**GCSE Mathematics (1MA1)**

**Themed papers – Angles: Proof**

**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 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 2 (Total 4 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | *ABC* = *BCD* | C1 | This mark is given for comparing triangles *ABC* and *BCD* (given in the diagram) |
| *AB* = *CD* | C1 | This mark is given for stating that line *AB* = *CD* (given in the diagram) |
| *BC* = *BC* (common) | C1 | This mark is given for stating that line *BC* is common to both triangles *ABC* and *BCD* |
| *ABC* ≡ *DCB* [SAS] and thus *AC* = *BD* | C1 | This mark is given for a conclusion to the proof showing that the two triangles have a common angle and two common sides; thus *AC* = *BD* |

**Question 3 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | *AD* = *BC* (opposite sides of a parallelogram are equal)  ∠ *BAD* = ∠ *BCD* (opposite angles of a parallelogram are equal)  ∠ *ADP* = ∠ *CBQ* = 90° (given on diagram) | C1 | This mark is given for identifying a pair of relevant equal sides or angles with reasons |
| C1 | This mark is given for a complete identification of all three aspects with reasons given |
| Two pairs of angles and one pair of sides are equal (ASA), so *ADP* is congruent to *CBQ* | C1 | This mark is given for a correct conclusion of congruency (with reference to ASA) |
| (b) | *AP* = *QC* since triangle *ADP* is congruent to triangle *CBQ* | C1 | This mark is given for identifying a pair of equal sides in *APCQ* with reasons |
| *APCQ* is a parallelogram and opposite sides of a parallelogram are equal | C1 | This mark is given for a complete explanation |

**Question 4 (Total 3 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | sin 30° = , cos 30° = , tan 30° = | B1 | This mark is given for using any correct trigonometric value for 30° |
| 2*n*  *n* | M1 | This mark is given for finding the hypotenuse of the large triangle = 2*n* |
| 2*n*  *n*  = *n* | A1 | This mark is given for a method to find the hypotenuse of middle triangle |
| √3*n*  *n*2  *n*2 (= 2*y*) | A1 | This mark is given for a correct equation linking *y* and *n* and correct working leading to the given result |

**Question 5 (Total 4 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
|  | *BEF* = *x*  (alternate angles are equal) | M1 | This mark is given for the use of parallel lines to find an angle |
| *EFB* =  (angles in a triangle add up to 180) | M1 | This mark is given for finding an expression for the size of angle *EFB* |
| *w* +  = 180  (angles on a straight line add up to 180)  *w* = 180 –  = 90 + *x* | M1 | This mark is given for a complete method to show the printed result |
| Alternate angles are equal  Angles in a triangle add up to 180  Angles on a straight line add up to 180 | C1 | This mark is given for a complete list of reasons |

**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** | **9** | **8** | **7** | **6** | **5** | **4** | **3** | **2** | **1** | **U** |
| 1 | 3 | Nov 2017 | 1H | 4 | Geometry | G1, G3, G4 | 2 | 41 | 1.64 | 3.25 | 2.94 | 2.96 | 2.77 | 2.43 | 1.84 | 1.28 |  |  | 0.59 |
| 2 | 21 | June 2017 | 1H | 4 | Geometry | G65 | 2 | 21 | 0.85 | 2.24 | 1.44 | 0.98 | 0.72 | 0.54 | 0.39 | 0.28 | - | - | 0.18 |
| 3a | 21a | June 2018 | 3H | 3 | Geometry | G5 | 2 | 10 | 0.31 | 1.12 | 0.65 | 0.40 | 0.22 | 0.11 | 0.07 | 0.06 | - | - | 0.05 |
| 3b | 21b | June 2018 | 3H | 2 | Geometry | G5 | 2 | 2 | 0.03 | 0.28 | 0.06 | 0.02 | 0.01 | 0.00 | 0.00 | 0.00 | - | - | 0.00 |
| 4 | 20 | Mock Set 3 | 1H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 5 | 9 | Mock Set 3 | 2H | 4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
|  |  |  |  | 21 |  |  |  |  | **2.83** | **6.89** | **5.09** | **4.36** | **3.72** | **3.08** | **2.3** | **1.62** | **-** | **-** | **0.82** |