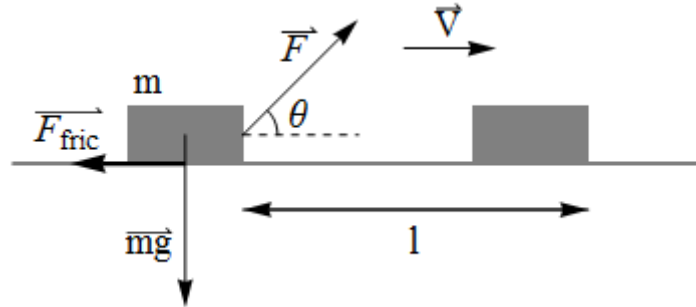# Answer on Question #43998, Physics, Mechanics | Kinematics | Dynamics

A block of cement of mass 10 kg is pulled 200 m along a cement floor at 40 m/s . If the block is pulled by a cord making an angle of 45 degrees to the horizontal the coefficient of friction between the block and the floor is 0.54. Calculate the tension in the cord and the work done on the block.

Solution.

Work done on the block by force **F** is equal to:

$$A = \vec{F} \cdot \vec{l} = F \cdot l \cdot \cos(\theta)$$

From the Newton's 1st law (as the block moves uniformly) in projection on horizontal axes:

$$F_{fric} = F \cos(\theta)$$

So: $A = F_{fric} \cdot l = \mu N \cdot l = \mu m g l$

Relation for the force of tension **F** is:

$$F = \frac{F \cos(\theta)}{\cos(\theta)} = \frac{F_{fric}}{\cos(\theta)} = \frac{\mu m g}{\cos(\theta)}$$

Numerically:

$$A = 0.54 \cdot 10kg \cdot 9.8 \frac{m}{s^2} \cdot 200m = 10584J$$

$$F = \frac{0.54 \cdot 10kg \cdot 9.8 \frac{m}{s^2}}{\cos(45°)} \approx 74.8N$$

Answer: $A = 10584J; F \approx 74.8N$