have clarified this.
Q8	Question was well worded and presented. Part (e) was helped with the bold "second". Part (f) was more challenging
Q9	Again the bold words in the question were helpful to students. Part (c) which ask students to explain will be hard to mark – any valid reason in the student's own words should be given credit. Part (f) was a nice way to use the sum of a geometric formula outside of financial maths.



AT AL P2

Q1	Part (a)(ii) for the justification students should be given full marks for correct answer in their own words as it did not specify that they should use calculations.
Q2	In part (b) work shown on the diagram should be given credit.
Q4	<p>On page 25 of the syllabus, section 2.3 Trigonometry says, “derive the trigonometric formulae 1, 2, 3, 4, 5, 6, 7, 9”. Part (a) (i) asks students to “prove” formula number 10 which is not on the syllabus. While they must be able to apply formula 10, they are not required to prove it. Therefore, a formula proof cannot be required for full marks on this question. This is obviously easily done proving $Tan(A + B)$ identity with B replaced with -B, but this was not stated. This is an unfortunate error and one we hope is a mere oversight in 2022. How will this be reflected in the marking?</p> <p>In part (a)(ii) it was a pity that the students were not directed to use the surd values from the tables, which allowed them get their answers in the required form much easier. If they use the calculator, they will get $\frac{3-\sqrt{3}}{3+\sqrt{3}}$ which we would suggest should be awarded F*. It was a pity that so much scaffolding had been provided in other parts of the paper (which is welcomed) but didn't happen here. This could have reduced issues with surds.</p> <p>In part (b) the surd in the surd threw some students and some rounded as a result, they should get F* for rounding.</p>
Q5	<p>Part (a)(i) should get full marks for decimal or percentage answers. Most students knew what the “more accurate” confidence interval was, but the language was vague and should have told them to use standard tables.</p> <p>The layout and signposting of part (b) is highly commended as students will not leave out any element of required solution.</p>
Q6	Part (b) the diagram should have been beside the workspace, and they will need to be clipped together in the online marking system. The wording on part (b) does not tell students to justify any of their work so they must get full credit for the correct answer without an explanation. Part (c) challenged even very good students. While the directed hint was laudable, did it end up causing more confusion?
Q7	<p>In part (c) the radius of the cone can be also found by letting the CS Area of the Cone = Area of the sector and should get high marks.</p> <p>Major or Minor arc required? Both should be accepted for FC.</p> <p>Part (e) led students to use similar triangles by assuming as the question did not tell them to prove and hence solve. If they use similar triangles correctly and don't prove they should still get full credit.</p>
Q8	<p>In part (a) (iv) students should get marks for any correct reason in their own words. In part (b) “why you might think” is going to get very vague answers – any valid possibility should get full marks. Part (c) caused issues with timing. The diagram in part (d) caused confusion in part (ii) as students thought they needed all the information shown. Probabilities are normally given in a sentence and students are more used to seeing them presented that way.</p> <p>Question whether the 3 events are independent. If the head gasket goes then the car is off the road?! (d) could have benefitted from being laid out better as most of the text and table were not needed until (ii).</p>
Q9	Part (d)(i) “explain briefly” will cause huge issues. If the students say “this is a balance equation, time = time” that is a brief explanation and full credit should be given. In part (d)(ii) the need for one decimal threw students 4.004... do they have to write 4.0? In future planning this should be avoided.
Q10	Part (a)(ii) when students read the Z-score they may take 0.84 or 0.85, both should get credit as a similar question did last year. If they round their answer up or down 235 or 236 they should get full credit as a similar question last year did. Part (b) and (c) were clear and fair. In part (d) lots of student will write out combinations and should get some credit. The amount of language on part (e) was not needed. Students are used to the figures explained in a sentence not a table. Again, rounding Z scores and P values up or down should get full credit.



AT GL

- Students appeared to 'enjoy' paper 1 more than 2.
- Questions in Section A appear to have more subparts than previously, not necessarily a bad thing given the welcome choice.
- Q8 on paper 2 was very long for students.
- Very little geometry on the papers.
- Some literacy issues on both papers which some EAL students will have struggled with (eg halfway line etc).
- Short questions on both papers were on the side of challenging more so than fair for students.
- Paper 2 Q7 (c) (ii) – while it said 'different animals' at the top of the part, saying 'without replacement' would have been helpful.
- P2 Q9 (d) – the inclusion of enlargements is to be commended.

AT BL

Fair, accessible and well thought out paper.

LC Applied Mathematical Applications

Fair, accessible and well thought out paper.

TS AL

We welcome the paper given the experience the students have had. However, we would like to ensure that this is the standard for this year and this year only. This paper can in no way be indicative of the standard going forward. There will need to be far more rigorous examination of pure algebraic skills and a precedent cannot be created that this is now the gold standard for JC HL students.

Although the paper had more scaffolding than typical for JCHL that may have been appropriate for this year's JC students considering the difficulties they have had with school-time missed during their Junior Cycle years.

In Q2, it is regrettable that a level of accuracy for the pie chart wasn't specified.

Q3 (a) Will students be expected to expand the denominator?

Q8(a) students could do it by subtracting from 180 or using \tan^{-1} using the 220 and 154 (which is clear on diagram though not mentioned until the next part of the question). Since the **154m distance is in the diagram before (a) they should receive full marks** for either approach, even though 154 is not included in text at the start of the Q. Using \tan^{-1} students will get 55.0079... Any version of this should be acceptable for FC.



TS GL

Short paper with reasonable mix of extremely accessible material for the previous Foundation Level student to access, with appropriate questions at this level.

Very little by way of calculations really.

The inclusion of the formula in one part of the paper was welcome – assuming there will be FL reintroduced, could we include relevant formulae on the papers going forward or at least direct students to the relevant pages in the formulae book where required.

Thanking you in advance and every best wish for the challenging work ahead during the summer months. Perhaps you would be able to address our members later in the year in relation to areas of students' strengths and weaknesses to enable us to better prepare our students for the state examinations in mathematics.

Finally, a reminder again that we in the IMTA implore the SEC, the NCCA and the DES to maintain this level of choice in the state examination papers going forward. We are happy to meet to discuss this further with you if this is appropriate.

Thanking you,

Ciarán Duffy,

Chairperson,
IMTA