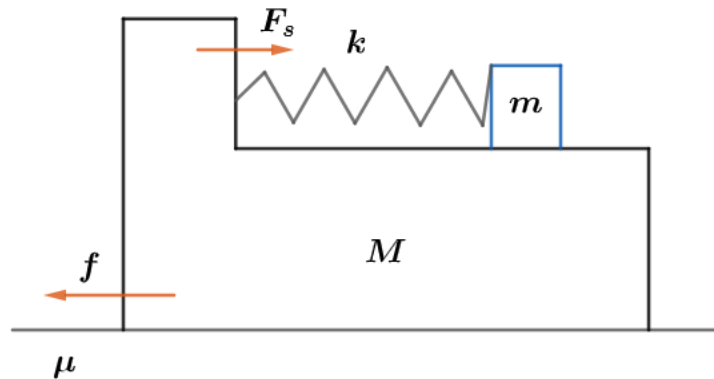


# 2021 F=ma Exam: Problem 12

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The friction force  $f$  on the platform has to always balance the spring force  $F_s$  from the mass  $m$  for the platform to never slip. The amplitude of oscillations of  $m$  can be determined by conservation of energy,

$$\frac{1}{2}mv^2 = \frac{1}{2}kA^2$$

$$A = v\sqrt{\frac{m}{k}}$$

Then the maximum spring force is

$$F_s = kA = v\sqrt{mk}$$

This has to be less than the maximum value of static friction,

$$v\sqrt{mk} \leq f_{max} = \mu(m + M)g$$

$$v \leq \frac{\mu(m + M)g}{\sqrt{mk}} = 0.25 \text{ m/s}$$

so the answer is  C.