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50(9.81)= 491 N

$$ZF_y = 0: N-491 \cos 15^\circ = 0, N=474 N$$

Assume equilibrium:

 $ZF_x = 0: F-491 \sin 15^\circ = 0, F=127.0 N$
 $F(b,c)$
 $ZF_y = 0: N-491 \cos 15^\circ = 0, F=127.0 N$
 $ZF_x = 0: F-491 \sin 15^\circ = 0, F=127.0 N$
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 $ZF_x = 0: F-491 \sin 15^\circ =$

incline

(b)
$$P = 200 \text{ N}$$
; assume equilibrium

 $EF_g = 0$: $N - 491 \cos 15^\circ + 200 \sin 20^\circ = 0$, $N = 405 \text{ N}$
 $EF_x = 0$: $200 \cos 20^\circ - 491 \sin 15^\circ - F = 0$, $F = 61.0 \text{ N}$
 $F_{max} = \mu_s N = 0.25 (405) = 101.3 \text{ N} > 61.0 \text{ N}$ so assumption $0K$

(c) $P = 250 \text{ N}$; assume equilibrium

 $EF_g = 0$: $N - 491 \cos 15^\circ + 250 \sin 20^\circ = 0$, $N = 388 \text{ N}$
 $2F_x = 0$: $250 \cos 20^\circ - 491 \sin 15^\circ - F = 0$, $F = 108.0 \text{ N}$
 $F_{max} = \mu_s N = 0.25(388) = 97.1 \text{ N} < F$; assumption invalid

 $F = \mu_k N = 0.2(388) = 77.7 \text{ N}$ down the incline

(d) To initiate motion, set $F = \mu_s N = 0.25 N$ down the incline:

 $2F_g = 0$: $N - 491 \cos 15^\circ + P \sin 20^\circ = 0$
 $2F_x = 0$: $P \cos 20^\circ - 491 \sin 15^\circ - 0.25 N = 0$

Solve to obtain $\begin{cases} N = 392 \text{ N} \\ P = 239 \text{ N} \end{cases}$