**GCE AS Mathematics (8AM0) – Paper 21**

**Statistics**

**October 2020 student-friendly mark scheme**

**Please note that this mark scheme is not the one used by examiners for making scripts. It is intended more as a guide to good practice, indicating where marks are given for correct answers. As such, it doesn’t show follow-through marks (marks that are awarded despite errors being made) or special cases.**

**It should also be noted that for many questions, there may be alternative methods of finding correct solutions that are not shown here – they will be covered in the formal mark scheme.**

**This document is intended for guidance only and may differ significantly from the final mark scheme published in December 2020.**

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| **Guidance on the use of codes within this document** |
| M1 – method mark. This mark is generally given for an appropriate method in the context of the question. This mark is given for showing your working and may be awarded even if working is incorrect.  A1 – accuracy mark. This mark is generally given for a correct answer following correct working.  B1 – working mark. This mark is usually given when working and the answer cannot easily be separated.  Some questions require all working to be shown; in such questions, no marks will be given for an answer with no working (even if it is a correct answer). |

**Question 1 (Total 4 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 1 square is  = 1.5 students | M1  3.1a | This mark is given for a method to find the frequency density scale |
| 24 students took less than 11 minutes | A1  1.1b | This mark is given for the correct number of students |
| × 100 | M1  3.1b | This mark is given to find the percentage |
| 18% | A1  1.1b | This mark is given for the correct answer only (to the nearest whole number) |

**Question 2 (Total 5 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 0 to 50 m | B1  1.2 | This mark is given for the correct range of distances |
| (b) | 1100 + 1600 + (1.5 × 1600) = 5100 | M1  2.1 | This mark is given for a method to find *Q*3 |
| 5300 > 5100, there fore it is an outlier | A1  1.1b | This mark is given for showing that the circled point is an outlier |
| (c) | As the humidity increases, the mean visibility decreases | B1  2.4 | This mark is given for a valid interpretation of the correlation |
| (d) | Hours of sunshine | B1  2.2b | This mark is given for a correct deduction that the unlabelled variable is the hours of sunshine |

**Question 3 (Total 6 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *a* + *b* = 2*c* + 0.5 | M1  2.1 | This mark is given for a method to form an equation from the information given |
| B1  2.2a | This mark is given for a correct equation |
| *a* + *b* + *c* = 0.75 | B1  1.1b | This mark is given for a correct equation using ∑*x* = 1 |
| 3*c* = 0.25  *c* = | M1  1.1b | This mark is given for a method to find *c* |
| P(scoring 2, 4 or 4, 2 or 3, 3)  = 2 ×  × 0.15 + 0.12 | M1  3.1b | This mark is given for recognising the ways to get a total of 6 |
| = 0.035 | A1  1.1b | This mark is given for the correct answer only |

**Question 4 (Total 7 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | It is not possible to have a sampling frame | B1  2.3 | This mark is given for a correct reason stated |
| (b) | Quota sampling  Catch 85 common carp, 45 mirror carp and 30 leather carp | M1  1.1a | This mark is given for a correct description and method of sampling |
| Ignore any fish caught of a type where the quota is full | A1  1.1b | This mark is given for a full explanation including fish to ignore |
| (c) | *σ* = | M1  1.1b | This mark is given for a method to find an estimate for the standard deviation |
| = 0.613 | A1  1.1b | This mark is given for a correct answer only |
| (d)(i) | This would have no effect because the piece of data would remain in the same class | B1  2.2a | This mark is given for a correct reason stated |
| (d)(ii) | This would increase the standard deviation because a change in the mean is small and 6.4 – 4.6 = 3*σ* | B1  2.2a | This mark is given for a correct reason stated |

**Question 5 (Total 8 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | Let *C* = the number of successful calls  *C* ~ B | M1  3.3 | This mark is given for selecting a correct model |
| P(*C* ≥ 3) = 1 – P(*C* ≤ 2) = 0.1782 | A1  1.1b | This mark is given for the correct answer only |
| (b) | Let *X* = the number of occasions when at least 3 calls are successful  P(*X* = 1) = 5 × 0.178 × (0.822)4 | M1  1.1b | This mark is given for a method to find the probability that at least 3 calls will be successful |
| = 0.406 | A1  1.1b | This mark is given for the correct answer only |
| (c) | H0 : *p* =  H1 : *p* > | B1  2.5 | This mark is given for correctly stating both hypothesis in terms of *p* |
| Let *R* = the number of successful calls  *R* ~ B | M1  3.3 | This mark is given for selecting a correct model |
| P(*R* ≥ 11) = 1 – P(*R* ≤ 10) = 0.0232 | A1  3.4 | This mark is given for the correct answer only |
| There is sufficient evidence to support that Rowan has more successful sales calls than Afrika | A1  2.2b | This mark is given for a correct conclusion in context |