

Question

1 2 3 4 5 6 7 8 9 10

Description

PHYS141 - Fall 2012 Chapter 3, #22, 28, 32, 34, 56 Chapter 4, #2, 6, 12, 16, 30

1. Question Details

SerCP9 3.P.022. [1631972]

One of the fastest recorded pitches in major-league baseball, thrown by Tim Lincecum in 2009, was clocked at 101.0 mi/h (see the figure). If a pitch were thrown horizontally with this velocity, how far would the ball fall vertically by the time it reached home plate, 60.5 ft away?

 ft

From the window of a building, a ball is tossed from a height y_0 above the ground with an initial velocity of 8.10 m/s and angle of 19.0° below the horizontal. It strikes the ground 5.00 s later.

(a) If the base of the building is taken to be the origin of the coordinates, with upward the positive y -direction, what are the initial coordinates of the ball? (Use the following as necessary: y_0 .)

$$x_i =$$

$$y_i =$$

(b) With the positive x -direction chosen to be out the window, find the x - and y -components of the initial velocity.

$$v_{i,x} = \text{[]} \text{ m/s}$$

$$v_{i,y} = \text{[]} \text{ m/s}$$

(c) Find the equations for the x - and y - components of the position as functions of time. (Use the following as necessary: y_0 and t . Let the variable t be measured in seconds.)

$$x = \text{[]} \text{ m}$$

$$y = \text{[]} \text{ m}$$

(d) How far horizontally from the base of the building does the ball strike the ground?

$$\text{[]} \text{ m}$$

(e) Find the height from which the ball was thrown.

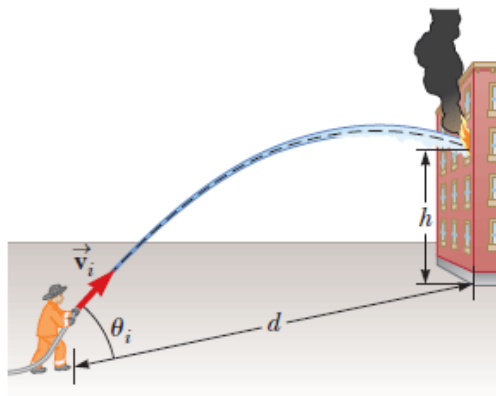
$$\text{[]} \text{ m}$$

(f) How long does it take the ball to reach a point 10.0 m below the level of launching?

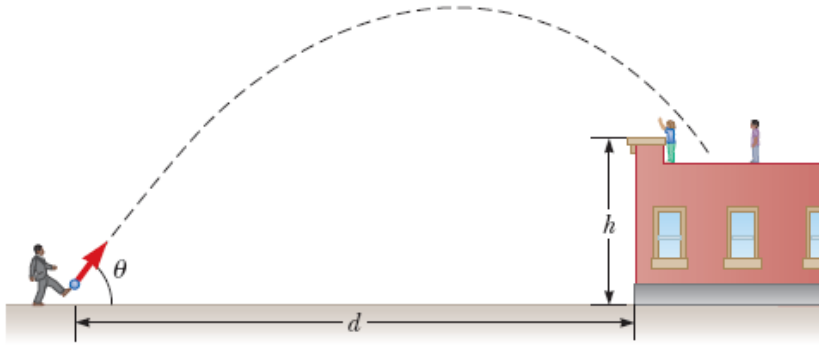
$$\text{[]} \text{ s}$$

A fireman $d = 47.0$ m away from a burning building directs a stream of water from a ground-level fire hose at an angle of $\theta_i = 32.0^\circ$ above the horizontal as shown in the figure. If the speed of the stream as it leaves the hose is $v_i = 40.0$ m/s, at what height will the stream of water strike the building?

$$\text{[]} \text{ m}$$



A playground is on the flat roof of a city school, 6.7 m above the street below (see figure). The vertical wall of the building is $h = 8.00$ m high, to form a 1.3 -m-high railing around the playground. A ball has fallen to the street below, and a passerby returns it by launching it at an angle of $\theta = 53.0^\circ$ above the horizontal at a point $d = 24.0$ m from the base of the building wall. The ball takes 2.20 s to reach a point vertically above the wall.



(a) Find the speed at which the ball was launched.

 m/s

(b) Find the vertical distance by which the ball clears the wall.

 m

(c) Find the horizontal distance from the wall to the point on the roof where the ball lands.

 m

A ball is thrown straight upward and returns to the thrower's hand after 2.55 s in the air. A second ball thrown at an angle of 40.0° with the horizontal reaches the same maximum height as the first ball.

(a) At what speed was the first ball thrown?

 m/s

(b) At what speed was the second ball thrown?

 m/s

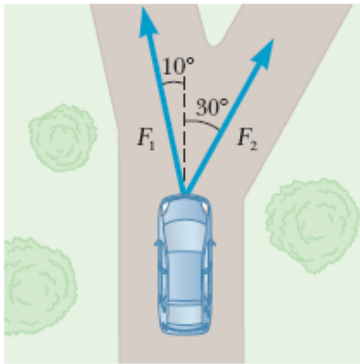
A football punter accelerates a football from rest to a speed of 9 m/s during the time in which his toe is in contact with the ball (about 0.17 s). If the football has a mass of 0.50 kg, what average force does the punter exert on the ball?

 N

A freight train has a mass of 1.6×10^7 kg. If the locomotive can exert a constant pull of 8.0×10^5 N, how long does it take to increase the speed of the train from rest to 82 km/h?

 min

Two forces are applied to a car in an effort to move it, as shown in the following figure, where $F_1 = 441$ N and $F_2 = 397$ N. (Assume up and to the right as positive directions.)



(a) What is the resultant of these two forces?

magnitude N

direction ° to the right of the forward direction

(b) If the car has a mass of 3,000 kg, what acceleration does it have? Ignore friction.

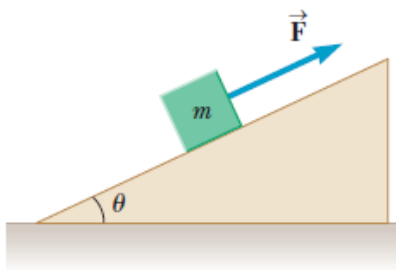
m/s²

The force exerted by the wind on the sails of a sailboat is $F_{\text{sail}} = 460$ N north. The water exerts a force of $F_{\text{keel}} = 250$ N east. If the boat (including its crew) has a mass of 300 kg, what are the magnitude and direction of its acceleration?

magnitude m/s²

direction ° north of east

A block of mass $m = 5.5$ kg is pulled up a $\theta = 26^\circ$ incline as in the figure with a force of magnitude $F = 38$ N.



(a) Find the acceleration of the block if the incline is frictionless.

m/s²

(b) Find the acceleration of the block if the coefficient of kinetic friction between the block and incline is 0.12.

m/s²

Assignment Details

Name (AID): Homework #3 - Due Friday Sep. 21, 2012. (2811348)

Submissions Allowed: 5

Category: Homework

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