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AS/A LEVEL GCE

Examiners' report

MATHEMATICS (MEI)

3895-3898, 7895-7898

4754/01B Summer 2018 series

Version 1

Contents

Introduction

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

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report. A full copy of the question paper can be downloaded from OCR.
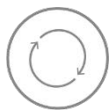
Paper 4754/01B series overview

Applications of Advanced Mathematics (core 4) 4754 is the fourth mandatory component of 7895 A Level Mathematics (MEI). This component is made up of an examination paper and this separate comprehension task. This is the final assessment series for this specification, although there is a resit opportunity in summer 2019.

The rationale for the comprehension paper is to assess the ability of candidates to read and comprehend a mathematical argument or an example of the application of mathematics in a specific context and then demonstrate their understanding through undertaking further calculations and commenting on the results in that context.

The comprehension paper this year concerned the mathematical procedures that can be employed to try to ensure a fair outcome in cricket matches when bad weather reduces the time available for the match to be completed. Whilst using a sporting context in a question paper has the potential to introduce bias we take great care to ensure that the questions asked are about the mathematics and do not require any background knowledge of the sport.
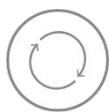
The vast majority of candidates dealt with the demands of this paper well and good marks were scored here.

In order to prepare for this assessment candidates need to read the passage carefully – not skim read as they might a novel, or to rush straight to the questions. It is recommended that candidates read the passage in its entirety first, then read the questions before rereading the passage to identify the relevant information for each question and making notes in the text as appropriate.

There was a minor typo in line 105 of the comprehension insert, this did not affect candidates' ability to answer the question.

Key

AfL   Guidance to offer for future teaching and learning practice.

Question 1

1 In a 40-over match, Team 1 scored 183/8 in their 40 overs. Team 2, in the first 23 overs of their innings, reached 102/4 when rain caused a delay. This delay meant that only 5 more overs were available to Team 2. Using the ARR method, calculate how many runs Team 2 had to score in these 5 overs in order to win the match. **[3]**

The vast majority of candidates correctly calculated the ARR for Team 1 by considering $\dfrac{183}{40}$. however; many then went on to incorrectly multiply this by 5 to give 22.875; concluding that 23 runs were required. The correct method was to multiply the ARR by 28 (the total number of overs available to Team 2) to give a rounded value of 129 and then to consider 129 – 102 which gives the 27 runs required in the last 5 overs.

Question 2

2 In line 94 the article says that the D/L method can set a higher target for Team 2 than the ARR method would have set.

In a 50-over match Team 1 scores 239 runs. Team 2 only have 40 overs available. Calculate how many more runs Team 2 need to score to win the match if the D/L method, rather than the ARR method, is used. **[3]**

While the vast majority of candidates scored at least one mark for correctly using one of the methods provided in the passage, many believed that both methods gave the same answer. Furthermore, some candidates only calculated the runs required by one of the two methods. Of those candidates who correctly obtained 213.427 for D/L and 191.2 for ARR nearly all correctly rounded up to 214 and 192 and then went on to calculate the required difference.

Question 3

3 Rewrite equation (4) in line 101 to make the b the subject. **[2]**

Most candidates in this question correctly re-arranged to make e^{-bu} the subject and then successfully went on to take logs (in an attempt to make b the subject).

? A number of candidates partially re-arranged and then wrote that

$$-e^{-bu} = \frac{z}{z_0} - 1 \Rightarrow bu = \ln\left(\frac{z}{z_0} - 1\right).$$

Other candidates started this question by first expanding the brackets and then, mistakenly, took logs of each term, for example, writing $z = z_0 - z_0 e^{-bu} \Rightarrow \ln z = \ln z_0 - \ln\left(z_0 e^{-bu}\right)$

? **Misconception**

Question 4(i)

4   The article, in line 147, says that the D/L method can be used to deal with a match in which there are multiple interruptions in either team's innings.

In 2003, a 50-over match between two teams took place and before play began the match was reduced to 46 overs each.

Rain stopped play when Team 1 reached 123/2 from 25 overs. At the restart both innings were reduced to 43 overs.

Rain stopped play again when Team 1 had reached 150/3 from 33 overs, and at the restart both innings were reduced further to 38 overs.

Team 1 finished on 185/3 from their 38 overs.

   (i) Complete the final column of the table below.   [4]

4(i)		Overs left and wickets remaining	Resource as a percentage
	Total resource available to Team 1 at the start	46 overs left, 10 wickets remaining	
	Total resource remaining to Team 1 at the first interruption	21 overs left, 8 wickets remaining	
	Total resource remaining to Team 1 at the restart	18 overs left, 8 wickets remaining	
	Total resource lost by first interruption		
	Total resource remaining to Team 1 at the second interruption	10 overs left, 7 wickets remaining	
	Total resource remaining to Team 1 at the second restart	5 overs left, 7 wickets remaining	
	Total resource lost by second interruption		
	Total resource available to Team 1		
	Total resource available to Team 2	38 overs left, 10 wickets remaining	86.7

The majority of candidates scored at least the first two marks for correctly filling in the table with 96.1, 54.1, 48.6, 29.8 and 16.5 for the first, second, third, fifth and sixth values respectively. The values for the 'Total resource lost by first/second interruption' seemed to be the most demanding for candidates even though in both cases these were simply the difference of the two values given directly above these gaps. The vast majority of candidates either correctly calculated the Total resource to Team 1 as 77.3 or scored this mark on the follow through from their (earlier incorrect) values.

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Question 4(ii)

(ii) Calculate the target score to win for Team 2 given that in 2003 the value of G50 was 235. **[2]**

This part was answered well with most candidates scoring at least the method mark for using the correct formula $S2 = S1 + \left(\dfrac{R2 - R1}{100}\right) \times G50$ with S1 = 185, R2 = 86.7, G50 = 235 and their value from part 4(i) for R1. A number of candidates attempted to use this formula when they had a value of R1 greater R2. Of those candidates who obtained the correct value of 207.09 most correctly rounded up (rather than down) to obtain the required 208.

Question 5

5   In lines 148 and 149 the article says

'There are also cases where the D/L method sets a target that requires Team 2 to score *fewer* runs than Team 1 in the same number of overs.'

By calculating the target score required by Team 2 to win, show that the above statement is true in the following scenario.

> **50 overs per innings**
>
> Team 1 scores 110/8 in 35 overs
>
> Rain causes Team 1's innings to be terminated and Team 2 have 35 overs for their innings

[4]

The most common error in this part was to state that the resource remaining for Team 1 was 11.9% (which examiners can only assume came from reading across the row for 35 overs left in Table 1) and not the correct 11.8% (which is the value in Table 1 when reading across from the correct row of 15 overs remaining). Although a small number of candidates attempted to use the formula $S2 = S1 + \left(\dfrac{R2 - R1}{100}\right) \times G50$ to calculate the target score for Team 2 most correctly used $S2 = S1 \times \dfrac{R2}{R1}$ with R2 = 82.7, although a number of candidates thought that R1 was 100. Of those that correctly found that Team 2 score to win was 104 many did not give a suitable conclusion regarding the fact the D/L method in this scenario sets a target for Team 2 that required them scoring fewer runs than Team 1 scored.

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