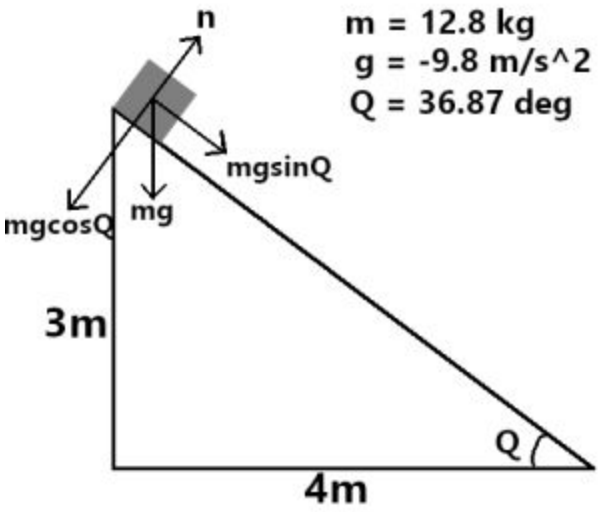
Assignment 2 Math

Calculating Angle of Incline



$cos\theta = 4 / 5$
$\theta = cos^{-1}(4 / 5)$
$\theta = 36.87$

Calculating Acceleration along X

$ma_x = mgsin\theta$
$a_x = 9.8 * sin(36.87)$
$a_x = 5.88$

∴ The acceleration on the x axis is 5.88 m/s.

Calculating Net Force on Ramp

$\Sigma Fx = ma_x$
$\Sigma Fx = 12.8 * 5.88$
$\Sigma Fx = 75.264N$

$\Sigma Fy = n - mg\,cos\theta = 0$

$\Sigma Fn = Fx + Fy$
$\Sigma Fn = 75.264N$

∴ The net force acting on the cube is 75.264 Newtons.

Calculating Velocity at end of Ramp

$S_f = S_i + V_i t + \frac{1}{2}at^2$
$5 = 0 + 0 + \frac{1}{2}(5.88)t^2$
$5 = 2.94t^2$
$\frac{5}{2.94} = t^2$
$\sqrt{1.7} = t$
$1.304 = t$

$V_f = V_i + at$

$V_f = 0 + 5.88(1.304)$

$V_f = 7.668$

∴ the velocity at the bottom of the ramp is 7.668 m/s

Calculating New Acceleration

$\Sigma Fx = -f_k = ma_x$

$-\mu_k n = -\mu_k mg = ma_x$

$a_x = -\mu_k g$

$a_x = -0.42 * 9.8 = -4.116$

∴ after the cube exits the ramp onto the friction surface, the new acceleration is -4.116m/s

Calculating New Net Force

$\Sigma Fx = ma_x$

$\Sigma Fx = 12.8 * -4.116$

$\Sigma Fx = -52.68N$

$\Sigma Fy = n - mg = 0$

$\Sigma Fn = Fx + Fy$

$\Sigma Fn = -52.68N$

Calculating Distance Travelled on Ground

$\mu_k = Vxi^2 / 2gx_f$

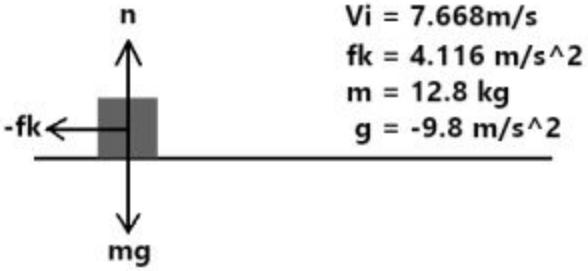
$0.42 = 58.798 / 2 * 9.8 \ x_f$

$0.42 = 58.798/19.6 \ x_f$

$8.232 \ x_f = 58.798$

$x_f = 7.143$

∴ The cube travels 7.143m on the ground before stopping.



Calculating Length of Time until Stop

$V_f = V_i + at$

$0 = 7.668 + -4.116t$

$4.116t = 7.668$

$t = 1.863$

∴ the cube travels for 1.863 seconds before stopping.