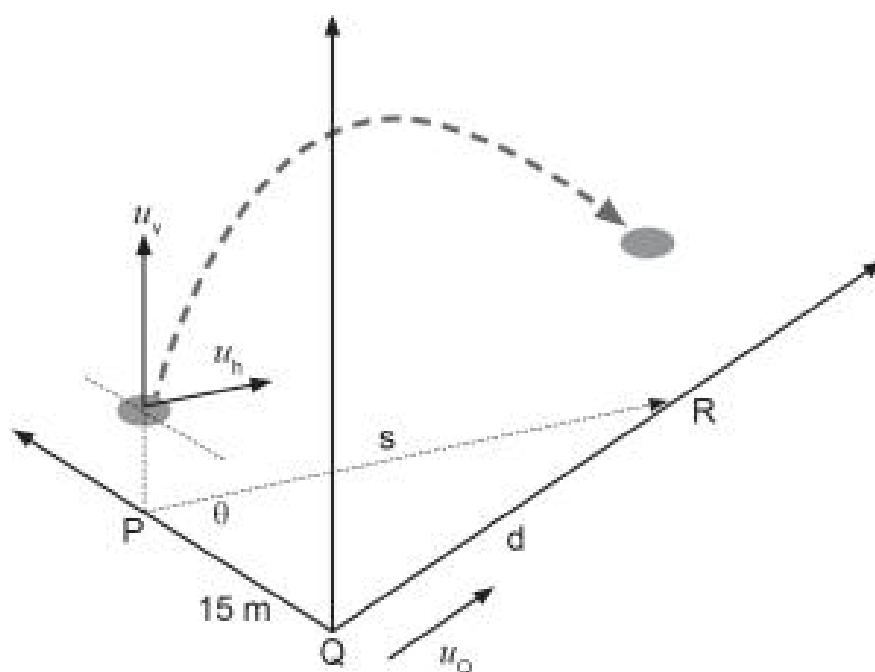


### Question 14

(13 marks)

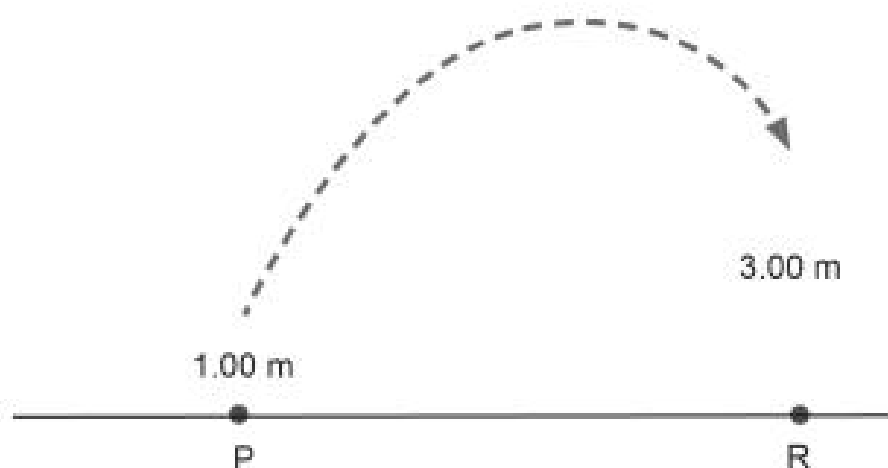
Paul kicks a ball from point P to point R. At the same instant, Quinn starts from point Q and runs forward, to catch the ball at point R. The horizontal distance between P and Q when Paul kicks the ball is 15.0 m. The initial vertical velocity ( $u_v$ ) of the ball is  $12.0 \text{ m s}^{-1}$  and its horizontal velocity ( $u_h$ ) is  $10.0 \text{ m s}^{-1}$ . Ignore air resistance throughout this question.



- (a) Calculate the magnitude of the initial velocity of the ball.

(2 marks)

Paul kicks the ball 1.00 m above the ground. Quinn jumps and catches the ball when it is 3.00 m above the ground at point R.



- (b) (i) Show by calculation that the total time taken by the ball in the air to get from 1.00 m above the ground to 3.00 m above the ground could be either 0.180 s or 2.27 s. (3 marks)

- (ii) Which of these two calculated time values in part (b)(i) is more appropriate for the ball to travel to Quinn? State a reason why. (2 marks)

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- (c) Determine the horizontal distance ( $s$ ) the ball will cover before Quinn catches it at point R. (2 marks)

Answer \_\_\_\_\_ m

- (d) Determine the average speed at which Quinn would need to travel from point Q to be able to catch the ball at point R. (3 marks)

- (e) Determine the ground angle ( $\theta$ ) at which Paul needs to kick the ball as shown on the initial diagram so that the ball travels to point R. (1 mark)

Answer \_\_\_\_\_