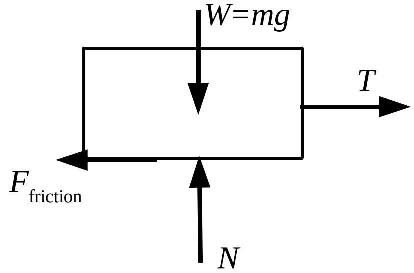
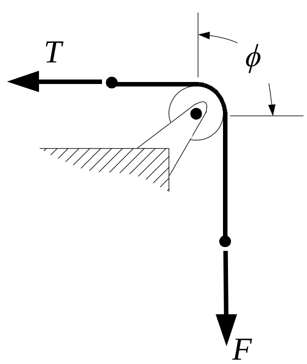
A free body diagram of the block can be used to obtain the force required to initiate movement:



where $F_{\text{friction}} = \mu_s \cdot N = \mu_s \cdot m \cdot g$.

At the instant of impending motion the force T from the cord is equal to the static friction force:

$$T = \mu_s \cdot m \cdot g = 0.25 \cdot 20\,\text{kg} \cdot 9.81\,\text{m/s}^2 = 49.1\,\text{N} .$$



For the rope wrapped around the cylinder, there is a "slack" side tension force, and a "tense" side tension force. The slack side tension is equal in magnitude but in opposite direction to the force pulling the block, T . The tense side tension is the externally applied force F . These forces are related by:

$$\frac{F}{T} = e^{f\phi}$$

where f is the coefficient of friction between the cord and the cylinder. In this expression, the angle of contact ϕ must be in radians. Solving for f :

$$f = \frac{1}{\phi} \cdot \ln\left(\frac{F}{T}\right)$$

Since $T = 49.1\,\text{N}$, $\phi = \pi/2 \approx 1.571$, and $F = 65\,\text{N}$ we then have:

$$f = \frac{1}{1.571} \cdot \ln\left(\frac{65}{49.1}\right) \approx 0.18$$

The correct answer is (B)

