Answer on Question # 69212, Physics – Mechanics - Relativity :

Question: An object of m kg with speed of v m/s strikes a wall at an angle and rebounds at the same speed and same angle. What is the magnitude of the change in momentum of the object.

Solution: Let the object strikes the wall at an angle Θ.

When the object of mass m with a speed v strikes the wall, then momentum will be

$P = mv \sin\Theta\, i - mv \cos\Theta\, j$

[i and j are the unit vectors along the direction of x and y direction respectively.]

So, when it rebounds at same speed and same angle , then momentum will be

$Q = mv \sin\Theta\, i + mv \cos\Theta\, j$

So, change in momentum = $Q - P = 2mv \cos\Theta\, j$ [j is unit vector along y direction.]

So , the magnitude of change in momentum is $2mv \cos\Theta$.