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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **1a** | Let  and Therefore, the statement is true for  | **B1** | 2.2a | 6thProve general results for the summation of polynomial series |
| Assume general statement is true for So assume,   | **M1** | 2.4 |
| Begins to build an expression for *n* = *k* + 1So, Therefore,  | **M1** | 2.1 |
| Factorises and arrives at the intended expression.  | **A1** | 1.1b |
| Demonstrates an understanding of the process of mathematical inductionThen the general statement is true for As the general result has been shown to be true for  then the general result is true for all  | **A1** | 2.4 |
|  | **(5)** |  |  |
| **1b** | Makes an attempt to substitute ‘2*n* – 1’ into their expression from **1a**  oe | **M1** | 1.1b | 6thProve general results for the summation of polynomial series |
| Simplifies to obtain  | **A1** | 1.1b |
|  | **(2)** |  |  |
| (7 marks) |
| Notes |
| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **2** | ,  and  | **B1** | 2.2a | 6thProve general results for the summation of more complicated series |
| Assume the general statement is time for *n* = *k*So assume  is true. | **M1** | 2.4 |
| Begins to build an expression for *n* = *k* + 1So, Therefore  | **M1** | 2.1 |
| Multiplies  by  to obtain a common denominator,  | **M1** | 1.1b |
| Attempts to simplify:   | **M1** | 1.1b |
| Demonstrates an understanding of the process of mathematical induction,Then the general statement is true for . As the general result has been shown to be true for  then the general result is true for all  | **A1** | 2.4 |
| (6 marks) |
| Notes |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **3** | Let , whereTherefore,  36 is divisible by 6 | **B1** | 2.2a | 7thProve that given complicated expressions are divisible by certain integers |
| Assume statement is true for *n* = *k*So, assume  is divisible by 6 | **M1** | 2.4 |
| Begins to build an expression for *n* = *k* + 1:  | **M1** | 2.1 |
| Use properties of laws of indices in an attempt to simplify,  | **M1** | 1.1b |
| Recognises the need to find  and simplifies, | **A1** | 1.1b |
| Therefore, f(*n*) is divisble by 6 when *n* = *k* + 1 | **B1** | 2.4 |
| Demonstrates an understanding of the process of mathematical induction,If f(*n*) is divisible by 6 when *n* = *k*, then it has been shown that f(*n*) is also divisible by 6 when *n* = *k* + 1As f(*n*) is divisible by 6 when *n* =1, f(*n*) is also divisible by 6 for all  and  by mathematical induction | **A1** | 2.4 |
| (7 marks) |
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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **4** | Let , where Therefore, 4 is divisible by 4 | **B1** | 2.2a | 7thProve that given complicated expressions are divisible by certain integers |
| Assume statement is true for *n* = *k*So, assume  is divisible by 4 | **M1** | 2.4 |
| Begins to build an expression for *n* = *k* + 1, | **M1** | 2.1 |
| Recognises the need to find  and simplifies, | **M1** | 1.1b |
| Use expression for to find an expression for Therefore,     | **A1** | 1.1b |
| Therefore, f(*n*) is divisible by 4 when *n* = *k* + 1 | **B1** | 2.4 |
| Demonstrates an understanding of the process of mathematical induction: If f(*n*) is divisible by 4 when *n* = *k*, then it has been shown that f(*n*) is also divisible by 4 when *n* = *k* + 1. As f(*n*) is divisible by 4 when *n* = 1, f(*n*) is also divisible by 4 for all  and  by mathematical induction. | **A1** | 2.4 |
| (7 marks) |
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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **5** | Let , where Therefore, 15 is divisible by 3 | **B1** | 2.2a | 6thProve that given simple expressions are divisible by certain integers |
| Assume statement is true for *n* = *k*So, assume  is divisible by 3 | **M1** | 2.4 |
| Begins to build an expression for *n* = *k* + 1,   | **M1** | 2.1 |
| Recognises the need to find  and simplifies,   | **M1** | 1.1b |
| Use expression for to find an expression for ,   | **A1** | 1.1b |
| Therefore f(*n*) is divisible by 3 when *n* = *k* + 1 | **B1** | 2.4 |
| Demonstrates an understanding of the process of mathematical induction,If f(*n*) is divisible by 3 when *n* = *k*, then it has been shown that f(*n*) is also divisible by 3 when *n* = *k* + 1As f(n) is divisible by 3 when *n* = 1, f(*n*) is also divisible by 4 for all  and  by mathematical induction | **A1** | 2.4 |
| (7 marks) |
| Notes |

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| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **6** | Let LHS =  RHS =  As LHS = RHS, the matrix equation is true for *n* = 1. | **B1** | 2.2a | 6thProve results involving powers of matrices using induction |
| Assume statement is true for *n* = *k*.So assume   | **M1** | 2.4 |
| Begins to build an expression for *n* = *k* + 1:    | **M1** | 2.1 |
| Multiplies the matrices together and simplifies.   | **M1** | 1.1b |
| Makes correct conclusionTherefore, the matrix equation is true when   | **B1** | 2.4 |
| Demonstrates an understanding of the process of mathematical induction,If the matrix equation is true for  then it is shown to be true for As the matrix equation is true for  and  by mathematical induction | **A1** | 2.4 |
| (6 marks) |
| Notes |
| Q | Scheme | Marks | AOs | Pearson Progression Step and Progress Descriptor |
| **7a** | Let LHS  RHS  As LHS = RHS, the matrix equation is true for *n* = 1. | **B1** | 2.2a | 6thProve results involving powers of matrices using induction |
| Assume statement is true for *n* = *k*. So assume   | **M1** | 2.4 |
| Begins to build an expression for *n* = *k* + 1:  | **M1** | 2.1 |
| Correctly multiplies the matrices together, but does not have the correct form for the row 2, column 1 expression.  | **M1** | 1.1b |
| Simplifies the  term so that it is in the correct form,  Sates the correct version of , | **M1** | 1.1b |

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|  | Therefore the matrix equation is true when   | **B1** | 2.4 |  |
| Demonstrates an understanding of the process of mathematical induction: If the matrix equation is true for , then it is shown to be true for  As the matrix equation is true for  and  by mathematical induction. | **A1** | 2.4 |
|  | **(7)** |  |  |
| **7b** |   | **A1** | 1.1b | 7thUse matrix proofs to solve problems |
|   | **A2** | 1.1b |
|  | **(3)** |  |  |
| (10 marks) |
| Notes**7b:** 1 mark award for stating  (or dividing each term by ) and 1 mark for switching ‘*a*’ and ‘*d*’ and negating ‘*b*’ and ‘*c*’. |