**GCSE Mathematics (1MA1)**

**Themed papers – 3D Trigonometry**

**Compiled from student-friendly mark schemes**

**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.**

**NOTES ON MARKING PRINCIPLES**

|  |
| --- |
| **Guidance on the use of codes within this mark scheme** |
| 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.P1 – process mark. This mark is generally given for setting up an appropriate process to find a solution in the context of the question.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.C1 – communication mark. This mark is given for explaining your answer or giving a conclusion in context supported by your working.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 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) |  | M1 | This mark is given for a drawing of an isosceles diagram |
| A1 | This mark is given for a fully correct diagram with correct dimensions |
| (b) |  × 6 × 5 = 15 | M1 | This mark is given for a method to find the area of one triangular face |
| (4 × 15) + (6 × 6) = 60 + 36 | M1 | This mark is given for a method to find the total surface area of the pyramid, including the base |
| 96 | A1 | This mark is given for the correct answer (96) only |
| cm3 | B1 | This mark is given for correct units seen |

**Question 2 (Total 4 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | *A* 7.3 *B*48°*D* *C*sin 48° =  | P1 | This mark is given for a correct trigonometric statement to find the length of *AC* |
| *AC* =  = 9.82 | P1 | This mark is given for a correct complete process to find the length of *AC* |
|  *H* 8.1*A* 9.82 *C*tan *CAH* =  | P1 | This mark is given for a correct process to find the angle *CAH* |
|  | *CAH* = 39.5° | A1 | This mark is given for the correct answer only |

**Question 3 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *MB*2 = *MA*2 + *AB*2*MA* = 15 ×  = 9*MB*2 = 92 + 152 = 306*MB* = 17.49 | P1 | This mark is given for a process to find the length of length *MB* |
| *BE* = tan 35° × 15 = 10.5 | P1 | This mark is given for a process to find the length of length *BE* |
| tan *EMB* =  = 0.6 | P1 | This mark is given for a process to find the angle *EMB* |
| *EMB* = 30.1 | A1 | This mark is given for the correct answer only |

**Question 12 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *π* × 52 × *h* = 1178 | P1 | This mark is given for a correct substitution into the formula for the volume of a cylinder |
| *h* =  = 14.99… | P1 | This mark is given for a process to find the height of the cylinder |
|  *B* 14.99…*A* 10 *C**x* = the angle between the road and the base of the tintan *x* =  = 1.499… | P1 | This mark is given for a process to find the tangent of the angle to be found |
| 56.31 | A1 | This mark is given for an answer in the range 56 – 56.31 |

**Question 5 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 15 ÷ *DH* = sin 64 | P1 | This mark is given for a process to find *DH* |
| 15 ÷ *DH* = sin 64 | P1 | This mark is given for a process to find *AD* |
| tan-1 (7.9756 ÷ 16.68902911) | P1 | This mark is given for a full method to find and *AHD* |
| 25.5 | A1 | This mark is given for an answer in the range of 25.5 to 25.6 |

**Question 6 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | *AC* =  | P1 | This mark is given for a process to find the distance *AC* |
| Distance from *A* to midpoint *M* of *AC* =  | P1 | This mark is given for a process to find the distance from *A* to midpoint *M* of *AC*  |
| *T**T*12 m*M**A*  m tan *TAC* =  = 3.394 | P1 | This mark is given for a process to find an expression for the tangent of angle *TAC* |
| ∠ *TAC* = 73.6° | A1 | This mark is given for the correct answer only |

**Question 7 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | tan 34° = , *CD* = 20 tan 34° =13.49 | P1 | This mark is given for a process to process to find the length of *CD* |
| cos 34° = , *BD* =  = 24.12 or *BD*2 = 202 + *CD*2 = 400 + 181.98 = 581.98*BD* = √581.98 = 24.12 | P1 | This mark is given for a process to process to find the length of *BD* |
| *AD =*  × sin 60° = 21.63 | P1 | This mark is given for using the sine rule to find the length of *AD* |
| sin *DAC* == 0.624 | P1 | This mark is given for a process to process to find sin *DAC* |
| ∠ *DAC* = 38.6 | A1 | This mark is given for a correct answer only answer in range 38.5 – 38.6 |

**Performance data:**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Q** | **Taken from**  | **Total Marks available** | **TOPIC** | **Spec Ref** | **AO** | **% Mean marks** | **Edexcel mean averagesMarks of candidates who achieved grade:** |
| **Q** | **Series** | **Paper** | **ALL** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **U** |
| 1a | 5a | June 2018 | 1H | 2 | Geometry | G2, G13 | 2 | 74 | 1.47 | 1.81 | 1.69 | 1.62 | 1.51 | 1.40 | 1.20 | 0.92 | - | - | 0.63 |
| 1b | 5b | June 2018 | 1H | 4 | Geometry | G17,N2 | 1 | 56 | 2.23 | 3.71 | 3.32 | 2.85 | 2.35 | 1.76 | 1.05 | 0.51 | - | - | 0.33 |
| 2 | 18 | June 2018 | 2H | 4 | Geometry | G20 | 3 | 26 | 1.03 | 3.29 | 2.38 | 1.48 | 0.78 | 0.33 | 0.11 | 0.03 | - | - | 0.01 |
| 3 | 19 | June 2019 | 2H | 4 | Geometry | R5, G20 | 3 | 40 | 1.60 | 3.58 | 3.03 | 2.26 | 1.40 | 0.72 | 0.31 | 0.09 | - | - | 0.04 |
| 4 | 12 | Mock Set 3 | 3H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 12 | Mock Set 4 | 2H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 6 | 12 | Nov 2018 | 3H | 4 | Geometry | G20 | 3 | 14 | 0.56 | 3.80 | 3.41 | 2.33 | 1.52 | 0.67 | 0.13 | 0.02 | - | - | 0.00 |
| 7 | 19 | Mock Set 1  | 3H | 5 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |  |  |  | **31** |  |  |  |  | **6.89** | **16.19** | **13.83** | **10.54** | **7.56** | **4.88** | **2.8** | **1.57** | **-** | **-** | **1.01** |