| **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 A1M1 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* | B1B1 |
|  |  | **(2)** |
| **12(b)** |  | M1 |
| { or } |  |
|  or  | A1 |
|  | **d**M1 |
|  | A1**cso** |
|  |  |
|  | B1 |
|  |  | **(5)** |
|  |  | **(7 marks)** |

|  |  |  |  |  |  |
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|  | **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 |