

## Mark scheme instructions to examiners

### General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- marking instructions that indicate when marks should be awarded or withheld including the principle on which each mark is awarded. Information is included to help the examiner make his or her judgement and to delineate what is creditworthy from that not worthy of credit
- a typical solution. This response is one we expect to see frequently. However credit must be given on the basis of the marking instructions.

If a student uses a method which is not explicitly covered by the marking instructions the same principles of marking should be applied. Credit should be given to any valid methods. Examiners should seek advice from their senior examiner if in any doubt.

### Key to mark types

|   |                                                               |
|---|---------------------------------------------------------------|
| M | mark is for method                                            |
| R | mark is for reasoning                                         |
| A | mark is dependent on M marks and is for accuracy              |
| B | mark is independent of M marks and is for method and accuracy |
| E | mark is for explanation                                       |
| F | follow through from previous incorrect result                 |

### Key to mark scheme abbreviations

|         |                                                                   |
|---------|-------------------------------------------------------------------|
| CAO     | correct answer only                                               |
| CSO     | correct solution only                                             |
| FT      | follow through from previous incorrect result                     |
| 'their' | indicates that credit can be given from previous incorrect result |
| AWFW    | anything which falls within                                       |
| AWRT    | anything which rounds to                                          |
| ACF     | any correct form                                                  |
| AG      | answer given                                                      |
| SC      | special case                                                      |
| OE      | or equivalent                                                     |
| NMS     | no method shown                                                   |
| ISW     | ignore subsequent working                                         |
| PI      | possibly implied                                                  |
| sf      | significant figure(s)                                             |
| dp      | decimal place(s)                                                  |

**AS/A-level Maths/Further Maths assessment objectives**

| <b>AO</b>  |        | <b>Description</b>                                                                |
|------------|--------|-----------------------------------------------------------------------------------|
| <b>AO1</b> | AO1.1a | Select routine procedures                                                         |
|            | AO1.1b | Correctly carry out routine procedures                                            |
|            | AO1.2  | Accurately recall facts, terminology and definitions                              |
| <b>AO2</b> | AO2.1  | Construct rigorous mathematical arguments (including proofs)                      |
|            | AO2.2a | Make deductions                                                                   |
|            | AO2.2b | Make inferences                                                                   |
|            | AO2.3  | Assess the validity of mathematical arguments                                     |
|            | AO2.4  | Explain their reasoning                                                           |
|            | AO2.5  | Use mathematical language and notation correctly                                  |
| <b>AO3</b> | AO3.1a | Translate problems in mathematical contexts into mathematical processes           |
|            | AO3.1b | Translate problems in non-mathematical contexts into mathematical processes       |
|            | AO3.2a | Interpret solutions to problems in their original context                         |
|            | AO3.2b | Where appropriate, evaluate the accuracy and limitations of solutions to problems |
|            | AO3.3  | Translate situations in context into mathematical models                          |
|            | AO3.4  | Use mathematical models                                                           |
|            | AO3.5a | Evaluate the outcomes of modelling in context                                     |
|            | AO3.5b | Recognise the limitations of models                                               |
|            | AO3.5c | Where appropriate, explain how to refine models                                   |

Examiners should consistently apply the following general marking principles:

### No Method Shown

Where the question specifically requires a particular method to be used, we must usually see evidence of use of this method for any marks to be awarded.

Where the answer can be reasonably obtained without showing working and it is very unlikely that the correct answer can be obtained by using an incorrect method, we must award **full marks**. However, the obvious penalty to students showing no working is that incorrect answers, however close, earn **no marks**.

Where a question asks the student to state or write down a result, no method need be shown for full marks.

Where the permitted calculator has functions which reasonably allow the solution of the question directly, the correct answer without working earns **full marks**, unless it is given to less than the degree of accuracy accepted in the mark scheme, when it gains **no marks**.

**Otherwise we require evidence of a correct method for any marks to be awarded.**

### Diagrams

Diagrams that have working on them should be treated like normal responses. If a diagram has been written on but the correct response is within the answer space, the work within the answer space should be marked. Working on diagrams that contradicts work within the answer space is not to be considered as choice but as working, and is not, therefore, penalised.

### Work erased or crossed out

Erased or crossed out work that is still legible and has not been replaced should be marked. Erased or crossed out work that has been replaced can be ignored.

### Choice

When a choice of answers and/or methods is given and the student has not clearly indicated which answer they want to be marked, mark positively, awarding marks for all of the student's best attempts. Withhold marks for final accuracy and conclusions if there are conflicting complete answers or when an incorrect solution (or part thereof) is referred to in the final answer.