**COLLISIONS WITH SURFACES IN 2-DIMENSIONS**

**SOLUTIONS**

|  |  |  |
| --- | --- | --- |
| **1.** |  |  |
|  | First impact:  |  |
|  | Component parallel to wall:  | B1 |
|  | Perp to wall: NLR:  | M1 A1 |
|  |  | A1 |
|  | Second impact:  |  |
|  | parallel to wall vel after  | B1 |
|  | Perp to wall  | B1 |
|  | Direction at  to the wall | B1 |
|  |   or  | M1 |
|  |  or  | A1 |
|  |   | A1  |
|  |  | **[9]** |

|  |  |  |
| --- | --- | --- |
| **2a** | Resolve parallel to barrier - condone sin/cos confusion | M1 |
|  |  | A1 |
|  | Resolve perpendicular to the barrier - condone consistent sin/cos confusion. Use *e* correctly | M1 |
|  |  | A1 |
|  |  | M1 |
|  |  | A1 |
|  |  | (6) |
|  |  |  |
| **b** | Angle of approach with *BC* =  | B1 |
|  |  | M1 |
|  |  | M1 |
|  |  | A1 |
|  |  |  |
|  | Form equation in *v* and  | M1 |
|  |  | A1 |
|  |  | A1 |
|  |  | (7) |
|  |  | [13] |

|  |  |  |
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| **3****alt1** |  |  |
|  | Speed perpendicular to wall after collision =  | B1 |
|  | Speed parallel to the wall is unchanged | B1 |
|  |  | M1 |
| A1 |
|  | , ,  | A1 |
|  | direction deflected by  | M1 |
| A1 |
|  |   (104) | A1[8] |

|  |  |  |
| --- | --- | --- |
| Question Number | Scheme | Marks  |
| **alt2** |  |  |
|  | Speed perpendicular to wall after collision =  | B1 |
|  | Speed parallel to the wall is unchanged | B1 |
|  |  | M1 |
| A1 |
|  | ,  | A1 |
|  | deflected by ,   | M1 |
| A1 |
|  |   (104)  | A1[8] |