

Q- A block of weight 125 N is placed on a horizontal surface and subjected to a force of 75 N as shown in the figure.

(a) If the block remains stationary, find the force of friction acting on the block.



(a) The block is not sliding hence the friction force will be equal the external horizontal force.

$$\text{Friction} = F \cos \theta = 75 * \cos 30^\circ = 75 * 0.866 = 64.95 \text{ N}$$

(b) If the block is at the verge of sliding find the coefficient of static friction.

The vertical component of the 75N force is pushing the block against the floor and increases the normal reaction. The horizontal component will try to slide it forward.

As the friction force increases with the external force and equal to it till the block is just at the verge of sliding (limiting equilibrium). At this time the friction is maximum which is μN . Before sliding, friction can be anything between 0 to μN . hence in this case the limiting friction is equal to the horizontal component of the force applied.

Now as the normal reaction is

$$N = W + F \sin \theta = 125 + 75 \sin 30^\circ = 125 + 75 * 0.5 = 162.5 \text{ N}$$

And $\mu N = F \cos \theta$

$$\text{Or } \mu = \frac{F \cos \theta}{N} = \frac{64.95}{162.5} = 0.4$$
