| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1** |  |  |
|   | B1 |
| Long division as far as  | M1 |
| Two of  | A1 |
| All four of  | A1 |
|  |  | **(4 marks)** |
| **2** |   | B1 |
|   | M1 |
|   | A1 |
|   |  |
|   | A1 |
|  |   | **(4 marks)** |
| **3** | Factorise  | B1 |
| Use of common denominator  | M1 |
|   | A1 |
|   | A1 |
|  |   | **(4 marks)** |
| **4** |   At any stage | B1 |
| Eliminating the common factor of (3*x* + 2) at any stage |  |
|  |  |
|   | B1 |
| Use of a common denominator |  |
|  or  | M1 |
|   | A1 |
|  |  | **(4 marks)** |
| **5(a)** |  | M1 |
|  |  |
| Sets  |  |
|  | M1 |
|  |  |
|  | dM1 |
|  | A1 |
|  |  | **(4)** |
| **5(b)** |  | B1ft |
|  |  | **(1)** |
|  |  | (**5 marks)** |
| **6** |  *ln* graph crossing *x* axis at (1,0) and asymptote at *x* = 0 | B1 |
|  | Shape including cuspTouches or crosses the *x* axis at (1,0)Asymptote given as *x*=0 | B1ftB1ftB1 |
|  | ShapeCrosses at (5, 0)Asymptote given as *x* = 4 | B1B1ftB1 |
|  |  | **(7 marks)** |
| **7(a)** |   | B1 |
|  |  | **(1)** |
| **7(b)** |  | M1 A1 |
|    | A1 |
|  |  | **(3)** |
| **7(c)** |  |  |
|    | M1 A1 |
|   only | M1 A1 |
|  |  | **(4)** |
| **7(d)** |   | B1 ft |
|  |  | **(1)** |
|  |  | **(9 marks)** |
| **8(a)** | Shape*x* coordinates correcty coordinates correct  | B1B1B1 |
|  |  | **(3)** |
| **8(b)** | ShapeMax at (2,4)Min at (-3,0) | B1B1B1 |
|  |  | **(3)** |
|  |  | **(6 marks)** |
| **9(a)** | ff(-3)= f(0),=2 | M1 A1 |
|  |  | **(2)** |
| **9(b)** |  *y y* = f-1( *x*) |  |
|  |  |
| Shape  | B1 |
|   |  |
|  (2,0) *x*  |  |
|  |  (0,-3) (0,-3) and (2,0) | B1 |
|  |   | **(2)** |
| **9(c)** |  *y*  |  |
|  *y*=f(|*x*|)-2  |  |
| Shape | B1 |
|  |  |
|  (0,0)  | B1 |
|  (0,0) *x* |  |
|  |   | **(2)** |
| **9(d)** |  *y*  |  |
| Shape  | B1 |
|  |  |
| (-6,0) or (0,4) | B1 |
|  |  |
|  (0,4)  |  |
|  (-6,0) and (0,4) | B1 |
|  (-6,0) *x*  |  |
|   |  |
|  |  | **(3)** |
|  |  | **(9 marks)** |
| **10(a)** | ‘W’ Shape(0, 11) and (6, 1) | B1B1 |
|  |  | **(2)** |
| **10(b)** | ‘V’ shape(-6,1)(0,25) | B1B1B1 |
|  |  | **(3)** |
| **10(c)** |  One of *a* = 2 or *b* = 6 | B1 |
|  *a* = 2 and *b* = 6 | B1 |
|  |  | **(2)** |
|  |  | **(7 marks)** |
| **11(a)** | Shape including cusp (–1.5, 0) **and** (0, 5)  | B1B1 |
|  |  | **(2)** |
| **11(b)** | Shape (0,5) | B1B1 |
|  |  | **(2)** |
| **11(c)** | Shape(0,10)(-0.5, 0)  | B1B1B1 |
|  |   | **(3)** |
|  |  | **(7 marks)** |
| **12(a)** | V shaped graphTouches *x* axis at ¾ and cuts y axis at 3 | B1B1 |
|  |  | **(2)** |
| **12(b)** | Solves  or  to give either value of *x*Both  and  or  or   | M1A1 |
|   or  | dM1A1 |
|  |  | **(4)** |
| **12(c)** | Draws graph Or solves to give one soln *x* = ¾  | M1 |
| Accept for all values of *x* except  Or , or  | A1 |
|  |  | **(2)** |
|  |  | **(8 marks)** |
| **13(a)** |   | B1 |
|   | M1 |
|   | A1 |
|   |  |
|   cso | A1\* |
|  |   | **(4)** |
| **13(b)** |  One end either  or   | B1 |
|   | B1 |
|  |  | **(2)** |
| **13(c)** | Attempt to set |  |
| Either  or  or  or  |  |
|      | M1 |
|  |  |
|   | A1, dM1 |
|   cso | A1 |
|  |  | **(4)** |
|  |  | **(10 marks)** |
| **14(a)(i)** | V shape on *x* - axis **or** coordinates **and**  Correct shape, position and coordinates  | B1 B1 |
|  |   |  |
| **14(a)(ii)** | Their ''V'' shape translated up or Correct shape, position and   | B1ftB1 |
|  |   | **(4)** |
| **14(b)** |  States or uses   | B1 |
| Attempts to solve  in either *x* or with *x* = *c* |  |
|    | M1 |
|   |  |
|  Combines with   | dM1 A1 |
|  |  | **(4)** |
|  |  | **(8 marks)** |
| **15** |    | B1 |
|  |  |
|   | M1 |
|  |  |
|   Any two of *A*, *B*, *C* | A1 |
|  |  |
|  terms  All three correct | A1 |
|  |  | **(4 marks)** |
| **16** | **Method 1: Using one identity** |  |
|  |  |
|  |  |
|  their constant term | B1 |
|  | B1 |
| Forming a correct identity. |  |
| Either or   |  |
| Attempts to find the value of either one of their *B* or their *C* from their identity. | M1 |
| Correct values for their *B* and their *C*, which are found using a correct identity. | A1 |
|  | **(4)** |
| **Method 2: Long Division** |  |
|  |  |
| their constant term | B1 |
| So,  |  |
|  |  |
| Forming a correct identity. | B1 |
| Either or   |  |
| Attempts to find the value of either one of their *B* or their *C* from their identity. | M1 |
| Correct values for their *B* and their *C*, which are found using | A1 |
| So,  | **(4)** |
|  |  | **(4 marks)** |

|  |  |  |  |  |  |
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|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C3 2013 | 1 | 2.6 | Algebraic fractions | 1.1b |
| 2 | C3 2017 | 1 | 2.6 | Algebraic fractions | 1.1b |
| 3 | C3 June 2014R | 1 | 2.6 | Simplification of rational expressions | 1.1b |
| 4 | C3 2012 | 1 | 2.6 | Algebra and functions | 1.1b |
| 5 | C3 2016 | 1 | 2.6, 2.8 | Composition of function | 1.1b, 2.2a  |
| 6 | C3 2013 | 2 | 2.7, 2.9 | Modulus function, transformations | 1.1b |
| 7 | C3 2017 | 3 | 2.3, 2.8 | Functions, Inverses, Range | 1.1b, 2.2a |
| 8 | C3 Jan 2012 | 2 | 2.9 | Algebra and functions | 1.1b |
| 9 | C3 Jan 2013 | 3 | 2.8, 2.9 | Algebra and functions | 1.1b, 2.2a |
| 10 | C3 June 2014 | 4 | 2.7, 2.9 | Transforming graphs, modulus | 1.1b, 2.2a |
| 11 | C3 2012 | 4 | 2.9 | Algebra and functions | 1.1b |
| 12 | C3 June 2014R | 5 | 2.7,  | Modulus function, Linear inequalities | 1.1b, 3.1a |
| 13 | C3 June 2014 | 5 | 2.6, 2.8 | Algebraic fractions, function work | 1.1b, 3.1a |
| 14 | C3 2017 | 6 | 2.7, 2.9 | Modulus graph, transformation and equation | 1.1b, 2.2a, 3.1a |
| 15 | C4 2011 | 1 | 2.10 | Partial fractions | 1.1b |
| 16 | C4 Jan 2013 | 3 | 2.10 | Partial fractions | 1.1b |