**GCSE Mathematics (1MA1)**

**Themed papers – Angles**

**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**

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| --- |
| **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 2 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | 180 – (100 + 35) | M1 | This mark is given for a method for finding the value of *x* |
| 45 | A1 | This mark is given for the correct answer only |

**Question 2 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | 90 – 25 – 25 | B1 | This mark is given for a method to find *x* |
| 40 |  | This mark is given for the correct answer only |
| (b)(i) | *b* or *d* | M1 | This mark is given for the correct answer only |
| For *b* chosen:  vertically opposite angles are equal  For *d* chosen:  alternate angles are equal | C1 | This mark is given for a correct reason stated |
| (b)(ii) | Angles around a point add up to 360° | C1 | This mark is given for a correct reason stated |

**Question 3 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | 90 + 2*x* + 3*x* = 360 | M1 | This mark is given for a method to form an equation |
| 2*x* + 3*x* = 360 – 90  5*x* = 270 | M1 | This mark is given for a method to solve the equation formed |
| 54 | A1 | This mark is given for the correct answer only |

**Question 4 (Total 2 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | Angle *EBD* = 45° (half a right angle)  Angle *DBC* = 60° (equilateral triangle) | M1 | This mark is given for one of the angles *EBD* or *DBC* found |
| Angle *EBC* = 105° | A1 | This mark is given for the correct answer only |

**Question 5 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *x*, 4*x* and 4*x* – 27 | P1 | This mark is given for find at least two of the angles in algebraic form |
| *x* + 4*x* + 4*x* – 27 = 180 | P1 | This mark is given for an equation summing three angles to 180 |
| 9*x* – 27 = 180 | P1 | This mark is given for a correct process to simplify the algebraic expression |
| *x* = 23 | P1 | This mark is given for a correct process to solve the equation for *x* |
| 23, 92, 65 | A1 | This mark is given for three correct angles |

**Question 6 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 180 – 117 = 63 | P1 | This mark is given for a process to find the other angle in the parallelogram |
| 180 –  = 108 | P1 | This mark is given for a process to find the interior angle of the pentagon |
| 108 – 63 | P1 | This mark is given for a process to find the value of *x* |
| 45 | 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** |
|  | Sum of interior angles of a pentagon  = (5 – 2) × 180 | P1 | This mark is given for a process to find the total of the interior angles of a pentagon |
| 540 | A1 | This mark is give for the correct total of the interior angles of a pentagon |
| 540 – 90 – 115 – 125 = 210 | P1 | This mark is given for a process to find the sum of the angles *ABC* and *BCD* |
| *BCD* = 2 × *ABC*  *BCD* : *ABC* = 140 : 70 | P1 | This mark is given for a process to find the ratio between angle *BCD* and angle *ABC* |
| *BCD* = 140 | A1 | This mark is given for the correct answer only |

**Question 8 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *ACB* = 180 – 75 – 51 = 54 | M1 | This mark is given for a method to find the angle *ACB* |
| *ACD* =  = 18  *DCB* =  × 2 = 36 | M1 | This mark is given for a method to find the size of angles *ACD* and *DCB* |
| *BDC* = 180 – 51 – 36 | M1 | This mark is given for a method to find the angle *BDC* |
| *BDC* = 93 | A1 | This mark is given for the correct answer only |

**Question 9 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | (6 – 2) × 180 = 720 | M1 | This mark is given for a method to find the sum of the interior angles of a hexagon |
| Letting the angles *AFE* and *BCD* = *x* and the angles *FED* and *CDE* = 2*x*, then  720 – 117 – 117 = 6*x* | M1 | This mark is given for a method to find the missing angles of the hexagon |
| *x* =  = 81 | M1 | This mark is given for a method to find the value of *x* |
| Thus angle *CDE* = 2*x* = 162 | C1 | This mark is given for the correct answer only following from correct working |

**Question 10 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 2*x* + 3*x* + 10 ≤ 90 | P1 | This mark is given for a process to derive an inequality to find *x* |
| 5*x* ≤ 80  *x* ≤ 16 | P1 | This mark is given for a process to solve the inequality found |
| Thus the greatest value of *x* = 16 | A1 | This mark is given for the correct answer only |

**Question 11 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *x* + 11*x* = 180  Exterior angle *x* =  = 15 | P1 | This mark is given for a process to find the exterior angle of the polygon |
|  | P1 | This mark is given for a complete process to find the number of sides |
| 24 | A1 | This mark is given for the correct answer only |

**National performance data:**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Q** | **Taken from** | | | **Total Marks available** | **TOPIC** | **Spec Ref** | **AO** | **% Mean marks** | **Edexcel mean averages Marks of candidates who achieved grade:** | | | | | | |
| **Q** | **Series** | **Paper** | **ALL** | **5** | **4** | **3** | **2** | **1** | **U** |
| **1** | 9 | Nov 2019 | 1F | 2 | Geometry | G3 | 2 | **91** | 1.81 | 1.97 | 1.93 | 1.85 | 1.63 | 1.19 | 0.90 |
| **2a** | 12a | June 2019 | 1F | 2 | Geometry | G1, G3 | 1 | **75** | 1.50 | 1.94 | 1.83 | 1.62 | 1.30 | 0.79 | 0.29 |
| **2bi** | 12bii | June 2019 | 1F | 1 | Geometry | G3 | 2 | **69** | 0.69 | 0.94 | 0.89 | 0.77 | 0.56 | 0.26 | 0.07 |
| **2bii** | 12bi | June 2019 | 1F | 2 | Geometry | G3 | 1 | **60** | 1.20 | 1.71 | 1.53 | 1.28 | 0.96 | 0.58 | 0.24 |
| **3** | 9 | June 2017 | 2F | 3 | Geometry | G3, A21 | 3 | **44** | 1.31 | 2.79 | 2.17 | 1.15 | 0.43 | 0.12 | 0.02 |
| **4** | 20 | June 2019 | 3F | 2 | Geometry | G1, G3, G4 | 1 | **42** | 0.84 | 1.68 | 1.34 | 0.85 | 0.36 | 0.09 | 0.02 |
| **5** | 13 | June 2017 | 3F | 5 | Geometry | G3, A21 | 3 | **22** | 1.10 | 3.35 | 1.83 | 0.70 | 0.14 | 0.01 | 0.00 |
| **6** | 29 | Nov 2019 | 3F | 4 | Geometry | G3, G4 | 1 | **19** | 0.74 | 2.44 | 1.37 | 0.59 | 0.19 | 0.05 | 0.00 |
| **7** | 26 | June 2018 | 3F | 5 | Geometry | G3, A21, R6 | 3 | **16** | 0.82 | 3.15 | 1.51 | 0.51 | 0.12 | 0.02 | 0.01 |
| **8** | 24 | Nov 2019 | 1F | 4 | Ratio | R5, G3 | 3 | **14** | 0.55 | 2.19 | 0.92 | 0.43 | 0.23 | 0.19 | 0.04 |
| **9** | 28 | June 2019 | 3F | 4 | Geometry | G3 | 1 | **10** | 0.41 | 1.72 | 0.72 | 0.23 | 0.06 | 0.01 | 0.00 |
| **10** | 28 | Nov 2019 | 1F | 3 | Geometry | G1, G3, A22 | 3 | **9** | 0.26 | 1.15 | 0.48 | 0.20 | 0.05 | 0.05 | 0.02 |
| **11** | 28 | Nov 2018 | 1F | 3 | Geometry | G3 | 3 | **0** | 0.01 | 0.21 | 0.02 | 0.01 | 0.01 | 0.01 | 0.00 |
|  |  |  |  |  | **40** |  |  |  |  | **11.24** | **25.24** | **16.54** | **10.19** | **6.04** | **3.37** |