Next-Time Question

The spaceship at S wishes to touch the surface of the giant planet and proceed to point X in the shortest distance possible. To what point P on the planet surface should the spaceship travel?

X

a) Point a.
b) Point b.
c) Point c. a b c 
d) Actually, all yield the same total distance.

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Answer: c, Point c

The spaceship should first travel to Point b. Create a reflection of S below the planet surface and call it S’. Then the distance SPX equals S’PX, which will be the shortest when S’PX is a straight line. Can you see that P is the point wherein SP and PX make the same angle with the ground?

This idea was formulated by the French scientist Pierre de Fermat in about 1650, and is called Fermat’s principle of least time. But the idea goes even further back, to Hero of Alexandria in the first century A.D. From this we get the law of reflection: The angle of incidence equals the angle of reflection.