

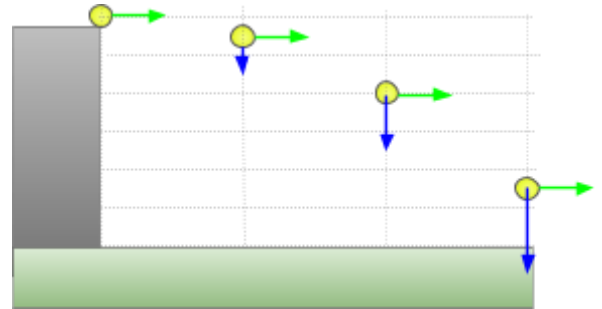
Projectiles

Space School



1) A ball is projected horizontally off a table with a horizontal speed of 10 ms^{-1}

- State what happens to the horizontal component of the ball's velocity during the flight.
- State what happens to the ball's vertical velocity during the flight.
- At a time of 0.8 s into the flight determine the ball's
(i) horizontal and (ii) vertical velocities
- At the time of 0.8 s determine the resultant velocity of the ball.

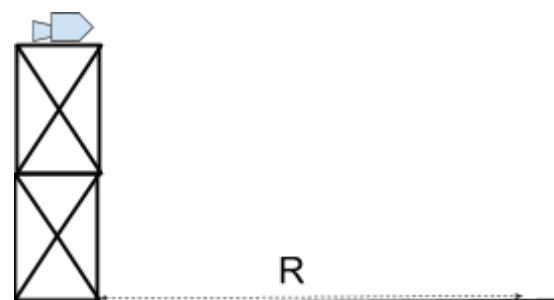


2) An object is ejected horizontally off a tower with a horizontal speed of 90 ms^{-1} .
The object lands 1.5 s later. (Ignore air resistance)

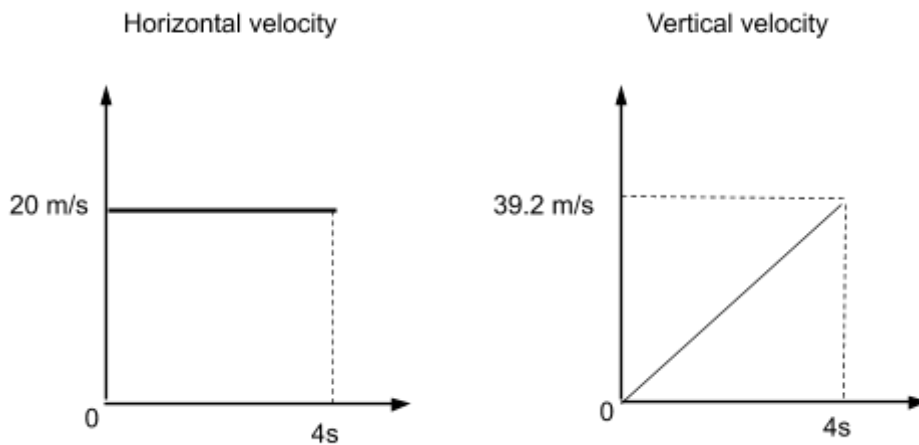
- State the horizontal speed of the object throughout the flight.
- Determine the vertical speed of the object just before it lands.
- Determine the distance the object landed from the foot of the tower.
- Calculate the height of the tower.

3) An experimental rocket is launched from a launch tower with a horizontal speed of 50 ms^{-1}

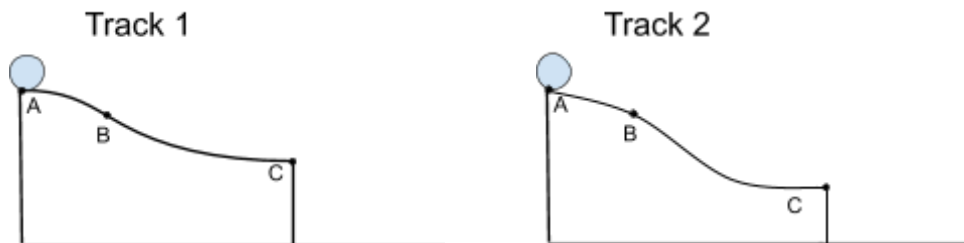
- The experimental rocket lands 3 s after launch.
Determine the vertical speed of the experimental rocket at 3 s .
- Sketch a velocity time graph of the experimental rocket's vertical velocity and determine the height of the launch tower.
- Sketch a graph of the horizontal velocity of the experimental rocket and determine its range R .



- 4) The graphs below represent the horizontal and vertical velocities of a projectile which is launched horizontally from a high platform. It lands 4s later and the data of the flight is displayed.

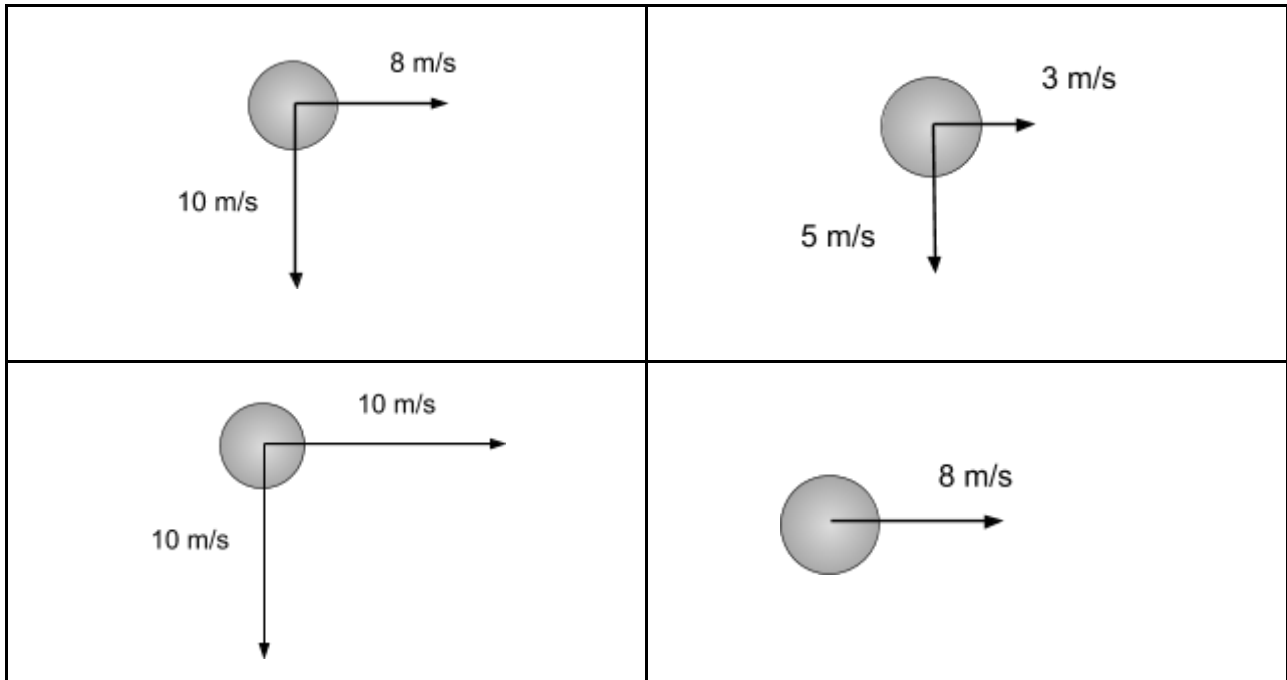


- a) Determine the horizontal distance travelled by the projectile.
- b) Determine the height of the platform.
- c) Calculate the magnitude of the speed of the projectile just at the moment before landing.
- 5) A ball is released and allowed to roll down either track 1 or track 2 leaving at point C.

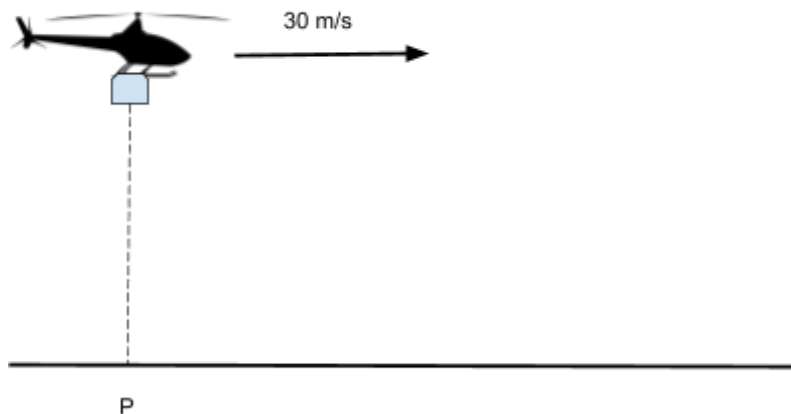


- 6) Which of the following statements are true:
- a) When the ball is released from position A on each track, the time taken to land will be greater for track 1.
- b) On track 1 the when the ball is released from position B it will take a smaller time to land compared to being released from position A
- c) The horizontal speed of the ball will be greater for track 2 than for track 1 when released from position A on each track.
- d) A pupil carries out several experiments releasing the ball from different points along the track 1 . She concludes that no matter where you release the ball on track 1 between A and C the time taken to land is the same.

7) Find the resultant velocity in each of these situations.

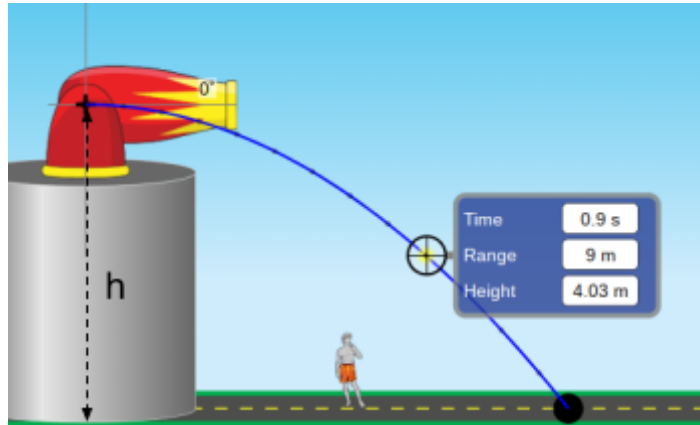


7) A helicopter drops off a sack of rocks to help build a mountain path. The helicopter is moving horizontally at a speed of 30 m/s when it drops the sack. The sack hits the ground 1.8 seconds after being dropped.



- Determine how far from position P will the sack land?
- Sketch a diagram showing the position of the helicopter in relation to the sack just as the sack hits the ground.
- Determine the height the sack was dropped from above P.

- 8) An object is fired horizontally from a tower. At a time of 0.9 s into the projectile's flight the distance the projectile is from the foot of the tower is 9.0 m and has a height of 4.03 m above the ground.



- Determine the horizontal velocity of the projectile.
- Find the vertical velocity at the time of 0.9s
- Determine the height the projectile dropped during the 0.9s and use this information to calculate the height of the tower.

Answers.

- a) Constant b) accelerates 9.8 m/s^2 c) 10 m/s , 7.8 m/s d) 13 m/s 39° below horizontal.
- a) 90 m/s b) 15 m/s c) 135 m d) 11 m
- a) 29 m/s b) 44 m c) 150 m
- a) 80 m b) 78 m c) 44 m/s
- a) True b) False (both take the same time to land) c) True d) True
- a) 13 m/s @ 51° below horizontal b) 5.8 m/s @ 59° below horizontal
c) 14 m/s @ 45° below horizontal d) 8 m/s 90 degrees.
- a) 54 m b) helicopter immediately above sack c) 18 m/s d) 16 m
- a) 10 m/s b) 8.8 m/s c) 3.96 m d) 8.00 m