| **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 cusp  Touches or crosses the *x* axis at (1,0)  Asymptote given as *x*=0 | B1ft  B1ft  B1 |
|  | Shape  Crosses at (5, 0)  Asymptote given as *x* = 4 | B1  B1ft  B1 |
|  |  | **(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 correct  y coordinates correct | B1  B1  B1 |
|  |  | **(3)** |
| **8(b)** | Shape  Max at (2,4)  Min at (-3,0) | B1  B1  B1 |
|  |  | **(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) | B1  B1 |
|  |  | **(2)** |
| **10(b)** | ‘V’ shape  (-6,1)  (0,25) | B1  B1  B1 |
|  |  | **(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) | B1  B1 |
|  |  | **(2)** |
| **11(b)** | Shape  (0,5) | B1  B1 |
|  |  | **(2)** |
| **11(c)** | Shape  (0,10)  (-0.5, 0) | B1  B1  B1 |
|  |  | **(3)** |
|  |  | **(7 marks)** |
| **12(a)** | V shaped graph  Touches *x* axis at ¾  and cuts y axis at 3 | B1  B1 |
|  |  | **(2)** |
| **12(b)** | Solves  or  to give either value of *x*  Both  and  or  or | M1  A1 |
| 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 | B1ft  B1 |
|  |  | **(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 |