| **Question** | **Scheme** | | | | **Marks** |
| --- | --- | --- | --- | --- | --- |
| **1** |  | | | | M1 |
| = | | | | A1, B1 |
|  | | | | M1 |
|  | | | | A1cso |
|  |  | | | | **(5 marks)** |
| **2(a)** | or  (oe) | | | | B1 |
|  |  | | | | **(1)** |
| **2(b)** | See  or equivalent | | | | B1 |
| Attempt to use  –  = | | | | M1 |
| = | | | | dM1 |
| = | | | | A1 |
|  | | | |  |
|  |  | | | | **(4)** |
|  |  | | | | **(5 marks)** |
| **3(a)** |  | | | |  |
|  | | | | B1 |
|  | | | | M1 A1 |
|  | | | | dM1 |
|  | | | |  |
| or | | | |  |
| **\*\* given answer\*\*** | | | | A1\* |
|  |  | | | | **(5)** |
| **3(b)** |  | | | | M1 |
|  | | | | dM1 |
| or *a* = 7, *b* = 20 | | | | A1 |
|  | | | | **(3)** |
|  |  | | | | **(8 marks)** |
| **4(a)** |  | | | |  |
|  | | | | M1A1B1 |
|  | | | | dM1 |
| **(AG)** | | | | A1 \* |
|  |  | | | | **(5)** |
| **4(b)** |  | | | |  |
|  | | | | M1 |
|  | | | | A1 **cao** |
|  |  | | | | **(2)** |
|  |  | | | | **(7 marks)** |
| **5(a)** |  | | |  |  |
|  | | | Multiplying out brackets and an attempt to use at least one of the standard formulae correctly. | M1 |
| Correct expression. | A1 |
|  | | |  |  |
|  | | | Factorising out at least | dM1 |
|  | | |  |  |
|  | | | Correct 3 term quadratic factor | A1 |
| \* | | | Correct proof. No errors seen. | A1 |
|  |  | | |  | **(5)** |
| **5(b)** |  | | |  |  |
|  | | |  |  |
|  | | | Use of | M1 |
|  | | |  |  |
|  | | |  | A1 |
|  | | | Correct answer only 2/2 |  |
|  |  | | | | **(2)** |
|  |  | | | | **(7 marks)** |
| **6(a)** |  | | | | B1 |
|  | | | |  |
|  | | | | M1A1 |
|  | | | | M1 |
|  | | | |  |
|  | | | | A1 |
|  |  | | | | **(5)** |
| **6(b)** |  | | | | M1 |
|  | | | | A1 |
| = 1621800 - 1890 | | | |  |
| = 1619910 | | | | A1 |
|  |  | | | | **(3)** |
|  |  | | | | **(8 marks)** |
| **7(a)** |  | | | | B1 |
| Proof by induction will usually score no more marks without use of standard results | | | |  |
|  | | | |  |
|  | | | |  |
|  | | | | M1A1B1 |
|  | | | | M1 |
|  | | | | A1 |
|  |  | | | | **(6)** |
| **7(b)** |  | | | | M1 |
|  | | | | A1 |
|  | | | |  |
|  | | | | A1 |
|  |  | | | | **(3)** |
|  |  | | | | **(9 marks)** |
| **8(a)** |  | | | | B1 |
|  | | | | M1 B1ft |
|  | | | | M1 A1 |
|  | | | | A1\*cso |
|  |  | | | | **(6)** |
| **8(b)** |  | | | | M1A1 |
| **3**f(***n***) – f(*n* or *n*+1) is M0 | | | |  |
|  | | | |  |
|  | | | | dM1 |
|  | | | | A1 |
|  | | | |  |
|  |  | | | | **(4)** |
|  |  | | | | **(10 marks)** |
| **9(a)** |  | |  | |  |
|  | | Multiplying out brackets and an attempt to use at least one of the two standard formulae correctly. | | M1 |
| First two terms correct. | | A1 |
|  | | B1 |
|  | |  | |  |
|  | | Attempt to factorise out | | M1 |
| Correct expression with  factorised out with no errors seen. | | A1 |
|  | |  | |  |
|  | |  | |  |
|  | |  | |  |
|  | | Correct proof. No errors seen. | | A1 **\*** |
|  |  | | | | **(6)** |
| **9(b)** |  | |  | |  |
|  | | Use of  or  with the result from (a) used at least once. | | M1 |
| Correct unsimplified expression.  E.g. Allow 2(3*n*) for 6*n*. | | A1 |
|  | |  | |  |
|  | | Factorising out  ( or  ) | | dM1 |
|  | |  | |  |
|  | |  | | A1 |
|  | |  | |  |
|  |  | | | | **(4)** |
|  |  | | | | **(10 marks)** |
| **10(a)** |  | Shows **both** LHS = 1 **and** RHS = 1 | | | B1 |
| Assume true for n = k |  | | |  |
| When n = k + 1 | Adds (k + 1)3 to the given result | | | M1 |
|  | Attempt to factorise out | | | dM1 |
|  | Correct expression with factorised out. | | | A1 |
| Must see 4 things: true for *n* = 1, assumption true for *n* = *k*, said true for *n* = *k* + 1 and therefore true for all *n* | Fully complete proof with no errors and comment. All the previous marks must have been scored. | | | A1cso |
|  |  | | | | **(5)** |
| **10(b)** |  | Attempt two sums | | | M1 |
| **is M0** | | | |  |
|  | Correct expression | | | A1 |
|  | Completion to printed answer with no errors seen. | | | A1 |
|  |  |  | | | **(3)** |
| **10(c)** |  | Attempt S50 – S20 or S50 – S19 and substitutes into a correct expression at least once. | | | M1 |
|  | Correct numerical expression (unsimplified) | | | A1 |
| = 1 589 463 | cao | | | A1 |
|  |  | | | | **(3)** |
|  |  | | | | **(11 marks)** |

|  |  |  |  |  |  |
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|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | FP1 Jan 2013 | 1 |  | Series | 1.1b, 2.1 |
| 2 | FP1 2016 | 3 |  | Series | 1.1b, 2.1 |
| 3 | FP1 2015 | 3 |  | Series | 1.1b, 2.1 |
| 4 | FP1 2012 | 4 |  | Series | 1.1b, 2.1 |
| 5 | FP1 2011 | 5 |  | Series | 1.1b, 2.1,3.1a |
| 6 | FP1 2014R | 5 |  | Series | 1.1b, 2.1 |
| 7 | FP1 2014 | 5 |  | Series | 1.1b, 2.1 |
| 8 | FP1 2013 | 5 |  | Series | 1.1b, 2.1 |
| 9 | FP1 2011 | 7 |  | Series | 1.1b, 3.1a |
| 10 | FP1 Jan 2012 | 6 |  | Series | 1.1b, 2.1 |