| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1(a)** |  | B1 |
| Uses common denominator to give  | M1 |
|  Replaces  by  to give  | M1 |
| Obtains  ( *a* =3, *b* = 5, *c* = -2 ) | A1 |
|  |  | **(4)** |
| **1(b)** | Solves  to give cos *x* = | M1 |
| cos *x* =  only (rejects cos *x* = -2) | A1 |
| So *x* = 1.23 or 5.05 | dM1A1 |
|  |  | **(4)** |
| **1(c)** | Either | Or |  |
|  |  | B1 |
|  |  | M1 |
|  |  | M1 |
|  (so ) |  (so ) | A1 |
|  |  | **(4)** |
|  |  | **(12 marks)** |
| **2(a)** |   |   |
|   | B1 B1 |
|  |  | **(2)** |
| **2(b)** |    |  |
|   | M1 |
|  Using   | M1 |
|   | M1 A1\* |
|  |  | **(4)** |
| **2(c)** |   | M1 |
|   | A1 A1 |
|  |  | **(3)** |
|  |  | **(9 marks)** |
| **3(a)** |  | M1 |
|  | M1 A1 |
|  | A1\* |
|  |  | **(4)** |
| **3(b)(i)** |  | M1 |
| cso | dM1 A1\* |
|  |  | **(3)** |
|  | Alternative |  |
|  | tan 15° = tan (60° – 45°) or tan (45° – 30°) |  |
|  or  | M1 |
|  or  | M1 |
| Rationalises to producetan 15° = 2 –  | A1\* |
| **3(b)(ii)** | tan 2*x* = 1 | M1 |
| 2*x* = 45° | A1 |
| 2*x* = 45° + 180° | M1 |
| *x* = 22.5°, 112.5°, 202.5°, 295.5° | A1(any two)A1 |
|  |  | **(5)** |
|  |  | **(12 marks)** |
| **4(a)** |    | M1 |
|   | M1 |
|   |  |
|   | M1 A1 |
|   | A1\* |
|  |  | **(5)**  |
| **4(b)** |   |  |
|   | M1 |
|   | dM1 A1 |
|   | dM1 |
|   | A1 |
|  |  | **(5)** |
|  |  | **(10 marks)** |
| **5(a)** |  | B1 |
|   | M1 |
|   | M1 |
|   | A1\* |
|  |  | **(4)** |
| **5(b)** |  |  |
|   | M1 |
|   | A1 |
|   | M1 |
|   | M1 |
|   | A2,1,0 |
|  |  | **(6)** |
|  |  | **(10 marks)** |
| **6(a)** |  | B1 |
|  | M1 |
|  | M1 |
|  |  |
|  | M1 |
|  | A1\* |
|  |  | **(5)** |
| **6(b)** |  |  |
|  |  |
|    |  |
|   | M1 A1 |
|   | dM1A1 |
|  |  | **(4)** |
|  |  | **(9 marks)** |
| **7(a)** |   *R* = 25  | B1 |
|   | M1 A1 |
|  |  | **(3)** |
| **7(b)** |   | M1 |
|   | A1 |
|    | M1 |
|   | A1 A1 |
|  |   | **(5)** |
| **7(c)** | Attempts to use  **AND**  in the expression | M1 |
|  |  |
|   | A1 |
|  |  | **(2)** |
| **7(d)** |  |  |
| Maximum value =’*R*’+’*c*’ | M1 |
|  = 32 cao | A1 |
|  |  | **(2)** |
|  |  | **(12 marks)** |
| **8(a)** |  | M1A1 |
| (÷ cos *A*cos *B*) | M1 |
| = | A1 \* |
|  |  | **(4)** |
| **8(b)** |  | M1 |
|   | M1 |
|  | A1 \* |
|  |  | **(3)** |
| **8(c)** |  | M1 |
|  | M1 |
|  | M1 A1 |
|  | M1 |
|   | A1 |
|  |  | **(6)** |
|  |  | **(13 marks)** |
| **9(a)** |    | M1 |
|    | M1 |
|   |  |
|   | dM1 A1\* |
|  |  | **(4)** |
| **9(b)** |  |  |
|    | M1 |
|    | M1 |
|    | M1 |
|  Two of   | A1 |
|  All four of  | A1 |
|  |  | **(5)** |
|  |  | **(9 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C3 June 2014R | 3 | 5.4, 5.5, 5.6, 5.7, 5.8 | Trigonometry  | 1.1b, 1.2, 2.1,  |
| 2 | C3 2012 | 5 | 5.4, 5.5, 5.6, 5.7, 5.8 | Trigonometry | 1.1b, 2.1, 3.1a |
| 3 | C3 2011 | 6 | 5.3, 5.4, 5.6, 5.7, 5.8 | Trigonometry | 1.1b, 2.1, 3.1a |
| 4 | C3 June 2014 | 7 | 5.5, 5.6, 5.7, 5.8 | Trig identities and equation solving | 1.2, 1.1b, 2.1, 2.2a |
| 5 | C3 2016 | 8 | 5.5, 5.6, 5.7, 5.8 | Proof and equation | 1.1b, 2.1, 3.1a |
| 6 | C3 2015 | 8 | 5.5, 5.6, 5.7, 5.8 | Proof using sec and double angle formulae | 1.1b, 1.2, 2.1, 3.1a |
| 7 | C3 2012 | 8 | 5.6, 5.7, 5.8 | Trigonometry | 1.1b, 2.1, 2.1a,  |
| 8 | C3 Jan 2012 | 8 | 5.3, 5.6, 5.7, 5.8 | Trigonometry | 1.1b, 2.1, 2.2a, 3.1a |
| 9 | C3 2017 | 9 | 5.5, 5.6. 5.7 | Trig proof, equation involving double angles | 1.1b, 1.2, 2.1, 3.1a |