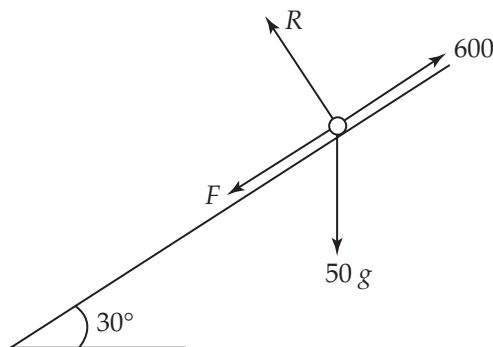


5.2.3 Motion on an inclined plane

Example 1

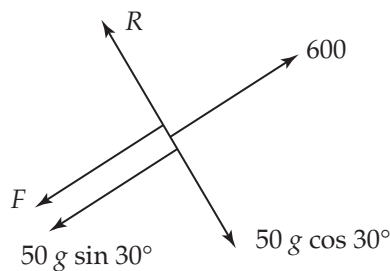
A block of mass 50 kg lies on a rough slope inclined at 30° to the horizontal. The coefficient of friction between the block and the slope is $\frac{1}{3}$. A cable attached to the block is pulled with a force of 600 N in a direction parallel to the slope, so the block is accelerating up the slope. Find the acceleration of the block.

Assume the weight of the cable is negligible compared with the weight of the block.



Note: the block is accelerating up the slope so the friction force acts down the slope to oppose motion.

Resolve forces parallel and perpendicular to the plane:



Perpendicular to the slope: $R = 50g \cos 30^\circ$
 $= 424 \text{ N}$

Friction: $F = \mu R$
 $= \frac{1}{3} \times 424$
 $= 141 \text{ N}$

Parallel to the slope, using $F = ma$:

$$600 - (141 + 50 \times 9.8 \times \sin 30) = 50a$$

$$355 = 50a$$

$$a = 7.1$$

Acceleration = 7.1 ms^{-2} .