Answer on Question #70798, Physics / Mechanics | Relativity

Question. After a lead-off single in the 8^{th} inning, Earl makes an effort to steal second base. As he hits the dirt on his head first dive, his $73.2\ kg$ body encounters $249\ N$ of friction force. Construct a free body diagram depicting the types of forces acting upon Earl. Then determine the net force and acceleration.

Given.

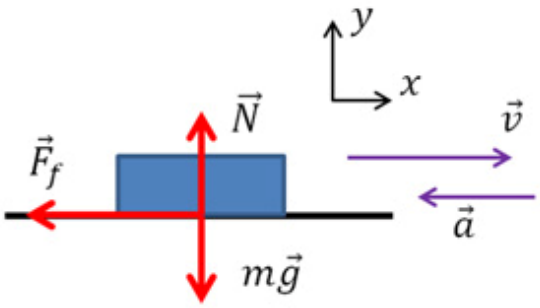
$m = 73.2\ kg; F_f = 249\ N.$

Find.

$F - ?; \boldsymbol{a_x} - ?.$

Solution.

According to second Newton's law



$$\sum F_x = ma_x \quad and \quad \sum F_y = ma_y.$$

So

$$-F_f = \boldsymbol{ma_x} \quad and \quad N - mg = 0 \ \rightarrow \ N = mg.$$

We have

$$F = -F_f = -249\ N.$$

$$\boldsymbol{a_x} = \frac{-F_f}{m} = -\frac{249}{73.2} = -3.4\ \frac{m}{s^2}.$$

Answer. $\boldsymbol{F = 249\ N}$ **(against his motion)**; $\boldsymbol{a_x = 3.4\frac{m}{s^2}}$ **(against his motion)**.