

We will now introduce a new kinematic quantity called angular momentum.

Angular momentum will be very useful when we describe the rotation and objects.

In particular, how will it be related to torque.

Now, what is angular momentum?

Suppose we have an object of mass m .

And it's moving in this direction.

And it has momentum p .

Remember, p equals mv .

Angular momentum is always defined about some point.

So suppose we choose a point s , and I wanted to find the angular momentum about s due to this motion of the object.

And the way it's defined is I'll draw a vector from the point s to where the object is.

And our definition of angular momentum about s is equal-- this is three lines for our definition-- it's the vector cross product of the vector rs .

We have the vector p .

Now, how do we define the direction of this vector?

Well, the way we do that for any vector product is we take the two vectors and we put them tail to tail.

So let's start off by drawing the vector rs in that direction.

And now when you take a cross product, we draw an arrow from the first vector to the second one.

Remember, cross in vector products are the same thing.

And now we want to use our right hand rule to get the direction of the angular momentum.

So we curl our fingers.

And notice in this case, it's pointing into the plane of the figure.

And so the direction of the angular momentum about s is given into the plane of the figure in our light board.

Now, we'll learn how to calculate this cross product in detail.

But suppose we have our vectors which are in a slightly different arrangement as seen in this figure here.

Well, what we see is with the vector p and the vector r_s , we still use our right hand rule to calculate the direction of L_s .

Notice, whenever you have a vector cross product, that the vector L_s is perpendicular to both the vectors r_s and is perpendicular to the vector p .

And you can see in both of these examples that the angular momentum is perpendicular to the plane formed by the vectors r_s and p .