| **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)** | B    d  l  C    D  B  A | 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)** |

|  |  |  |  |  |  |
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|  | **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 |