F_1

5

3

4

a

F_2

y

x

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Here is a hypothetical, plausible scenario: a completely ordinary box (no special properties, but has a mass $\frac{M}{3}$ and a coefficient of friction $\frac{\mu}{3}$) rests on the floor.
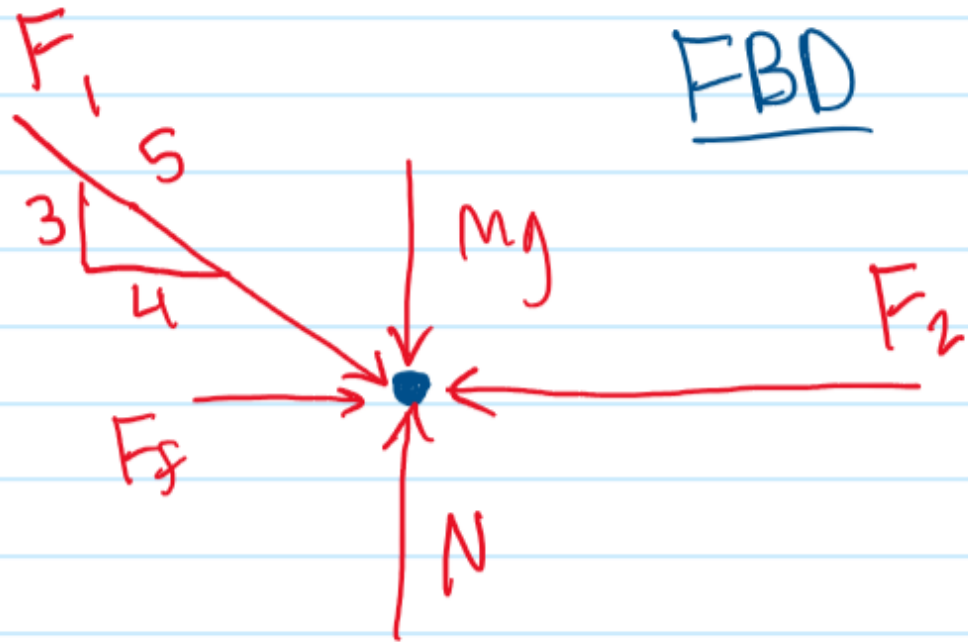
A force $F_1 = \frac{F_1}{3}$ acts on the box as shown.

You decide to push on the blue box with a force F_2, causing the box to accelerate to the left at $\frac{a}{3}$.

What is the magnitude of the force you're applying (F_2)?

(Assume $g = 9.81 \text{ m/s}^2$. Treat the box as a particle).

F_1

5

3 | 4

F_f

mg

N

F_2

FBD

given: F_1, m, g, μ, a

find: F_2

$F_f = \mu N$

Force Equilibrium

$\Sigma F_y = 0 = N - mg - F_1 \frac{3}{5}$

$N = mg + F_1 \frac{3}{5}$

$\Sigma F_x = ma = F_1 \frac{4}{5} + F_f - F_2$

$F_2 = ma + F_1 \frac{4}{5} + \mu N$