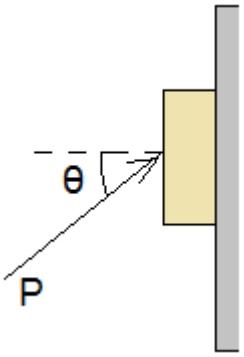
Answer on Question #64160, Physics / Mechanics | Relativity

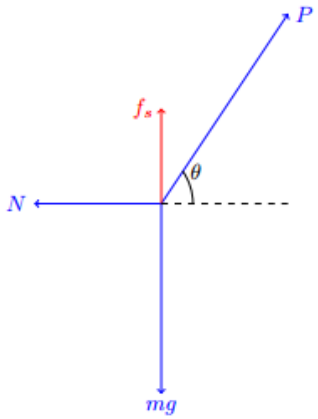
The coefficient of friction between the wall and the weight shown in the figure is 0.25. What force P is necessary to keep the body in place? What force P will keep the body moving up uniformly?

Solution:



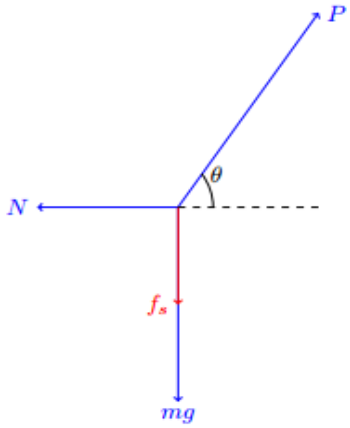
We will draws two free body diagrams for this problem

To keep the body in place



$\sum F_x = 0$
$\sum F_y = 0$
$N = P \cos\theta$
$P \sin\theta + f_s - mg = 0$
with $f_s = \mu_s N$
$mg = P \sin\theta + P\mu_s \cos\theta$
$mg = P(\sin\theta + \mu_s \cos\theta)$
$P = mg / (\sin\theta + \mu_s \cos\theta)$
$P = mg / (\sin\theta + 0.25 \cos\theta)$

The body moving up



$\sum F_x = 0$
$\sum F_y = 0$
$N = P \cos\theta$
$P \sin\theta - mg - f_s = 0$
with $f_s = \mu_s N$
$mg = P \sin\theta - P\mu_s \cos\theta$
$mg = P(\sin\theta - \mu_s \cos\theta)$
$P = mg / (\sin\theta - \mu_s \cos\theta)$
$P = mg / (\sin\theta - 0.25 \cos\theta)$

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