**GCSE Mathematics (1MA1)**

**Themed papers – Circles – Area and Perimeter**

**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** |
|  | 0.5 × *π* × 50 = 78.55 | P1 | This mark is given for a process to find the circumference of the semicircle |
| 78.55 + 50 = 128.55 | P1 | This mark is given for a complete process to find the perimeter of the field |
| 128.55 × 29.86 = 3838.50 | P1 | This mark is given for finding the cost of the fencing |
| 3838.50 + (180 × 3) | P1 | This mark is given for a complete method to find the total cost of the job |
| 4378.50 | 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) | *π* × 102 | M1 | This mark is given for the recall of the formula for the area of a circle (*π r* 2), used with the correct radius |
| 3 × 102 | M1 | This mark is given for an estimate using an approximate value of *π* and the correct radius |
| 300 ÷ 45 or 300 ÷ 50 | M1 | This mark is given for an estimate to find the number of boxes of grass seed required |
| 6 or 7 or 8 | A1 | This mark is given for an estimate in the range 6 – 8 boxes supported by estimates chosen |
| (b) | An underestimate; the true area is greater so Balena could need more boxes | C1 | This mark is given for a correct explanation |

**Question 3 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  |  = 56.25*π* | M1 | This mark is given for a method to find the area of **A** |
|  **=** 6.25*π* | M1 | This mark is given for a method to find the area of **B** |
| *r* 2 =  = √6.25 = 2.5 | A1 | This mark is given for a complete process to show the radius of **B** is 2.5 cm |

**Question 4 (Total 3 marks)**

| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| --- | --- | --- | --- |
| (a) | π × 80 = 251.327… | 1 | This mark is given for finding the length of the circumference of the circle |
| 251.327 ÷ 8 = 31.4… | 1 | This mark is given for the correct answer only |
| (b) | No, the mean distance stays the same because the total distance and the number of points stays the same | 1 | This mark is given for a correct comment |

**Question 5 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | π × 42 = 50.265… π × 72 = 153.938…π × 102 = 314.159… | 1 | This mark is given for process to find the area of any relevant circle  |
| π × 72 – π × 42  | 1 | This mark is given for complete method to find the shaded area |
| = 103.673… | 1 | This mark is given for the correct answer only |
| Daisy is wrong since = 0.329… and 0.329 ≠  | 1 | This mark is given for a correct comment supported by working |

**Question 6 (Total 6 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
| (a) | process to find area of circle or semicircle π × 4.22 (÷ 2) | P1 |  |
| process to find area of garden (= 74.7...)  | P1 |  |
| process to find number of boxes “74.7” ÷ 12 | P1 |  |
| process to find cost “7” × 4.99 | P1 |  |
| 34.93 | A1 |  |
| (b) | Correct statement | C1 | e.g. She might need to buy fewer boxes |

**Question 7 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | for using *π* × 4² ÷ 2 (=25.13..) | P1 |  |
| for finding the area of the trapezium eg 64 $-$“25.13” (=38.86..) | P1 |  |
| for finding the sum of *AB* and *DC* eg “38.86..” ÷ 5 × 2 (=15.54..) | P1 |  |
| for complete process to find the missing length eg “15.54..”$ -$ 8 (=7.546..) | P1 |  |
| 7.5 to 7.6 | A1 | Accept answers in the range 7.5 to 7.6If an answer is given in the range but then incorrectly rounded award full marks. |

**Question 8 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | π × 54 (= 169.6460033) or ( π × 54) ÷ 2 (= 84.82300165) | P1 | process to find the distance around one or both ends of the track |
| 40 × 2 + “169.6460033” (= 249.6460033)  | P1 | (dep on P1) complete process to find the total length of the track,  |
| π × 590 (=1853.539666 mm) or π ×0.59 (= 1.85353966 m) | P1 | process to find the circumference of wheel |
| “249.64…” ÷ “1.85…” or unrounded answer of 134.6860863 | P1 | complete process to find the number of revolutions in consistent units |
| 134 | A1 |  |

**Question 9 (Total 5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | for process to form equation to determine the radius, Pythagoras or trigonometry, e.g. *r*² + *r*² = 8² | P1 |  |
| for *r*² = 32 or *r* = 8cos 45° oe | P1 |  |
| (dep first P1) for process to find area of circle, e.g.× 5.6² dependant on first P1 | P1 |  |
| for complete process to find shaded area, e.g. 32 − 8² | P1 |  |
| 36.5 | P1 | for 36.5 to 36.6 |

**Question 10 (Total 4 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | for process to find the area of one shape, eg. 19×16 (= 304) or $π×8^{2}$ (= 201.06...) | P1 |  |
| for process to find the shaded area, eg. "304" – "201.06" ÷2 (= 203.46...) | P1 |  |
| for a complete process to find required percentage, eg. $\frac{"203.46"}{304}×10$0 | P1 |  |
| 66.9 | A1 | or answer in range 66 to 68 |

**Question 11 (Total 3 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **Working or answer an examiner might expect to see** | **Mark** | **Notes** |
|  | $\frac{1}{4}$ × π × 4.8² | P1 | for use of formula for area of a circle |
| $\frac{1}{2}$ × 4.8 × 4.8 | P1 | for complete process to find area of shaded region |
| $\frac{1}{4}$ × π × 4.8² − $\frac{1}{2}$ × 4.8 × 4.8 = 6.58 | A1 | for 6.56 – 6.58 |

**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** | **5** | **4** | **3** | **2** | **1** | **U** |
| **1** | 19 | June 2018 | 2F | 5 | Geometry | R11, G17 | 3 | **49** | 2.44 | 3.50 | 2.75 | 2.47 | 2.28 | 1.56 | 0.45 |
| **2a** | 18a | June 2017 | 1F | 4 | Geometry | G17,N14 | 3 | **26** | 1.04 | 2.91 | 1.74 | 0.70 | 0.21 | 0.04 | 0.01 |
| **2b** | 18b | June 2017 | 1F | 1 | Number | N14 | 3 | **8** | 0.08 | 0.27 | 0.12 | 0.03 | 0.01 | 0.00 | 0.00 |
| **3** | 30 | Nov 2019 | 3F | 3 | Geometry  | G3, G4 | 1 | **19** | 0.74 | 2.44 | 1.37 | 0.59 | 0.19 | 0.05 | 0.00 |
| **4a** | 18a | Nov 2017 | 2F | 2 | Geometry | G17,  | 1 | **13** | 0.26 | 0.97 | 0.46 | 0.21 | 0.09 | 0.03 | 0.01 |
| **4b** | 18b | Nov 2017 | 2F | 1 | Statistics | S4 | 3 | **23** | 0.23 | 0.45 | 0.29 | 0.22 | 0.17 | 0.10 | 0.06 |
| **5** | 26 | Nov 2017 | 1F | 4 | Number | N1, R3, G17 | 3 | **2** | 0.08 | 0.66 | 0.16 | 0.04 | 0.01 | 0.01 | 0.00 |
| **6a** | 24 | Mock Set 1 | 3F | 5 | − | − | − | − | − | − | − | − | − | − | − |
| **6b** | 24 | Mock Set 1 | 3F | 1 | − | − | − | − | − | − | − | − | − | − | − |
| **7** | 24 | Mock Set 4 | 2F | 5 | − | − | − | − | − | − | − | − | − | − | − |
| **8** | 26 | Mock Set 2 | 2F | 5 | − | − | − | − | − | − | − | − | − | − | − |
| **9** | 26 | Mock Set 3 | 2F | 5 | − | − | − | − | − | − | − | − | − | − | − |
| **10** | 27 | Specimen Set 1 | 2F | 4 | − | − | − | − | − | − | − | − | − | − | − |
| **11** | 28 | Specimen Set 2 | 2F | 3 | − | − | − | − | − | − | − | − | − | − | − |
|  |  |  |  | **48** |  |  |  |  | **4.87** | **11.20** | **6.89** | **4.26** | **2.96** | **1.79** | **0.53** |