Flipping Physics Lecture Notes:

Angular Momentum of Particles Introduction

We have already worked with the angular momentum of rotating objects like records, spinning tops, and merry-go-rounds. Because those objects are rotating, it is probably clear they have angular momentum. Today we are going to show that an object which is moving in a straight line can also have angular momentum.

You really need to watch the video at http://www.flippingphysics.com/angular-momentum-particles.html

The equation for angular momentum of a rigid object with shape is: $\vec{L} = I\vec{\omega}$

Because the wooden board is not moving before the collision with the point particle, the board has an angular velocity of zero and therefore an angular momentum of zero before the collision. After the collision, the wooden board does have an angular velocity and therefore angular momentum. Because the wooden board has gained angular momentum, that angular momentum must have come from somewhere. The explanation is that the point particle, which was moving in a straight line, transferred some of its angular momentum to the wooden board. Therefore, the point particle, which was moving in a straight line, has angular momentum.

The equation for the magnitude of the angular momentum of a point particle is: $L = rmv\sin\theta$
In the video we give evidence that this equation is correct.

- r is the vector pointing from the axis of rotation to the center of mass of the point particle.
- m is the mass of the point particle.
- v is the velocity of the point particle.
- θ is the angle between the direction of the r vector and the velocity of the point particle.

Please realize angular momentum is still about an axis of rotation and you need to identify the axis of rotation when using the equation for the angular momentum of a point particle.

Angular momentum is a vector and the way you determine the direction of the angular momentum of a point particle is by using the right hand rule. Fingers of your right hand start at the axis of rotation, point your fingers in the direction of "r", curl your fingers in the direction of the velocity, and stick out your thumb. Your thumb points in the direction of the angular momentum of the point particle.