if a block up an inclined plane 30 degree with a velocity of 5 m/s ,stops after 0.5 s then ; coffecient of friction will be ?

Solution:

$F_{fr} -$ friction force;

$\alpha = 30° -$ angle of the inclined plane;

$V_0 = 5\frac{m}{s} -$ initial velocity;

$t = 0.5s -$ time after the block stoped;

$a -$ deceleration of the block;

Newton's second law for the block on the X-axis:

$x: F_{fr} + mg_x = ma$

Formula for the friction force:

$F_{fr} = \mu N \Longrightarrow$

$\mu N + mg_x = ma \qquad (1)$

Newton's second law for the block on the Y-axis:

$y: N - mg_y = 0$

$N = mg_y$

From te right triangle ABC:

$\sin\alpha = \frac{mg_x}{mg} \Longrightarrow mg_x = mg\sin\alpha$

$\cos\alpha = \frac{mg_y}{mg} \Longrightarrow mg_y = mg\cos\alpha$

$N = mg_y = mg\cos\alpha \qquad (2)$

$(2) in (1):$

$\mu mg\cos\alpha + mg\sin\alpha = ma$

$\mu g\cos\alpha + g\sin\alpha = a \qquad (3)$

Rate equation of the block along X-axis:

$z: 0 = V - at$

$V = at$

$a = \frac{V}{t} \qquad (4)$

$(3) in (4):$

$\mu g\cos\alpha + g\sin\alpha = \frac{V}{t}$

$$\mu = \frac{\frac{V}{t} - g\sin\alpha}{g\cos\alpha} = \frac{V}{t\cdot g\cos\alpha} - \tan\alpha = \frac{5\frac{m}{s}}{0.5\ s\ \cdot 9.8\frac{m}{s^2}\cdot\cos 30°} - \tan 30° = 0.6$$

Answer: coefficient of the friction is $\mu = 0.6$