12 A girl is practising netball.

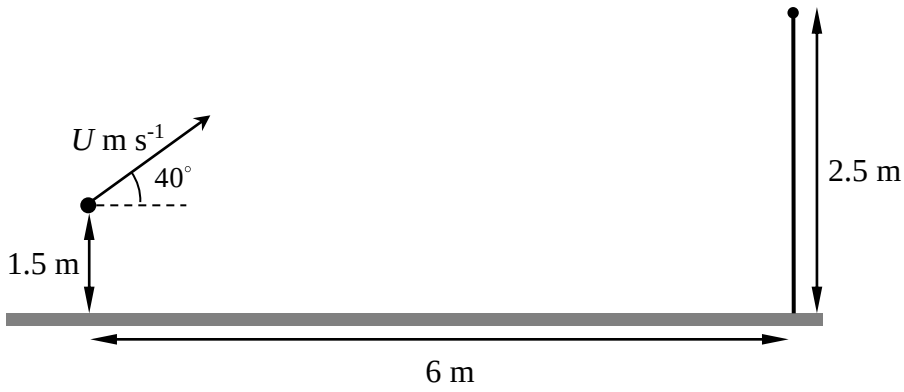
She throws the ball from a height of 1.5 m above horizontal ground and aims to get the ball through a hoop.

The hoop is 2.5 m vertically above the ground and is 6 m horizontally from the point of projection.

The situation is modelled as follows.

- The initial velocity of the ball has magnitude U m s^{-1}.
- The angle of projection is 40°.
- The ball is modelled as a particle.
- The hoop is modelled as a point.

This is shown on the diagram below.



(a) For $U = 10$, find

(i) the greatest height above the ground reached by the ball **[5]**

(ii) the distance between the ball and the hoop when the ball is vertically above the hoop. **[4]**

(b) Calculate the value of U which allows her to hit the hoop. **[3]**

(c) How appropriate is this model for predicting the path of the ball when it is thrown by the girl? **[1]**

(d) Suggest one improvement that might be made to this model. **[1]**