**GCSE Mathematics (1MA1)**

**Themed papers – Angles: Geometrical reasoning**

**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 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | 180 – 117 = 63  Angles on a straight line add up to 180 | 1 | This mark is given for finding angle *ACB* |
| 180 – 63 – 54 = 63  Angles in a triangle add up to 180 | 1 | This mark is given for finding angle *BAC* |
| Angle *ACB* = angle *BAC* | 1 | This mark is given for stating that two angles in the triangle are equal |
| Thus triangle is isosceles | 1 | This mark is given for stating that the triangle is isosceles, supported by correct reasons given |

**Question 2 (Total 2 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| (a) | *x* is not a base angle | C1 | This mark is given for a correct explanation |
| (b) | alternate (not corresponding) angles are equal  or  allied (or co-interior) angles add up to 180 | C1 | This mark is given for a correct version of the first reason |

**Question 3 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | ∠ *ADC* = 180 – 75 = 105  Angles on a straight line add up to 180 | M1 | This mark is given for a method to find the size of angle *ADC* with a reason |
| ∠ *BCD* = 50  Vertically opposite angles are equal | M1 | This mark is given for a method to find the size of angle *BCD* with a reason |
| ∠ *ABC* = 360 – 100 – 105 – 50 = 105  Angles in a quadrilateral add up to 360 | M1 | This mark is given for a method to find the size of angle *ABC* with a reason |
| *ABCD* is a kite since angles *ABC* and *ADC* are both 105 | C1 | This mark is given for a correct conclusion supported by reasons given |

**Question 4 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *EBC* = 35°  *FDE* = 75°  corresponding angles are equal | 1 | This mark is given for finding one or two angles using parallel lines |
| *FED* = 70°  angles in a triangle sum to 180 | 1 | This mark is given showing method to complete calculation to reach 70° |
| *ABF* = 70°  opposite angles in a parallelogram are equal | 1 | This mark is given for *ABF* identified as 70° |
|  | 1 | This mark is given for full appropriate reasons given |

**Question 5 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *ADB* = 64  Base angles of a isosceles triangle are equal | B1 | This mark is given for a finding the size of the angle *ADB* |
| *BDC* = *x*  64 + 64 + 2*x* = 180 | M1 | This mark is given for a method to find the value of *x* |
| Base angles of a isosceles triangle are equal  Angles in a triangle add up to 180 | C1 | This mark is given for correct reasons given for each stage of reasoning |
| 180 – 128 = 2*x*  2*x* = 52  *x* = 26 | A1 | This mark is given for the correct answer only |

**Question 6 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | *ABE* = 70°  Co-interior angles add up to 180 | M1 | This mark is given for finding the size of angle *ABE* |
| *EBG* = 75°, *BEG* = 45°  Angles on a straight line add up to 180 | M1 | This mark is given for finding the size of angles *EBG* and *BEG* |
| *x* = 60  Angles in a triangle add up to 180 | A1 | This mark is given for the correct answer only |
|  | C1 | This mark is given for a full set of reasons given with working |

**Question 7 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | for angle *BCD* = angle *CDB* = angle *DBC* = 60 | P1 |  |
| for (*x* = ) 180 – 25 – 60 – 60 (= 35)  **OR** (*x* = ) 60 – 25 (= 35)  **OR** 180 – 60 (= 120) **and** 180 – “120” – 25 (= 35) | P1 |  |
| for *x* = 35 with fully correct reasons, | C2 | eg. angles in an equilateral triangle are equal (60) **and** angles in a triangle add up to 180  **OR** angles in an equilateral triangle are equal (60) **and** the exterior angle of a triangle is equal to the sum of the interior opposite angles  **OR** angles in an equilateral triangle are equal (60) **and** angles on a straight line add up to 180 **and** angles in a triangle add up to 180 |
| for *x* = 35 with one correct relevant reason) | C1 |  |

**Question 8 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working an or answer examiner might expect to see** | **Mark** | **Notes** |
|  | = 150 | M1 | This mark is given for a complete method to find the interior angle of the dodecagon |
| at *B* or *C*, 360 – 150 – 90 = 120 | M1 | This mark is given for a complete method to find the interior angle of polygon **P** |
| = 120,  = 60,  *x* = 6 | A1 | This mark is given for using the interior and to find out the number of sides of polygon **P** |
| Polygon **P**has 6 sides, so is a hexagon | C1 | This mark is given for a complete solution, fully supported by accurate figures |

**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** | 7 | | | Nov 2017 | 3F | 4 | Geometry | G1, G3, G4 | 2 | **45** | 1.79 | 3.12 | 2.52 | 1.80 | | 1.02 | 0.40 | | 0.14 | |
| **2a** | 15a | | | June 2018 | 2F | 1 | Geometry | G4 | 2 | **31** | 0.31 | 0.70 | 0.48 | 0.30 | | 0.15 | 0.05 | | 0.01 | |
| **2b** | 15b | | | June 2018 | 2F | 1 | Geometry | G1 | 2 | **38** | 0.38 | 0.63 | 0.48 | 0.37 | | 0.28 | 0.21 | | 0.14 | |
| **3** | 14 | | | Nov 2018 | 1F | 4 | Geometry | G1, G3, G4 | 2 | **27** | 1.09 | 2.46 | 1.75 | 1.03 | | 0.44 | 0.28 | | 0.12 | |
| **4** | 25 | | | Nov 2017 | 1F | 4 | Geometry | G1, G3, G4 | 2 | **25** | 1.00 | 2.27 | 1.53 | 0.96 | | 0.50 | 0.28 | | 0.16 | |
| **5** | 17 | | | Nov 2019 | 2F | 4 | Geometry | G3, G4 | 2 | **18** | 0.73 | 2.25 | 1.30 | 0.61 | | 0.23 | 0.11 | | 0.06 | |
| **6** | 22 | | | Nov 2018 | 2F | 4 | Geometry | G3, G4 | 2 | **11** | 0.42 | 2.18 | 0.81 | 0.33 | | 0.13 | 0.07 | | 0.00 | |
| **7** | 17 | | | Mock Set 5 | 2F | 4 | − | − | − | **−** | − | − | − | − | | − | − | | − | |
| **8** | 19 | | | June 2017 | 3F | 4 | Geometry | G3 | 2 | **7** | 0.27 | 1.28 | 0.36 | 0.09 | | 0.02 | 0.00 | | 0.00 | |
|  |  | | |  |  | **30** |  |  |  |  | **4.20** | **11.77** | **6.71** | **3.69** | | **1.75** | **1.00** | | **0.49** | |