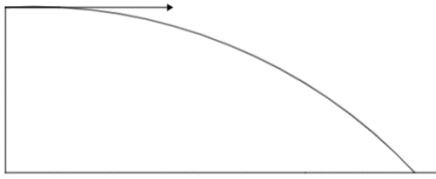
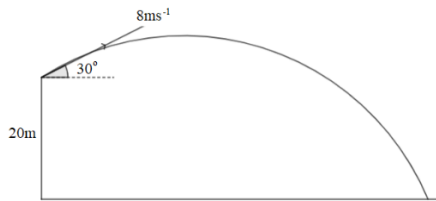


(1) A particle is projected horizontally with speed  $Ums^{-1}$  as shown in the diagram below.



Given that the particle hits the ground 3 seconds after projection and the range of the particle is 60m, find:

- The height of projection.
  - The value of  $U$ .
  - The speed of the particle as it hits the floor.
- (2) A particle is projected from a point 20m above the ground with speed  $8ms^{-1}$  and angle of elevation  $30^\circ$  as shown below.

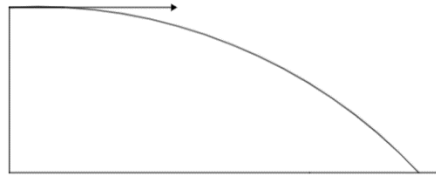


- Find the time taken for the particle to hit the floor.
  - Find the distance from where the particle was projected to where it hits the floor.
  - Find the speed of the particle when it hits the floor.
- (3) A particle is projected from a point with speed  $U$  and makes an angle of  $\theta$  with the horizontal. At time  $t$  seconds the particle is  $y$  metres above its point of projection and has moved a horizontal distance of  $x$  metres. Given that the particle moves freely under gravity:

$$y = x \tan \theta - \frac{gx^2}{2U^2} (1 + \tan^2 \theta)$$

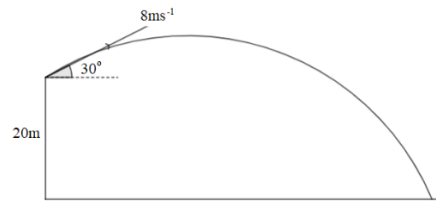
- Show that:
- Given that a particle is projected with initial velocity  $24ms^{-1}$  and passes through a point 36m away horizontally and 12m above the point of projection, find the acute angle  $\theta$ .

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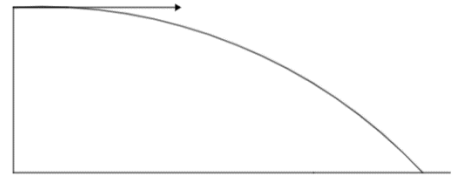


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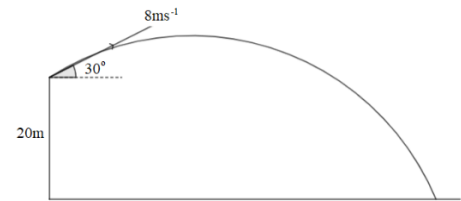
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