| **Paper 1MA1: 3H** | | |  |  | |
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| **Question** | | **Working** | **Answer** | **Notes** | |
| 1 |  |  | 171 | P1 | for process to find one share |
|  |  |  |  | P1 | for process to find total |
|  |  |  |  | A1 | cao |
| 2 |  |  | plan | C1 | a partially correct plan |
|  |  |  |  | C1 | correct plan |
| 3 |  |  | *t* = 3(*y* + 2*a*) | M1 | adding 2*a* to both sides or multiplying each term by 3 |
|  |  |  |  | A1 | *t* = 3(*y* + 2*a*) or *t* = 3*y* + 6*a* |
| 4 |  |  | 7.15 ≤ *x* < 7.25 | B1 | for 7.15 and 7.25 |
|  |  |  |  | B1 | cao |
| 5 | (a) |  | improvement | C1 | appropriate improvement eg do not have axes starting at (0, 0) |
|  | (b) |  | explanation | C1 | explanation eg pine cone has a very short width for its length |
| 6 | (a) |  | 1.95 | M1 | method to find one temperature eg 4500 ÷ 1200 |
|  |  |  |  | M1 | for complete method |
|  |  |  |  | A1 | cao |
|  | (b) |  | D | B1 | cao |

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| **Question** | | **Working** | **Answer** | **Notes** | |
| 7 |  |  | complete chain of reasoning | C1 | starts chain of reasoning eg finds area of large square and area of triangle or use of Pythagoras |
|  |  |  |  | C1 | for (*x* + *y*)2 – 4× (*x*×*y*÷2) oe or × |
|  |  |  |  | C1 | complete chain of reasoning with correct algebra |
| 8 | (a) |  | 36.4 | P1 | start process eg method to find area of trapezium |
|  |  |  |  | P1 | complete process to find volume of tank |
|  |  |  |  | P1 | process to find time eg volume × 1000 ÷ 300 |
|  |  |  |  | P1 | process to find 85% of volume or of time |
|  |  |  |  | A1 | for 36.4 or 36 mins 24 secs |
|  | (b) |  |  | C1 | explanation eg if the average rate was slower it would take more time, if the average rate was faster it would take less time |
| 9 | (a) |  | No with reason | C1 | partial explanation, eg 0.96 × 0.975 |
|  |  |  |  | C1 | No with full explanation, eg 0.96 × 0.975 = 0.936 so only a 6.4% reduction |
|  | (b) |  | 3.15 | P1 | complete process to find value after 2 years eg (145000 – ‘5800’) × 2.5/100 oe or 145000 × 0.96 × 0.975 (= 135720) |
|  |  |  |  | P1 | (140 000 – ‘135720’) ÷ ‘135720’ × 100 oe |
|  |  |  |  | A1 | for 3.15 – 3.154 |
| 10 |  |  | 1 : 2.53 | P1 | for substituting values to find surface gravity of either Earth (= 9.805..) or Jupiter (= 24.796..) |
|  |  |  |  | P1 | for complete process |
|  |  |  |  | A1 | for 1 : 2.528 to 2.53 |
| 11 |  |  | *x* = 4.5  *y* = –2.5 | M1 | for a correct process to eliminate one variable (condone one arithmetic error) |
|  |  |  |  | A1 | cao for either *x* or *y* |
|  |  |  |  | M1 | (dep) for substituting found value into one of the equations or appropriate method after starting again (condone one arithmetic error) |
|  |  |  |  | A1 | cao |
| 12 |  |  | 12.2 | P1 | begins process eg 150÷19.3 (= 7.77..) or 150÷8.9 (= 16.85..) |
|  |  |  |  | P1 | complete process to find total volume |
|  |  |  |  | P1 | complete process to find the density of the alloy |
|  |  |  |  | A1 | for answer in range 12.1 to 12.2 |
| 13 |  |  | Triangle  (–6, 2), (–6, –1), | M1 | for correct shape and the correct orientation in the wrong position or two vertices correct. |
|  |  |  | (–3, –1) | A1 | cao |

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| **Question** | | **Working** | **Answer** | **Notes** | |
| 14 | (a) |  | histogram | C1 | for 2 correct bars of different widths or at least 3 correct frequency densities |
|  |  |  |  | C1 | all bars in correct proportions or 4 correct bars with axes scaled and labelled |
|  |  |  |  | C1 | fully correct histogram with axes scaled and labelled |
|  | (b) | 81 ÷ 2 = 40.5 | 108.2 | C1 | for 81 ÷ 2 = 40.5 and 11.5 ÷ 18 × 5 (= 3.19..) |
|  |  | 90 to 105 is 29 |  | C1 | For answer in range 108 to 109 |
| 15 |  |  | shown | C1 | for or oe |
|  |  |  |  | C1 | complete chain of reasoning |
| 16 |  |  | 18.2 | M1 | for × π ×8 oe or × π ×8 oe |
|  |  |  |  | A1 | for 18.1 to 18.2 |
| 17 |  |  | proof | C1 | starts proof eg *n*(*n*+1) or (*n* – 1)×*n* |
|  |  |  |  | C1 | *n*(*n*+1) + *n*+1 or (*n* – 1)×*n* + *n* |
|  |  |  |  | C1 | for convincing proof including (*n*+1)2 or *n*2 |

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| **Question** | | **Working** | **Answer** | **Notes** | |
| 18 | (a) | values 0, 2, 5, 9, 15, 24 | 86 | M1 | for starting to find area under curve |
|  |  |  |  | M1 | for method to find the area under the curve between *t* = 0 and *t* = 10 (and at least 2 areas) |
|  |  |  |  | A1 |  |
|  | (b) |  | overestimate with reason | C1 | for overestimate and appropriate reason linked to method eg area between trapeziums and curve  also included |
| 19 |  |  | proof  leading to | M1 | for finding two correct recurring decimals that when subtracted would result in a terminating decimal or integer with intention to subtract  eg *x* = 0.31818..., 100*x* = 31.81818... |
|  |  |  |  | A1 | fully correct proof |
| 20 |  |  |  | P1 | starts process eg 2**b** – 2**a** |
|  |  |  |  | P1 | process to find or |
|  |  |  |  | P1 | complete process to find |
|  |  |  |  | A1 | for  oe |

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| **Question** | | **Working** | **Answer** | **Notes** | |
| 21 |  |  | 10.4 | P1 | starts process by using cosine rule to find *CD*  eg (*CD*)2 = 4.92+3.82– 2×4.9×3.8×cos80 (= 31.98..) |
|  |  |  |  | P1 | uses sine rule to find angle *ACD* or angle *ADC*  eg  or |
|  |  |  |  | P1 | uses sine rule to find *BC* or *BD*  eg |
|  |  |  |  | P1 | process to find area eg 1/2 *ab*sin*C* |
|  |  |  |  | A1 | for 10.4 to 10.43 |

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| **Question** | | **Working** | **Answer** | **Notes** | |
| 22 | (a) |  | chain of reasoning | C1 | for a relevant product eg × |
|  |  |  |  | C1 | for a correct equation eg 2×= |
|  |  |  |  | C1 | for method to eliminate fractions from algebraic expression |
|  |  |  |  | C1 | complete chain of reasoning |
|  | (b) |  |  | M1 | method to solve equation eg (*ax* + *b*)(*cx* +*d*) with *ac* = 3 and *bd* = ±60 |
|  |  |  |  | A1 | for selecting *y* = 6 |
|  |  |  |  | A1 | for  oe |
| 23 |  |  | 2(*x* + 4)2 + 3 | P1 | process to find *a*, eg 2*x*2 + 16*x* + 35 = 2(*x*2 + …) or *a* = 2 |
|  |  |  |  | P1 | for 2((*x* + 4)2 + …)) or *b* = 4 |
|  |  |  |  | A1 | for 2(*x* + 4)2 + 3 or *a* = 2, *b* = 4, *c* = 3 |
|  |  |  | (–4, 3) | B1 | ft from answer of form *a*(*x* *+* *b*)2 *+* *c* |