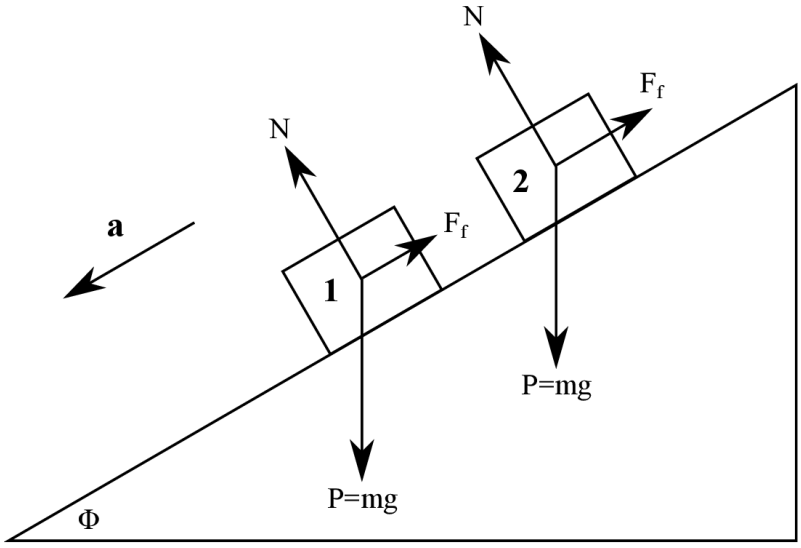
Question 26983



For the general case of motion over inclined plane without any force, except gravitational and force of friction: $N = m\,g\cos\phi$, $F = m\,g\sin\phi - F_f = m\,g\sin\phi - \mu\,m\,g\cos\phi$, where ϕ is the angle, μ is the friction coefficient.

Thus, using 2nd Newton's law, $a = \frac{F}{m} = g\sin\phi - \mu\,g\cos\phi$.

For two people sliding down the roof, $a_1 = g(\sin\phi - \mu_1\cos\phi)$, $a_2 = g(\sin\phi - \mu_2\cos\phi)$. Not knowing the angle, but knowing that $\mu_2 > \mu_1$, according to the latter formulas $a_2 < a_1$.

Let us assume that initial velocity of both is zero, so $S = 50\,m = const = \frac{a_1 t_1^2}{2} = \frac{a_2 t_2^2}{2}$, from where $\frac{t_1}{t_2} = \sqrt{\frac{a_2}{a_1}} < 1$, so $t_2 > t_1$, and second person will arrive at the bottom second.

To explicitly calculate the times, one needs the value of the angle of inclined plane (roof).

In case if friction coefficients are equal ($\mu_1 = \mu_2$), formula $a_1 = g(\sin\phi - \mu_1\cos\phi)$, $a_2 = g(\sin\phi - \mu_2\cos\phi)$ shows that accelerations will be equal. Hence, in this case if initial velocities were equal (or were both zero), persons will arrive at the bottom at the same time.