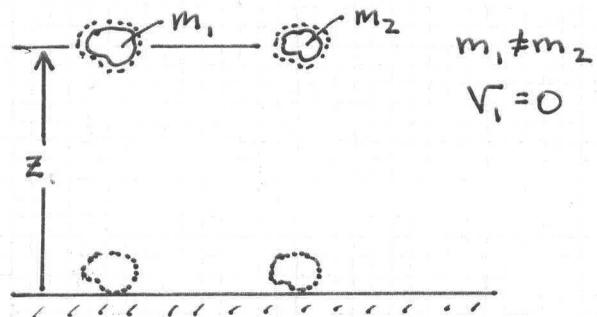


PROBLEM 2.13

KNOWN: Two objects fall freely under the influence of gravity from rest and the same initial elevation.

FIND: Show that the magnitudes of the velocities are equal at the moment just before they strike the earth.

SCHEMATIC & GIVEN DATA:



ENGR. MODEL: (1) An object in free fall is a closed system. (2) The acceleration of gravity is constant. (3) There is no effect of air resistance. (4) The only force acting is that due to gravity.

ANALYSIS: For an object falling freely under the influence of gravity, Eq 2.11 applies

$$\frac{1}{2} m (V_2^2 - V_1^2) + mg(z_2 - z_1) = 0$$

For $V_1 = 0$ and $z_2 = 0$

$$\frac{1}{2} m V_2^2 = mgz_1$$

Thus
$$V_2 = \sqrt{2gz_1}$$

Since the final velocity doesn't depend on mass, both objects will have identical velocities at the moment just before they strike the earth.