Answer on Question#37670, Physics, Other

Question:

Suppose the skateboarder shown in the drawing reaches a height of 2.20 m above the right side of the semicircular ramp. He then makes an incomplete midair turn and ends up sliding down the right side of the ramp on his back. When the skateboarder reaches the bottom of the ramp, his speed is 6.20 m/s. The skateboarder's mass is 53.0 kg, and the radius of the semicircular ramp is 2.60 m. What is the average frictional force exerted on the skateboarder by the ramp?

Answer:

$\Delta E + W = 0$ - the law of conservation of energy.

W – work of friction force,

ΔE – change of body's energy.

Change of body's energy equals: $\Delta E = mg(h + r) - \frac{mv^2}{2}$

Work can be expressed by the following equation:

We can express work with average force of friction: $W = -F_{av}d$

F_{av} - the average force of friction,

d - the distance along ramp, $d = \frac{\pi r}{2}$.

We used the minus sign here because the force of friction is directed against motion.

$$mg(h + r) - \frac{mv^2}{2} = F_{av}\frac{\pi r}{2}$$

$$F_{av} = \frac{mg(h + r) - \frac{mv^2}{2}}{\frac{\pi r}{2}} = 349\ N$$

Answer: $349\ N$