| **Question** | **Scheme** | **Marks** |
| --- | --- | --- |
| **1(a)** |  Let acute angle between  and  |  |
| So,  | M1A1 |
|  |  | **(2)** |
| **1(b)** |  | M1 |
| or  | M1 A1 |
|  |  | **(3)** |
| **1(c)** | ,   | M1 |
|  | dM1 |
|  | A1 |
|  |  | **(3)** |
| **1(d)** |  | M1 |
|  |  | dM1 |
|  | A1 |
|  |  | **(3)** |
|  |  | **(11 marks)** |
| **2(a)** |   | M1 A1 |
|  |  | **(2)** |
| **2(b)** |  | M1 A1ft |
|  or  |  |
|  |  | **(2)** |
| **2(c)** |  |  |
|   or  | B1 |
|   | M1 |
|   |  |
|  Leading to  | M1 A1 |
|  |  | **(4)** |
| **2(d)** |  | M1 |
|   accept awrt 6.8 | A1 |
|  |  |  **(2)**  |
|  |  | **(10 marks)** |
| **3(a)** |   ;  lies on   |  |
| or  | B1 |
|   or  | M1 |
| So,   | A1 **cao** |
|  |  | **(3)** |
| **3(b)** | ,   | M1 |
|  | dM1 |
|  | A1 |
|  |  | **(3)** |
| **3(c)** |  or  |  |
|  | M1 A1 **cao** |
|  |  | **(2)** |
| **3(d)** |  | M1 |
|   | A1 |
|  |  | **(2)** |
| **3(e)** |  |  |
|   | M1 A1 A1 |
|  |  | **(3)** |
|  |  | **(13 marks)** |
| **4(a)** |  **i**:  |  |
|  **j:** Any two equations | M1 |
|  leading to ,  | M1 A1 |
|   *or*  | M1 A1 |
|  **k: ,**  | B1  |
|  (As LHS = RHS, lines intersect)  |  |
|  |  | **(6)** |
| **4(b)** |   | M1 A1 |
|  Acute angle is  awrt 69.1 | A1 |
|  |  | **(3)** |
| **4(c)** |   | B1 |
|  |  | **(1)** |
| **4(d)** | Let *d* be shortest distance from *B* to  |  |
|   | M1 |
|  = awrt 7.5  | A1 |
|   | M1 |
|   awrt 6.99 | A1  |
|  |  |  **(4)** |
|  |  | **(14 marks)** |
| **5(a)** |   | Any two equations.(Allow one slip). | M1 |
| Eg:  or  | An attempt to eliminate one of the parameters. | M1 |
| Leading to  | Either  | A1 |
|  or  | M1 A1 |
|  |  |  **(5)** |
| **5(b)** | ,   | Realisation that the dot product is required between and . | M1 |
|  | Correct **equation**. | A1 |
|  | awrt 69.1 | A1 |
|  |  |  **(3)** |
| **5(c)** |  ,  |  |
|  | M1 A1 |
|  | M1 |
| leading to  |  | A1 |
| Position vector  | M1 A1 |
|  |  |  **(6)** |
|  |  | **(14 marks)** |
| **6(a)** |  |  |
|  | M1 A1 |
|  |  |  **(2)** |
| **6(b)** |  or  | M1 A1ft |
|  |  |  **(2)** |
| **6(c)** | BdlCDBA | Let *d* be the shortest distance from *C* to *l*. |  |
|  | M1 |
| Applies dot product formula between their  and their  | M1 |
| Correct followed through expression or **equation**. | A1 |
|  | awrt 109 | A1 **cso AG** |
|  |  |  **(4)** |
| **6(d)** |  |  | M1 |
| So,  |  | A1 |
|  |  |  |  **(2)** |
| **6(e)** |  |  | M1 dM1 A1 |
|  |  |  |  **(3)** |
| **6(f)** |   or  |  | M1 |
|  | awrt 3.54 | A1 |
|  |  |  **(2)** |
|  |  | **(15 marks)** |
| **7(a)** |  |  |
|  | M1 A1 |
|  |  |  **(2)** |
| **7(b)** |  or  | B1ft |
|  |  |  **(1)** |
| **7(c)** |  | M1 |
| Applies dot product formula between their  and their  | M1 |
|  | A1 cso |
|  |  |  **(3)** |
| **7(d)** |  | Applies dot product formula between their and their  | M1 |
| Correct proof | A1 ft |
|  |  |  **(2)** |
| **7(e)** |  | Either or  | M1 |
|  | At least one set of coordinates are correct.  | A1 ft |
|  | Both sets of coordinates are correct.  | A1 ft |
|  |  |  **(3)** |
| **7(f)** |   |  | M1 |
|  |  or  or or awrt 4.9 or equivalent | A1 oe |
|  |  | dM1 |
|  |  | A1 **cao** |
|  |  |  **(4)** |
|  |  | **(15 marks)** |
| **8(a)** | , ,  |  |
|  |  | Finds the difference betweenand .Ignore labelling. | M1 |
|   |   | Correct difference. | A1 |
|   |  | M1 |
|   |  | A1 **cso** |
|  |  |  **(4)** |
| **8(b)** |  | M1 |
| So,  **cao** | A1 **cao** |
| It follows that,  or  | B1 ft |
| {Note that } |  |
|   or  and  | Uses a correct method in order to find both possible sets of coordinates of *B*. | M1 |
|   | Both coordinates are correct. | A1 **cao** |
|  |  |  **(4)** |
|  |  | **(9 marks)** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Source paper** | **Question number** | **New spec references** | **Question description** | **New AOs** |
| 1 | C4 2015 | 4 | 6.1, 6.3 | Vector equations, scalar products | 1.1b, 3.1a |
| 2 | C4 Jan 2011 | 4 | 6.1, 6.3, 6.4 | Vectors | 1.1b, 2.1 |
| 3 | C4 2017 | 6 | 6.1, 6.3, 6.4 | Vectors | 1.1b, 2.1, 3.1a |
| 4 | C4 2011 | 6 | 6.1, 6.3 | Vector equations of lines and planes, Scalar products | 1.1b, 2.1, 3.1a |
| 5 | C4 Jan 2013 | 7 | 6.1, 6.3, 6.4 | Vector equations of lines and planes, Scalar products | 1.1b, 3.1a |
| 6 | C4 Jan 2012 | 7 | 6.1, 6.3 | Vectors | 1.1b, 2.1, 3.1a |
| 7 | C4 June 2014 | 8 | 6.1, 6.3 | Vector equations, scalar products | 1.1b, 2.1, 3.1a |
| 8 | C4 2013 | 8 | 6.1, 6.3, 6.4 | Vectors | 1.1b, 2.2a, 3.1a |