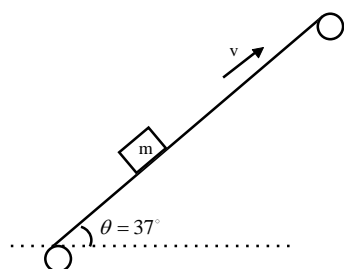


Consider a conveyor belt moving at constant speed as shown in the figure\* and a suitcase moves along with it without skidding. What minimum value of coefficient of friction  $\mu$  can be chosen out of the options given below to make this possible?



- (A) 0.75      (B) 0.76      (C) 0.33      (D) 0.34

\*The figure shows the relevant portion of the complete setup.

*Solution*

For the suitcase, normal reaction  $N = mg \cos \theta$

As there is no skidding and the speed is constant, the static frictional force  $f_s = mg \sin \theta$ .

We have,  $f_s \leq \mu N$

So,  $mg \sin \theta \leq \mu N$

Or,  $mg \sin \theta \leq \mu mg \cos \theta$

$\Rightarrow \tan \theta \leq \mu$  Or  $\mu \geq \tan \theta$

So,  $\mu_{\min} = \tan \theta = \tan 37^\circ$

Often,  $\tan 37^\circ$  is approximated as  $\frac{3}{4}$  or 0.75 but actually  $\tan 37^\circ$  is slightly greater than  $\frac{3}{4}$  or 0.75. So, 0.76 should serve the purpose.

Hence, (B).