## MATHEMATICS - MARKING SCHEME

### *Types of Marks*

### Method Marks
Method marks are awarded for presenting a correct method of solution and attempting to apply it. There are two types of method marks: **M** marks and **(M)** marks.

- **M marks** are <u>only</u> awarded if method is seen.

- **(M) marks** are awarded even when a correct answer is given and no workings are shown.

### Accuracy Marks
There are two types of Accuracy marks: **A** marks and **B** marks.

- **A** marks are accuracy marks given for correct answer only following a correct method.
  Accuracy marks are also awarded for incorrect answers which are correctly followed through (f.t.) from an incorrect previous answer, provided that f.t. is indicated in the marking scheme.

- **B** marks are accuracy marks awarded for specific results or statements independent of the method used.

## Marking Scheme (Max mark: 100)

| Quest. | | Workings and Answers | Mark | | Comments |
|---|---|---|---|---|---|
| **1** | (a) | (i)   Any one from 1, 4, 9, 16, 25 <br> (ii)  56 <br> (iii) 23 or 29 <br> (iv)  64 | B1 <br> B1 <br> B1 <br> B1 | **5** | |
| | (b) | 18 | B1 | | |
| **2** | (a) | $3.2 \times 30\,000$ <br> $96\,000 \div 100$ <br> 960 m | M1 <br> (M)1 <br> A1 | **6** | |
| | (b) | $4.8 \times 1000 \times 100$ <br> $480\,000 \div 30\,000$ <br> 16 cm | (M)1 <br> M1 <br> A1 | | |
| **3** | (a) | Cross-sect. area $= \frac{1}{2}(4.2 + 6.5) \times 3.6$ <br> $\qquad\qquad = 19.26$ cm$^2$ | M1 <br> A1 | **4** | |
| | (b) | Volume $= 19.26 \times 12$ <br> $\qquad\quad = 231.12$ cm$^3$ | (M)1 <br> A1 f.t. | | f.t. from (a) |
| **4** | (a) |  | B2 | **5** | B1 for every 7 correct entries |
| | (b) | (i)   $\frac{1}{6}$ o.e. <br><br> (ii)  $\frac{5}{18}$ o.e. <br><br> (iii) $\frac{1}{3}$ o.e. | B1 <br><br> B1 <br><br> B1 | | |
| **5** | (a) | (i)   €480 | B1 | **7** | |
| | | (ii)  $\frac{10}{100} \times 480 = $ €48 <br> $\qquad 48 \times 52$ <br> $\qquad = $ €2496 | M1 <br> (M)1 <br> A1 f.t. | | f.t. from (a)(i) |
| | (b) | $570 - 480 = 90$ <br> $90 \div (12 \times 1.5)$ <br> $= 5$ hr | M1 <br> M1 <br> A1 f.t. | | f.t. from (a)(i) |

| 6 | (a) | $4n + 7$ | B1 | | |
|---|---|---|---|---|---|
| | (b) | $(4 \times 50) + 7$<br>207 | (M)1<br>A1 f.t. | **5** | f.t. from (a) |
| | (c) | $4n + 7 = 391$<br>$\qquad 4n = 384$<br>$\qquad n = 96$ | M1<br>A1 f.t. | | f.t. from (a) |
| **7** | (a) | Sum of interior angles $= (n - 2) \times 180°$<br>$\qquad\qquad\qquad\qquad = 5 \times 180°$<br>$\qquad\qquad\qquad\qquad = 900°$ | M1<br><br>A1 | **5** | |
| | (b) | $74 + 133 + 146 + 150 + 160 + x + 2x = 900$<br><br>$3x = 237$<br>$x = 79$ | M1<br><br>M1<br>A1 f.t. | | M1 for equating to answer in (a)<br><br>f.t. from (a) |
| **8** | (a)<br><br>(b) |  | M1<br>A1<br><br><br>M1<br>A1 | **6** | Correct orientation<br>Accurate size and position<br><br>Correct orientation<br>Accurate size and position |
| | (c) | Reflection<br>in the $y$-axis | B1<br>B1 | | |
| **9** | (a) | $13 - 4x + 12 - 6x$<br>$25 - 10x$ | M1<br>A1 | | |
| | (b) | $8x(2xy + 4y - 3x^2)$ | B2 | **7** | B1 for correct partial factorisation |
| | (c) | $3x + 15 = 12 - 6x + 6$<br>$3x + 6x = 12 + 6 - 15$<br>$9x = 3$<br>$x = \frac{1}{3}$ or $0.\dot{3}$ | M1<br><br>M1<br><br>A1 | | |
| **10** | (a) | $m = \frac{20 - 2}{7 - 1}$<br><br>$m = 3$ | (M)1<br><br>A1 | **3** | |
| | (b) | $y = 3x - 1$ | A1 f.t. | | f.t. from (a) |

| 11 | (a) | (i) $p^2 x = y + t$ | (M)1 | | |
|---|---|---|---|---|---|
| | | $x = \dfrac{y+t}{p^2}$ | A1 | | |
| | | (ii) $x = \dfrac{-12+8}{5^2}$ | (M)1 | | |
| | | $x = -0.16$ | A1 f.t. | | f.t. from (a)(i) |
| | (b) | $6x + 14y = 114$ <br> $6x - 9y = 45$ | M1 | **8** | |
| | | $23y = 69$ <br> $y = 3$ | A1 | | |
| | | $3x + 7 \times 3 = 57$ <br> $3x = 36$ <br> $x = 12$ | (M)1 <br><br> A1 | | |
| 12 | (a) | ∠AOD = 27 × 2 = 54° <br> Angle at the centre is equal to twice the angle at the circumference. | A1 <br> M1 | | |
| | (b) | ∠ADO = (180 − 54) ÷ 2 = 63° <br> Angles in a triangle add up to 180° <br> *or* Angles in an isosceles triangle. | A1 f.t. <br> M1 | **8** | f.t. from (a) |
| | (c) | ∠BAD = (180 − 74) = 106° <br> Opposite angles in cyclic quad add up to 180°. | A1 <br> M1 | | |
| | (d) | ∠BAE = 74° <br> Exterior angle of a cyclic quad is equal to the interior opposite angle. | A1 <br> M1 | | |

| 13 | (a) | $\frac{6}{30} \times 100$ <br><br> 20% | M1 <br><br> A1 | | |
|---|---|---|---|---|---|
| | (b) | Mean = $\frac{6 + 16 + 12 + 8}{30}$ <br><br> = 1.4 | M1 <br><br> A1 | | |
| | (c) | $\frac{10}{30} \times 360 = 120°$ (0 pets) <br><br> Remaining angles: <br> 72° (1 pet), 96° (2 pets), 48° (3 pets) <br><br>  | M1 A1 <br><br> A1 <br><br><br><br> M1 <br><br> A1 <br><br> B1 | **10** | Award for any one correct angle <br><br><br><br> Correct drawing of one sector <br><br> Accurate drawing of pie chart <br><br> Correct labelling of pie chart |
| 14 | (a) | <table><tr><td>$x$</td><td>−3</td><td>−2</td><td>−1</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>$x^2$</td><td>9</td><td>4</td><td>1</td><td>0</td><td>1</td><td>4</td><td>9</td><td>16</td></tr><tr><td>$+3x$</td><td>−9</td><td>−6</td><td>−3</td><td>0</td><td>3</td><td>6</td><td>9</td><td>12</td></tr><tr><td>−4</td><td>−4</td><td>−4</td><td>−4</td><td>−4</td><td>−4</td><td>−4</td><td>−4</td><td>−4</td></tr><tr><td>$y$</td><td>−4</td><td>−6</td><td>−6</td><td>−4</td><td>0</td><td>6</td><td>14</td><td>24</td></tr></table> | B3 | | B1 for every 3 correct values |
| | (b) |  | M2 <br><br> A1 | **9** | Award M1 at least 2 points correctly plotted <br> For smooth curve |
| | (c) | $(−1.5, −6.25)$ | A1 f.t. | | Accept values of $y$ between −6.1 and −6.5 f.t. from (b) |
| | (d) | (i) 9.75 (Accept 9.5 to 9.9) | A1 f.t. | | f.t. from (b) |
| | | (ii) 3.4 (Accept 3.3 to 3.5) | A1 f.t. | | f.t. from (b) |

| 15 | (a) | $\text{Sin } 40° = \dfrac{30}{PS}$ <br><br> $PS = \dfrac{30}{\text{Sin } 40°}$ <br><br> $PS = 46.671\ldots = 46.7 \text{ m}$ | (M)1 <br> M1 <br> A1 | 7 | Do not penalise if answers are not to 1 d.p. |
|---|---|---|---|---|---|
| | (b) | $\text{Tan } \hat{Q} = \dfrac{30}{45}$ <br><br> $\text{Tan } \hat{Q} = 0.666\ldots$ <br><br> $P\hat{Q}R = 33.690\ldots = 33.7°$ | M1 <br><br> A1 | | |
| | (c) | $PQ^2 = 30^2 + 45^2$ <br> $PQ = \sqrt{2925}$ <br> $PQ = 54.083\ldots = 54.1 \text{ m}$ | M1 <br><br> A1 | | |
| 16 | (a) | In $\triangle OAC$ and $\triangle OBD$ <br><br> $\angle OCA = \angle ODB = 90°$ (given) <br><br> $\angle AOC = \angle BOD$      (common) <br><br> $\angle OAC = \angle OBD$      (corresponding $\angle$s) <br><br> Then, $\triangle OAC$ is similar to $\triangle OBD$, AAA | M1 <br> M1 <br><br> A1 | 5 | Award M1 for each of two correct statements |
| | (b) | $\dfrac{OA}{OB} = \dfrac{AC}{BD} \Rightarrow \dfrac{61.2}{214.2} = \dfrac{32.4}{BD}$ <br><br> $BD = \dfrac{32.4 \times 214.2}{61.2}$ <br><br> $BD = 113.4 \text{ m}$ | M1 <br><br> A1 | | |