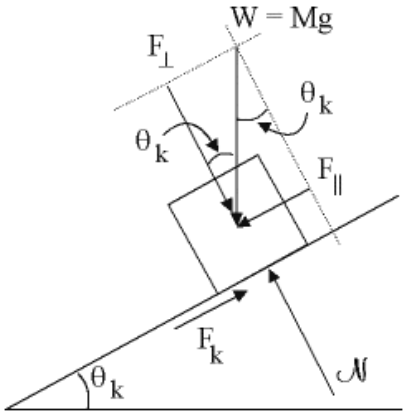
Answer on Question #41465, Physics, Mechanics

A block of wood is placed on an inclined plane. The angle θ (where θ is non-zero) of the inclined plane is gradually increased until the block is at the verge of sliding down the incline. What is the coefficient of friction between the block and the incline?

a. cosθ b. tanθ c. sinθ d. cotθ

Solution



$F_{\parallel} = W \sin\theta$ and $F_{\perp} = W \cos\theta$ are parallel and perpendicular projections of weight on an inclined plane.

For equilibrium, we must have $= F_{\perp} = W \cos\theta$.

At a certain angle of inclination, θ_k, at which the block slides down at constant velocity, the friction force F_k and $F_{\parallel}$ become equal:

$$F_k = F_{\parallel} = W \sin\theta_k.$$

Since, by definition $\mu_k = \frac{F_k}{N}$, we may write:

$$\mu_k = \frac{W \sin\theta_k}{N} = \frac{W \sin\theta_k}{W \cos\theta_k} = \tan\theta_k.$$

Answer: b. tanθ.

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