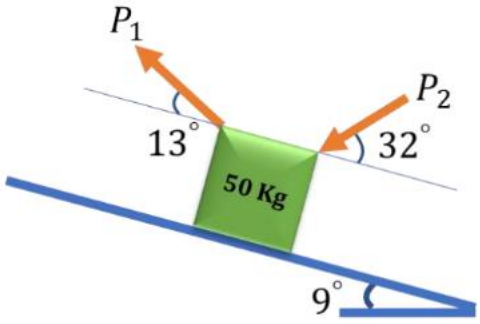
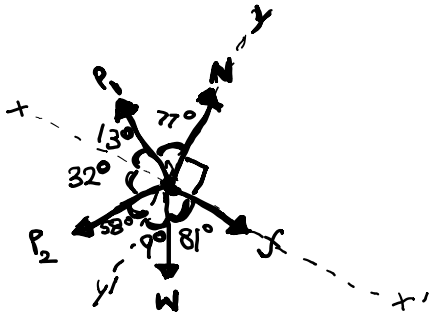
1.



(a)



N - Normal force exerted on the block by the inclined plane

f - Frictional force (Static or Kinetic)

w - Weight of the body = 50x9.8 = 490N

Resolving forces along XX' direction (taking forces in XX' direction as positive):

$F_{XX'} = f + w\cos(81°) - P_1\cos(13°) - P_2\cos(32°)$ → Eqn.1

Resolving forces along YY' direction (taking forces in YY' direction as positive):

$F_{YY'} = w\cos(9°) + P_2\cos(58°) - P_1\cos(77°) - N$ → Eqn.2

(b) Equations of Force equilibrium:

NOTE: Friction is static → $f = \mu_s N = 0.8N$

$P_1 = 2P_2$

$F_{XX'} = 0$: $0.8N + 490x0.156 - (2P_2)x0.974 - (P_2)x0.848 = 0$

$0.8N + 76.653 = 2.797P_2$ → Eqn.3 (From Eqn.1)

$F_{YY'} = 0$: $490x0.987 + 0.53P_2 - (2x0.225)P_2 - N = 0$

$483.967 + 0.08P_2 = N$ → Eqn.4 (From Eqn.2)

(c) To get P_2, we need to solve Eqn.3 and Eqn.4

Eqn.3 + (0.8)xEqn.4:

~~0.8N~~ + 76.653 + 387.174 + $0.064P_2 = 2.797P_2$ + ~~0.8N~~

$P_2 = 169.713N$

$\therefore P_1 = 2P_2 = 339.427N$

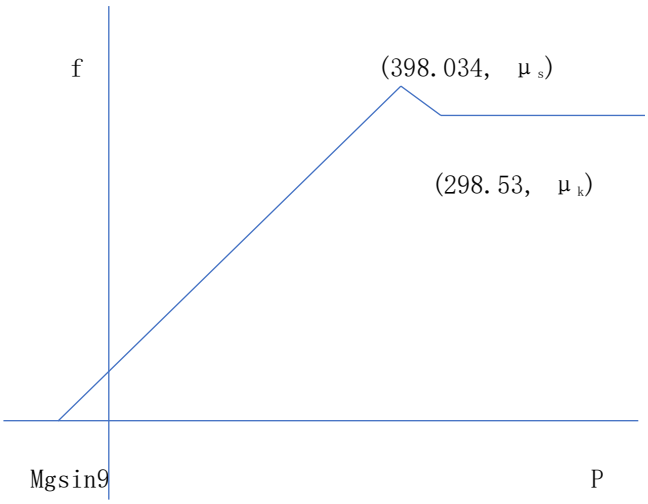
(d) The maximum force of friction is the static friction = 0.8N

We need to solve for N:

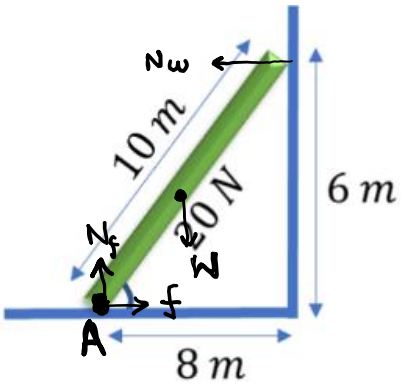
0.8N + 76.653 = 2.797x169.713

f_{max} = 0.8N = 398.034N

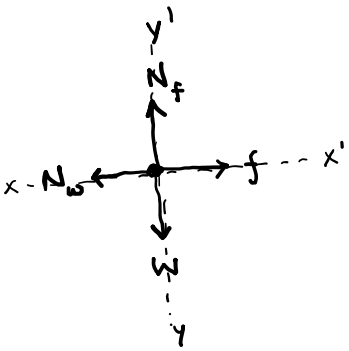
(e)



2.



(a)



N_w = Reaction force by the ladder by the wall

N_f = Reaction force on the ladder by the floor

f = Frictional force on the floor

w = Weight of body = 20N

(b) $F_{XX'} = 0$: $f - N_w = 0$ → **Eqn. 1**

$F_{YY'} = 0$: $N_f - w = 0$ → **Eqn. 2**

(c) We know moment about A is also 0:

$M_A = 0$: $(N_w) \times (6) - (w) \times (8/2) = 0$

$N_w = 2w/3 = 40/3 = 13.33N$ → **Result. 1**

$N_f = w = 20N$ (From Eqn. 2)

$f = N_w = 13.33N$ (From Result. 1)

(d) We know the maximum frictional force is the limiting static friction = 13.33N