P.56: Q28, Q29, E11, SP4

Q28. Assuming that the two trajectories in the diagram for question 26 represent throws by two different center fielders,
which of the two is likely to have been thrown by the player
with the stronger arm? Explain.

Q29. A cannonball fired at an angle of 70 8 to the horizontal stays
in the air longer than one fired at 45 8 from the same cannon.
Will the 70 8 shot travel a greater horizontal distance than
the 45 8 shot? Explain.

E11. A bullet is fired horizontally with an initial velocity of 900 m/s at a target located 150 m from the rifle.

a. How much time is required for the bullet to reach the target?

b. Using the approximate value of g 5 10 m/s^2, how far does the bullet fall in this time?

-

SP4. A cannon is fired over level ground at an angle of 30 8 to the
horizontal. The initial velocity of the cannonball is 400 m/s,
but because the cannon is fired at an angle, the vertical component of the velocity is 200 m/s and the horizontal component is 346 m/s.

a. How long is the cannonball in the air? (Use g 5 10 m/s
2
and the fact that the total time of flight is twice the time
required to reach the high point.)

b. How far does the cannonball travel horizontally?

c. Repeat these calculations, assuming that the cannon was
fired at a 60 8 angle to the horizontal, resulting in a vertical component of velocity of 346 m/s and a horizontal
component of 200 m/s. How does the distance traveled
compare to the earlier result?

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P.76:Q7, Q8, Q9, E1, E7, E9

Q7. A 3-kg block is observed to accelerate at a rate twice that of a 6-kg block. Is the net force acting on the 3-kg block therefore twice as large as that acting on the 6-kg block? Explain.

Q8 Diagram

Q8. Two equal-magnitude horizontal forces act on a box as shown in the diagram. Is the object accelerated horizontally? Explain.

Q9. Is it possible that the object pictured in question 8 is moving, given the fact that the two forces acting on it are equal
in size but opposite in direction? Explain.

E1. A single force of 40 N acts upon a 5-kg block. What is the magnitude of the acceleration of the block?

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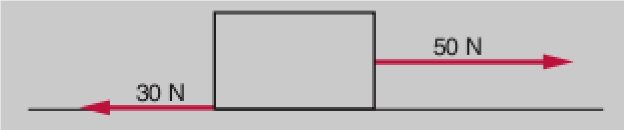


E7 Diagram

E7. Two forces, one of 50 N and the other of 30 N, act in opposite directions on a box as shown in the diagram. What is the mass of the box if its acceleration is 4.0 m/s^2?

-

E9. A 3-kg sled sliding freely on an icy surface experiences a 2-N frictional force exerted by the ice and an air-resistive force of 0.4 N.

a. What is the net force acting on the sled?

b. What is the acceleration of the sled?

-

P.76:Q15, Q17, Q20, E13, E19

Q15. Is the mass of an object the same thing as its weight? Explain.

Q17. The acceleration due to gravity on the moon is approximately one-sixth the gravitational acceleration near the Earth's surface. If a rock is transported from Earth to the moon, will either its mass or its weight change in the process? Explain.

Q20. A boy sits at rest on the floor. What two vertical forces act upon the boy? Do these two forces constitute an action/reaction pair as defined by Newton's third law of motion? Explain.

E13. One of the authors of this text has a weight of 600 N.

a. What is his mass in kilograms?

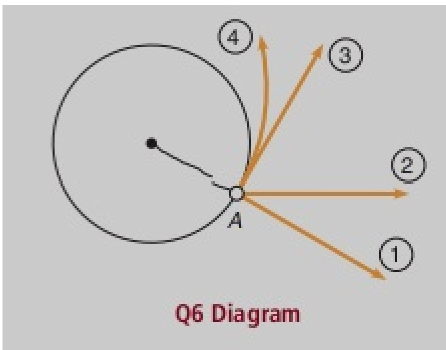
b. What is his weight in pounds? (1 lb 5 4.45 N)

-

E19. A 60-kg woman in an elevator is accelerating upward at a rate of 1.2 m/s
2
.
a. What is the net force acting upon the woman?
b. What is the gravitational force acting upon the woman?
c. What is the normal force pushing upward on the woman’s feet?
-

P.98: Q2, Q6, E4, E7

Q2. A car travels around a curve with constant speed.
a. Does the velocity of the car change in this process? Explain.
b. Is the car accelerated? Explain.



Q6. A ball on the end of a string is whirled with constant speed in a counterclockwise horizontal circle. At point A in the circle, the string breaks. Which of the curves sketched below most accurately represents the path that the ball will take after the string breaks (as seen from above)? Explain.

E4. How much larger is the required centripetal acceleration for a car rounding a curve at 60 MPH than for one rounding the same curve at 30 MPH?

-

E7. A car with a mass of 1000 kg travels around a banked curve with a constant speed of 27 m/s (about 60 MPH). The radius of curvature of the curve is 40 m.

a. What is the centripetal acceleration of the car?

b. What is the magnitude of the horizontal component of the normal force that would be required to produce this centripetal acceleration in the absence of any friction?

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P.119: Q1-Q5, E1, E3, E11

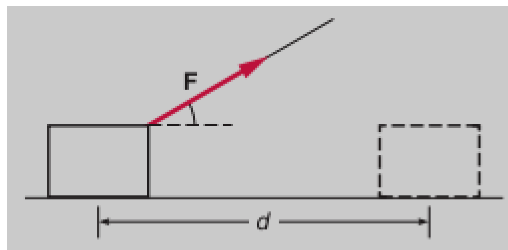
Q1. Equal forces are used to move blocks A and B across the floor. Block A has twice the mass of block B, but block B moves twice the distance moved by block A. Which block, if either, has the greater amount of work done on it? Explain.

Q2. A man pushes very hard for several seconds upon a heavy rock, but the rock does not budge. Has the man done any work on the rock? Explain.

Q3. A string is used to pull a wooden block across the floor without accelerating the block. The string makes an angle to the horizontal as shown in the diagram.

a. Does the force applied via the string do work on the block? Explain.

b. Is the total force or just a portion of the force involved in doing work? Explain.



Q3 Diagram

Q4. In the situation pictured in question 3 , if there is a frictional force opposing the motion of the block, does this frictional force do work on the block? Explain.

Q5. In the situation pictured in question 3 , does the normal force of the floor pushing upward on the block do any work? Explain.

E1. A horizontally directed force of 30 N is used to pull a box a distance of 2.5 m across a tabletop. How much work is done by the 30-N force?

-

E3. A force of 60 N used to push a chair across a room does 300 J of work. How far does the chair move in this process?

-

E11. Which requires more work: lifting a 2-kg rock to a height of 4 m without acceleration, or accelerating the same rock horizontally from rest to a speed of 10 m/s?

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P.120: Q14, Q15, Q17, Q24, E7, E12

Q14. Two balls of the same mass are accelerated by different net forces such that one ball gains a velocity twice that of the other ball in the process. Is the work done by the net force acting on the faster-moving ball twice that done on the slower-moving ball? Explain.

Q15. A box is moved from the floor up to a tabletop but gains no speed in the process. Is there work done on the box, and if so, what has happened to the energy added to the system?

Q17. Is it possible for a system to have energy if nothing is moving in the system? Explain.

Q24. Is the total mechanical energy conserved in the motion of a pendulum? Will it keep swinging forever? Explain.

E7. A 0.4-kg ball has a velocity of 25 m/s.

a. What is the kinetic energy of the ball?

b. How much work would be required to stop the ball?

-

E12. At the low point in its swing, a pendulum bob with a mass of 0.2 kg has a velocity of 4 m/s.

a. What is its kinetic energy at the low point?

b. Ignoring air resistance, how high will the bob swing above the low point before reversing direction?

-

P.140: Q2, Q4, Q5, Q9, E1, E3, E6

Q2. Two forces produce equal impulses, but the second force acts for a time twice that of the first force. Which force, if either, is larger? Explain.

Q4. Are impulse and force the same thing? Explain.

Q5. Are impulse and momentum the same thing? Explain.

Q9. What is the advantage of an air bag in reducing injuries during collisions? Explain using impulse and momentum ideas.

E1. An average force of 300 N acts for a time interval of 0.04 s on a golf ball.

a. What is the magnitude of the impulse acting on the golf ball?

b. What is the change in the golf ball's momentum?

-

E3. A bowling ball has a mass of 6 kg and a speed of 1.5 m/s.
A baseball has a mass of 0.12 kg and a speed of 40 m/s.
Which ball has the larger momentum?

-

E6. A ball experiences a change in momentum of 24 kg·m/s.

a. What is the impulse acting on the ball?

b. If the time of interaction is 0.15 s, what is the magnitude of the average force acting on the ball?

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P.141: Q33, E10, E11, SP5

Q33. A cue ball strikes an eight ball of equal mass, initially at rest. The cue ball stops and the eight ball moves forward with a velocity equal to the initial velocity of the cue ball. Is the collision elastic? Explain.

E10. A fullback with a mass of 100 kg and a velocity of 3.5 m/s due west collides head-on with a defensive back with a mass of 80 kg and a velocity of 6 m/s due east.

a. What is the initial momentum of each player?

b. What is the total momentum of the system before the collision?

c. If they stick together and external forces can be ignored, what direction will they be traveling immediately after they collide?

-

E11. An ice skater with a mass of 80 kg pushes off against a second skater with a mass of 32 kg. Both skaters are initially at rest.

a. What is the total momentum of the system after they push off?

b. If the larger skater moves off with a speed of 3 m/s, what is the corresponding speed of the smaller skater?

-

SP5. A 1500-kg car traveling due north with a speed of 25 m/s collides head-on with a 4500-kg truck traveling due south with a speed of 15 m/s. The two vehicles stick together after the collision.

a. What is the total momentum of the system prior to the collision?

b. What is the velocity of the two vehicles just after the collision?

c. What is the total kinetic energy of the system before the collision?

d. What is the total kinetic energy just after the collision?

e. Is the collision elastic? Explain.

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