Consult Multiple-Concept Example 5 for insight into solving this problem. A skier slides horizontally along the snow for a distance of 14.7 m before coming to rest. The coefficient of kinetic friction between the skier and the snow is 0.0376. Initially, how fast was the skier going?

The law of conservation of energy:

$$\Delta E + W = 0$$

where ΔE – change of body's energy, W – work of all forces

Work can be expressed by the following equation:

$$W = Fd \cos \theta$$

where F is the force, d is the displacement, and the angle θ is defined as the angle between the force and the displacement vector.

Therefore, for friction force work equals:

$$W = F_{fr} * d * \cos 180 = -F_{fr}d$$

Friction force equals:

$$F_{fr} = \mu mg$$

Change of body's energy equals $\frac{mv^2}{2}$, therefore:

$$\frac{mv^2}{2} = \mu mgd$$

$$v = \sqrt{2\mu gd} = 2.33\frac{m}{s}$$

Answer: $2.33\frac{m}{s}$