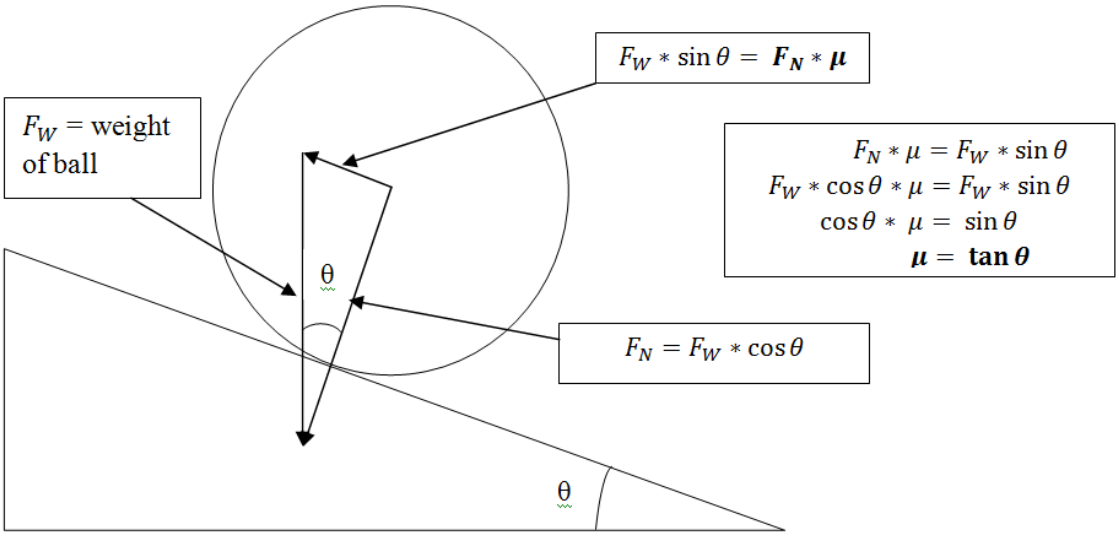
Shooter Wheel Friction

In order to determine the tread pattern that we would use on our robot's shooter wheel, we decided to create a test setup and collect hard data before we went and messed with the actual mechanism. Physics tells us that an object that exerts a normal force F_W on the surface it sits on and possesses a coefficient of friction μ with that surface requires F_W*μ force to move it sideways on that surface. We were able to generalize this to a Rebound Rumble ball sitting on a slanted surface.



We conducted the experiment by creating a friction test plate with the tread pattern that we thought was best. We weighted the test plate down until it compressed the ball the same amount as the shooter hood. Then, we tilted the ball with the friction plate resting on top until the plate slipped, measuring the angle at which this event occurred. From that angle θ, we were able to find the coefficient of friction between the ball and the test surface simply because the coefficient of friction is equal to the tangent of θ. From our tests, we concluded that 1/16 in. deep grooves with a ¼ in. width and ¼ in. spacing apart resulted in a coefficient of friction with the ball of 0.83, an increase of 97% over bare aluminum and more than adequate to give our shooter the capability to fire from the key.