

An interesting motion problem.

Landing Rovers on Mars When the twin Mars exploration rovers, *Spirit* and *Opportunity*, set down on the surface of the red planet in January 2004, their method of landing was both unique and elaborate. After initial braking with retro rockets, the rovers began their long descent through the thin Martian atmosphere on parachutes until they reached an altitude of about 16.7 m. At that point a set of air bags were inflated, additional retro rocket blasts slowed each craft nearly to a standstill, and the rovers detached from their parachutes. After a period of free fall to the surface, with an acceleration of 3.72 m/s^2 , the rovers bounced about a dozen times before coming to rest. They then deflated their air bags, righted themselves, and began to explore the surface.

Figure 4.44 shows a rover with its surrounding cushion of air bags making its first bounce off the Martian surface. The rover bounces upward with a speed of 9.92 m/s at an angle of 75.0° above the horizontal.

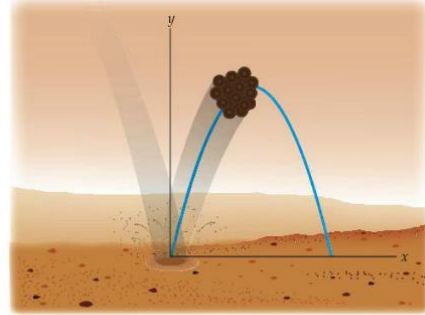


Figure 4.44

102. How much time elapses between the first and second bounces?
- A. 1.38 s C. 5.15 s
B. 2.58 s D. 5.33 s
103. How far does the rover travel in the horizontal direction between its first and second bounces?
- A. 13.2 m C. 51.1 m
B. 49.4 m D. 98.7 m
104. What is the maximum height of the rover between its first and second bounces?
- A. 2.58 m C. 12.3 m
B. 4.68 m D. 148 m