| **Question** | **Scheme** | | | **Marks** |
| --- | --- | --- | --- | --- |
| **1** |  | | | B1 |
|  | | | M1 |
|  | | | A1 o.e. |
| Solves  to give | | | M1 |
| , *x* = 6 | | | A1 |
|  |  | | | **(5 marks)** |
| **2(a)** | =  or  or | | | B1 |
|  | | | B1 |
| **Using** =1 | | | B1 |
|  |  | | | **(3)** |
| **2(b)** |  | | | M1 |
| Solves  to give  or *x* = 9 | | | M1 A1 |
|  |  | | | **(3)** |
|  |  | | | **(6 marks)** |
| **3(a)** |  |  | | B1 |
|  | Correct use of | | M1 |
| or | 64 used in the correct context | | B1 |
|  | Removes logs correctly | | M1 |
|  | Must see expansion of  to score the final mark. | |  |
|  |  | | A1 |
|  |  | | | **(5)** |
| **3(b)** |  | M1: Correct attempt to solve the **given** quadratic as far as *x* =... | | M1 A1 |
|  | A1: Both 25 and 9 | |
|  |  | | | **(2)** |
|  |  | | | **(7 marks)** |
| **4(i)** | or , or (see special case 2) | | | M1 |
| or  or  or | | | M1 |
| (depends on previous Ms and must be this equation or equivalent) | | | dM1 |
| *x* =  or exact recurring decimal after correct work | | | A1 **cso** |
|  |  | | | **(4)** |
| **4(ii)** |  |  | | M1 |
|  | Applies product law of logarithms. | | dM1 |
|  |  | | A1cao |
|  |  | | | **(3)** |
|  |  | | | **(7 marks)** |
| **5(i)** | Use of power rule so  or  or | | | M1 |
| Removes logs and square roots, **or** halves then removes logs to give  Or followed by factorisation or formula to give | | | M1 |
| ( (depends on previous M’s and must be this expression or equivalent) | | | A1cao |
|  |  | | | **(3)** |
| **5(ii)** | **Way 1** | | |  |
|  | Applies quotient law of logarithms | | M1 |
|  | Uses | | M1 |
|  | Multiplies across and makes *y* the subject | | M1 |
|  |  | | A1cso |
| **Way 2** | | |  |
|  | 2nd M mark | | M1 |
|  | 1st M mark | | M1 |
| Multiplies across and makes *y* the subject | | | M1 A1cso |
|  |  | | | **(4)** |
|  |  | | | **(7 marks)** |
| **6(a)** | and (b) | | |  |
| or |  | | M1 |
| (3 sf) | 1.43 | | A1 **cao** |
|  |  | | | **(2)** |
| **6(b)** |  | or | | M1 oe |
|  | or  or or awrt 2.33 | | A1 |
|  |  | | | **(2)** |
|  |  | | | **(4 marks)** |
| **7(a)** |  | | | M1 |
|  | | | A1 A1 |
|  |  | | | **(3 marks)** |
| **8(a)** | Attempt  or  Use of long division is M0A0 as factor theorem was required. | | | M1 |
| so (*x* + 3) is a factor | | | A1 |
|  |  | | | **(2)** |
| **8(b)** | Either (Way 1) | | |  |
|  | | | M1 A1 |
| or | | | M1 A1 |
| Or (Way 2) | | | **(4)** |
| Uses trial or factor theorem to obtain *x* = 1/2 **or** *x* = 7/3 | | | M1 |
| Uses trial or factor theorem to obtain both *x* = 1/2 **and** *x* = 7/3 | | | A1 |
| Puts three factors together (see notes below) | | | M1 |
| Correct factorisation : or  oe | | | A1 |
| Or (Way 3) | | |  |
| No working three factors  otherwise need working | | | M1 A1  M1 A1 |
|  |  | | | **(4)** |
| **8(c)** | or | | | B1 M1 |
|  | | | A1 |
|  |  | | | **(3)** |
|  |  | | | **(9 marks)** |
| **9(i)** |  | | |  |
| or | | or  and so  or | M1 |
| or | | or  o.e. | dM1 |
| = 0.264 | | | A1 |
|  |  | | | **(3)** |
| **9(ii)** |  | | | M1 |
| or | | | dM1 |
| or  (allow awrt 6 if replaced by 6 later) | | | B1 |
| Obtains  o.e. i.e.  for example | | | A1 |
| Solves quadratic to give *y* = | | | ddM1 |
| (need both- one should not be rejected) | | | A1 |
|  |  | | | **(6)** |
|  |  | | | **(9 marks)** |
| **10(i)** | or | | | M1 |
| or | | | M1 |
|  | | | A1 oe |
|  |  | | | **(3)** |
| **10(ii)** |  | | | M1 |
| So, | | | A1 oe |
|  | | | dM1 |
|  | | | A1 |
|  |  | | | **(4)** |
|  |  | | | **(7 marks)** |
| **11(i)** |  | | | M1 |
|  | awrt | | A1 |
|  |  | | | **(2)** |
| **11(ii)** |  | | |  |
|  | | | M1 |
|  | | | M1 |
|  | | | M1 |
|  | | | A1 |
|  | | | **ddd**M1 |
|  | | |  |
|  | | | A1 |
|  |  | | | **(6)** |
|  |  | | | **(8 marks)** |
| **12(a)** | Graph of  and solving | | |  |
|  | *x*    *y*  *O* | | | B1  B1 |
|  |  | | | **(2)** |
| **12(b)** |  | | | M1 |
| { or } | | |  |
| or | | | A1 |
|  | | | **d**M1 |
|  | | | A1**cso** |
|  | | |  |
|  | | | B1 |
|  |  | | | **(5)** |
|  |  | | | **(7 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C2 2012 | 2 | 6.3, 6.4 and 2.3 | Laws of logarithms | 1.1b, 2.1 and 2.4 |
| 2 | C2 Jan 2012 | Q4 | 6.3 and 6.4 | Laws of logarithms | 1.1b, 2.1, 2.2a |
| 3 | C2 Jan 2013 | Q6 | 6.3 and 6.4 | Laws of logarithms | 1.1b, 2.1, 2.2a and 2.4 |
| 4 | C2 2013 | 7 | 6.3, 6.4 | Laws of logarithms | 1.1b, 1.1a, 2.1, 2.2a, 3.1a |
| 5 | C2 2017 | 7 | 6.3 and 6.4 | Laws of logs | 1.1b, 2.1 and 2.5 |
| 6 | C2 2011 | Q3 | 6.3 and 6.5 | Exponentials and logarithms | 1.1b, 2.1 |
| 7 | C3 2017 | 2 | 6.3, 6.4 | Exponential equation | 1.1b |
| 8 | C2 2017 | 6 | 2.6 and 6.5 | Factor theorem and factorisation of cubic, *ax* and log | 1.1b, 2.2a and 3.1a |
| 9 | C2 2015 | 7 | 6.3, 6.4 and 6.5 | Exponentials and logarithms | 1.1b, 2.4, 2.5, 3.1a |
| 10 | C2 2016 | 8 | 2.3, 6.3, 6.4, 6.5 | Exponentials and logarithms | 2.1, 3.1a |
| 11 | C2 June 2014R | 8 | 6.4, 6.5 | Exponentials and logarithms | 1.1b, 2.4, 3.1a |
| 12 | C2 2014 | 8 | 6.1, 6.3 and 6.5 and 2.3 | Exponentials and logarithms | 1.1b, 1.1a, 2.1, 2.2a, 3.1a |