

The points  $O$  and  $P$  are on a horizontal plane, a distance 8 m apart. A ball is thrown from  $O$  with speed  $u \text{ m s}^{-1}$  at an angle  $\theta$  above the horizontal, where  $\tan \theta = \frac{4}{3}$ . At the same instant, a model aircraft is launched with speed  $5 \text{ m s}^{-1}$  parallel to the horizontal plane from a point 4 m vertically above  $P$ . The model aircraft moves in the same vertical plane as the ball and in the same horizontal direction as the ball. The model aircraft moves horizontally with a constant speed of  $5 \text{ m s}^{-1}$ . After  $T$  s, the ball and the model aircraft collide.

**(a)** Find the value of  $T$ . [6]

**(b)** Find the direction in which the ball is moving immediately before the collision. [3]