SQ1: Carl Lewis set a world record for the 100.0-m run with a time of 9.86 s. If, after reaching the finish line, Mr. Lewis walked directly back to his starting point in 90.14 s, what is the magnitude of his average velocity for the 200.0 m?

A. 5 m/s
B. 1 m/s
C. 0 m/s
D. 10 m/s
E. 2 m/s

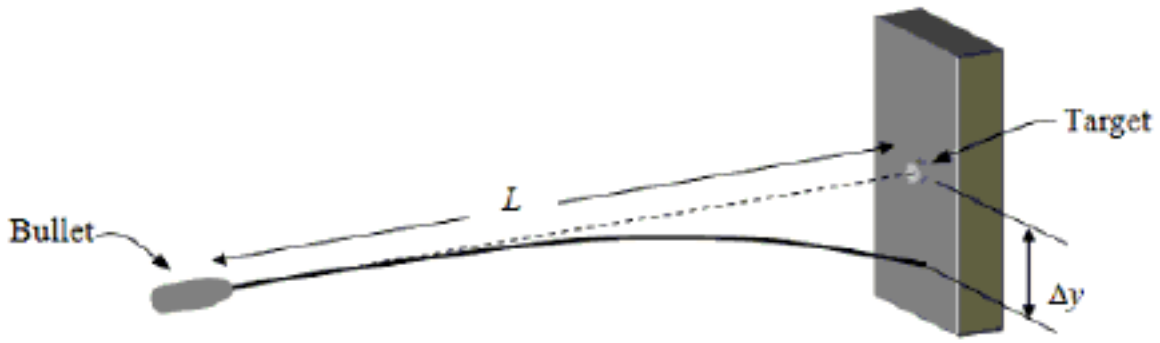
SQ2: A bicyclist is riding at a constant speed along a straight-line path. The rider throws a ball straight up to a height a few meters above her head. Ignoring air resistance, where will the ball land?

A. In front of the rider
B. In the opposite hand to the one that threw it
C. In the same hand that threw the ball
D. This cannot be determined without knowing the speed of the rider and the maximum height of the ball
E. Behind the rider

SQ3: During a one-hour trip, a small boat travels 8.0 km north and then travels 6.0 km east. What is the magnitude of the boat's average velocity for the one-hour trip?

A. 10 km/h
B. 14 km/h
C. 1000 km/h
D. 2 km/h
E. 4 km/h

SQ4: A bullet is aimed at a target on the wall a distance L away from the firing position. Because of gravity, the bullet strikes the wall a distance Δy below the mark as suggested in the figure. **Note**: *The drawing is not to scale.*



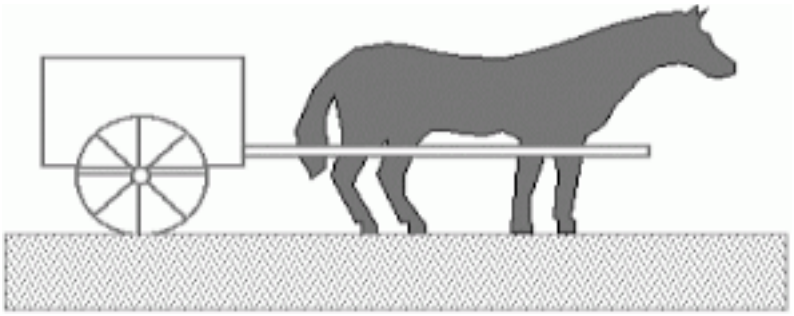
If the distance L was half as large and the bullet had the same initial velocity, how would Δy be affected?

A. Δy will be four times larger
B. Δy will double
C. Δy will be one fourth as large
D. Δy is not possible to determine unless numerical values are given for the distances
E. Δy will be half as large

SQ5: The minimum takeoff speed for a model airplane is 10 m/s. What minimum acceleration is required if the plane must leave a runway of length 50 m? Assume the plane starts from rest at one end of the runway.

A. 0.5 m/s^2
B. 1.0 m/s^2
C. 10 m/s^2
D. 2.0 m/s^2
E. 5.0 m/s^2

SQ6: A horse pulls a cart along a flat road. Consider the following four lateral forces that arise in this situation.

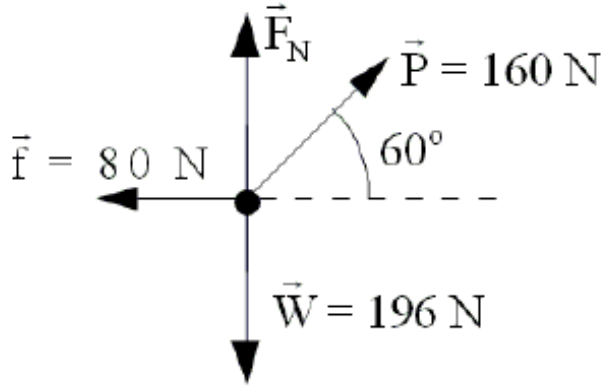


(*1*) the force of the horse pulling on the cart
(*2*) the force of the cart pulling on the horse
(*3*) the frictional force of the horse pushing on the road
(*4*) the frictional force of the road pushing on the horse

Suppose that the horse and cart have started from rest; and as time goes on, their speed increases in the same direction. Which one of the following conclusions is correct concerning the magnitudes of the forces mentioned above?

A. Force 2 exceeds force 4
B. Forces 1 and 2 cannot have equal magnitudes
C. Force 3 exceeds force 4
D. Force 1 exceeds force 2
E. Force 2 is less than force 3

SQ7: A force P pulls on a crate of mass *m* that is in contact with a rough surface. The figure shows the magnitudes and directions of the forces that act on the crate in this situation. **W** represents the weight of the crate. $\mathbf{F_N}$ represents the normal force on the crate, and **f** represents the frictional force.



Which statement best describes the motion of the crate?

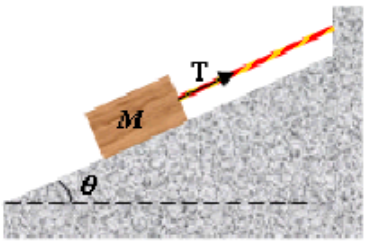
A. The crate may be either at rest or moving with constant velocity
B. The crate must be moving with constant velocity
C. The crate must be moving with constant acceleration
D. The crate must be either at rest or moving with constant acceleration
E. The crate must be at rest

SQ8: A 8-kg block is set moving with an initial speed of 6 m/s on a rough horizontal surface. If the force of friction is 12 N, approximately how far does the block travel before it stops?

A. 9 m
B. 1.5 m
C. 24 m
D. 12 m
E. 6 m

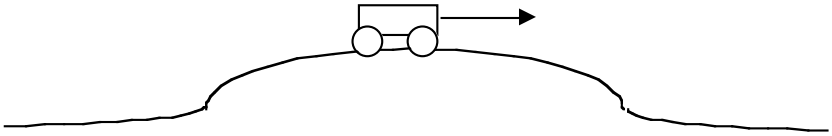
Question 9: A block of mass *M* is held motionless on a frictionless inclined plane by means of a string attached to a vertical wall as shown in the drawing.

What is the magnitude of the tension in the string?



A. $Mg \sin\theta$
B. $Mg \tan\theta$
C. Zero newtons
D. Mg
E. $Mg \cos\theta$

SQ10: A car of mass m, traveling at constant speed, rides over the top of a round hill



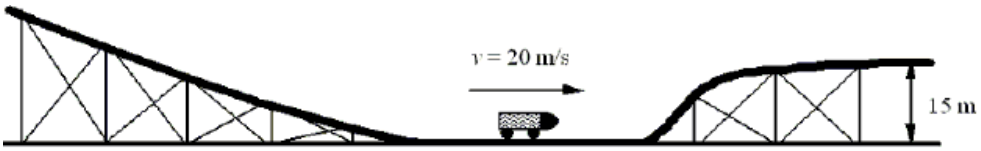
The normal force, N, of the road on the car at this point is

A: $N > mg$
B: $N < mg$
C: $N = mg$
D: Can't answer: depends on speed

SQ11: A block is dropped from a high tower and is falling freely under the influence of gravity. Which one of the following statements is true concerning this situation? Neglect air resistance.

A. The total energy of the block increases by equal amounts over equal distances
B. The potential energy of the block decreases by equal amounts in equal times
C. As the block falls, the net work done by all of the forces acting on the block is zero
D. The kinetic energy increases by equal amounts over equal distances
E. The kinetic energy of the block increases by equal amounts in equal times

SQ12: A roller-coaster car is moving at 20 m/s along a straight horizontal track. What will its speed be after climbing the 15-m hill shown in the figure, if friction is ignored (assume $g = 10$ m/s^2)?

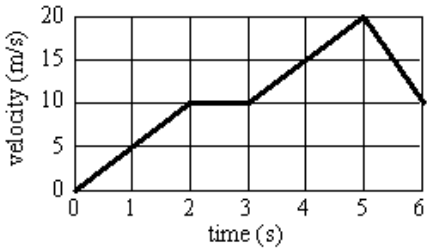


A. 17 m/s
B. 7 m/s
C. 10 m/s
D. 14 m/s
E. 5 m/s

SQ13: A racecar has a speed of 80 m/s when the driver releases a drag parachute. If the parachute causes a deceleration of -4 m/s^2, how far will the car travel before it stops?

A. 1000 m
B. 200 m
C. 800 m
D. 20 m
E. 400 m

SQ14: An object is moving along a straight line. The graph shows the object's velocity as a function of time.



How far does the object move in the interval from $t = 0$ to $t = 2$ s?

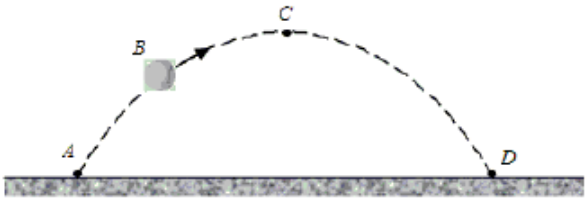
A. 25 m
B. 10 m
C. 7.5 m
D. 15 m
E. 20 m

SQ15: An object goes from one point in space to another. After it arrives at its destination, the size of its displacement is:

A. either greater than or equal to
B. always equal to
C. either smaller than or equal to
D. could be smaller or larger

than the distance it traveled.

SQ16: A tennis ball is thrown upward at an angle from point *A*. It follows a parabolic trajectory and hits the ground at point *D*. At the instant shown, the ball is at point *B*. Point *C* represents the highest position of the ball above the ground.



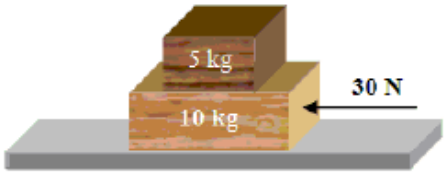
Which statement is true concerning the ball when it is at *C,* the highest point in its trajectory?

A. The ball's velocity is zero, but its acceleration is not zero
B. The ball's velocity and acceleration are both zero
C. The horizontal and vertical components of the ball's velocity are equal
D. The ball's velocity is perpendicular to its acceleration
E. The ball's velocity is not zero, but its acceleration is zero

SQ17: On a two lane highway, a car is following a pickup truck. At one instant, the car has a speed of 32 m/s and is 160 m behind the truck. At the same time, the truck has a speed of 28 m/s. If neither vehicle accelerates, how long will it take the car to catch up to the truck?

A. 20 s
B. 40 s
C. 80 s
D. 96 s
E. 5 s

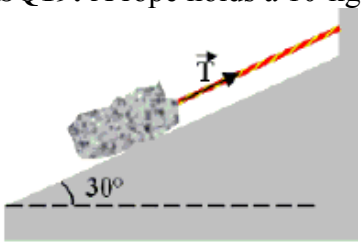
SQ18: Two blocks rest on a horizontal *frictionless* surface as shown. The surface between the top and bottom blocks is roughened so that there is no slipping between the two blocks. A 30-N force is applied to the bottom block as suggested in the figure.



What is the force of static friction between the top and bottom blocks?

A. zero newtons
B. 10 N
C. 25 N
D. 20 N
E. 30 N

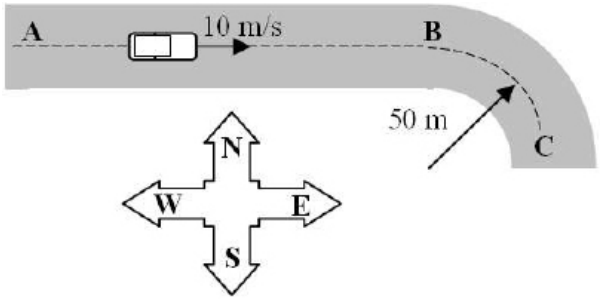
SQ19: A rope holds a 10-kg rock at rest on a *frictionless* inclined plane as shown.



Determine the magnitude of the acceleration of the rock down the inclined plane if the rope breaks?

A. zero m/s^2
B. 8.5 m/s^2
C. 4.9 m/s^2
D. 9.8 m/s^2
E. 5.7 m/s^2

SQ20: An 1800-kg Jeep travels along a straight 500-m portion of highway (from **A** to **B**) at a constant speed of 10 m/s. At **B**, the Jeep encounters an unbanked curve of radius 50 m. The Jeep follows the road from **B** to **C** traveling at a constant speed of 10 m/s while the direction of the Jeep changes from east to south.



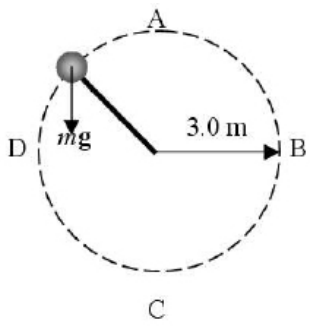
What is the magnitude of the frictional force between the tires and the road as the Jeep negotiates the curve from B to C?

A. 1800 N
B. 1000 N
C. 9600 N
D. 7200 N
E. 3600 N

SQ21:
A donkey pulls a crate up a rough, inclined plane at constant speed. Which one of the following statements concerning this situation is false?

A. The net work done by all the forces acting on the crate is zero joules.
B. The work done on the crate by the normal force is zero joules.
C. The work done on the object by gravity is zero joules.
D. The donkey does positive work in pulling the crate up the incline.
E. The gravitational potential energy of the crate is increasing.

SQ22: A 0.50-kg ball on the end of a rope is moving in a vertical circle of radius 3.0 m at constant speed. Point **A** is at the top of the circle; **C** is at the bottom. Points **B** and **D** are exactly halfway between **A** and **C**.



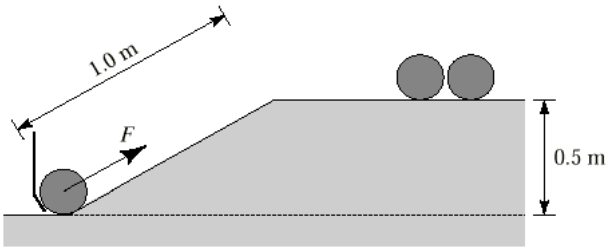
Which one of the following statements concerning the tension in the rope is true?

A. The tension is smallest at **A.**
B. The tension is smallest at **C.**
C. The tension is smallest at both **B** and **D**.
D. The tension is the same at **A** and **C.**
E. The tension is the same at **A**, **B**, **C**, and **D.**

SQ23: At the bowling alley, the ball-feeder mechanism must exert a force to push the bowling balls up a 1.0-m long ramp. The ramp leads the balls to a chute 0.5 m above the base of the ramp.

Approximately how much force must be exerted on a 5.0-kg bowling ball? Assume g = 10 m/s^2.

A: 200 N
B: 50 N
C: 25 N
D: 5.0 N
E: impossible to determine



SQ24: A marble rolls down a frictionless track, and reaches speed v at the bottom.

If you want it to reach a speed of 4v at the bottom, you need the start of the new track to be

A: twice as high
B: 4 times as high
C: half as high
D: 16 times as high
E: (need more information)

as the original track height.