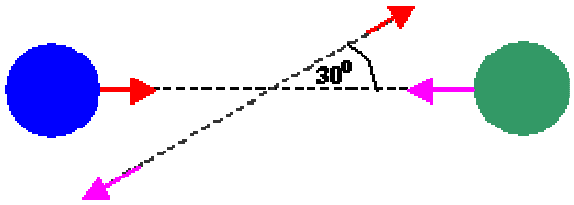
# Problem Sistem Partikel

1. a. A 90kg fullback running east with a speed of 5 m/s is tackled by a 95 kg opponent running north with a speed of 3 m/s. If the collision is perfectly inelastic, calculate the speed and the direction of the players just after the tackle.

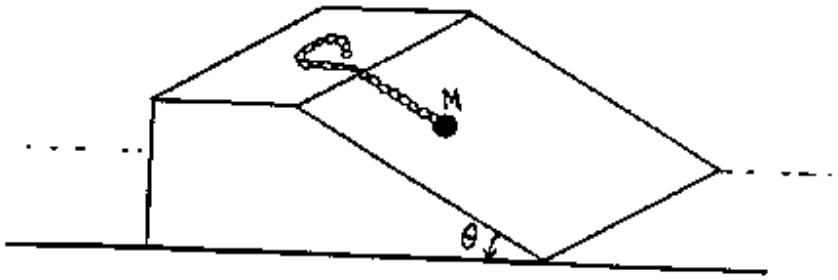
Answer: $\theta = 32.34^{o}$ with the x-axis

b. The mass of the blue puck is 20% greater than the mass of the green one. Before colliding, the pucks approach each other with equal and opposite momenta, and the green puck has an initial speed of 10 m/s. Find the speed of the pucks after the collision, if half the kinetic energy is lost during the collision.




Answer: $v_1' = 7.07$ m/s, $v_2' = 5.89$ m/s

2. A body of mass M slides down a frictionless inclined plane of angle $\theta$, starting from the top. To the body a chain is attached which is coiled at the top of the incline and for which the weight per unit length is r. By taking into account the uncoiling of the chain, derive the equation for the velocity of the system as a function of the distance traveled along the incline.

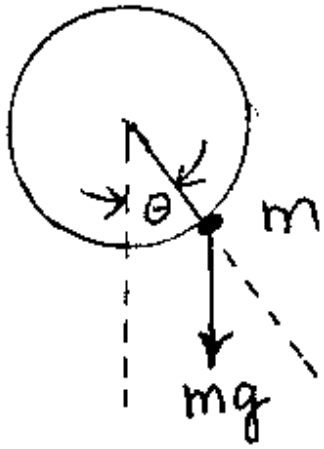



**Answer:** $v^2 = 2g\sin\theta\,(rx + Mg)/(3r) - 2g^4M^3\sin\theta/[3r(rx + Mg)^2]$

# Problem Gerak Rotasi Benda-1

A uniform circular disk of radius a and mass nm rotates without friction about a fixed axis through its center. Initially, an insect of mass m is at the lowest point of the disk and the system is at rest. The insect begins to crawl along the circumference of the disk with a velocity V relative to the disk and at any time is at an angle $\theta$ relative to the vertical line through the axis of the disk.

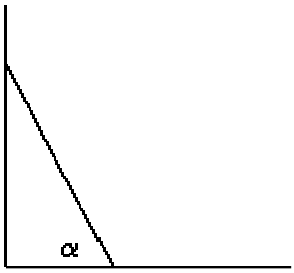
(a) Find the initial value of $d\theta/dt$.
(b) The insect continues to crawl at a constant speed relative to the disk. Show that, if the insect is to reach the top of the disk, that $V^2 > 8(n + 2)ga/n^2$.




Answer: (a) $Vn/[(n+2)a]$

A uniform ladder of mass M and length l slides without friction from wall or floor.

- (a) Set up the second order differential equation of motion, assuming the ladder remains in contact with the wall.
- (b) If the ladder is initially at rest at an angle $a_0$ with the floor, at what angle, if any, will it break contact with the wall?



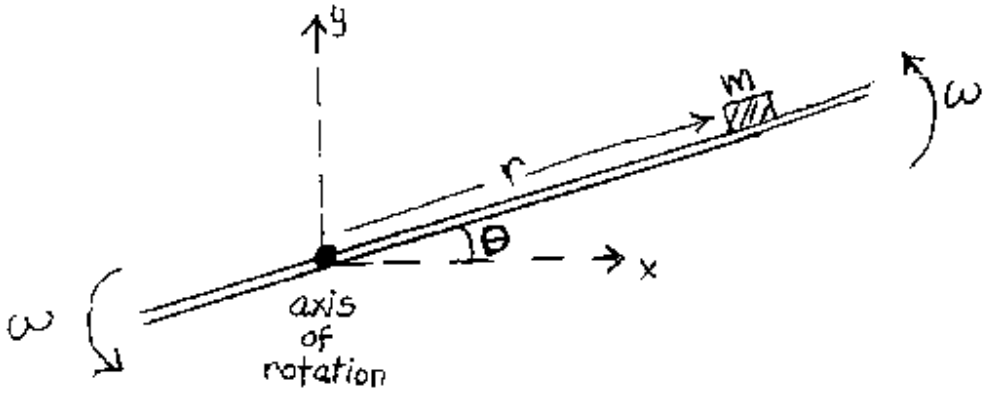

**Answer: (a)** $\ddot{\alpha} = -\frac{3g\cos\alpha}{2l}$ **dan (b)** $3Sin(\alpha) = 2Sin(\alpha_o)$

# Problem Gerak Rotasi Benda-2

## Soal Fowles (new edition) 9.1, 9.3, 9.5, 9.7 dan 9.8.

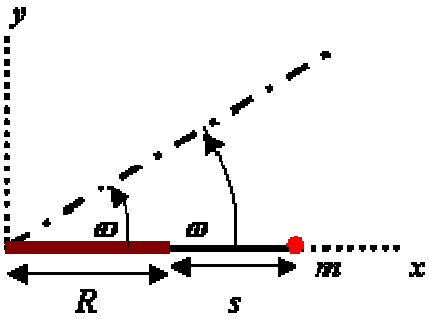
# Problem Mekanika Lagrange

1. An infinitely long rod is being rotated in a vertical plane at a constant angular velocity w about a fixed horizontal axis (the z-axis) passing through the origin. There is a mass m on the rod. The mass m is free to slide along the rod. Neglect friction. Hint: Recall that in plane polar coordinates the unit vectors $\hat{r}$ and $\hat{\theta}$ are not constant.




Answer: $\ddot{r} = r\omega^2 - g\sin(\omega t)$

2. A massless rod of length R is caused to rotate about one end in the x-y horizontal plane at constant angular frequency w. A massless string of length s is tied to the other end of the rod, and a point mass m is attached to the far end of the string. At time t = 0, both the rod and the string lie on the x-axis, and m is given a velocity w(R + s) along the y-axis. Suppose that the mass is given an initial velocity that is in the y-direction, but slightly different from w(R + s) in magnitude. Show that the mass will execute simple harmonic motion about a line, which is an extension of the rod. Find the frequency of the oscillation. Use the small angle approximation freely.




Answer: $\omega' = \omega\sqrt{\frac{R}{s}}$

# PENGUMUMAN

**BAGI MAHASISWA YANG MENGONTRAK MEKANIKA**

**RESPONSI AKAN DIADAKAN PADA HARI KAMIS, 27 DESEMBER 2007 JAM 08.00 S.D SELESAI**

**TES UNIT III AKAN DIADAKAN HARI SABTU, 29 DESEMBER 2007 JAM 08.00-10.30 DENGAN MATERI SISTEM PARTIKEL, GERAK ROTASI BENDA TEGAR DAN MEKANIKA LAGRANGE**

**DEMIKIAN AGAR MENJADI MAKLUM**