**International GCSE in Mathematics A - Paper 3H mark scheme**

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **1** |  | 7800 ÷ 9.75 or 7800 ÷ 585 × 60 |  |  | AO2 | M2 | M1 for 7800 ÷ 9.45 or 7800 ÷ 585 or 13.3.... |
|  |  |  | 800 | 3 |  | A1 |  |
| **2** |  | 28 ÷ (6 − 4) (=14) |  |  | AO1 | M1 | or use of cancelled ratios |
|  |  |  |  |  |  |  | (eg 3 : 6 : 4 = 0.75 : 1.5 : 1) |
|  |  |  |  |  |  |  |  |
|  |  | "14" × 3 (=42) |  |  |  | M1 (dep) | 28 ÷ 0.5(=56) |
|  |  |  |  |  |  |  | or cancelled ratios, (e.g. 56 × 0.75) |
|  |  |  |  |  |  |  | or M2 for 28 ÷ oe |
|  |  |  | 42 |  |  | A1 |  |
| **3** | **a** |  | 25 < *d* ≤ 30 | 1 | AO3 | B1 | B1 identifies 25 → 30 class |
|  |  |  |  |  |  |  |  |
|  | **b** | (12 × 2.5) + (6 × 7.5) + (4 × 12.5) +  (6 × 17.5) + (14 × 22.5) + (18 × 27.5) **or** |  |  | AO3 | M2 | M1 for frequency × consistent value within interval |
|  |  | 30 + 45 + 50 + 105 + 315 + 495 **or**  1040 |  |  |  |  | NB. Products do not need to be added Condone one error |
|  |  | ‘1040’ ÷ 60 |  |  |  | M1 |  |
|  |  |  | 17 | 4 |  | A1 | accept 17.3(33…) |
|  | **c** |  |  |  | AO3 | M1 | For  with *a* < 60 **or** with *b* > 32 |
|  |  |  |  | 2 |  | A1 |  |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **4** |  | **Working with all 12 boxes**  12 × 15 (=180) or 12 × 12 (=144) |  |  | AO1 | M1 | for correct total cost or correct total number of melons  (either may appear as part of another calculation) |
|  |  | 12 × 12 ×  × 1.6 oe (=172.8) |  |  |  | M1 | for revenue from all full price melons sold |
|  |  | 12 × 15 × 1.15 oe (=207) **or** |  |  |  | M1 | for total revenue or total profit |
|  |  | 180 × 0.15 oe (=27) |  |  |  |  |  |
|  |  |  |  |  |  | M1 | dep on M3 |
|  |  |  | 0.95 | 5 |  | A1 cao |  |
|  |  | **Alternative – working with one box**  15 ÷ 12 (=1.25) **or** 12 × (=9) |  |  |  | M1 | for price of 1 melon **or** number of full price melons |
|  |  | 12 ×  × 1.6 oe (=14.4) |  |  |  | M1 | for revenue from all full price melons sold |
|  |  | 15 × 1.15(=17.25) |  |  |  | M1 | for total revenue from one box |
|  |  |  |  |  |  | M1 | dep on M3 |
|  |  |  | 0.95 | 5 |  | A1 cao |  |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | | |
| **5** |  | Circular arc, centre *B*, to intersect  both lines *AB* and *BC* |  |  | AO2 | M1 |  | |
|  |  | Equal length arcs, from intersections  on each line, meeting to give a point  on the bisector |  |  |  |  |  | |
|  |  |  | correct bisector | 2 |  | A1 | dep on M1. Full construction shown. | |
| **6** | **a** |  |  |  | AO1 | M1 | Any correct partially factorised expression | |
|  |  |  | 9*e*2*f* (2*e* + 5*f* 3) | 2 |  | A1 |  | |
|  | **b** | (*x* ± 6)(*x* ± 2) |  |  | AO1 | M1 | or correct substitution into quadratic formula (condone one  sign error) | |
|  |  | (*x* – 6)(*x* + 2) |  |  |  | M1 |  | |
|  |  |  | 6, −2 | 3 |  | A1 | dep. on at least M1 | |
| **7** |  | cos 35 = |  |  | AO2 | M1 |  | |
|  |  | 17.6 × cos35 |  |  |  | M1 |
|  |  |  | 14.4 | 3 |  | A1 | 14.4 ~ 14.42 | |
| **8** |  | 22.50 ÷ 15 (=1.5) **or** 100 ÷ 15  (=6.6….) |  |  | AO1 | M1 |  | M2 for 22.5 ÷ 0.15 |
|  |  | ‘1.5’ × 100 (=150) **or** ‘6.6…’ ×  22.5(0) |  |  |  | M1 | dep |  |
|  |  |  | 150 | 3 |  | A1 |  | |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **9** | **a** |  | 140 000 | 1 | AO1 | B1 |  |
|  | **b** |  | Mars | 1 | AO1 | B1 |  |
|  | **c** | 1.2 × 105 – 5 × 104 **or** |  |  | AO1 | M1 |  |
|  |  | 120 000 – 50 000 **or** 70 000 oe |  |  |  |  |  |
|  |  |  | 7 × 104 | 2 |  | A1 |  |
|  | **d** | 3.5 × 103 : 1.4 × 106 |  |  | AO1 | M1 |  |
|  |  |  | 1 : 400 | 2 |  | A1 |  |
| **10** |  |  |  |  | AO2 | M1 |  |
|  |  | (*BC* = ) 5.7 |  |  |  | A1 |  |
|  |  | × 7.6 × ‘5.7’ **or** 21.6(6) **or** 21.7 |  |  |  | M1 | dep on first M1 |
|  |  |  |  |  |  |  | or eg. *ACB =* sin−1(=53.1...) **and** |
|  |  |  |  |  |  |  | × 9.5 × '5.7' × sin'53.1' |
|  |  | × *π* ×  **or** 12.7(587...) **or** 12.8 |  |  |  | M1 | dep on first M1 |
|  |  |  | 34.4 | 5 |  | A1 | for answer rounding to 34.4 |
|  |  |  |  |  |  |  | (*π*→ 34.4187... 3.14→34.4123...) |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **11** |  | e.g. (*x*2 + 5*x* – 3*x* – 15)(*x* + 3) **or** |  |  | AO1 | M1 | expansion of any two of the three brackets – at least 3  correct terms |
|  |  | (*x*2 + 2*x* – 15)(*x* + 3) **or** |  |  |  |  |  |
|  |  | (*x* – 5)(*x*2 + 3*x* – 3*x* – 9) **or** |  |  |  |  |  |
|  |  | (*x* – 5)(*x*2 – 9) |  |  |  |  |  |
|  |  | E.g. *x*3 + 3*x*2 + 2*x*2 + 6*x* – 15*x* – 45 **or** |  |  |  | M1 | (dep) ft for at least 3 correct terms in second expansion |
|  |  | *x*3 + 5*x*2 – 9*x* − 45 |  |  |  |  |  |
|  |  |  | *x*3 + 5*x*2 – 9*x* − 45 | 3 |  | A1 |  |
| **12** | **a** | 14 16 17 18 20 21 22 23 23 24  24 |  |  | AO3 | M1 | arrange in order **or**  One of 21(median), 17(LQ), 23(UQ) identified |
|  |  | (14 16 17 18 20 21 22 23 23 24  24) |  |  |  | M1 | Identify any **two** of 21, 17 and 23 |
|  |  | (14 16 17 18 20) and |  |  |  |  |  |
|  |  | (22 23 23 24 24 )  23 − 17 |  |  |  |  |  |
|  |  |  | 6 | 3 |  | A1 cao |  |
|  | **b** |  | Carmelo **and** reason  using IQR | 1 | AO3 | B1 | ft from (a) Carmelo - he has a lower IQR oe  (IQR must be part of the statement) |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **13** | **a** |  |  |  | AO1 | M1 | for gradient |
|  |  | eg. 2 =  × 1 + *c* **or** |  |  |  | M1 | for method to find *c* |
|  |  | *y* −2 = (*x* – 1) |  |  |  |  |  |
|  |  | *y* = *x* + |  |  |  | M1 | found values of *m* and *c* substituted in *y* = *mx* + *c* |
|  |  |  | 3*x* + 4*y* = 11 | 4 |  | A1 |  |
|  | **b** | *y* =  **or** *m* = |  |  | AO1 | M1 |  |
|  |  |  |  |  |  |  |  |
|  |  |  | shown | 2 |  | A1 | for conclusion from correct gradients |
| **14** |  | 26 ÷ 20 (=1.3) **or** |  |  | AO3 | M1 | Any one frequency density (without contradiction) or, |
|  |  | 3.6 × 10 or 3.3 × 10 or 1 × 30 **or** |  |  |  |  | e.g. 1cm2 = 5 **or** clear association of area with frequency |
|  |  | 36 **or** 33 **or** 30 **or** |  |  |  |  |  |
|  |  | 26 + 3.6 × 10 + 3. 3 × 10 + 1 × 30 **or** |  |  |  | M1 | Any fully correct complete method; condone one error in bar width or bar height |
|  |  | 26 + 36 + 33 + 30 **or** 625 × **or** |  |  |  |  |  |
|  |  | (130 + 180 + 165 + 150) × |  |  |  |  |  |
|  |  |  | 125 | 3 |  | A1 |  |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **15** | **a** | (3*x* + 2)(2*x* + 1) = 100 |  |  | AO1, | M1 | or (2*x* × 3*x*) + 2(2*x* + 1) + 3*x* = 100 oe |
|  |  |  |  |  | AO2 |  | or (2*x* × 3*x*) + (2 × 2*x* (×1)) + 1) + 3*x* + 1 + 1 = 100 oe |
|  |  |  |  |  |  |  | other partitions are acceptable but partitioning must go on to  form a correct equation. |
|  |  |  | 6*x*2 + 7*x* – 98 = 0 \* | 2 |  | A1 | Accept 6*x*2 + 7*x* + 2 = 100 if M1 awarded |
|  |  |  |  |  |  |  | \* Answer given |
|  | **b** | (3*x* + 14)(2*x* – 7) (= 0) |  |  | AO1 | M2 | or |
|  |  |  |  |  |  |  | If not M2 then M1 for (3*x* ±14)(2*x* ± 7) |
|  |  |  |  |  |  |  |  |
|  |  | *x* = 3.5 |  |  |  | A1 | Dependent on at least M1 Ignore negative root |
|  |  | (Area =) |  |  |  | M1 ft | Dependent on at least M1 and *x* > 0 |
|  |  | 6 × ‘3.5’2 or (3 × ‘3.5’) × (2 × ‘3.5’) |  |  |  |  |  |
|  |  |  | 73.5 | 5 |  | A1 |  |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **16** |  | 180 − 77 − 39 **or** |  |  | AO2 | M2 | Also accept 103−39 |
|  |  | *BAD* = 77° **and** *ABD* = 39° **or** |  |  |  |  |  |
|  |  | *BA*" *X*"= 64° where *X* is on *PA* |  |  |  |  | M1 for *BAD* = 77° **or** *ABD =* 39° |
|  |  | produced **or** |  |  |  |  | (angles may be stated or marked on diagram) |
|  |  | a fully correct method to find angle |  |  |  |  |  |
|  |  | *ADB* |  |  |  | B1 | Opposite angles in a cyclic quadrilateral add up to 180° |
|  |  |  |  |  |  | B1 | Alternate segment theorem oe |
|  |  |  | 64 | 5 |  | A1 | cao |
| **17** |  | 41.5 **or** 42.5 **or** 24.5 **or** 23.5 **or** 14.5  **or** 13.5 |  |  | AO1 | B1 |  |
|  |  |  |  |  |  | M1 |  |
|  |  |  | 7.5 | 3 |  | A1 | A1 accept  or 7.55 or  (depending on M1) |
|  |  |  |  |  |  |  | NB. Answer **must** come from correct working |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **16** |  | 180 − 77 − 39 **or** |  |  | AO2 | M2 | Also accept 103−39 |
|  |  | *BAD* = 77° **and** *ABD* = 39° **or** |  |  |  |  |  |
|  |  | *BA*" *X*"= 64° where *X* is on *PA* |  |  |  |  | M1 for *BAD* = 77° **or** *ABD =* 39° |
|  |  | produced **or** |  |  |  |  | (angles may be stated or marked on diagram) |
|  |  | a fully correct method to find angle |  |  |  |  |  |
|  |  | *ADB* |  |  |  | B1 | Opposite angles in a cyclic quadrilateral add up to 180° |
|  |  |  |  |  |  | B1 | Alternate segment theorem oe |
|  |  |  | 64 | 5 |  | A1 | cao |
| **17** |  | 41.5 **or** 42.5 **or** 24.5 **or** 23.5 **or** 14.5  **or** 13.5 |  |  | AO1 | B1 |  |
|  |  |  |  |  |  | M1 |  |
|  |  |  |  |  |  |  |  |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **18** |  |  |  |  | AO1 | M1 | correct method for divsion |
|  |  | (*x* + 1)(*x* – 1) |  |  |  | M1 | correct factorisation of *x*2 − 1 |
|  |  | eg |  |  |  | M1 | correct single fraction |
|  |  |  |  | 4 |  | A1 |  |
| **19** |  | 130 = *π* × 4.5 × *l* |  |  | AO2 | M1 |  |
|  |  | *l =* or *l* = 9.1956 |  |  |  | M1 | For exact expression or answer which rounds to 9.2 |
|  |  | sin (*AVO*) =  (= 0.489..) |  |  |  | M1 | For a correct expression for sin *AVO* or cos *AVB*  cos (*AVB*) = (“9.2”2 + “9.2”2 – 92)/(2 × “9.2” × “9.2”)  (=0.521...) |
|  |  |  | 58.6 | 4 |  | A1 | awrt 58.6 |
| **20** | **ai** |  | (0, 5) | 1 | AO1 | B1 |  |
|  | **aii** |  | (3, 10) | 1 |  | B1 |  |
|  | **aiii** |  | (1, 5) | 1 |  | B1 |  |
|  | **b** |  | translation | 1 | AO1 | B1 |  |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | |
| **21** |  | = 2 **×** 8*x* – 2*x*−2 |  |  | AO1 | M2 | (M1 for one term differentiated correctly) |
|  |  | 2 **×** 8*x* – 2*x*−2 = 0 |  |  |  | M1 | dep on M1 |
|  |  | *x* = or *x* = 0.5 oe |  |  |  | M1 |  |
|  |  |  | (0.5, 6) | 5 |  | A1 |  |
| **22** |  |  |  |  | AO2 | M1 | may be fully or partially in terms of **a** and/or **b** |
|  |  | eg. |  |  |  | M1 | correct use of ratio |
|  |  |  |  |  |  | A1 |  |
|  |  |  |  |  |  | M1 | may be fully or partially in terms of **a** and/or **b** |
|  |  |  | eg.  = 2(**b** + 2**a**) |  |  | A1 | **NB** Correct expressions for *BC* and *AE* must be given |
|  |  |  | **and**= 3(**b** + 2**a**) | 5 |  |  |  |

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| **Question** | | **Working** | **Answer** | **Mark** | **AO** | **Notes** | | |
| **23** |  | *a* + 3*d* = 17 or *a* + 9*d* = 35 or |  |  | AO1 | M1 |  | M1 for 17 = 4*p* + *q* **and** 35 = 10*p* + *q* |
|  |  | 35 – 17 = 6*d* |  |  |  | A1 |  | *p* = 3 and *q* = 5 |
|  |  | *d* = 3 |  |  |  | A1 | ft from *d* = 3 | *u*1 = 8 and *u*50 = 155 |
|  |  | *a = 8* |  |  |  | M1 |  | × 50(8 + 155) |
|  |  | (2 × '8' + (50 − 1) '3') oe | 4075 | 5 |  | A1 |  | |