

P12 - 3.6 - Dynamics Fric Slope Notes

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

$F_f = \mu F_n; \mu = 0$
 $F_f = 0$
 (F_n useless)

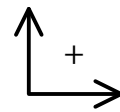
F_g : Straight Down
 F_n : Perpendicular (90°) to Surface

$F_g = mg$	$F_x = F_g \sin \theta$	$F = ma$
$F_g = 15(9.8)$	$F_x = mg \sin 30$	$F_x - F_f = ma$
$F_g = 147$	$F_x = 147(.5)$	$73.5 - 0 = 15a$
	$F_x = 73.5$	$a = 4.9 \frac{m}{s^2}$

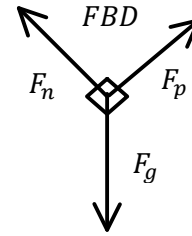
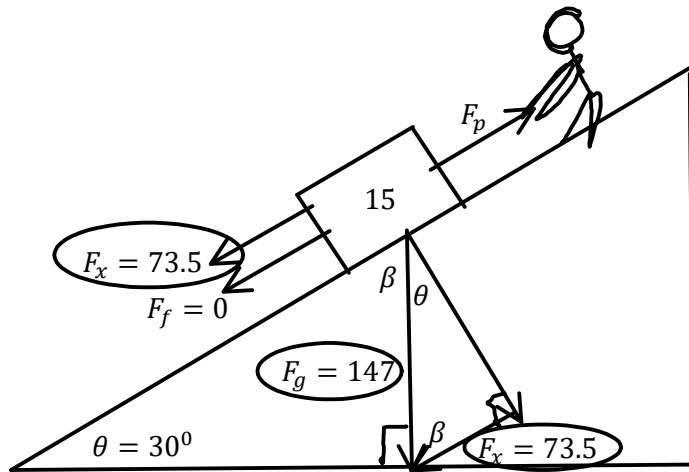
What is the acceleration of a 15 kg block sliding down a 30° slope with $\mu = 0.3$.

$F_g = mg$	$F_x = F_g \sin \theta$	$F = ma$
$F_g = 15(9.8)$	$F_x = mg \sin 30$	$F_x - F_f = ma$
$F_g = 147$	$F_x = 147(.5)$	$73.5 - 38.19 = 15a$
	$F_x = 73.5$	$a = 2.35 \frac{m}{s^2}$

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° with $\mu = 0$?



$$F_g = mg$$

$$F_g = 15(9.8)$$

$$F_g = 147$$

$$F_x = F_g \sin \theta$$

$$F_x = mg \sin 30$$

$$F_x = 147(.5)$$

$$F_x = 73.5$$

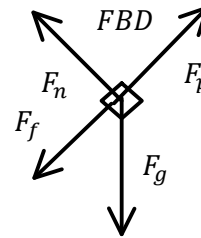
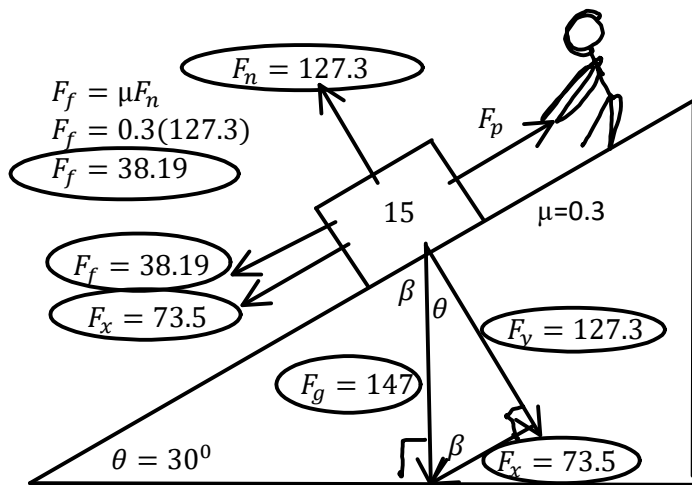
$$F = ma$$

$$F_p - F_x - \cancel{F_f} = ma$$

$$F_p - 73.5 = 15(2)$$

$$F_p = 103.5 \text{ N}$$

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



$$F_f = \mu F_n$$

$$F_f = 0.3(127.3)$$

$$F_f = 38.19$$

$$F_f = 38.19$$

$$F_x = 73.5$$

$$F_g = 147$$

$$F_y = 127.3$$

$$F_y = F_g \cos \theta$$

$$F_y = mg \cos \theta$$

$$F_y = 147(.866)$$

$$F_y = 127.3 \text{ N}$$

$$F_g = mg$$

$$F_g = 15(9.8)$$

$$F_g = 147$$

$$F_x = F_g \sin \theta$$

$$F_x = mg \sin 30$$

$$F_x = 147(.5)$$

$$F_x = 73.5$$

$$F = ma$$

$$F_p - F_x - F_f = ma$$

$$F_p - 73.5 - 38.19 = 15(2)$$

$$F_p = 141.69 \text{ N}$$

P12 - 3.6 - Dynamics Pulley Fric Up Slope Notes

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

$F_f = \mu F_n$
 $F_f = 0.3(127.3)$
 $F_f = 38.19$

$F_n = 127.3$
 $F_x = 73.5$
 $F_f = 38.19$
 $F_g = 147$
 $F_y = 127.3$
 $F_x = 73.5$
 $\theta = 30^\circ$
 $\mu = 0.3$

$F_{g1} = mg$
 $F_{g1} = 25(9.8)$
 $F_{g1} = 245$

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

$F_x = F_g \sin \theta$
 $F_x = mg \sin 30$
 $F_x = 147(.5)$
 $F_x = 73.5$

$F_y = F_g \cos \theta$
 $F_y = mg \cos \theta$
 $F_y = 147(.866)$
 $F_y = 127.3 \text{ N}$

$F_{g1} > F_{g2}$

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

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

Mass 2
 $F = ma$
 $T_2 - F_g = ma$
 $T_2 - 245 = 15(2.7)$
 $T_2 = 313.5 \text{ N}$

Mass 1
 $F = ma$
 $T_1 - F_g = ma$
 $T_1 - 245 = 25(2.7)$
 $T_1 = 312.5 \text{ N}$

$F_n = 1273.06$
 $F_f = 381.92$
 $F_x = 735$
 $F_g = 1470$
 $F_y = 1273.06$
 $F_x = 735$
 $\theta = 30^\circ$
 $\mu = 0.3$

$F_{g2} = mg$
 $F_{g2} = 25(9.8)$
 $F_{g2} = 245$

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

$F_x = F_g \sin \theta$
 $F_x = mg \sin 30$
 $F_x = 1470(.5)$
 $F_x = 735$

$F_y = F_g \cos \theta$
 $F_y = mg \cos \theta$
 $F_y = 1470(.866)$
 $F_y = 1273.06 \text{ N}$

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

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

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

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

Mass 1
 $F = ma$
 $T_1 - F_g = ma$
 $T_1 - 245 = 25(2.7)$
 $T_1 = 312.5 \text{ N}$