## ADVANCED GCE

MATHEMATICS (MEI)
Applications of Advanced Mathematics (C4) Paper B: Comprehension

Candidates answer on the question paper.
OCR supplied materials:

- Insert (inserted)
- MEI Examination Formulae and Tables (MF2)

Other materials required:

- Scientific or graphical calculator
- Rough paper

| Candidate <br> forename |  |  |  |  |  |  |  |  |  |  |
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| Centre number |  |  |  |  |  | Candidate <br> surname |  |  |  |  |

## INSTRUCTIONS TO CANDIDATES

- The insert will be found in the centre of this document.
- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer all the questions.
- Do not write in the bar codes.
- The insert contains the text for use with the questions.
- You are permitted to use a scientific or graphical calculator in this paper.
- Final answers should be given to a degree of accuracy appropriate to the context.


## INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- You may find it helpful to make notes and do some calculations as you read the passage.
- You are not required to hand in these notes with your question paper.
- You are advised that an answer may receive no marks unless you show sufficient detail of the working to indicate that a correct method is being used.
- The total number of marks for this paper is 18.
- This document consists of 4 pages. Any blank pages are indicated.

1 On lines 90 and 91 , the article says "The average score for each player works out to be 0.25 points per round". Derive this figure.
$\qquad$
2 Line 47 gives the inequality $b>c>d>w$.
Interpret each of the following inequalities in the context of the examples from the $1^{\text {st }}$ World War.
(i) $b>w$
(ii) $c>d$


3 Table 3 illustrates a possible game where you always co-operate. In lines 98 and 99 the article says
"Clearly the longer the game goes on the closer your average score approaches -2 points per round and that of your opponent approaches 3 ."

How many rounds have you played when your average score is -1.999 ?

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4 A Prisoner's Dilemma game is proposed in which

$$
b=6, c=1, d=-1 \text { and } w=-3 .
$$

Using the information in the article, state whether these values would allow long-term co-operation to evolve. Justify your answer.
$\qquad$
5 In a Prisoner's Dilemma game both players keep strictly to a Tit-for-tat strategy. You start with C and your opponent starts with D . The scoring system of $b=3, c=1, d=-1$ and $w=-2$ is used.
(i) The table shows the first 8 out of many rounds. Complete the table.
(ii) Find your average score per round in the long run.


6 In the article, the scoring system is $b=3, c=1, d=-1$ and $w=-2$.
In Axelrod's experiment, negative numbers were avoided by taking $b=5, c=3, d=1$ and $w=0$.
State the effect this change would have on
(i) the players' scores,
(ii) who wins.

| 6 (i) |  |
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| $\mathbf{6}$ (ii) |  |
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7 Two companies, X and Y , are the only sellers of ice cream on an island. They both have a market share of about $50 \%$. Although their ice cream is much the same, both companies spend a lot of money on advertising.
(i) What agreement might the companies reach if they decide to co-operate?
(ii) What advantage would a company hope to gain by 'defecting’ from this agreement?

| 7 (i) |  |  |  |
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| 7 (ii) |  |  |  |
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