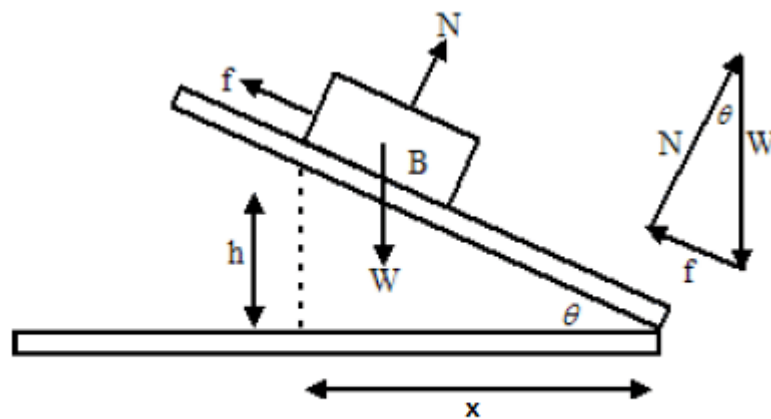


## Answer on Question #55630, Physics / Mechanics | Relativity

A student wants to use the inclined plane to measure the coefficient of friction but he was not supplied with a protractor. He measures the height  $h$  and the horizontal distance of the free end of the plane from the floor  $x$  when the wooden block on the plane just begins to move. Which of the following correctly gives the coefficient of friction?

- A.  $h/x$
- B.  $\sin(h/x)$
- C.  $\tan(h/x)$
- D.  $\cos(h/x)$

**Solution:**



It is found experimentally that the force of friction  $f$  is proportional to the normal component  $N$  of the plane's reaction. Stated algebraically

$$f = \mu N$$

where the constant of proportionality  $\mu$  is called the coefficient of kinetic friction.

If a body slides down an inclined plane without acceleration, it is in equilibrium and the vector diagram of forces is a closed polygon. For example, if the body B (Fig.) is sliding down the incline with constant velocity, the vector diagram formed by the weight  $W$  of the block, the force of friction  $f$  and the normal component  $N$  of the plane's reaction is a closed triangle. Since the coefficient of friction is the ratio  $f/N$ , it follows from the similarity of triangles that

$$\mu = \frac{f}{N} = \frac{h}{x} = \tan\theta$$

**Answer: A.  $h/x$**