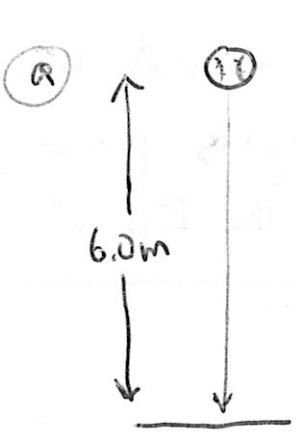
#3



← at its highest point the ball has Max. Potential energy (E_p) and zero Kinetic energy (ball is not moving) (E_K)

← at the lowest point the ball has zero E_p and max. E_K

The Total energy of this system is $E_p + E_K$ and remains constant as the ball falls (no air resistance)

So the E_p at the top would be equal to the E_K at the bottom

$$E_p = E_K$$

$$mgh = \frac{mv^2}{2}$$

$$\sqrt{2gh} = v$$

$$\sqrt{2(9.8)60} = v$$

$v = 10.8$ m/s

$\boxed{v = 11 \text{ m/s}}$

(b) a ball never returns to the height from which it was dropped because it loses energy during the bounce (contact with floor). The speed it rebounds with would be the same speed it would hit the floor with if it was dropped from 4.5m. So solve like 3a!

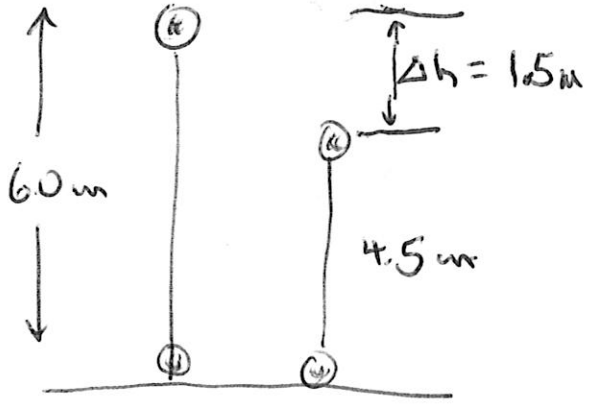
$$E_p = E_K$$

$$\sqrt{2gh} = v$$

$$v = \sqrt{2(9.8)(4.5)}$$

$\boxed{v = 9.4 \text{ m/s}}$

c). The energy lost to the floor would be equal to the difference in Total Energies of the two systems or the difference in the Ep of the two systems.



So

lost energy = $mg(\Delta h)$

$= (0.30)(9.8)(1.5)$

$= 4.4\ J$

* Some people got 4.9 J for an answer. This was because they solved for the difference in Total energies (which is five!) but used the rounded 11 m/s for V instead of 10.8 m/s.