

## Section 1: Introduction

### Exercise level 2

1. A particle is projected from point O on horizontal ground with a velocity of  $50 \text{ ms}^{-1}$  at an angle of  $30^\circ$  to the horizontal. Find
  - (i) The velocity of the particle after 2 seconds,
  - (ii) The time taken for the particle to reach its greatest height,
  - (iii) The greatest height reached by the particle.
2. A stone is thrown horizontally from a cliff 50 m high. It travels 65 m horizontally before hitting the water. Find
  - (i) the time in the air,
  - (ii) the initial speed of the stone.
3. A ball is thrown horizontally from a tower 19.6 m high at a speed of  $24.5 \text{ ms}^{-1}$ . Find the horizontal distance that it travels before hitting the ground and its velocity as it hits the ground.
4. A particle is projected from point O on a horizontal plane with a speed  $45 \text{ ms}^{-1}$  and at an angle  $\theta$  such that  $\tan \theta = 2$ .
  - (i) Write down the initial horizontal and vertical components of the velocity.
  - (ii) Write down equations for the velocity at time  $t$ .
  - (iii) Write down equations for the position at time  $t$ .
  - (iv) Find the time of flight and the range.
  - (v) Find the maximum height reached.
5. A golf ball is given an initial velocity of  $30 \text{ ms}^{-1}$  at an angle  $\alpha$  to the horizontal such that  $\tan \alpha = \frac{4}{3}$ . Find
  - (i) The horizontal and vertical components of the velocity initially,
  - (ii) The time to reach the highest point and the maximum height reached,
  - (iii) The time of flight and the range.
6. A tennis player serves the ball horizontally with a speed of  $20 \text{ ms}^{-1}$  and at a height of 2.8 m. The net is 1 m high and 12 m away. Will the ball clear the net and if so by how much?