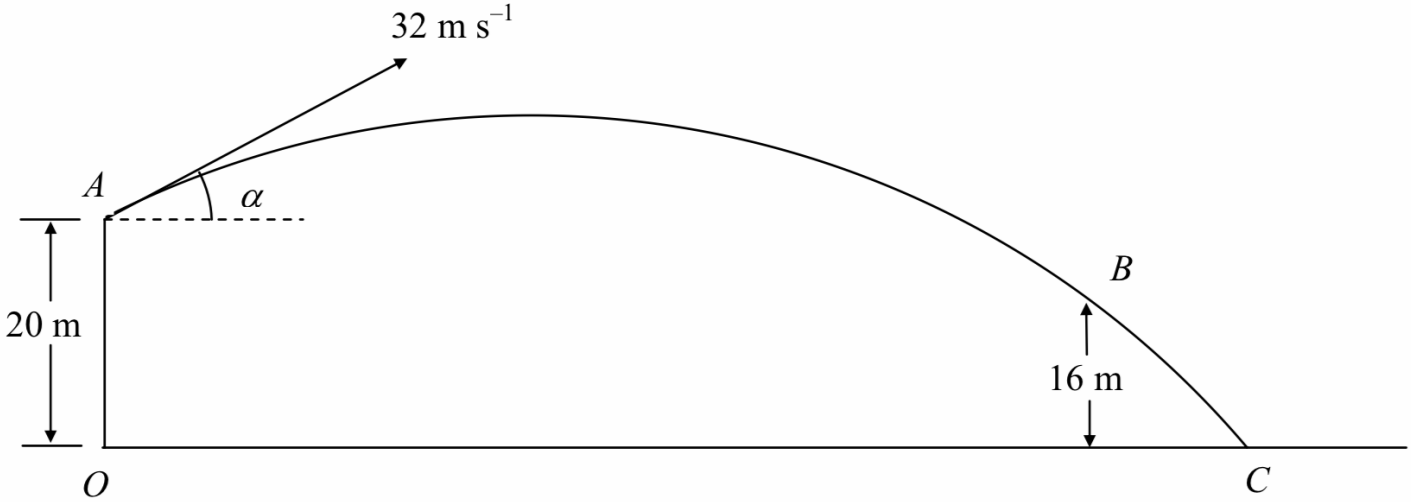
# Projectiles Homework

## Q1




A particle $P$ is projected from a point $A$ with speed 32 m s$^{-1}$ at an angle of elevation $\alpha$, where $\sin \alpha = \frac{3}{5}$. The point $O$ is on horizontal ground, with $O$ vertically below $A$ and $OA = 20$ m. The particle $P$ moves freely under gravity and passes through a point $B$, which is 16 m above ground, before reaching the ground at the point $C$, as shown in Figure 4.

Calculate

($a$) the time of the flight from $A$ to $C$,

**(5)**

($b$) the distance $OC$,

**(3)**

($c$) the speed of $P$ at $B$,

**(4)**

($d$) the angle that the velocity of $P$ at $B$ makes with the horizontal.

**(3)**

Q2

**4.** A darts player throws darts at a dart board which hangs vertically. The motion of a dart is modelled as that of a particle moving freely under gravity. The darts move in a vertical plane which is perpendicular to the plane of the dart board. A dart is thrown horizontally with speed $12.6\ \text{m s}^{-1}$. It hits the board at a point which is 10 cm below the level from which it was thrown.

(a) Find the horizontal distance from the point where the dart was thrown to the dart board.

**(4)**

The darts player moves his position. He now throws a dart from a point which is at a horizontal distance of 2.5 m from the board. He throws the dart at an angle of elevation $\alpha$ to the horizontal, where $\tan\alpha = \frac{7}{24}$. This dart hits the board at a point which is at the same level as the point from which it was thrown.

(b) Find the speed with which the dart is thrown.

**(6)**