Comparison of key skills specifications 2000/2002 with 2004 standardsX015461July 2004Issue 1

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Mark Scheme (Standardisation)

October 2020

Pearson Edexcel GCE Advanced Level

in Further Mathematics

Paper 2: Core Pure Mathematics 2 (9FM0/02)

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**General Marking Guidance**

* All candidates must receive the same treatment.  Examiners must mark the first candidate in exactly the same way as they mark the last.
* Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
* Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
* There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
* All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme.  Examiners should also be prepared to award zero marks if the candidate’s response is not worthy of credit according to the mark scheme.
* Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
* When examiners are in doubt regarding the application of the mark scheme to a candidate’s response, the team leader must be consulted.
* Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

**EDEXCEL GCE MATHEMATICS**

**General Instructions for Marking**

1. The total number of marks for the paper is 75.
2. The Edexcel Mathematics mark schemes use the following types of marks:
* **M** marks: method marks are awarded for ‘knowing a method and attempting to apply it’, unless otherwise indicated.
* **A** marks: Accuracy marks can only be awarded if the relevant method (M) marks have been earned.
* **B** marks are unconditional accuracy marks (independent of M marks)
* Marks should not be subdivided.
1. Abbreviations

These are some of the traditional marking abbreviations that will appear in the mark schemes.

* bod – benefit of doubt
* ft – follow through
* the symbol will be used for correct ft
* cao – correct answer only
* cso - correct solution only. There must be no errors in this part of the question to obtain this mark
* isw – ignore subsequent working
* awrt – answers which round to
* SC: special case
* oe – or equivalent (and appropriate)
* dep – dependent
* indep – independent
* dp decimal places
* sf significant figures
* 🞸 The answer is printed on the paper
* The second mark is dependent on gaining the first mark
1. All A marks are ‘correct answer only’ (cao.), unless shown, for example, as A1 ft to indicate that previous wrong working is to be followed through. After a misread however, the subsequent A marks affected are treated as A ft, but manifestly absurd answers should never be awarded A marks.

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| **Question** | **Scheme** | **Marks** | **AOs** |
| **1** |  | B1 | 1.1b |
|  | M1 | 3.1a |
|  | A1 | 1.1b |
|  | M1 | 1.1b |
|  | A1 | 1.1b |
|  | M1 | 1.2 |
|  | A1 | 2.2a |
|  | **(7)** |  |
| **(7 marks)** |
| **Notes** |
| B1: Correct differentiationM1: Identifies a correct approach by using a correct identity to make progress to obtain a quadratic in cosh *x*A1: Correct 3 term quadratic obtainedM1: Solves their 3TQA1: Correct values (may only see 4 here)M1: Correct process to reach values for *x* from their cosh *x*A1: Deduces the correct 2 values with no incorrect values or work involving  |

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| **Question** | **Scheme** | **Marks** | **AOs** |
| **2(a)** | Centre of circle *C* is (1, –1)  | B1 | 1.1b |
| oror | M1 | 3.1a |
|  | A1 | 2.5 |
|  | **(3)** |  |
| **(b)** |  | M1 | 3.1a |
| or | M1 | 1.1b |
|  | A1 | 1.1b |
| or | M1 | 1.1b |
|  or  | M1 | 2.1 |
|  | A1 | 2.2a |
|  | **(6)** |  |
| **(9 marks)** |
| **Notes** |
| (a)B1: Correct coordinates of centreM1: Fully correct strategy for identifying the radius A1: Correct equation using the required notation(b)M1: Begins the process of finding  and  by using the Cartesian equations to obtain the equation of the line of intersectionM1: Substitutes back into the equation of one of the circles to obtain an equation in one variableA1: Correct 3 term quadraticM1: Solves their 3TQM1: Substitutes to find values of the other variable to complete the process of finding  and A1: Correct complex numbers |

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| **Question** | **Scheme** | **Marks** | **AOs** |
| **3(a)** |  | M1 | 1.1b |
|  | A1 | 1.1b |
| PI: *x* = 2 | B1 | 1.1b |
|  | A1ft | 2.2a |
|  | **(4)** |  |
| **(b)** |  | M1 | 3.4 |
| (NB *B* = 47) | M1 | 3.4 |
|  | A1 | 1.1b |
|  | M1 | 3.1b |
|  | M1 | 2.1 |
| *t* = 3.15… weeks | A1 | 1.1b |
|  | M1 | 3.4 |
| = 12.1 μg/ml | A1 | 3.2a |
|  | **(8)** |  |
| **(c)** |  | M1 | 3.4 |
| The model suggests that it would be safe to give the second dose | A1ft | 2.2a |
|  | **(2)** |  |
| **(14 marks)** |
| **Notes** |
| (a)M1: Uses the model to form and solve the auxiliary equationA1: Correct CFB1: Correct PIA1ft: Deduces the correct GS (follow through their CF + PI)(b)M1: Uses the model and the initial conditions to establish the value of “*A*”M1: Differentiates their model and uses the initial conditions to establish the value of “*B*”A1: Correct particular solutionM1: Uses their solution to the model with a correct strategy to obtain the required value of *t* e.g. differentiates, sets equal to zero and solves for *t*M1: Uses a correct trigonometric approach that leads to a value for *t*A1: Correct value for *t*M1: Uses the model and their values to find the maximum concentrationA1: Correct value(c)M1: Uses the model to find the concentration when *t* = 10A1ft: Makes a suitable comment that is consistent with their calculated value |

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| **Question** | **Scheme** | **Marks** | **AOs** |
| **4(a)** |  | M1 | 1.1b |
|  | M1 | 2.1 |
|  | A1 | 1.1b |
|  | M1 | 2.1 |
| \* | A1\* | 1.1b |
|  | **(5)** |  |
| **(b)** |  | M1 | 3.1a |
| or | A1 | 1.1b |
| or | M1 | 2.2a |
|  | A1A1 | 1.1b2.3 |
|  | **(5)** |  |
| **(10 marks)** |
| **Notes** |
| (a)M1: Attempts to expand including a recognisable attempt at binomial coefficients (May only see imaginary terms)M1: Identifies imaginary terms with sin 7*θ* A1: Correct expression with coefficients evaluated and i’s dealt with correctlyM1: Replaces with and applies the expansions of and to their expressionA1\*: Reaches the printed answer with no errors(b)M1: Makes the connection with part (a) and realises the need to solve A1: At least one correct value forM1: Divides by 7 and deduces that *x* values are found by finding at least one value for sin*θ*A1: Awrt 2 correct values for *x*A1: Awrt all 4 *x* values correct and no extras |

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| **Question** | **Scheme** | **Marks** | **AOs** |
| **5(a)** |  | M1 | 3.1a |
|  | M1 | 1.1b |
|  | A1\* | 2.1 |
|  | **(3)** |  |
| **(b)** |  | B1 | 1.1b |
|    | M1A1 | 2.11.1b |
|  | M1 | 3.1a |
|  | A1 | 2.1 |
|  | **(5)** |  |
| **(c)** | Mean value =  | M1 | 2.1 |
|  oe | A1 | 1.1b |
|  | **(2)** |  |
| **(10 marks)** |
| **Notes** |
| (a)M1: Makes progress in establishing the derivative by taking the tan of both sides and differentiating with respect to *y*M1: Use of the correct identityA1\*: Fully correct proof(b)B1: Correct derivativeM1: Uses integration by parts in the correct directionA1: Correct expressionM1: Adopts a correct strategy for the integration by splitting into two fractionsA1: Correct answer(c)M1: Correctly applies the method for the mean value for their integrationA1: Correct exact answer. Allow exact equivalents e.g.  |

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| **Question** | **Scheme** | **Marks** | **AOs** |
| **6(a)** |  | M1 | 1.1b |
| Minors: Cofactors:  | B1 | 1.1b |
|  | M1A1 | 2.11.1b |
|  | **(4)** |  |
| **(b)** |  | M1 | 3.1a |
|  | A1 | 1.1b |
|  | A1 | 2.2a |
|  | **(3)** |  |
| **(c)(i)** |  |  |  |
| For consistency:E.g. and  | M1 | 3.1a |
|  | M1 | 1.1b |
|  | A1 | 1.1b |
| **(ii)** |  | M1 | 3.1a |
| Let *x* = *λ*,  | A1 | 1.1b |
|  | M1A1 | 1.1b2.5 |
|  | **(7)** |  |
| **(14 marks)** |

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| **Notes** |
| (a)M1: Correct method to find the determinantB1: A correct first step in obtaining the inverse. Could be the matrix of minors or cofactors. M1: Fully correct method to obtain the inverseA1: Correct matrix(b)M1: A complete strategy for solving the given equations e.g. multiplies the given coordinates by their inverse.A1: Correct calculationA1: Correct expressions given as coordinates(c)(i)M1: Uses a correct strategy that will lead to establishing a value for *q*. E.g. eliminating one of *x*, *y* or *z*M1: Solves a suitable equation to obtain a value for *q*A1: Correct value(ii)M1: Uses a correct strategy to obtain the Cartesian equation of the lineA1: Correct Cartesian equationM1: Uses their Cartesian equation to correctly extract the position and direction to form a vector equation for the required lineA1: Correct equation (oe) |

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| **Question** | **Scheme** | **Marks** | **AOs** |
| **7(a)** |  | M1 | 3.3 |
| *a* = 2, *b* = 1.5 | A1 | 1.1b |
|  | **(2)** |  |
| **(b)** |  | B1ft | 3.4 |
|  | M1 | 1.1a |
|  | M1 | 1.1b |
|  | B1 | 2.2a |
|  | M1 | 1.1b |
|  | M1 | 3.3 |
|  | A1 | 1.1b |
|  | dM1 | 3.4 |
|  | A1 | 2.2b |
|  | **(9)** |  |
| **(11 marks)** |
| **Notes** |
| (a)M1: Uses the given coordinates correctly in the equation modelling the curve to obtain at least one correct equation and attempts to find the values of *a* and *b*A1: Correct values(b)B1ft: Uses the model to obtain M1: Chooses limits appropriate to the model i.e. 0.5 and 2.5M1: Integrates to obtain an expression of the form *k*(*y* + “1.5”)-1B1: Deduces the correct equation for the circleM1: Uses their circle equation and  to attempt the top volumeM1: Identifies limits appropriate to the model i.e. 2.5 and 3 + their radiusA1: Correct integrationdM1: Uses the model to find the volume of the chess piece including the cylindrical base (dependent on all previous method marks)A1: Correct volume |

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