WebAssign
Module Two Problems & Exercises (Homework)

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PHY-101, section X3339, Spring 2017
Instructor: Patricia Espinoza-Torro

Current Score : – / 40 **Due :** Wednesday, January 18 2017 06:59 AM EST

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1. –/2.35 pointsOSColPhys1 3.2.004.

Suppose you walk 18.0 m straight west and then 25.0 m straight north.

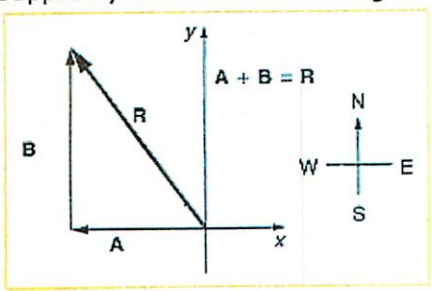

Figure 3.23

How far are you from your starting point?

[ ] m

What is the compass direction of a line connecting your starting point to your final position?

[ ] ° west of north

(If you represent the two legs of the walk as vector displacements **A** and **B**, as in Figure 3.23, then this problem asks you to find their sum **R** = **A** + **B**).

Additional Materials

- Reading

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2. –/2.35 pointsOSColPhys1 3.2.011.

Find the components of $\mathbf{v}_{tot}$ along the x and y axes in Figure 3.25, where θ = 20.5° and $\mathbf{v}_{tot}$ = 5.20 m/s.

$v_{tot,x}$ = [ ] m/s

$v_{tot,y}$ = [ ] m/s

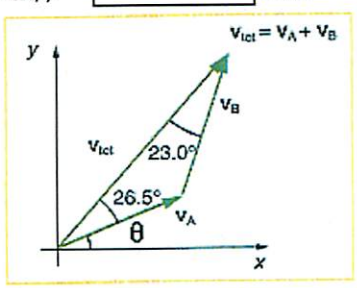


Figure 3.25.

Additional Materials

- Reading

3. –/2.35 pointsOSColPhys1 3.3.018.

You drive 6.00 km in a straight line in a direction 15° East of North.

(a) Find the distances you would have to drive straight East and then straight North to arrive at the same point. (This is equivalent to finding the components of the displacement along the East and North directions.)

[ ] km East

[ ] km North

(b) Show that you still arrive at the same point if the East and North legs are reversed in order.

This answer has not been graded yet.

Additional Materials

- Reading

4. –/2.35 pointsOSColPhys1 3.3.023.

In an attempt to escape his island, Gilligan builds a raft and sets to sea. The wind shifts a great deal during the day, and he is blown along the following straight lines:

2.5 km 45° north of west; then
4.70 km 60° south of east; then
5.1 km straight east; then
7.2 km 55° south of west; and finally
2.8 km 10° north of east.

What is his final position relative to the island?

[ ] km

[ ] ° south of east

Additional Materials

- Reading

5. –/2.35 pointsOSColPhys1 3.4.029.

An archer shoots an arrow at a 78.0 m distant target, the bull's-eye of which is at same height as the release height of the arrow.

(a) At what angle must the arrow be released to hit the bull's-eye if its initial speed is 34.0 m/s? (Although neglected here, the atmosphere provides significant lift to real arrows.)

[ ] °

(b) There is a large tree halfway between the archer and the target with an overhanging branch 3.50 m above the release height of the arrow. Will the arrow go over or under the branch?

- ○ over
- ○ under

Additional Materials

- Reading

6. –/2.35 pointsOSColPhys1 3.4.033.

The cannon on a battleship can fire a shell a maximum distance of 23.0 km.

(a) Calculate the initial velocity of the shell.

[ ] m/s

(b) What maximum height does it reach? (At its highest, the shell is above a substantial part of the atmosphere--but air resistance is not really negligible as assumed to make this problem easier.)

[ ] m

(c) The ocean is not flat, since the earth is curved. How many meters lower will its surface be 23.0 km from the ship along a horizontal line parallel to the surface at the ship?

[ ] m Does your answer imply that error introduced by the assumption of a flat earth in projectile motion is significant here? (Select all that apply.)

- ☐ The error is insignificant compared to the distance of travel.
- ☐ The error is significant compared to the distance of travel.
- ☐ The error is insignificant compared to the size of a target.
- ☐ The error could be significant compared to the size of a target.

Additional Materials

- Reading

7. –/2.35 pointsOSColPhys1 3.4.041.

An owl is carrying a mouse to the chicks in its nest. It is 4.00 m west and 12.0 m above the center of the 30 cm diameter nest and is flying east at 2.50 m/s at an angle 35° below the horizontal when it accidentally drops the mouse. Will it fall into the nest? Find out by solving for the horizontal position of the mouse (measured from the point of release) when it has fallen the 12.0 m.

[ ] m (from the point of release)

Additional Materials

- Reading

8. –/2.35 pointsOSColPhys1 3.5.053.

A seagull flies at a velocity of 7.00 m/s straight into the wind.

(a) If it takes the bird 19.0 min to travel 6.00 km relative to the earth, what is the velocity of the wind?

[ ] m/s

(b) If the bird turns around and flies with the wind, how long will he take to return 6.00 km?

[ ] s

(c) Discuss how the wind affects the total round-trip time compared to what it would be with no wind.

This answer has not been graded yet.

Additional Materials

- Reading

9. –/2.35 pointsOSColPhys1 3.5.054.

Near the end of a marathon race, the first two runners are separated by a distance of 45.0 m. The front runner has a velocity of 3.50 m/s, and the second a velocity of 4.25 m/s.

(a) What is the velocity of the second runner relative to the first?

[ ] m/s faster than the front runner.

(b) If the front runner is 250 m from the finish line, who will win the race, assuming they run at constant velocity?

- ○ The second runner will win.
- ○ The first runner will win.

(c) What distance ahead will the winner be when she crosses the finish line?

[ ] m

Additional Materials

- Reading

10. –/2.35 pointsOSColPhys1 3.5.057.

A ship sets sail from Rotterdam, The Netherlands, heading due north at 5.00 m/s relative to the water. The local ocean current is 1.51 m/s in a direction 40° north of east. What is the velocity of the ship relative to the earth?

[ ] m/s [ ] ° N of E

Additional Materials

- Reading

11.–/2.35 pointsOSColPhys1 3.5.061.

A knife is dropped from the top of a 17.0 m high mast on a ship moving at 1.75 m/s due south.

(a) Calculate the velocity of the knife relative to the ship when it hits the deck of the ship.

[ ] m/s (down)

(b) Calculate the velocity of the knife relative to a stationary observer on shore.

[ ] m/s [ ] Â° (below the horizontal to the south)

(c) Discuss how the answers give a consistent result for the position at which the knife hits the deck.

This answer has not been graded yet.

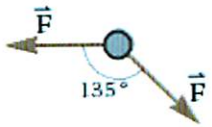
Additional Materials

- Reading

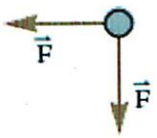
12.–/2.35 pointsOSColPhys1 4.3.003.

The diagrams below show different objects of equal masses that are acted on by one or more forces. In the diagrams below, each force vector labeled $\vec{F}$ has the same magnitude.

(i)



(ii)



(iii)

(iv)

(a) Which of the four objects shown has a net zero force acting on it?

- ○ (i)
- ○ (ii)
- ○ (iii)
- ○ (iv)

(b) Which object or objects have the largest magnitude of force? (Select all that apply.)

- ☐ (i)
- ☐ (ii)
- ☐ (iii)
- ☐ (iv)

(c) Which object or objects move with constant velocity? (Select all that apply.)

- ☐ (i)
- ☐ (ii)
- ☐ (iii)
- ☐ (iv)

(d) Which object or objects move with changing speed? (Select all that apply.)

- ☐ (i)
- ☐ (ii)
- ☐ (iii)
- ☐ (iv)

Additional Materials

- Reading

13.–/2.35 pointsOSColPhys1 4.3.009.

Suppose two children push horizontally, but in exactly opposite directions, on a third child in a wagon. The first child exerts a force of 75.0 N, the second a force of 92.0 N, friction is 12.0 N, and the mass of the third child plus wagon is 30.0 kg.

(a) What is the system of interest if the acceleration of the child in the wagon is to be calculated? (Select all that apply.)

- ☐ the wagon
- ☐ the children outside the wagon
- ☐ the child in the wagon

(b) Draw a free body diagram, including the weight and all other forces acting on the system. (Do this on paper. Your instructor may ask you to turn in this diagram.)

(c) Calculate the acceleration.

[ ] m/s^2

(d) What would the acceleration be if friction is 17.0 N?

[ ]

Additional Materials

- Reading

14.–/2.35 pointsOSColPhys1 4.3.014.

Suppose the mass of a fully loaded module in which astronauts take off from the Moon is 13,300 kg. The thrust of its engines is 28,000 N. (Assume that the gravitational acceleration on the Moon is 1.67 m/s^2.)

(a) Calculate its magnitude of acceleration in a vertical takeoff from the Moon.

[ ] m/s^2

(b) Could it lift off from Earth? If not, why not?

- ○ No, the thrust of the module's engines is less than its weight on Earth.
- ○ Yes, the thrust of the module's engines is equal to its weight on Earth.
- ○ No, the thrust of the module's engines is equal to its weight on Earth.
- ○ Yes, the thrust of the module's engines is greater than its weight on Earth.

If it could, calculate the magnitude of its acceleration. (If not, enter NONE.)

[ ] m/s^2

Additional Materials

- Reading

15.–/2.35 pointsOSColPhys1 4.4.015.

What net external force is exerted on a 1050-kg artillery shell fired from a battleship if the shell is accelerated at 2.60×10^4 m/s^2? (Enter the magnitude.)

[ ] N

What is the magnitude of the force exerted on the ship by the artillery shell?

[ ] N

Additional Materials

- Reading

16.–/2.35 pointsOSColPhys1 4.5.019.

(a) Calculate the tension in a vertical strand of spiderweb if a spider of mass 8.00×10^{-5} kg hangs motionless on it.

[ ] N

(b) Calculate the tension in a horizontal strand of spiderweb if the same spider sits motionless in the middle of it much like the tightrope walker in Figure 4.13. The strand sags at an angle of 12.0° below the horizontal.

[ ] N

Compare this with the tension in the vertical strand (find their ratio).

[ ] (tension in horizontal strand / tension in vertical strand)

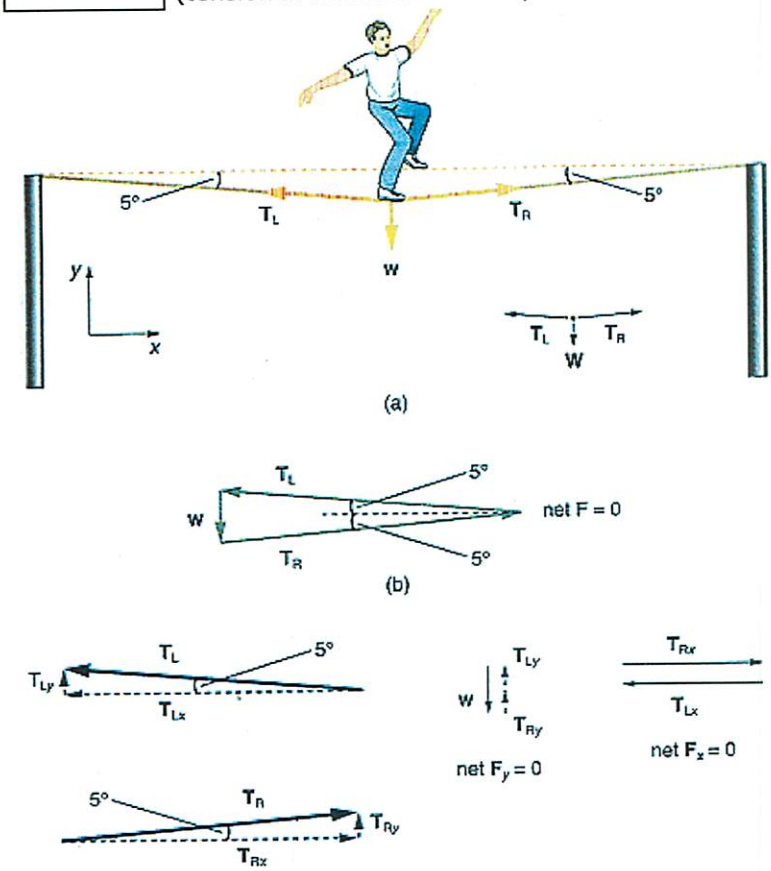


Figure 4.13

Additional Materials

- Reading

17.–/2.4 pointsOSColPhys1 4.5.022.

Consider the baby being weighed in Figure 4.25.

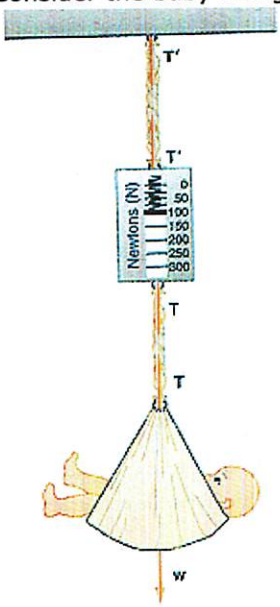


Figure 4.25

(a) What is the mass of the child and basket if a scale reading of 101 N is observed?

[ ] kg

(b) What is the tension *T* in the cord attaching the child to the scale?

[ ] N

(c) What is the tension *T'* in the cord attaching the scale to the ceiling, if the scale has a mass of 0.800 kg?

[ ] N

(d) Draw a sketch of the situation indicating the system of interest used to solve each part. The masses of the cords are negligible. (Do this on paper. Your instructor may ask you to turn in this work.)

Additional Materials

- Reading