NEXT-TIME QUESTION

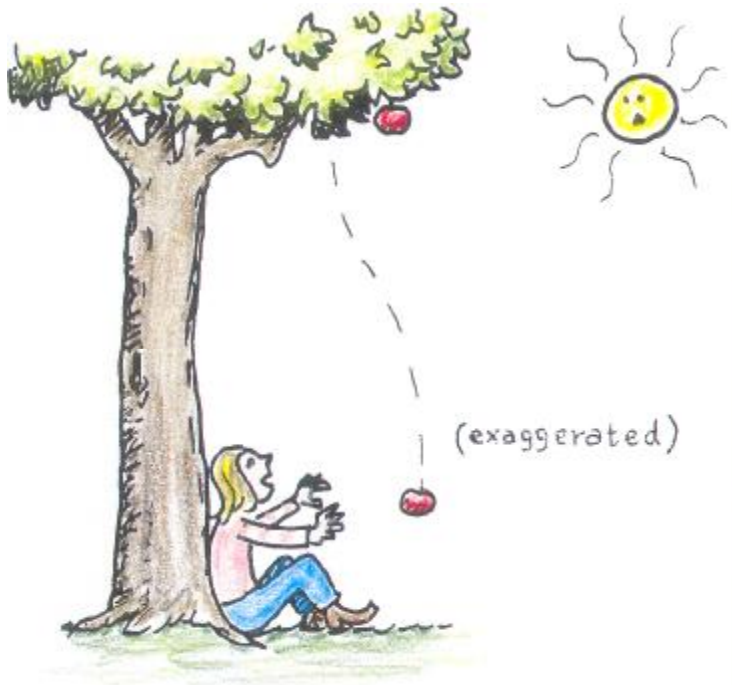
CONCEPTUAL Physics

A falling apple is gravitationally attracted to Earth—and also to the Sun (with a force about 0.0006 times the force that Earth exerts on it). Does this solar tug produce a subtle deviation in the otherwise straight-line vertical path of the falling apple?

a) Yes. Close examination shows the "straight line" to be slightly curved.

b) Yes. The path is still straight-line, but directed slightly away from a line intersecting the Earth's center.

c) No. The apple falls toward Earth's center in the manner described in all elementary physics courses—a straight-line vertical path.



thanx to Ernie Brown

Hewitt Drew it!

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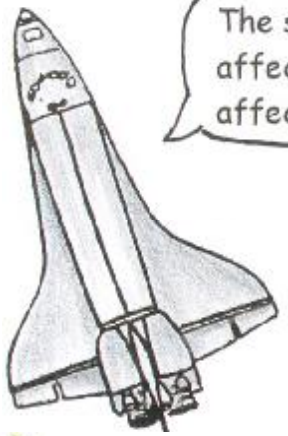
Answer: c

This is a frame-of-reference question. Planet Earth and the falling apple are part of a frame in "free fall" around the Sun. A freely-falling frame is equivalent to an inertial frame. The apple falls toward the center of Earth in the same way it would if Earth were drifting freely in empty space.



The straight-line path of a tin can tossed back and forth by astronauts in orbit isn't affected by Earth's gravity. Likewise, the straight-line fall of an apple on Earth isn't affected by solar gravity.

If you wish to consider the tiny micro-gravity effects due to the slightly different distances of the tree limb and the ground from the Sun, you may as well consider the gravitational effect of the falling apple with the mass of the tree trunk — both negligible.

Hewitt Drew-it!

CONCEPTUAL Physics