

Problem

Two blocks, of 30 kg and 10 kg, move with an acceleration of 2 m/s^2 on a rough horizontal surface under the action of a horizontal 200 N force exerted on the 30 kg block. The surface has coefficients of static and kinetic friction given by $\mu_s = 0.50$ and $\mu_k = 0.31$. Using $g = 9.81 \text{ m/s}^2$, find:

The frictional force exerted by the surface on the 30 kg block.

$$f_k = mg\mu_k = (30 \text{ kg})(9.81 \text{ m/s}^2)(0.31) = 91 \text{ N}$$

The frictional force exerted by the surface on the 10 kg block.

$$f_k = mg\mu_k = (10 \text{ kg})(9.81 \text{ m/s}^2)(0.31) = 30 \text{ N}$$

The net force exerted on the 30 kg block.

$$F_{\text{NET}} = (30 \text{ kg})(2 \text{ m/s}^2) = 60 \text{ N}$$

The net force exerted on the 10 kg block.

$$F_{\text{NET}} = (10 \text{ kg})(2 \text{ m/s}^2) = 20 \text{ N}$$

The CONTACT force exerted by the 30 kg block on the 10 kg block.

Applying NEWTON'S 2nd LAW on the 10 kg-block:

$$F_{\text{NET}} = F_c - 30 \text{ N} = 20 \text{ N}$$

$$\rightarrow F_c = 20 \text{ N} + 30 \text{ N}$$

