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

**GCE A level Statistics (9MA0) – Paper 31**

**Statistics**

**October 2021 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 2021.**

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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 – accuracy 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 7 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | Disadvantage: e.g. Not random; cannot use (reliably) for inferences | B1 | This mark is given for a suitable disadvantage. |
| (b) | *X* ~B(36, 0.08) | M1 | This mark is given for stating B(36,0.08) or in words. |
| (i) |  P(*X* = 4) = 0.167387… = 0.167 | A1 | This mark is given for the correct value. |
| (ii)  |  0.022233… = 0.0222 | A1 | This mark is given for the correct value. |
| (c) | P(In dance club and dance tango) =  = 0.032 | B1 | This mark is given for the correct probability. |
| (d) | Let *T* = those who can dance the Tango. *T* ~B(50, 0.032) | M1 | This mark is given for stating B(50,0.032) |
| P(*T* < 3 ) = P(*T*  2) = 0.7850815… = 0.785 | A1 | This mark is given for the correct value. |

**Question 2 (Total 6 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | Negative | B1 | This mark is given for negative correlation. |
| (b) | Marc’s suggestion is compatible because it’s negative correlation  | B1 | This mark is given for suitable comment to suggest data is compatible and suitable reason such as negative correlation. |
| (c) | *r* = – 0.54458266… = – 0.545 | B1 | This mark is given for the correct value of *r*. |
| (d) |  | B1 | This mark is given for both hypotheses correct in terms of . |
| 5% 1-tail critical value = – 0.4259 | M1 | This mark is given for finding the critical value. |
| significant result / reject H0There is evidence of negative correlation between the number of letters in a student’s last name and their first name | A1 | This mark is given for correct conclusion in context. |

**Question 3 (Total 8 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | hPa  | B1 | This mark is given for Hectopascal or hPa. |
| (b) | = 1017.1333… = 1017 | M1 | This mark is given for a correct method to find  |
| A1 | This mark is given for the correct value. |
| (c) |  | M1 | This mark is given for using the fact   |
|  | M1 | This mark is given for correct expression. |
| =12.0905… = 12.1 | A1 | This mark is given for the correct value. |
| (d) | High pressure so clockwise | B1 | This mark is given for at least one of these reasons. |
| Wind direction is direction wind blows from |
| Heathrow (NE) Hurn (E) Leuchars (W) | B1 | This mark is given for deducing the 3 correct directions. |

**Question 4 (Total 11 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 0.08 + 0.09 + 0.36 = 0.53 | B1 | This mark is given for the correct value. |
| (b)(i) |  *p* = 0 | B1 | This mark is given for the correct value. |
| (ii) | P(*G*) = 0.25  | M1 | This mark is given for a linear equation of *q*. |
| *q* = 0.12 | A1 | This mark is given for the correct value. |
| (c)(i) |  | M1A1 | This mark is given for a correct ratio of probabilities and the correct value. |
|  *r* = 0.10 | A1 | This mark is given for the correct value. |
| (ii) |  *t* = 0.20 | B1 | This mark is given for the correct value of *t*. |
| (d) | P = 0.36 + *q* = 0.48 | B1 | This mark is given for the correct value of P |
| = 0.12P(*G*) = 0.25=0.12 | M1 | This mark is given for all required probabilities and using them in a correct test. |
| So are independent  | A1 | This mark is given for all probabilities correct. |
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**Question 5 (Total 11 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| **(a)** |  P(*F* < *k* ) = 0.01  | M1 | This mark is given for standardising with k, 166.5 and 6.1 and set equal to a z value. |
| *k* = 152.309…k=152 | A1 | This mark is given for the correct value. |
| **(b)** |  P( 150 < *F* < 175) = 0.914840… = 0.915 | B1 | This mark is given for the correct value. |
| **(c)**  | P( *F* > 160 | 150 < *F* < 175) | M1 | This mark is given for interpreting demand as an appropriate conditional probability. |
| =  | M1 | This mark is given for correct ratio of expressions. |
| =  | A1 | This mark is given for correct ratio of probabilities. |
| = 0.84708… = 0.847 | A1 | This mark is given for the correct value. |
| **(d)** |  | B1 | This mark is given for both correct hypotheses in terms of ** |
| Let *X* = height of female from 2nd country | M1 | This mark is given for selecting the correct model. |
|  | A1 | This mark is given for correct use of the correct model. |
| 0.0347… < 0.05 so significant, reject H0There is evidence to support Mia’s belief | A1 | This mark is given for a correct inference in context. |

**Question 6 (Total 7 marks)**

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| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| **(a)** | Sum of probs = 1 implies  | M1 | This mark is given for for a start to the problem using sum of probabilities leading to equation in *a*, *b* and *c*. |
|  so *abc* = 36 | A1 | This mark is given for reducing to the equation *abc* = 36 |
| All probabilities greater than 0 implies each of *a*, *b* and *c* > 1 | B1 | This mark is given for deducing that each value > 1. |
|  | M1 | This mark is given for writing 36 as a product of prime factors. |
| Since *a*, *b* and *c* are distinct must be 2, 3, 6 (*a* = 2, *b* = 3, *c* = 6) | A1 | This mark is given for 2, 3 and 6 as a list. |
| **(b)** | = 0.0374137…+ 0.09398737…+0.25 | M1 | This mark is given for a correct expression in terms of *a*, *b* and *c*. |
| = 0.38140… = 0.381 | A1 | This mark is given for the correct value. |