

# Free Fall

1. If a rock takes 0.750 s to hit the ground after being thrown down from a height of 4.80, determine the rock's initial velocity. **(2.7 m/s [down])**.
2. Having scored a touchdown, a football player spikes the ball in the end zone. If the ball was thrown down with an initial velocity of 2.0 m/s from a height of 1.75m, determine how long until it hits the ground. **(0.43 s)**.

3. An elevator moving downward at  $4.00 \text{ m/s}$  experiences an upward acceleration of  $2.00 \text{ m/s}^2$  for  $1.80 \text{ s}$ . What is its velocity at the end of the acceleration interval and far has it travelled? ( $0.40 \text{ m/s}$  [down],  $4.0 \text{ m}$ ).

4. The Drop Zone drops riders 27.0 m from rest before slowing them down to a stop. How fast are they moving before they start slowing down? **(23 m/s)**.
5. A pebble falls from a ledge 20.0 m high.
- A) Find its velocity just before it hits the ground. **( $2.0 \times 10^1$  m/s [down])**.
  - B) Find the time it takes to hit the ground. **(2.0 s)**.

# Acceleration due to gravity – summary

- Acceleration near the Earth's surface (unless specified otherwise).
- Vertical acceleration
- Does not depend on mass (you can read about the famous Galileo's experiment and the Tower of Pisa).



- The value of the acceleration due to gravity varies with geographic location.
- The acceleration due to gravity on Earth is approximately  $9.8 \text{ m/s}^2$  [down].
- Symbol:  $\vec{g}$
- Direction of the acceleration due to gravity is always towards the center of the Earth.
- When air resistance of a falling object can be neglected and no other forces except gravity act on an object the object is said to be falling in free fall.