

Q- A child (20 kg) is lying on his hospital bed with the side railings down. The patient turns sideways and starts to fall off his bed, which is 1.2 m tall. The healthcare professional sees the patient falling and attempts to break the fall by throwing a pillow on the floor directly below the child. If it took 0.3 s to get the pillow in place, will the pillow cushion the child's fall before he hits the floor? (Assume that the pillow thickness is negligible for calculation purposes).

The patient falls under gravity with acceleration 'g' and zero initial velocity.

To cover a height h the time taken t can be calculated using second equation of motion i.e.

$$s = ut + \frac{1}{2} at^2$$

Taking downward direction positive

$$s = h = 1.2 \text{ m}$$

and $a = g = 9.8 \text{ m/s}^2$ we get

$$1.2 = 0 * t + \frac{1}{2} * 9.8 * t^2$$

$$\text{Or } 1.2 = \frac{1}{2} * 9.8 * t^2$$

$$\text{Gives } t = \sqrt{\frac{2*1.2}{9.8}}$$

$$\text{Or } t = 0.49 \text{ sec}$$

Yes the pillow cushioned the child.