3. **(a)** In a room of height 6 m, a ball is projected from a point P.

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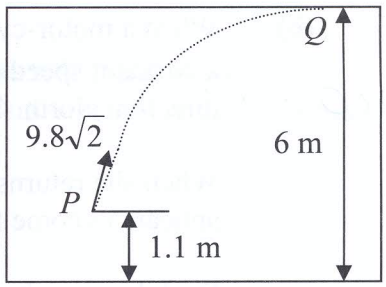
P is 1.1 m above the floor.

The velocity of projection is $9.8\sqrt{2}$ m s^{-1} at an angle of 45° to the horizontal.



The ball strikes the ceiling at Q without first striking a wall.
Find the length of the straight line PQ.

$$9.8\sqrt{2}\sin 45.t - \tfrac{1}{2}gt^2 = 4.9$$

$$4.9t^2 - 9.8t + 4.9 = 0$$

$$t^2 - 2t + 1 = 0$$

$$t = 1$$

$$r_{\vec{i}} = 9.8\sqrt{2}\cos 45.t$$

$$= 9.8$$

$$|PQ| = \sqrt{9.8^2 + 4.9^2}$$

$$= 4.9\sqrt{5} \text{ or } 10.96 \text{ m}$$

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