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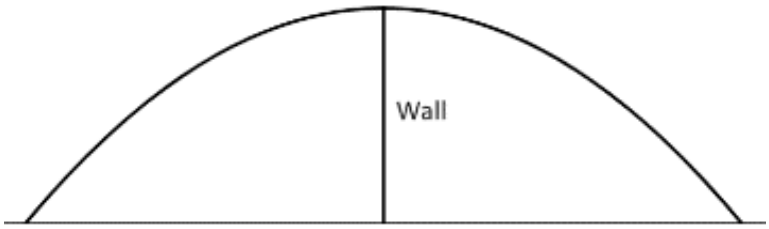
(1) A particle is projected from the ground with velocity Ums^{-1} at an angle of θ . The particle travels Xm in T seconds before hitting the ground. The particle just clears a wall of height Ym as shown below



(a) Given that the distance of the wall from the point of projection is $0.5X$, show that $T = \frac{2U}{g}\sin\theta$

(b) Given further that $\tan\theta = 0.75,$ show that $Y < \frac{9U^2}{50g}$

(2) A particle is projected at point O with velocity $(6i + 12j)ms^{-1}$ towards a moveable ledge.

(a) Given that the ledge is initially $8m$ above O, show that the particle cannot land on the ledge.

(b) The ledge is now lowered to a point $5m$ above O. The particle is launched and lands on the ledge. Find the maximum horizontal distance of the ledge from O.

(c) Find speed the particle hits the ledge with at the distance found in part (b).

(3) A particle is launched from a point $40m$ above the ground with velocity $(20i - 3j)ms^{-1}$. Find the angle the velocity of the projectile makes with the ground as it strikes the ground.

(4) A particle is projected from a point A with velocity $16ms^{-1}$ at angle of 50^o to the horiztonal. Find the horizontal distance travelled when the particle is more than $2m$ above A.

(5) A particle is projected from a point $30m$ above the ground with velocity $20ms^{-1}$ at an angle α. The particle hits the ground after 2 seconds.

(a) Show that $-30 < \propto < 0$

(b) Given instead the particle is projected at an angle θ, find the maximum possible time for the particle to hit the ground.