Our Dynamic Universe

Horizontal Projectiles

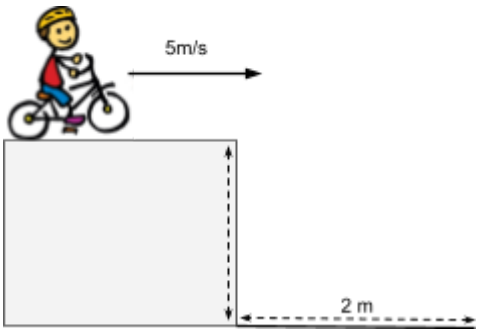
A ball is pushed off a table with a horizontal velocity of 3 ms^{-1}. The table is 0.5 m high.

a. Calculate the time taken for the ball to hit the ground. [0.3 s]
b. Find out how far the ball landed from the table. [0.9 m]

2. A stunt car is driven off a cliff of height 20 metres with a horizontal velocity of 30 ms^{-1} .

a. Calculate the time taken for the car to hit the ground. [2.0 s]
b. How far away from the foot of the cliff did the stunt car land? [60 m]

3. A mad cyclist cycles off a platform with a horizontal speed of 5 ms^{-1} .
He lands 2 metres away from the foot of the platform.

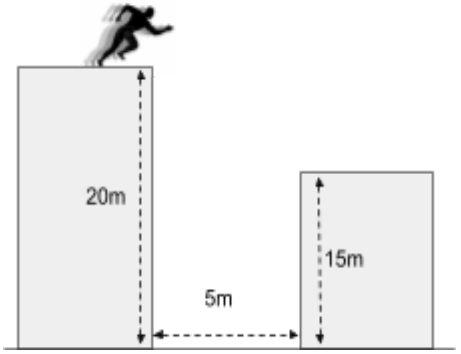


a. Find the time the cyclist takes to hit the ground.
b. Calculate the height of the platform.
c. Calculate the velocity of the cyclist at a time of 0.2 s.

[0.4 s, 0.78 m, 2.2 ms^{-1} 63^0 below the horizontal]

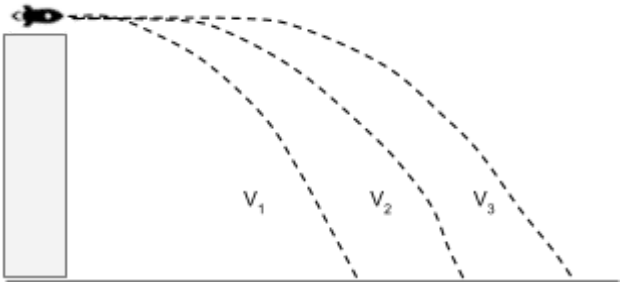
4. In a ballistic test centre a bullet is fired horizontally with a speed of 800 ms^{-1}
The bullet strikes a target 100 metres away.
Calculate how much the bullet will have fallen from the horizontal. [7.7 cm]

5. A scene from a James Bond film requires Bond to run off a high to low building.
The two buildings are separated by a distance of 5 m



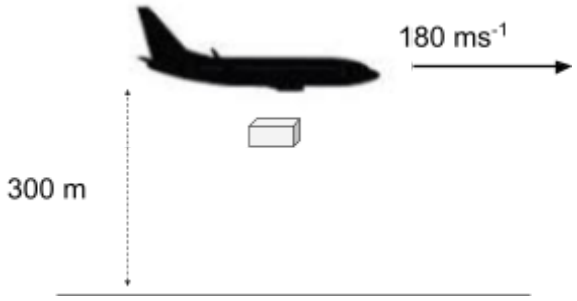
You are a consultant physicist for the movie.
Show that horizontal speed of the stuntman must be greater than 4.95 ms^{-1}

6. A small rocket is launched horizontally off a tower. The launch is repeated with increasing horizontal speeds.



   a. What can you say about the time each launched rocket will take to land on the ground.
   b. If the tower has a height of 50 metres determine the time it takes for each rocket's launch to land.

7. An airplane on a mercy mission drops an aid package from its hold. The airplane is travelling at 180 ms^{-1} and is at an altitude of 300m. The package has to land in a target area.



   a. Calculate the time it takes for the package to land on the ground.
   b. Determine the distance from the target area that the parcel must be dropped. *Neglect air resistance*.

8. An eagle flying horizontally at 8 ms^{-1} drops a mouse from a height of 20 m.

   a. Calculate the time taken for the prey to hit the ground.
   b. Determine the horizontal distance the mouse travelled before it hit the ground.