

# ONE DIMENSIONAL MOTION

People become uncomfortable in an elevator if it starts at rest and then accelerates downward at a rate such that it attains a speed of about 6 m/s after ten stories (~30 m). What is this acceleration?

A car accelerates uniformly from rest to a speed of 40mph in 12.0s. (a) Find the distance the car travels during this time and (b) the car's constant acceleration.

A certain car is capable of accelerating at a rate of  $+0.60 \text{ m/s}^2$ . How long does it take for this car to go from a speed of 55 mph to 60 mph? [1 mph = 0.447 m/s]

I. You are on the 62<sup>nd</sup> floor of a skyscraper (i.e. you are 186 meters above the ground). If you drop a ball, A) how long does it take to hit the ground? B) How fast is it moving right before hitting the ground? [See also example 2.7 in the text.]

II. If you actually toss the ball upwards from the same building with a speed of 10.0 m/s. Answer the same two questions. [See also examples 2.7-2.8.]

III. What is the maximum height (above the ground) of the ball? [See also example 2.8]

IV. Write down an equation, using symbols, that states mathematically that the ball is 5 meters A) above and B) below the elevator.

V. Now let's say you throw the ball up an elevator shaft, again from 186 m above ground. At the instant you toss the ball up with a speed of 10m/s, the elevator is at the 30<sup>th</sup> floor (top at 90m) and is descending at a constant rate of 6 m/s. When does the ball land on the elevator's roof? Is this before or after the elevator reaches the ground? [See also example 2.4.]

VI. If the elevator were stationary when you tossed the ball, but then starts descending 1.00s after you toss the ball, when does the ball land on the roof? [See also examples 2.4 and 2.5.]