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Examiners' report

MATHEMATICS B (MEI)

H640

For first teaching in 2017

H640/03 Autumn 2021 series

Version 1

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

	Reports for the November 2021 series will provide a broad commentary about candidate performance, with the aim for them to be useful future teaching tools. As an exception for this series they will not contain any questions from the question paper nor examples of candidate responses.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

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Paper 3 series overview

This paper consisted of two sections

- Section A was 60 marks of synoptic Pure mathematics
- Section B was 15 marks of Comprehension based on an unseen article

This is the first live paper of this specification to be sat since October 2020. Examinations did not take place in the summer due to COVID-19 and Teacher Assessed Grades (TAGs) were awarded instead. Examiners saw many very competent scripts with correct solutions being seen to nearly all questions. Nevertheless, there were also many scripts that demonstrated little familiarity with the specification content and did not score more than a scant handful of marks over the paper.

Two areas that caused particular concern to candidates were

- the Comprehension (Section B, Q12 – 15)
- the questions where candidates were told they 'must show detailed reasoning'. There will be more comments on each of these in the relevant section.

Candidates who did well on this paper generally did the following:	***Candidates who did less well on this paper generally did the following:***
• Presented their solutions clearly with full working out. • Understood the difference between an exact solution and an approximate solution. • Used clear, annotated diagrams to support their solutions. • Showed resilience in getting to the end of more complex questions.	• Showed working in a haphazard and disconnected way. • Made many slips in algebraic manipulation. • Struggled to make appropriate comments on modelling assumptions. • Lacked confidence to attempt the questions in the Comprehension.

Section overview

Section A – Pure mathematics

There seemed to be plenty of opportunity in this paper for both the least confident candidates to gain some marks but also the most able to show their skills.

Comments on responses by question

1 This was an accessible start to the paper with most earning some marks here. Some candidates lost marks by introducing extra transformations in part (c) such as 'stretch'. Also in (c) some candidates used imprecise language such as 'shift' or 'move' rather than the correct 'translation'.

2 There was confusion in finding the second solution here and many struggled to round correctly to one decimal place.

3 In part (a) many scored an accuracy mark for an unsimplified answer, despite then simplifying incorrectly.

In (b), many who got as far as $x^2 + x = 0$ struggled to factorise correctly.

4 The method for finding the gradient of the chord was well understood but many found the rounding challenging.

5 Correct sketches were seen frequently in (a)(i) but less so in (a)(ii).

Questions that ask candidates to comment on the suitability or limitations of a mathematical model, such as part (b)(i), are a common feature of the reformed Maths qualification. Those candidates that appeared familiar with this requirement provided comments around 'population growth is proportional to population', but there were candidates that struggled to write anything relevant.

(b)(ii) and (iii) were generally answered successfully.

	OCR support	A number of questions have the instruction '**In this question you must show detailed reasoning**'. Well prepared candidates recognise this as a sign that any steps that they would have done electronically should be shown explicitly in their working. Topics where this could be expected include indices, surds, trigonometry and both differential and integral calculus. An Exam hints for students guide is available for students from the Mathematics B (MEI) – H640 qualification page. A command word poster is also available to download in A2 or A4 format.

6 This was the first Detailed Reasoning (**DR**) question in the paper. Candidates were required to demonstrate that they knew how to rationalise a denominator rather than use their calculator to do it. Often candidates scored the B1 for writing out the terms but did not give the 'detailed reasoning' required to score the M mark. So $\frac{1}{\sqrt{2}+1}$ simply appeared as $\sqrt{2}-1$ without showing the rationalisation. This meant the two A marks were lost as well.

7 There were plenty of correct solutions to this integration by parts question. Weaker solutions showed confusion in how to deal with the 2 when integrating $\sin 2x$.

8 Some candidates did not manage to find the negative x values.

9 A number of candidates were in line for 10/10 here but did not show sufficient 'detailed reasoning' to be awarded full credit. This usually occurred when $x = 0.64$ was quoted as the solution to the quadratic equation $25x^2 - 41x + 16 = 0$ without any justification. This lost a mark and consequently the final A mark could not be given. Some candidates did not show sufficient working for their definite integrals.

10 The partial fractions in (a) were often found successfully. The differential equation in (b) proved harder to get full marks on. Only the very best candidates explicitly showed their separation of variables with y and $\mathrm{d}y$ on one side and x terms and $\mathrm{d}x$ on the other. Some introduced confusion for themselves by expanding their denominators. Many omitted the '$+c$' and only the best could go on and find the c successfully. Use of log laws was often correctly seen but this was often not the case with modulus signs.

11 This question was generally poorly answered. The first M1A1 was often scored but the majority of candidates did not give the '**detailed reasoning**' necessary to determine the 'exact' length of AB. The decimal approximation $\sin 45 = 0.707$, rather than $\sin 45 = \frac{1}{\sqrt{2}}$, was often.

Section overview

Section B – Comprehension

Many candidates seemed reluctant to attempt this section and there were a lot of scripts where the Section B modal mark was 'No Response'. Candidates would be well advised to have a go at the Comprehension questions, with those that did finding that many of the earlier marks were quite accessible.

Comments on responses by question

Good solutions were often seen to 12, 13(b) and 14(a). Only one or two correct responses to 13(c) were seen and nobody scored the first mark in 14(b). Part marks were often given in 14(b) and 15.

Key teaching and learning points – comments on improving performance

1 Read the question, particularly when specific conditions are requested (1dp, 2dp, exact solution etc).

2 Be prepared to answer the 'detailed reasoning' questions. Even if it is just 'put your calculators away'.

3 Be willing to 'have a go' at the comprehension. Candidates should not feel they have failed if they find some parts tricky.

Guidance on using this paper as a mock

The comments made in this report are fairly typical of those made on previous H640/03 papers.

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