Here, we will talk about in the calculation of angular momentum.

People often forget that angular momentum can be calculated for any object, even for an object that's traveling in a straight line and not rotating at all.

For example, here I have an object with mass m moving at a speed v along a street line.

Another important thing to keep in mind is that angular momentum does not have a definite value.

It depends on the choice of origin, which is arbitrary, although some choices are easier to calculate or more useful than others.

Here, I will choose this completely random point to be my origin.

Notice that it can be any point in space.

Angular momentum is a lot like torque.

They both involve a cross product of a distance vector with another vector.

For angular momentum, it's the distance vector r, the vector from the origin to the object, cross p, the momentum of the object, or mv.

Once again, we can write the magnitude of this cross-product as r times mv times the size of the theta between the two.

But it's often more helpful to think about this as r times sine theta times mv.

In other words, the r sine theta is the component of the position vector that's perpendicular to the direction of the momentum.

Let's practice with a few other examples.

If I have a ball moving up and I have my origin at the side, then this is the perpendicular distance.

So the angular momentum is r perpendicular times mv.

A reference point that's the same horizontal distance away from the object will see the same angular momentum.

Notice that in this case, the angular momentum is not changing as the ball moves, because the perpendicular distance is not changing with time.

In this case, if the ball is moving at an angle, we again, have to take the perpendicular component of the position vector to find the angular momentum.

This second reference point is now a different distance away.

So the angular momentum is larger.

Now, let's talk about the sign of angular momentum.

You can calculate the sine of a cross product with the right hand rule.

Make sure your vectors are tail to tail when you compare the directions.

So in this case, we have that r cross v points into the page.

In the case of circular motion, r and v are always perpendicular.

So we can just multiply the magnitudes together.

And the sine tells us which way we're going around the circle.

If we consider out of the page to be positive and the angular momentum is positive, then the object is circulating counter-clockwise.

If the angular momentum is negative, the object is circulating clockwise.