Section 4: Free Fall and Acceleration Due to Gravity

Remember: **In the kinematics formulae, the variables represent vector quantities and not scalar quantities.**

Examples

1. A ball takes 2.00 s to reach the water when dropped from a bridge. Calculate the displacement of the ball.

2. An 8.0 kg object is dropped from a height of 6.5 m above the ground. What is the object's velocity after 0.75 s?

3. An athlete in good physical condition can land on the ground at a speed of up to 12 m/s without injury. Calculate the maximum height from which he/she can jump without injury.

4. A rocket is launched from rest with a uniform vertical acceleration of 15.0 m/s².
   After 4.80n s, the engines shut off.
   A) To what height has the rocket risen in 4.80 s?

   B) How much higher will the rocket rise after the engines shut off?

5. An object is thrown up into the air with a speed of 18 m/s.
   A) How long will it take the ball to return to the same position?

   B) What is the maximum height the ball will reach?

6. A ball is dropped from a helicopter from a height of 50.0 m. When the ball was dropped, the helicopter was moving upward with a velocity of 30.0 m/s. How long would it take the object to hit the ground?