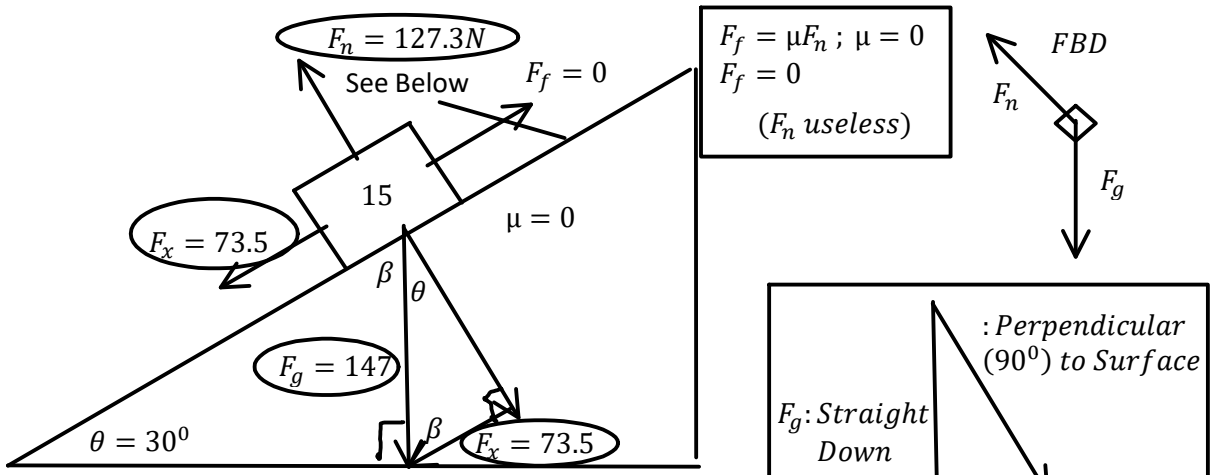
P12 - 3.6 - Dynamics Fric Slope Notes

What is the acceleration of a 15 *kg block sliding down a* 30^0*slope? Ignore Friction.*

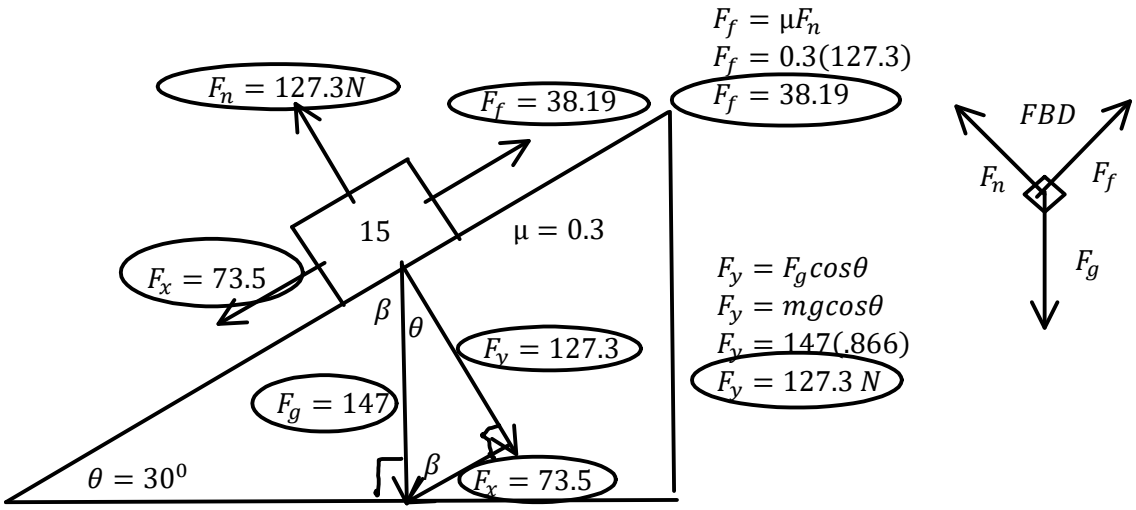


$F_g = mg$
$F_g = 15(9.8)$
$F_g = 147$

$F_x = F_g sin\theta$
$F_x = mgsin30$
$F_x = 147(.5)$
$F_x = 73.5$

$F = ma$
$F_x - F_f = ma$
$73.5 - 0 = 15a$
$a = 4.9 \frac{m}{s^2}$

What is the acceleration of a 15 *kg block sliding down a* 30^0*slope with* $\mu = 0.3$.

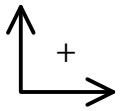


$F_g = mg$
$F_g = 15(9.8)$
$F_g = 147$

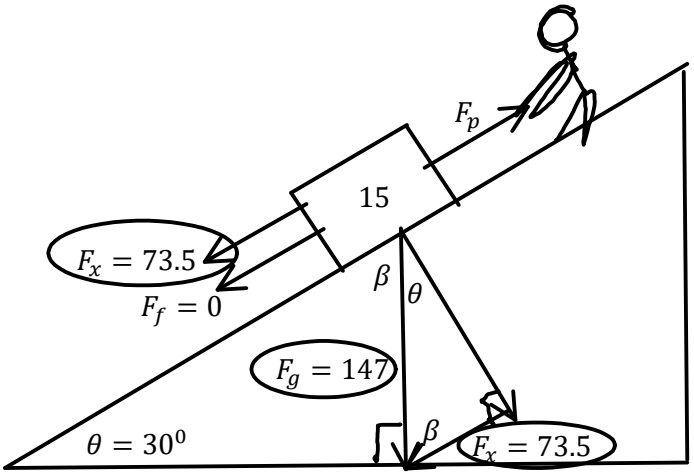
$F_x = F_g sin\theta$
$F_x = mgsin30$
$F_x = 147(.5)$
$F_x = 73.5$

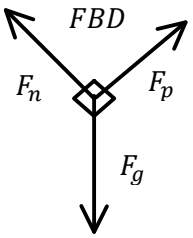
$F = ma$
$F_x - F_f = ma$
$73.5 - 38.19 = 15a$
$a = 2.35 \frac{m}{s^2}$

P12 - 3.6 - Dynamics Pull Fric Slope Notes



How much force is required to accelerate a 15 *kg object at* $2\frac{m}{s^2}$ *up a slope* 30^0 *with* $\mu = 0$?



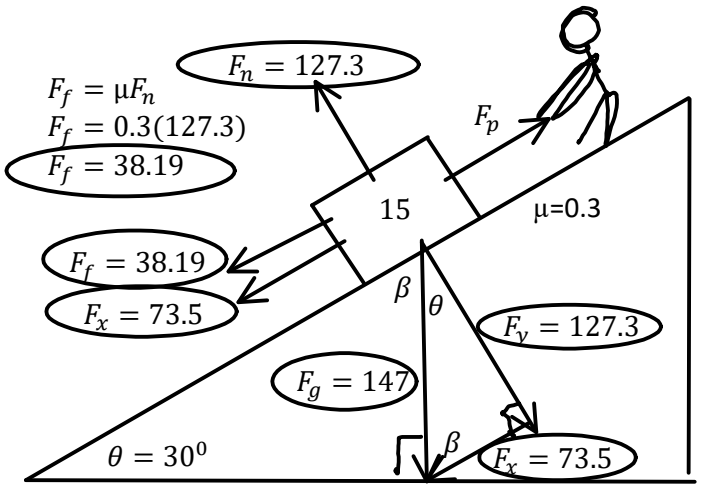


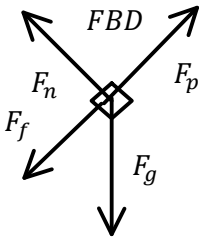
$F_g = mg$
$F_g = 15(9.8)$
$F_g = 147$

$F_x = F_g sin\theta$
$F_x = mgsin30$
$F_x = 147(.5)$
$F_x = 73.5$

$F = ma$
$F_p - F_x - F_f = ma$
$F_p - 73.5 = 15(2)$
$F_p = 103.5\ N$

How much force is required to accelerate a 15 *kg object at* $2\frac{m}{s^2}$ *up a slope* 30^0 *with* $\mu = 0.3$?





$F_y = F_g cos\theta$
$F_y = mgcos\theta$
$F_y = 147(.866)$
$F_y = 127.3\ N$

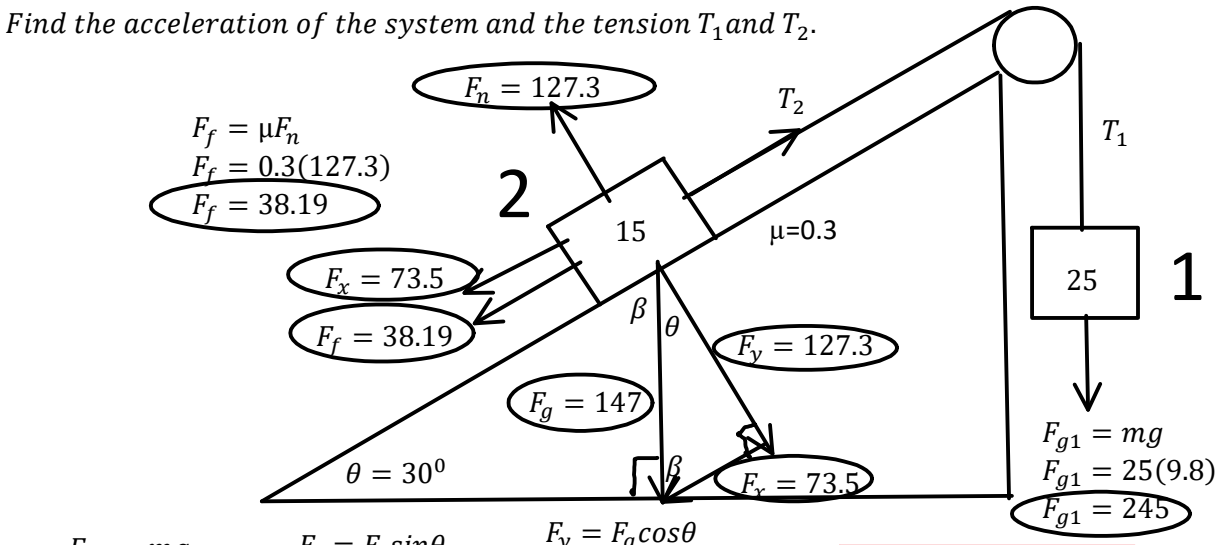
$F_g = mg$
$F_g = 15(9.8)$
$F_g = 147$

$F_x = F_g sin\theta$
$F_x = mgsin30$
$F_x = 147(.5)$
$F_x = 73.5$

$F = ma$
$F_p - F_x - F_f = ma$
$F_p - 73.5 - 38.19 = 15(2)$
$F_p = 141.69\ N$

P12 - 3.6 - Dynamics Pulley Fric Up Slope Notes

Find the acceleration of the system and the tension T_1 and T_2.



$F_{g2} = mg$
$F_{g2} = 15(9.8)$
$F_{g2} = 147$

$F_x = F_g sin\theta$
$F_x = mgsin30$
$F_x = 147(.5)$
$F_x = 73.5$

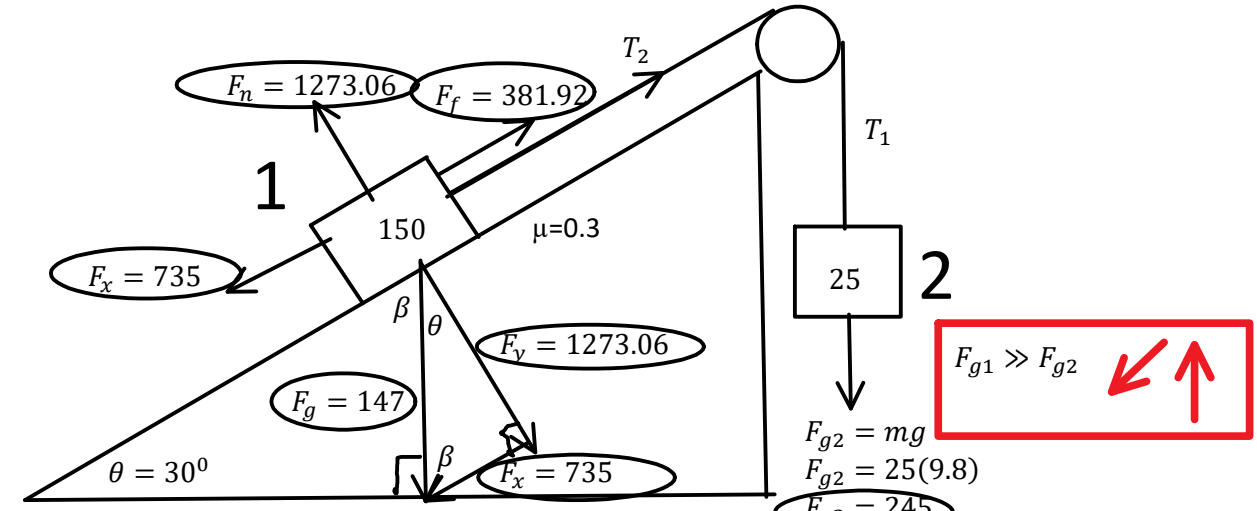
$F_y = F_g cos\theta$
$F_y = mgcos\theta$
$F_y = 147(.866)$
$F_y = 127.3\ N$

$F_{g1} > F_{g2}$

$F = ma$
$F_{g1} - T_1 + T_2 - F_x - F_f = ma$
$245 - 73.5 - 38.19 = 40a$
$a = 3.3 \frac{m}{s^2}$

Mass 2
$F = ma$
$T_2 - F_x - F_f = ma$
$T_2 - 73.5 - 38.19 = 15 \times 3.3$
$T_2 = 161.19\ N$

Mass 1
$F = ma$
$Fg - T_1 = ma$
$245 - T_1 = 25 \times 3.3$
$T_1 = 162.5\ N$



$F_{g1} \gg F_{g2}$

$F_{g1} = mg$
$F_{g1} = 150(9.8)$
$F_{g1} = 1470$

$F_x = F_g sin\theta$
$F_x = mgsin30$
$F_x = 1470(.5)$
$F_x = 735$

$F_y = F_g cos\theta$
$F_y = mgcos\theta$
$F_y = 1470(.866)$
$F_y = 1273.06\ N$

$F_f = \mu F_n$
$F_f = 0.3(1273.06)$
$F_f = 381.92$

$F = ma$
$F_x - F_f - T_2 + T_1 - F_{g2} = ma$
$735 - 381.92 - 245 = 40a$
$F_p = 2.7\ N$

Mass 1
$F = ma$
$F_x - F_f - T_2 = ma$
$735 - 381.92 - T_2 = 15(2.7)$
$T_2 = 313.5\ N$

Mass 2
$F = ma$
$T_2 - F_g = ma$
$T_2 - 245 = 25(2.7)$
$T_1 = 312.5\ N$