**Complex numbers using *eiθ***

**In-class investigation**

**Solutions and marking key**

**Question 1(a)(i)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Correctly substitutes for * Simplifies the terms * Identifies the expansion for * identifies the expansion for | 1  1  1  1 |

**Question 1(a)(ii)**

|  |  |
| --- | --- |
| Solution | |
| Replace  with , | |
| Mathematical behaviours | Marks |
| * Correctly substitutes for * Simplifies the terms | 1  1 |

**Question 1(b)**

|  |  |
| --- | --- |
| Solution | |
| Given that  and | |
| Mathematical behaviours | Marks |
| * Recognises the need for addition to obtain * Recognises the need for subtraction to obtain * Correct expressions for  and for | 1  1  1 |

**Question 1(c)(i)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Rewrites the equation in terms of * Solves for | 1  1 |

**Question 1(c)(i)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Rewrites the equation in terms of * Solves for | 1  1 |

**Question 2(a)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Correct modulus * Correct argument | 1  1 |

**Question 2(b)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Correct modulus * Correct argument | 1  1 |

**Question 2(c)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Applies definition of * Expresses  in Cartesian form | 1  1 |

**Question 2(d)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Expresses  in exponential form * Expresses  in exponential form * Applies definition of * Correct real component * Correct imaginary component | 1  1  1  1  1 |

**Question 3(a)(i)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Substitutes  for * Establishes | 1  1 |

**Question 3(a)(ii)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Establishes | 1 |

**Question 3(a)(iii)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Substitutes for  and * Simplifies resulting expression | 1  1 |

**Question 3(b)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Writes expression for * Factorises numerator * Rewrites in terms of and | 1  1  1 |

**Question 3(c)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Substitutes for * Recognises * Establishes | 1  1  1 |

**Question 3(d)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Substitutes  for * Establishes * Establishes | 1  1  1 |

**Question 3(e)**

|  |  |
| --- | --- |
| Solution | |
|  | |
| Mathematical behaviours | Marks |
| * Substitutes for * Applies trig identity * Simplifies to establish | 1  1  1 |