

Falling Stuff Problems

1. A ball is dropped from 2 meters above the ground. How fast is it traveling immediately before it hits the ground?
2. Kirk throws a ball directly up in the air with an initial speed of 25 m/s.
 - a. How high does the ball go above his release point?
 - b. How long is the ball in the air before it returns to the release height?
3. Sara has a vertical leap of 1.0 meters. How fast is she traveling when she leaves the ground?
4. Affaan is standing by a window when he sees a ball travel straight up past a window that is 1.5 meters tall. 2.5 seconds after the ball leaves view it came back into view.
 - a. How fast was the ball traveling when it first left his view?
 - b. How high did the ball go above his window?
 - c. How fast was the ball traveling when it first got to the bottom of his window?
5. A stone is dropped from a bridge that is 20.0 m above the water. 1.00 seconds after releasing the stone, a second stone is thrown straight down. How fast must the second stone be traveling when it is released if both of the stones are to hit the water at the same time?
6. A pebble is dropped into a deep hole that has a pool of water at the bottom.
 - a. If there is a 40.0 meter drop before the water, how long after the drop will you hear the splash? (Use the speed of sound to be 340 m/s.)
 - b. Suppose that you don't know the depth, but would like to determine it from measuring the total time from the moment you drop the stone to the moment you hear the sound.
 - i. Find the equations that relate the depth to the times down and up.
 - ii. Derive an equation that, when solved, will give you the depth of the well if the time is known.
7. Sonya is riding in the power tower. She is traveling upward at 15 m/s, 20 m above the ground when her shoe comes off.
 - a. Sketch the motion diagram for the shoe.
 - b. How long will it take for her shoe to reach the ground?
 - c. How fast will it be traveling?
 - d. How far will the shoe have traveled from the time it leaves her foot until it reaches the ground?
8. A small rocket is launched with an acceleration of 4.00 m/s/s straight up. The fuel provides thrust for 5.00 seconds.
 - a. Sketch the motion diagram for the rocket.
 - b. How high is the rocket when the fuel runs out?
 - c. How high does the rocket travel?
 - d. How long is the rocket off the ground? (Assume it lands at launch height.)
 - e. Draw the **y vs. t**, **v vs. t**, and **a vs. t** graphs for the motion.