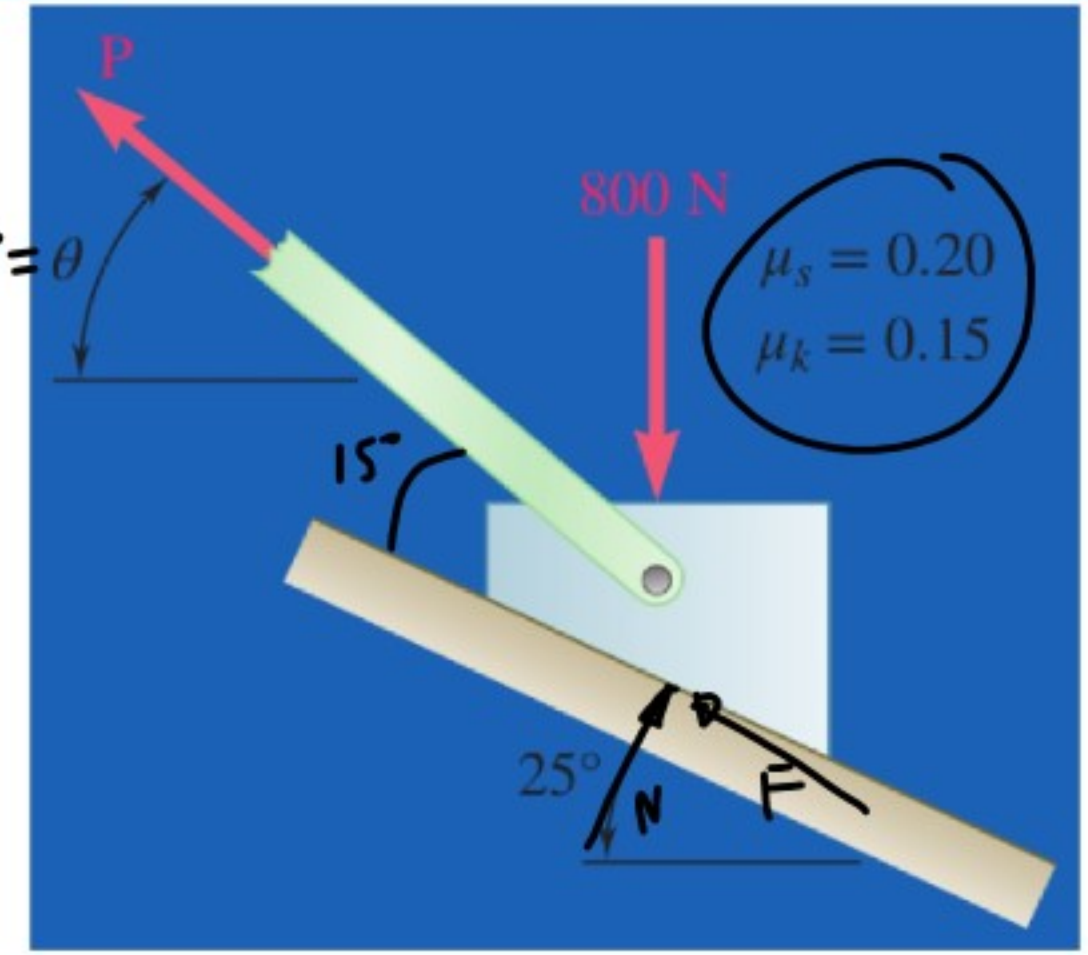
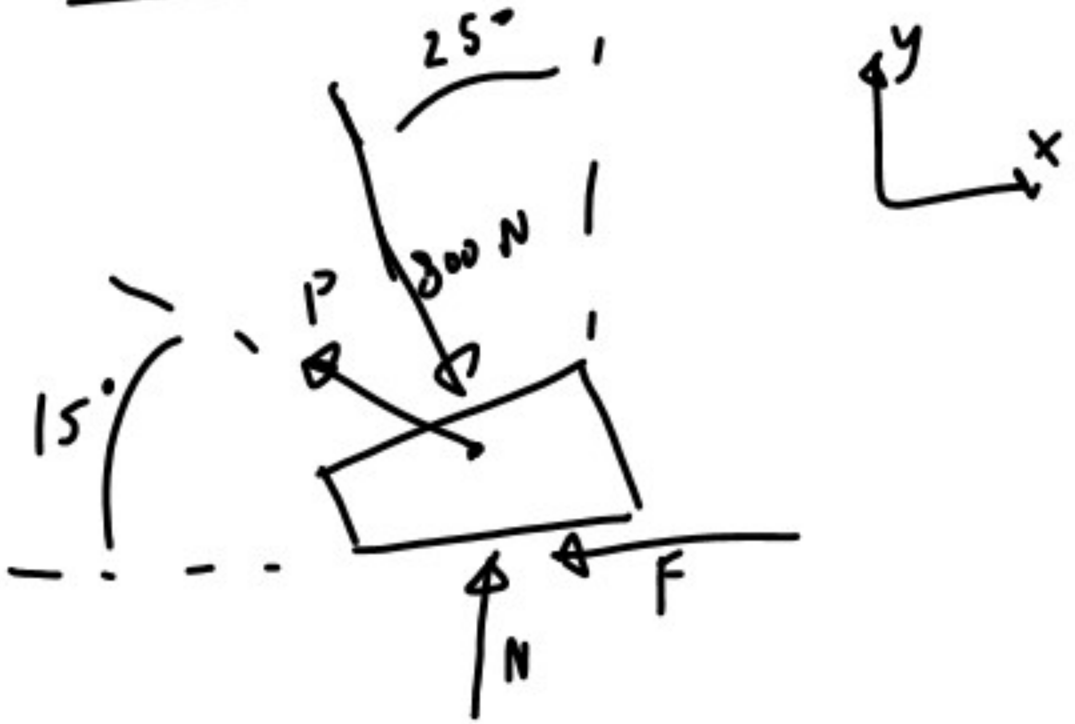
Determine whether the block shown is in equilibrium and find the magnitude and direction of the friction force when $\theta = 40°$ and $P = 400$ N.

$90° = \theta$





$\Sigma F_x = 0$

$-F - P\cos 15 + 800\sin 25 = 0$

$-P\cos 15 + 800\sin 25 = F$

$-400\cos 15 + 800\sin 25 = -48$ N

$\Sigma F_y = 0$

$N + P\sin 15 - 800\cos 25 = 0$

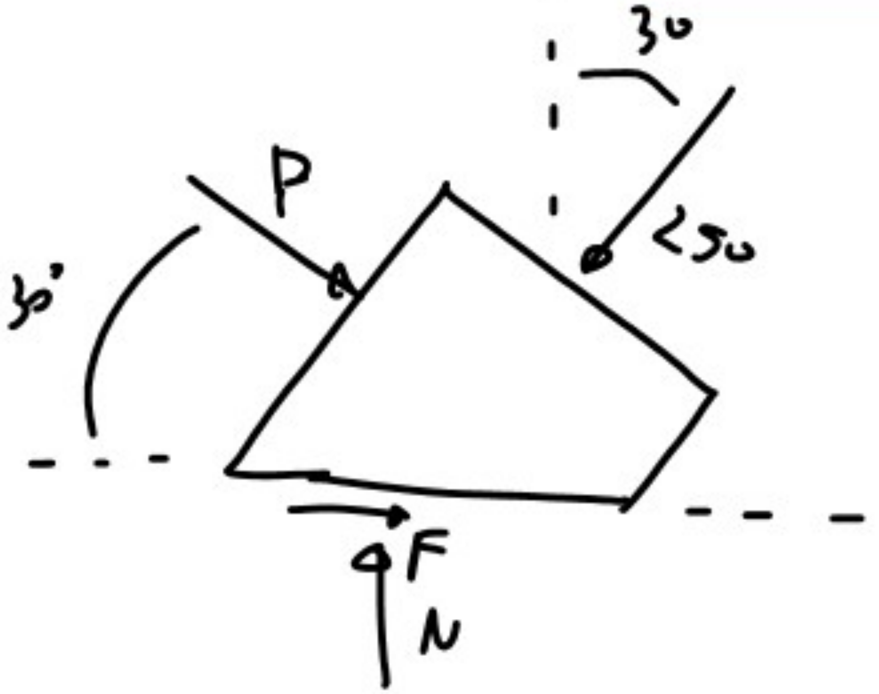
$N = 800\cos 25 - 400\sin 15 = 622$ N

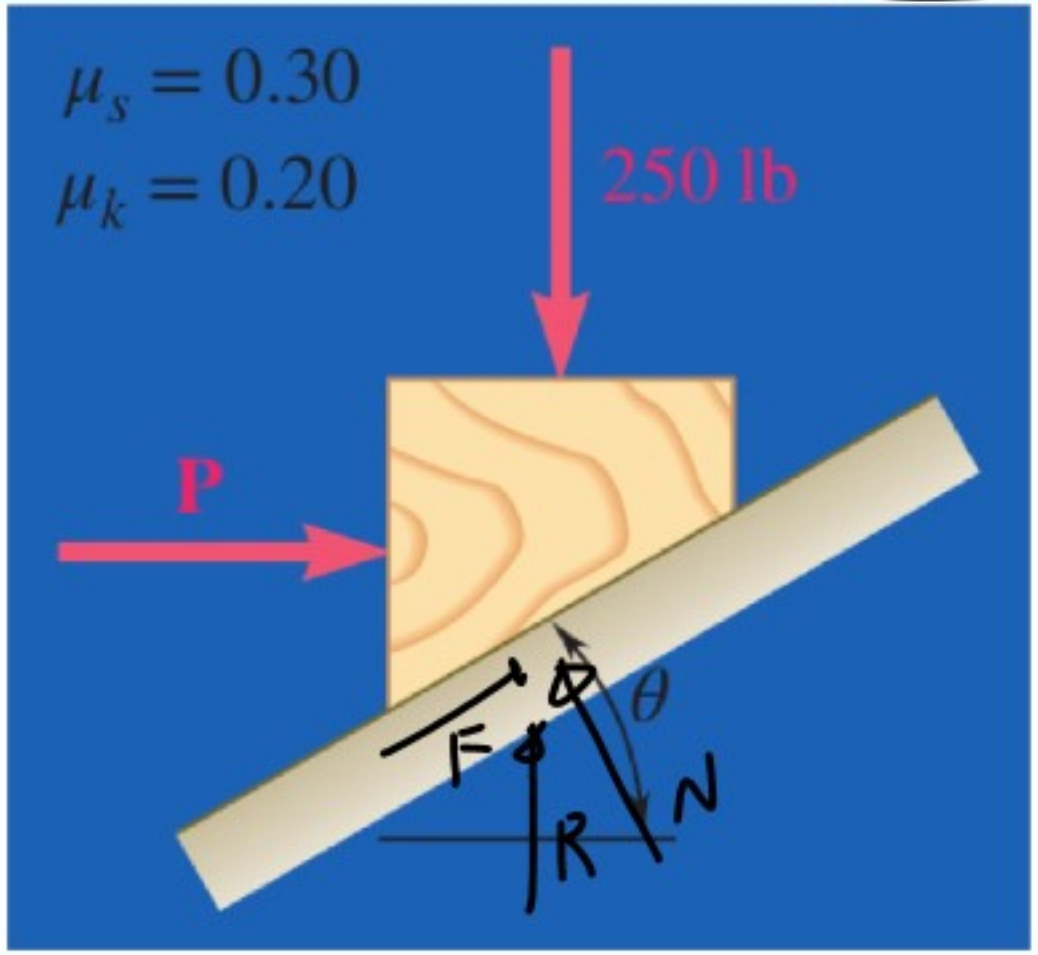
$F \le \mu_s N$

$48 \le 0.2 \cdot 622$

$48 \le 124$ ✓

Determine whether the block shown is in equilibrium and find the magnitude and direction of the friction force when $\theta = 30^\circ$ and $P = 50$ lb.





$\Sigma F_x = 0$

$F + P\cos 30 - 250\sin 30 = 0$

$F = 250\sin 30 - P\cos 30 = 82$

$\Sigma F_y = 0$

$N - P\sin 30 - 250\cos 30 = 0$

$N = P\sin 30 + 250\cos 30 = 242$

$\operatorname{atan}\left(\frac{P}{250}\right) = 11.3^\circ$

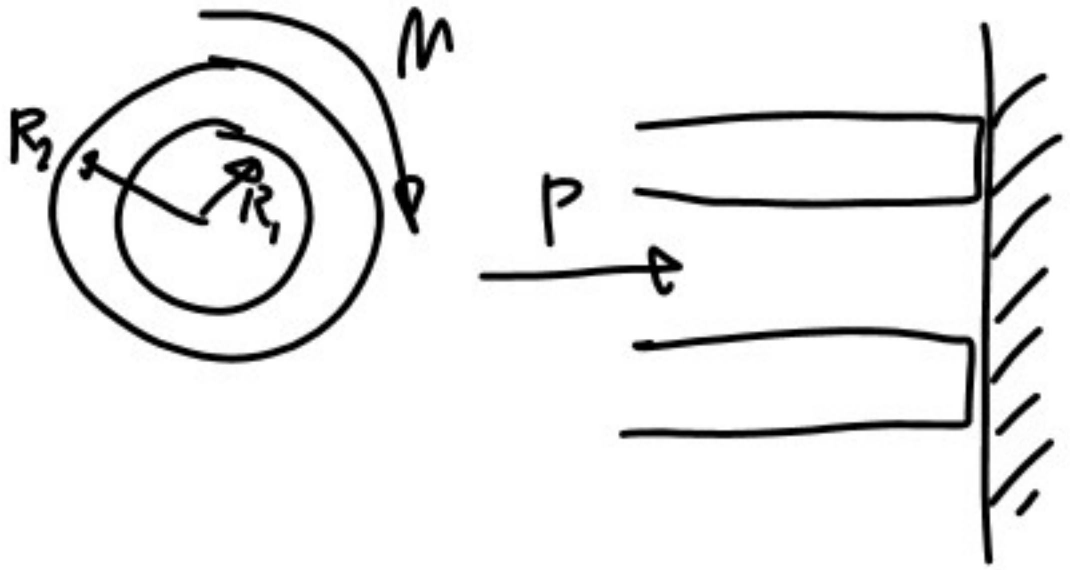
$\phi_s = 30 - 11.3 = 18.7^\circ$

$\tan(\phi_s) = \tan(18.7) = 0.34 = \mu_s$

$82 \le 0.3 \cdot 242$

$82 \le 72.6$ X

Rotational Friction

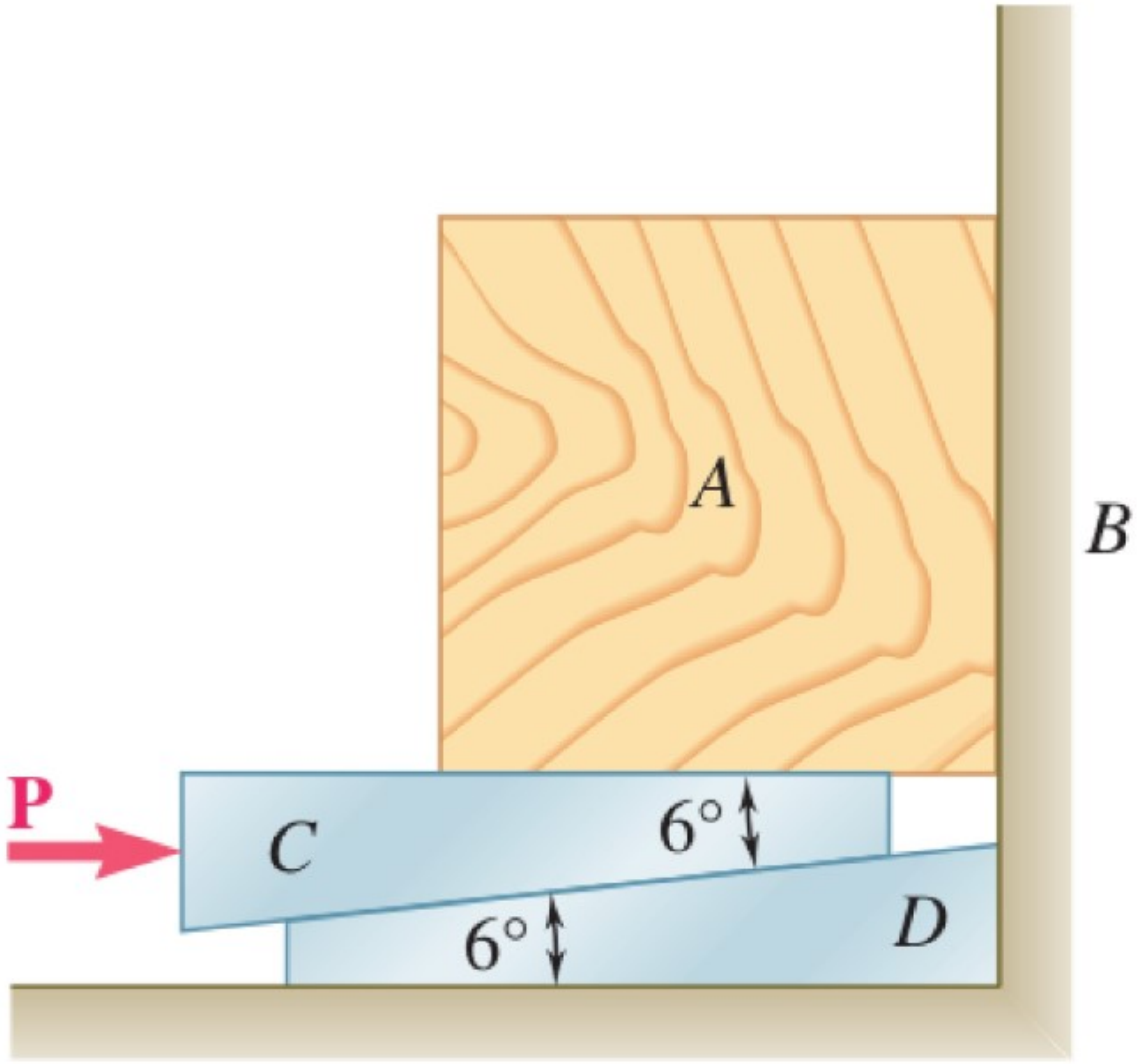


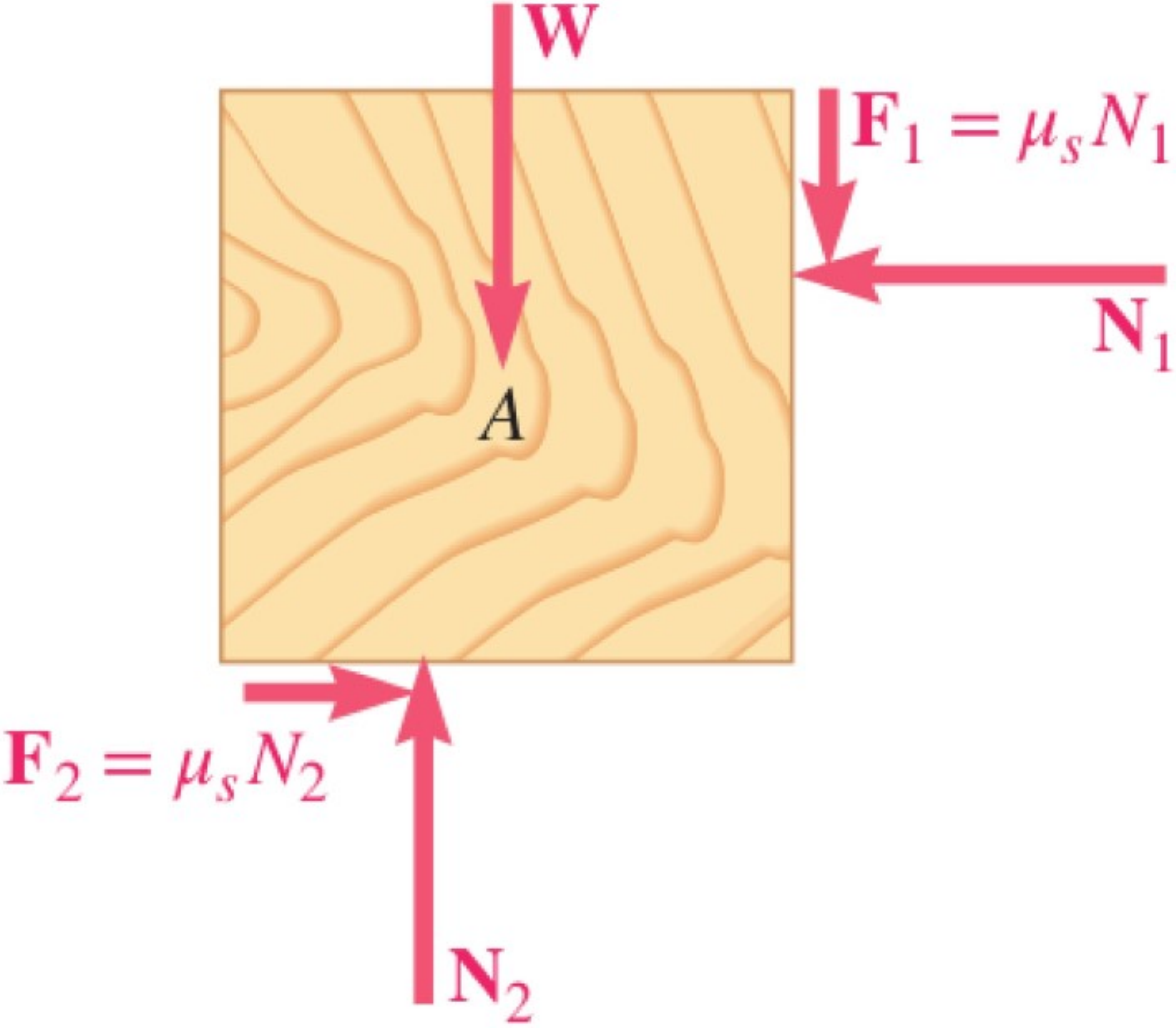
$$M = \frac{2}{3} \mu_k P \frac{R_2^3 - R_1^3}{R_2^2 - R_1^2}$$

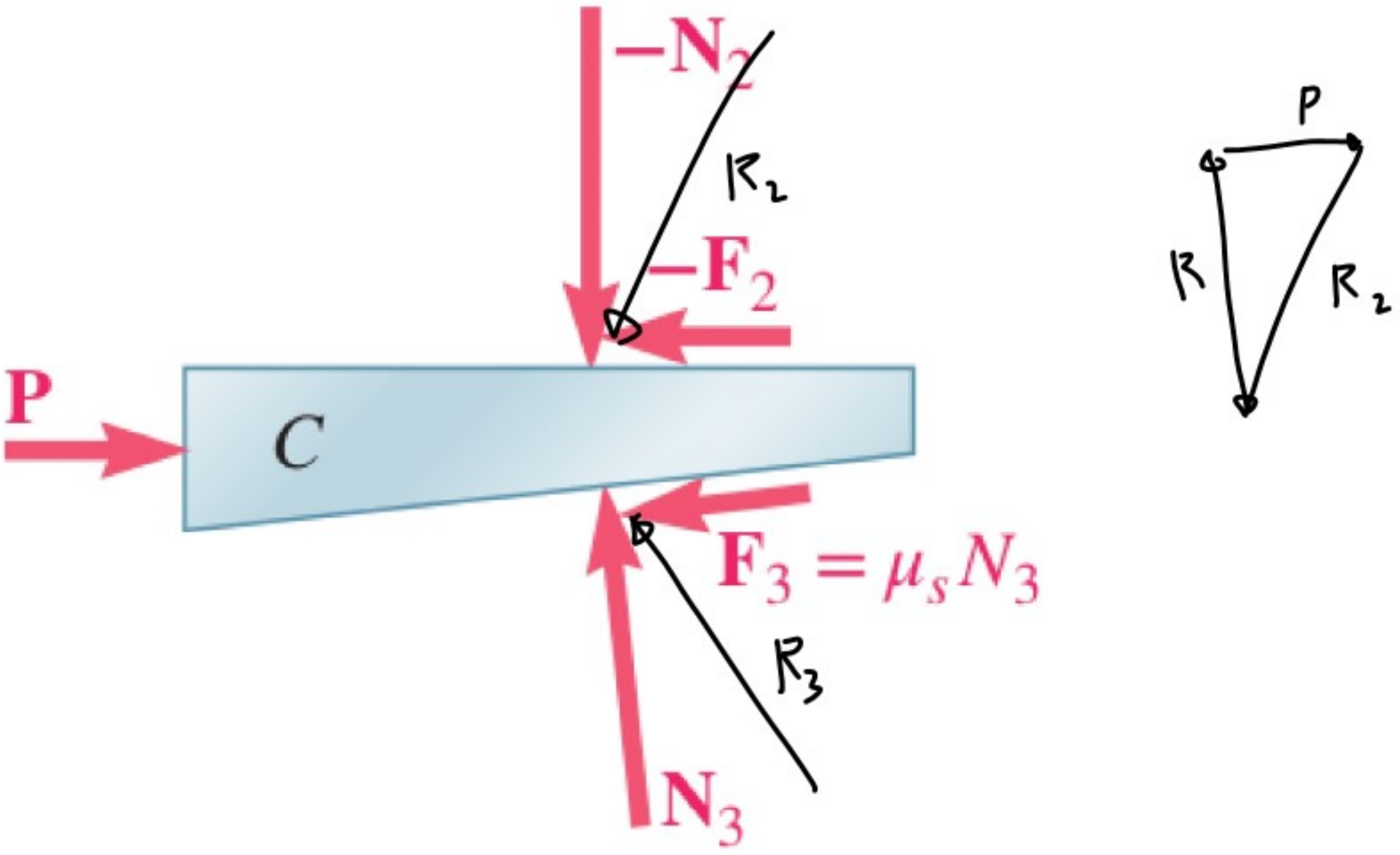
if $R_1 = 0$

$$M = \frac{2}{3} \mu_k P R$$

Wedges

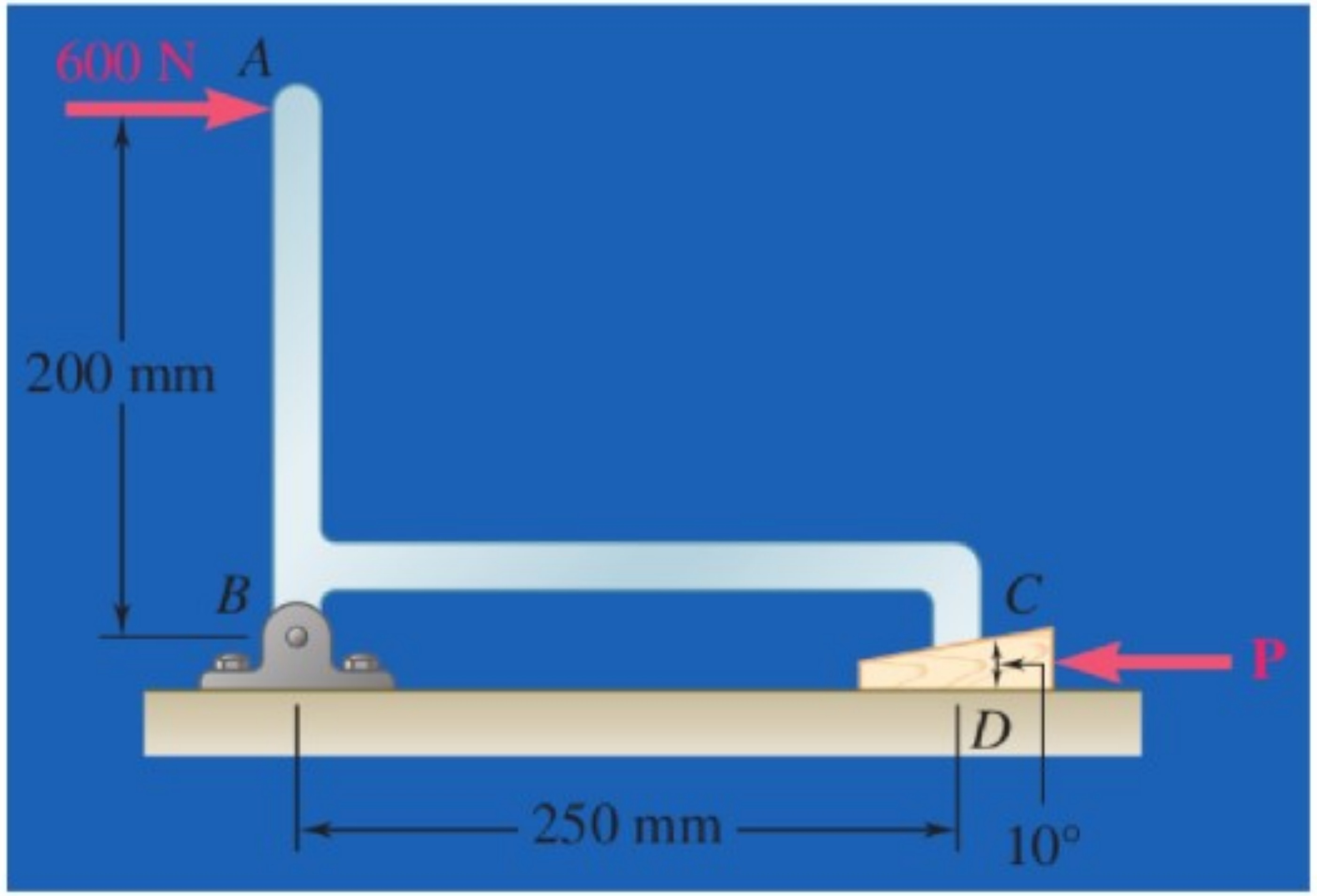



W
$F_1 = \mu_s N_1$
N_1
A
$F_2 = \mu_s N_2$
N_2



−N2
R2
−F2
P
C
F3 = μs N3
R3
N3
P
R
R2

The machine part *ABC* is supported by a frictionless hinge at *B* and a 10° wedge at *C*. Knowing that the coefficient of static friction is 0.20 at both surfaces of the wedge, determine (*a*) the force **P** required to move the wedge to the left, (*b*) the components of the corresponding reaction at *B*.



Block A supports a pipe column and rests as shown on wedge B. Knowing that the coefficient of static friction at all surfaces of contact is 0.25 and that $\theta = 45°$, determine the smallest force **P** required to raise block A.