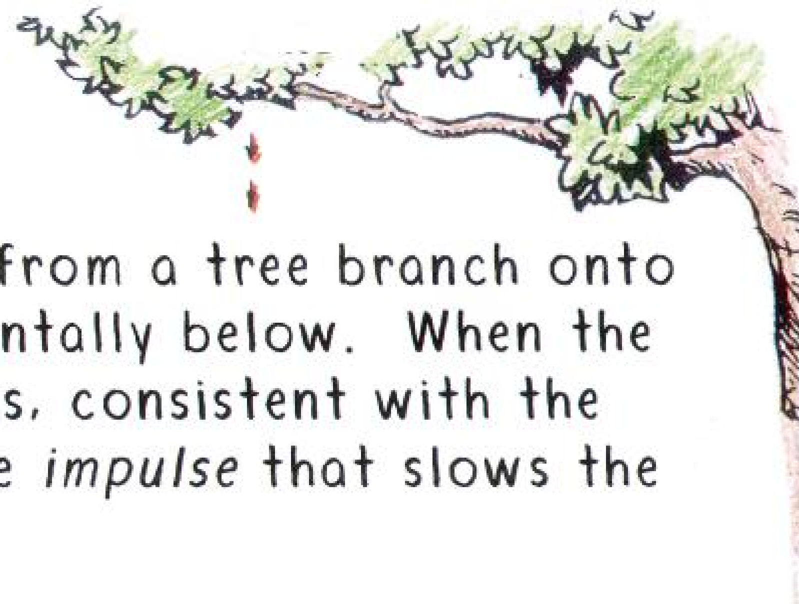
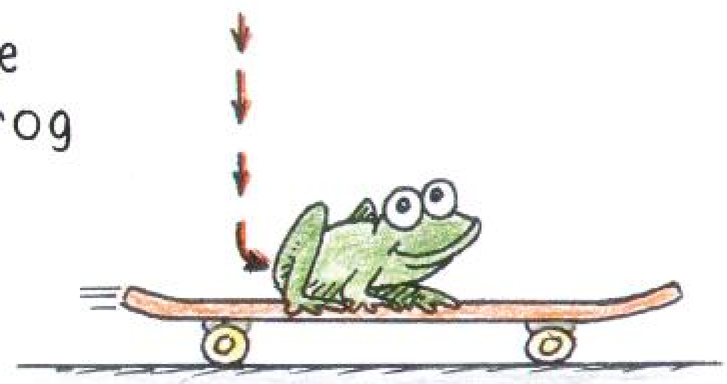
NEXT-TIME QUESTION



CONCEPTUAL Physics

A massive frog drops vertically from a tree branch onto a skateboard that moves horizontally below. When the frog lands, the skateboard slows, consistent with the conservation of momentum. The *impulse* that slows the skateboard is

a) the friction force of the frog's feet acting backward on the skateboard × time during which the speed changes.
b) equal and opposite to the impulse that brings the frog up to speed.
c) Both of these.
d) Neither of these.



Hewitt Drew it!

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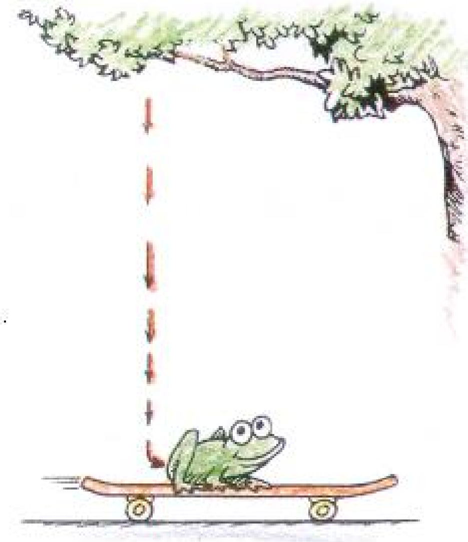

Answer: c

When the frog lands, a force of friction keeps it on the skateboard (a slippery surface wouldn't provide a ride). The impulse that reduces the momentum of the skateboard is the friction force of the frog's feet acting backwards on the skateboard × time during which the speed changes. The equal and opposite friction force of the skateboard on the frog's feet × the same time provides the forward impulse on the frog to bring it up to speed.

The net horizontal momentum of the (frog + skateboard) system is the same before and after the frog lands — because no *external* friction forces act (such as between the ground and the skateboard).

ARBOR SCIENTIFIC
TOOLS THAT TEACH.

Hewitt Drew it!