



# **General Certificate of Secondary Education**

## **Mathematics 4307**

### *Specification B*

**Module 5 Paper 2 Tier H 43055/2H**

## **Mark Scheme**

*2009 examination - November series*

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**The following abbreviations are used on the mark scheme:**

|              |   |
|--------------|---|
| <b>M</b>     | Method marks awarded for a correct method.  |
| <b>A</b>     | Accuracy marks awarded when following on from a correct method.<br>It is not necessary always to see the method. This can be implied. |
| <b>B</b>     | Marks awarded independent of method.  |
| <b>E</b>     | Marks awarded for an explanation.   |
| <b>M dep</b> | A method mark which is dependent on a previous method mark being awarded.   |
| <b>ft</b>    | Follow through marks. Marks awarded for correct working following a mistake in an earlier step.                                       |
| <b>SC</b>    | Special Case. Marks awarded for a common misinterpretation which has some mathematical worth.   |
| <b>oe</b>    | Or equivalent.  |
| <b>eeoo</b>  | Each error or omission.   |

**MODULE 5 HIGHER TIER****43055/2H**

|   |                                   |        |  |
|---|-----------------------------------|--------|--|
| 1 | $180 - 90 - 38$                   | M1     |  |
|   | 52                                | A1     | May be seen on the diagram                                   |
|   | $(180 - \text{their } 52) \div 2$ | M1 dep | dep on an attempt to find the third angle in $\triangle DEC$ |
|   | 64                                | A1     |  |

|   |  |    |   |
|---|--|----|---|
| 2 | Trial for $3 < x \leq 4$                     | B1 | Accurate to nearest whole number (truncated or rounded) |
|   | Trial at 3.6 or 3.7 (or between)             | B1 | Accurate to at least 1 dp (t or r)                      |
|   | Trials that bracket 31 <b>and</b> answer 3.7 | B1 |   |

|      |   |       |   |
|------|---|-------|---|
| 3(a) | $\frac{1}{2}(7.8 + 14.8) \times 6.2$      | M1    | for any <b>complete</b> method          |
|      | [70, 70.1]                                | A1    |   |
| 3(b) | $\left(\frac{1}{2}\right)\pi \times 17^2$ | M1    | $\frac{1}{2}$ not necessary for this M1 |
|      | [453.7, 454]                              | A1    | or $144.5\pi$                           |
|      | 450 or 454                                | B1 ft | ft their answer                         |

|      |                      |    |   |
|------|----------------------|----|---|
| 4(a) | 8                    | B1 |   |
|      | -1                   | B1 |   |
| 4(b) | 7 correct plots      | M1 | ft their table  |
|      | Correct smooth curve | A1 |   |
| 4(c) | -1.8                 | B1 | ft their curve crossing $x$ -axis<br>Allow $(-1.8, 0)$ and $(3.8, 0)$ |
|      | 3.8                  | B1 |   |
| 4(d) | $x = 1$              | B1 |   |

|   |                     |        |   |
|---|---------------------|--------|---|
| 5 | $x + 15 + 4x = 180$ | M1     | or $x + 15 + 4x + x + 15 + 4x = 360$                                    |
|   | $5x = 180 - 15$     | M1 dep | $10x = 360 - 30$<br>This mark for collecting terms to the form $ax = b$ |
|   | 33                  | A1     | 33  |

|      |                   |    |               |    |   |
|------|-------------------|----|---------------|----|---|
| 6(a) | Rotation          | or | Enlargement   | B1 | <b>Note:</b><br>Must be a single transformation<br>or half turn (if rotation)<br>or about origin or about 0 |
|      | 180°              |    | sf -1         | B1 |   |
|      | About (0, 0)      |    | Centre (0, 0) | B1 |   |
| 6(b) | Enlargement       |    |               | B1 | Must be a single transformation   |
|      | [Scale factor] -2 |    |               | B1 |   |
|      | [Centre] (0, 0)   |    |               | B1 | or centre at origin,<br>centre at 0   |

|   |                     |  |    |            |
|---|---------------------|--|----|------------|
| 7 | 1089 ÷ 44           |  | M1 |            |
|   | 24.75 or 24.8 or 25 |  | A1 |            |
|   | cm <sup>2</sup>     |  | B1 | Units mark |

|      |       |    |              |
|------|-------|----|--------------|
| 8(a) | 23.5  | B1 | or 23.499... |
| 8(b) | 19.25 | B1 |              |

|      |                                |    |  |
|------|--------------------------------|----|--|
| 9(a) | $n + 1 \quad n + 2$<br>$n + 9$ | B2 | B1 for one correct box   |
| 9(b) | $(n +) n + 1 + n + 2 + n + 9$  | M1 | eg $3n + 12$ gains this M1<br>but not this A1                  |
|      | $4n + 12$                      | A1 | ft their boxes provided they<br>are $n \pm k$ for M1 only      |
|      | $4(n + 3)$                     | A1 | or $4n$ is always a multiple of 4 and<br>12 is a multiple of 4 |

|       |  |    |                       |
|-------|--|----|-----------------------|
| 10(a) | $4c + 4 - 3c + 6$                            | M1 | Allow one error       |
|       | $c + 10$                                     | A1 |                       |
| 10(b) | $6x^5y^4$                                    | B2 | B1 for $x^5$ or $y^4$ |
| 10(c) | $7n - 3n < 5 + 1$                            | M1 |                       |
|       | $n < 1.5$ or $1\frac{1}{2}$ or $\frac{3}{2}$ | A1 |                       |

|       |   |        |  |
|-------|---|--------|--|
| 11(a) | Sine  | M1     | Scale drawing M0                           |
|       | $\frac{9}{13}$ (= 0.692...)                         | M1 dep |  |
|       | [43.78, 44]   | A1     | Answer 44 only credited if working is seen |
| 11(b) | $8^2 + 11^2 - 2 \times 8 \times 11 \times \cos 105$ | M1     | (= 230.5...)                               |
|       | $\sqrt{\text{their } 230.5}$                        | M1 dep |  |
|       | [15, 15.2]  | A1     | Answer 15 only credited if working is seen |

|       |  |          |  |
|-------|--|----------|--|
| 12(a) | $\frac{1}{2}h(h+7)$ [= 36]                   | M1       |  |
|       | $h(h+7) = 72$                                | M1 dep   |  |
|       | $h^2 + 7h = 72$                              | A1       |  |
| 12(b) | $\frac{-7 \pm \sqrt{7^2 - 4 \times -72}}{2}$ | M1<br>A1 | Allow one numerical or sign error.<br>Fully correct substitution<br><b>Note:</b> $\pm$ can be just + |
|       | 5.68   | A1       |  |

|    |                           |    |                          |
|----|---------------------------|----|--------------------------|
| 13 | $4\pi r^2 = 2450$         | M1 |                          |
|    | $\sqrt{(2450 \div 4\pi)}$ | M1 | Must be complete process |
|    | [13.96, 14]               | A1 |                          |

|    |                               |    |   |
|----|-------------------------------|----|---|
| 14 | $x^2 + (2x + 3)^2 = 2$        | M1 |   |
|    | $4x^2 + 12x + 9$              | A1 | or $4x^2 + 6x + 6x + 9$   |
|    | $5x^2 + 12x + 7 = 0$          | M1 | ft their quadratic, must be = 0   |
|    | $(5x + 7)(x + 1)$             | M1 | or correct use of formula   |
|    | $(x =) -\frac{7}{5}$ and $-1$ | A1 | or $x = -\frac{7}{5}, y = \frac{1}{5}$ oe<br>or $x = -1, y = 1$                                 |
|    | $(y =) \frac{1}{5}$ and $1$   | A1 | Both pairs<br>Allow consistent ordering as implying the pairings<br>Allow coordinates for pairs |

|    |   |        |                                 |
|----|---|--------|---------------------------------|
| 15 | $(TB =) 120 \times \tan 18$                           | M1     | = 38.99                         |
|    | $(AB^2 =) 140^2 - 120^2$                              | M1     | = 5200                          |
|    | $\sqrt{\text{their } 5200}$                           | M1 dep | = 72.11 dep on M1 in line above |
|    | $(\text{their } 39) \div (\text{their } 72) = \tan x$ | M1     |                                 |
|    | [28, 28.5]  | A1     | Allow 28.40(00...)              |