

# KINEMATICS

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## BASE Jumpers Double the Dare



MOAB, Utah — Castle Valley spread out about 1,500 feet below, and Mario Richard scooted his toes to the edge of the cliff. It can be an awkward shuffle when there is another person fastened to the front of him.



BASE jumping in tandem in Moab, Utah. Some have Estimated that 10 to 15 BASE jumpers per year, on average, have died over the past decade.

The height from Parriott Mesa flattened the rugged topography into a wrinkled blanket of swirled reds. Sandstone spires, like exclamation points of the gods, spiked the landscape. On the horizon, the La Sal Mountains provided a snow-tipped backdrop. **“The product, what I’m giving people, is the sensation of leaving a cliff,”** Richard said.

Richard, 46, asked his passenger for a thumbs up. Larry Harpe, a 42-year-old climbing guide who had spent many nights in a sleeping sling thousands of feet above the Yosemite Valley in California, had never been more terrified. For weeks, his thoughts were occasionally punctured by the dread of this moment. He slept fitfully the night before. Minutes before the jump, he was too nervous to sip from the whiskey flask he carried in his pack.

They counted down. They leapt, and Harpe screamed. A photographer, Chris Hunter, followed, about two beats behind.

**The free fall (((lasted only two or three seconds, about 100 feet,))) before the static line, a sort of leash attached to the cliff, tugged the chute from the bag on Richard’s back as they fell away.**

The chute immediately engaged, and Richard guided the pair along the face of the canyon wall, over the ridge and out over the open desert. Less than a minute later, they landed on their feet in a sandy wash near the car.

**INTRODUCTION:** These base jumping skydivers are stated, in the article below, to have jumped off a cliff and in 2-3 sec. gone 100 ft. The purpose of this NYTimes Physics application is to verify what is stated below and determine their velocity after falling 100 ft.

**PRELIMINARY HINTS:**  $g = -32 \text{ ft./s}^2$ ,  $v = v_o + at$   
 $X = v_o t + \frac{1}{2} at^2$ , take down as negative, up as positive

**QUESTIONS:** (a) Determine how long (t) it takes to free fall 100 ft.?

(b) Find the velocity after free falling 100 ft.?

(c) Sketch (approximate) a graph of these jumpers velocity vs. time?

(d) Which of the two preliminary hint equations is (c)?

(e) Sketch (approximate) a graph of these jumpers displacement vs. time?

(f) Which of the two preliminary hint equations is (e)?

**ANSWERS:** (a) 2.5 s , (b) 80 ft/s (c)-(f) \_\_\_\_\_.