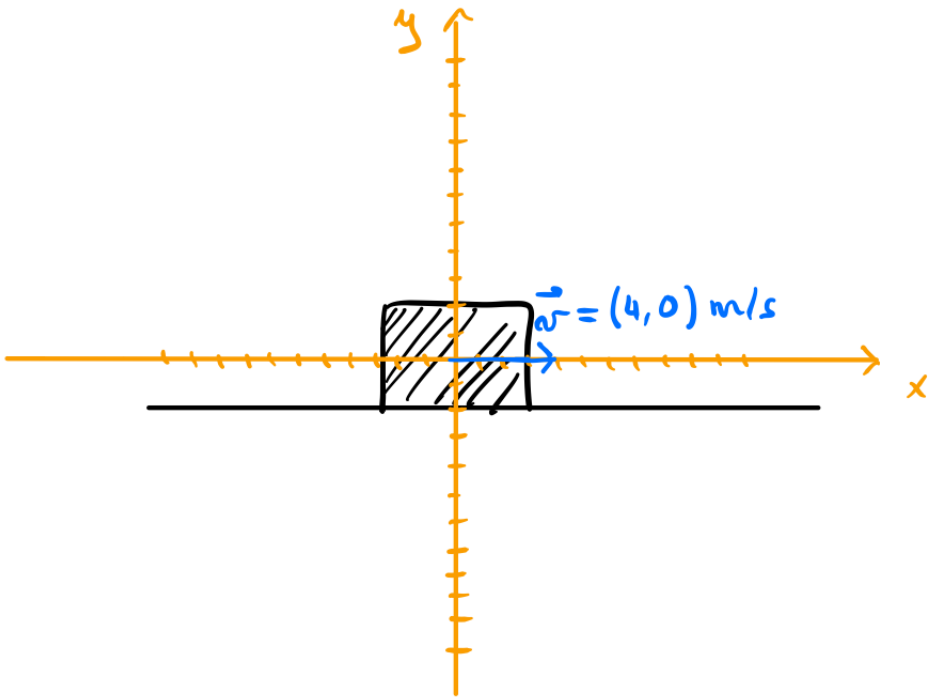
Today's worksheet consists of a few questions related to the concepts covered in Lecture 8.

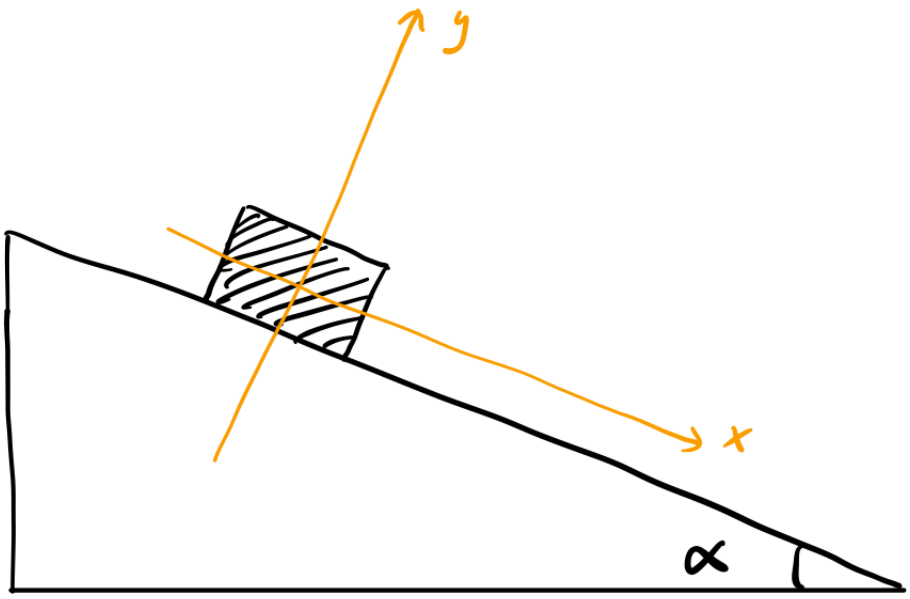
1. If a constant force of (5,0,0) N is applied to a mass of 5 kg. What will be the equations for the acceleration, velocity and position of this object? Write them down.

2. What should the sum of all forces, i.e $\vec{F}_{\text{total}}$, be on an object if the object is moving at a constant velocity? (Hint: you can use the second law to deduce the answer)

3. The figure below represents a wooden block of mass $m = 1$ kg moving at a constant velocity horizontally on the surface of the earth. Assuming there is a friction force of $\vec{F}_{friction} = (-8, 0, 0)$ N, draw all arrows corresponding to each force acting on the object and label them (e.g. $\vec{F}_{\text{gravity}}$, $\vec{F}_{\text{Normal}}$, $\vec{F}_{\text{friction}}$, $\vec{F}_{\text{pull}}$). The length and direction of these arrows should match the actual value of the forces. (Draw all force vectors starting at the center of the block)




4. Solve the motion of a block of mass $m = 1$ kg and initial velocity $\vec{v_0} = (-10, 0)$ m/s falling on an inclined plane with angle $\alpha = 30$ degrees and kinetic friction coefficient of $\mu_k = 0.2$.The starting point should be writing down expressions for all the forces acting on the object with respect to the given frame of reference. The ending point should be the formulas for the position, velocity and acceleration as a function of time. Try to simplify everything so that the only independent variable is time. Once you have these equations, use the equation for the velocity to calculate the time at which the velocity is zero (this is the time when the object reaches its maximum height on the plane).


y
x
α

5. Using this simulator https://ophysics.com/f2.html set up all the parameters to equal the ones in problem 4 and see how the motion looks like. Using the data from the simulator, record what the time reads when the velocity is zero. DO you get the same value as what you got in problem 4? Why?
   Record a clip (video) of the motion and upload it with the rest of the worksheet.