ENERGY

Review

An egg is dropped from a third-story window. The distance the egg falls from the window to the ground is closest to

(A) 10^0 m
(B) 10^1 m
(C) 10^2 m
(D) 10^3 m

An egg is dropped from a third-story window. The distance the egg falls from the window to the ground is closest to

(A) 10^0 m
(B) 10^1 m
(C) 10^2 m
(D) 10^3 m

Which phenomenon provides evidence that light has a wave nature?

(A) emission of light from an energy-level transition in a hydrogen atom
(B) diffraction of light passing through a narrow opening
(C) absorption of light by a black sheet of paper
(D) reflection of light from a mirror

Which phenomenon provides evidence that light has a wave nature?

(A) emission of light from an energy-level transition in a hydrogen atom

(B) diffraction of light passing through a narrow opening

(C) absorption of light by a black sheet of paper

(D) reflection of light from a mirror

Which body is in equilibrium?

(A) a satellite orbiting Earth in a circular orbit
(B) a ball falling freely toward the surface of Earth
(C) a car moving with a constant speed along a straight, level road
(D) a projectile at the highest point in its trajectory

Which body is in equilibrium?

(A) a satellite orbiting Earth in a circular orbit

(B) a ball falling freely toward the surface of Earth

(C) a car moving with a constant speed along a straight, level road

(D) a projectile at the highest point in its trajectory

Work

A student does 60 joules of work pushing a 3.0-kilogram box up the full length of a ramp that is 5.0 meters long. What is the magnitude of the force applied to the box to do this work?

(A) 20 N
(B) 15 N
(C) 12 N
(D) 4.0 N

A student does 60 joules of work pushing a 3.0-kilogram box up the full length of a ramp that is 5.0 meters long. What is the magnitude of the force applied to the box to do this work?

(A) 20 N
(B) 15 N
(C) 12 N
(D) 4.0 N

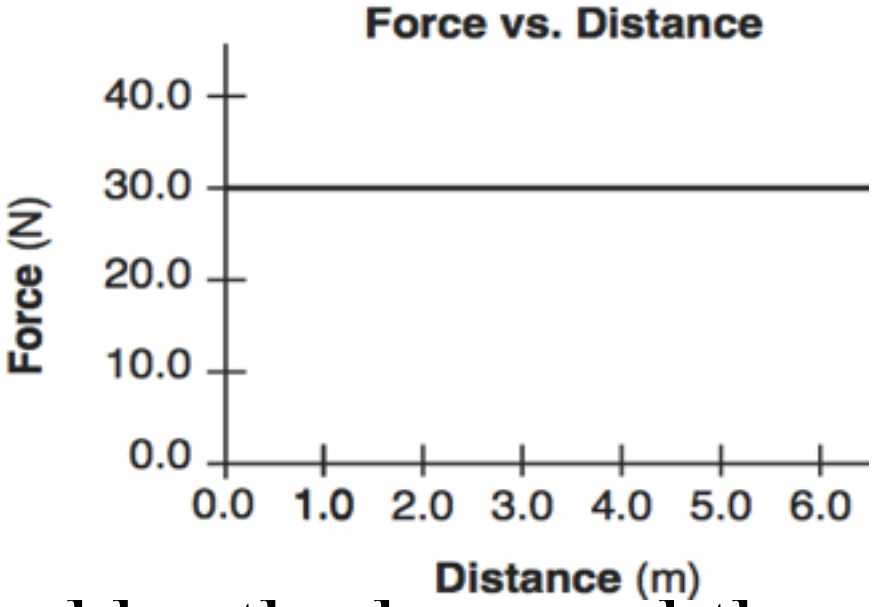
Which combination of fundamental units can be used to express energy?

(A) $kg \cdot m/s$
(B) $kg \cdot m^2/s$
(C) $kg \cdot m/s^2$
(D) $kg \cdot m^2/s^2$

Which combination of fundamental units can be used to express energy?

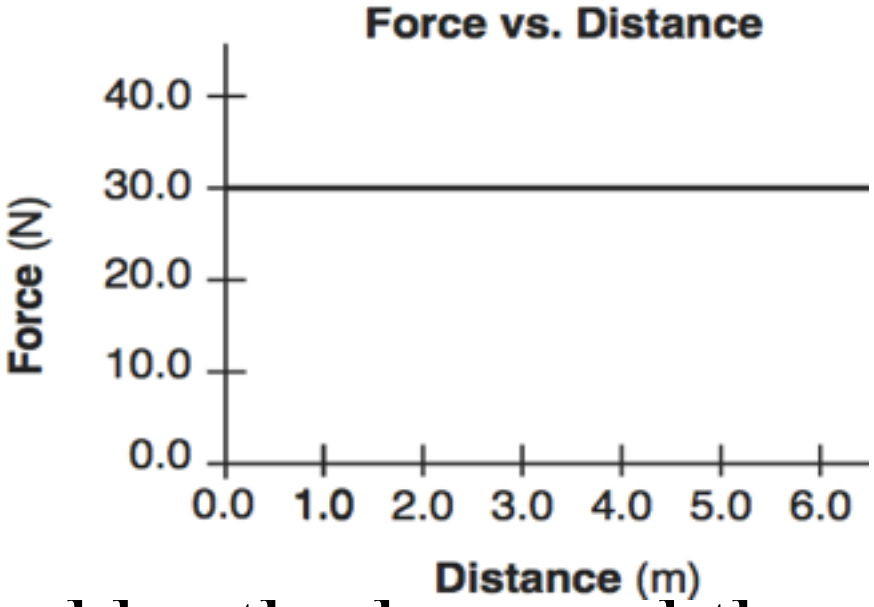
(A) $kg \cdot m/s$
(B) $kg \cdot m^2/s$
(C) $kg \cdot m/s^2$
(D) $kg \cdot m^2/s^2$

A boy pushes his wagon at constant speed along a level sidewalk. The graph represents the relationship between the horizontal force exerted by the boy and the distance the wagon moves. What is the total work done by the boy in pushing the wagon 4.0 meters?



(A) 5.0 J (B) 7.5 J (C) 120 J (D) 180 J

A boy pushes his wagon at constant speed along a level sidewalk. The graph represents the relationship between the horizontal force exerted by the boy and the distance the wagon moves. What is the total work done by the boy in pushing the wagon 4.0 meters?



(A) 5.0 J (B) 7.5 J **(C) 120 J** (D) 180 J

Which is an SI unit for work done on an object?

A. $\frac{kg \cdot m^2}{s^2}$

B. $\frac{kg \cdot m}{s}$

C. $\frac{kg \cdot m^2}{s}$

D. $\frac{kg \cdot m}{s^2}$

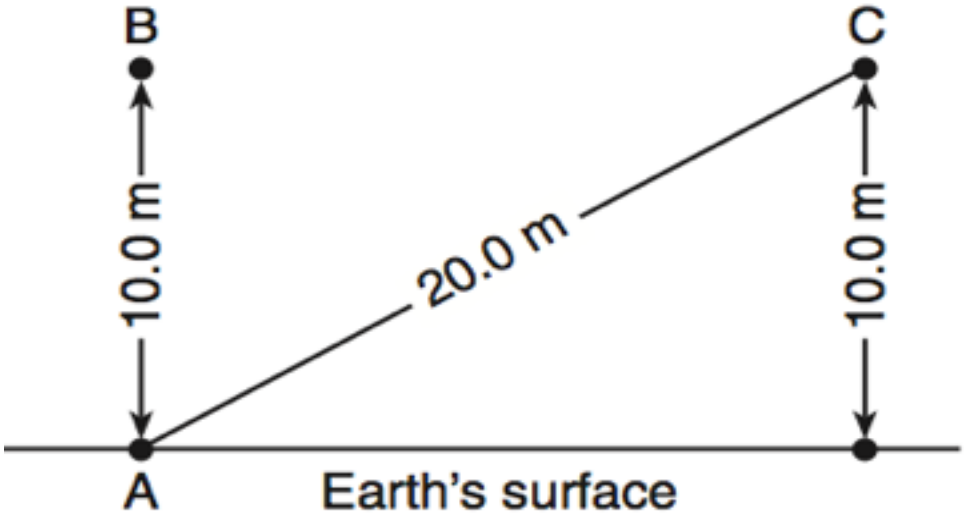
Which is an SI unit for work done on an object?

A. $\mathbf{\frac{kg \cdot m^2}{s^2}}$

B. $\frac{kg \cdot m}{s}$

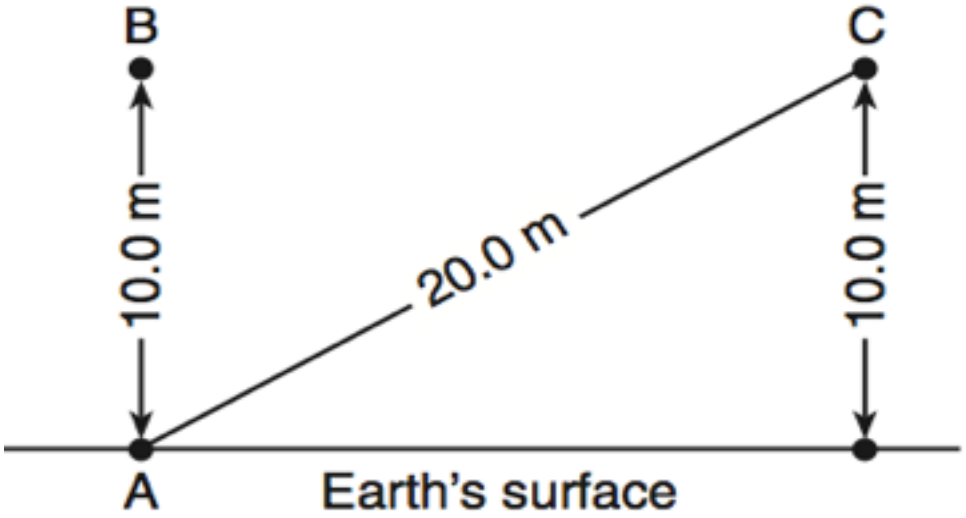
C. $\frac{kg \cdot m^2}{s}$

D. $\frac{kg \cdot m}{s^2}$



The diagram shows points A, B, and C at or near Earth's surface. As a mass is moved from A to B, 100 joules of work are done against gravity. What is the amount of work done against gravity as an identical mass is moved from A to C?

(A) 100 J (B) 173 J (C) 200 J (D) 273 J



The diagram shows points A, B, and C at or near Earth's surface. As a mass is moved from A to B, 100 joules of work are done against gravity. What is the amount of work done against gravity as an identical mass is moved from A to C?

(A) 100 J (B) 173 J (C) 200 J (D) 273 J

Kinetic Energy

A 15.0-kilogram mass is moving at 7.50 meters per second on a horizontal, frictionless surface. What is the total work that must be done on the mass to increase its speed to 11.5 meters per second?

(A) 120 J
(B) 422 J
(C) 570 J
(D) 992 J

A 15.0-kilogram mass is moving at 7.50 meters per second on a horizontal, frictionless surface. What is the total work that must be done on the mass to increase its speed to 11.5 meters per second?

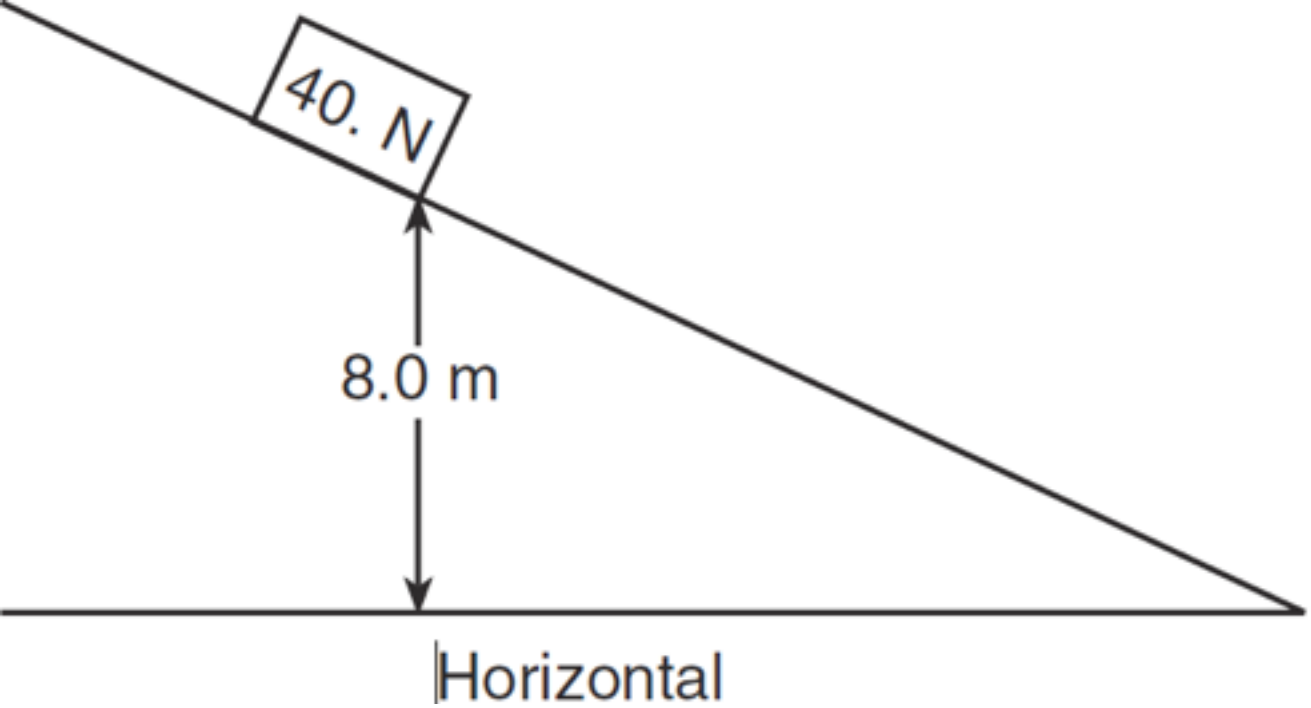
(A) 120 J
(B) 422 J
(C) 570 J
(D) 992 J

A 75-kilogram bicyclist coasts down a hill at a constant speed of 12 meters per second. What is the kinetic energy of the bicyclist?

(A) 4.5×10^2 J
(B) 9.0×10^2 J
(C) 5.4×10^3 J
(D) 1.1×10^4 J

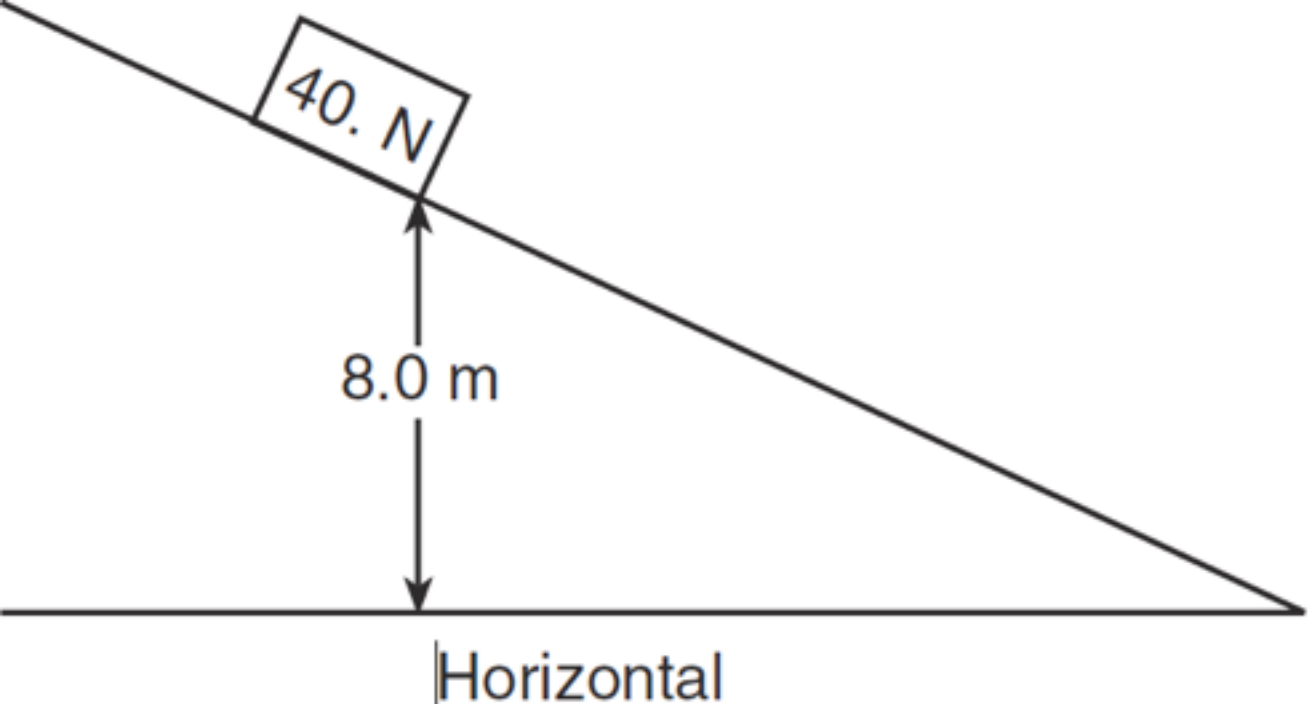
A 75-kilogram bicyclist coasts down a hill at a constant speed of 12 meters per second. What is the kinetic energy of the bicyclist?

(A) 4.5×10^2 J
(B) 9.0×10^2 J
(C) 5.4×10^3 J
(D) 1.1×10^4 J



A block weighing 40 N is released from rest on an incline 8.0 meters above the horizontal. If 50 joules of heat is generated as the block slides down the incline, the maximum kinetic energy of the block at the bottom of the incline is

(A) 50 J (B) 270 J (C) 320 J (D) 3100 J



A block weighing 40 N is released from rest on an incline 8.0 meters above the horizontal. If 50 joules of heat is generated as the block slides down the incline, the maximum kinetic energy of the block at the bottom of the incline is

(A) 50 J **(B) 270 J** (C) 320 J (D) 3100 J

A 1-kilogram rock is dropped from a cliff 90 meters high. After falling 20 meters, the kinetic energy of the rock is approximately

(A) 20 J
(B) 200 J
(C) 700 J
(D) 900 J

A 1-kilogram rock is dropped from a cliff 90 meters high. After falling 20 meters, the kinetic energy of the rock is approximately

(A) 20 J
(B) 200 J
(C) 700 J
(D) 900 J

If the speed of a car is doubled, the kinetic energy of the car is

(A) quadrupled
(B) quartered
(C) doubled
(D) halved

If the speed of a car is doubled, the kinetic energy of the car is

(A) quadrupled
(B) quartered
(C) doubled
(D) halved

A 60.0-kilogram runner has 1920 joules of kinetic energy. At what speed is she running?

(A) 5.66 m/s
(B) 8.00 m/s
(C) 32.0 m/s
(D) 64.0 m/s

A 60.0-kilogram runner has 1920 joules of kinetic energy. At what speed is she running?

(A) 5.66 m/s
(B) 8.00 m/s
(C) 32.0 m/s
(D) 64.0 m/s

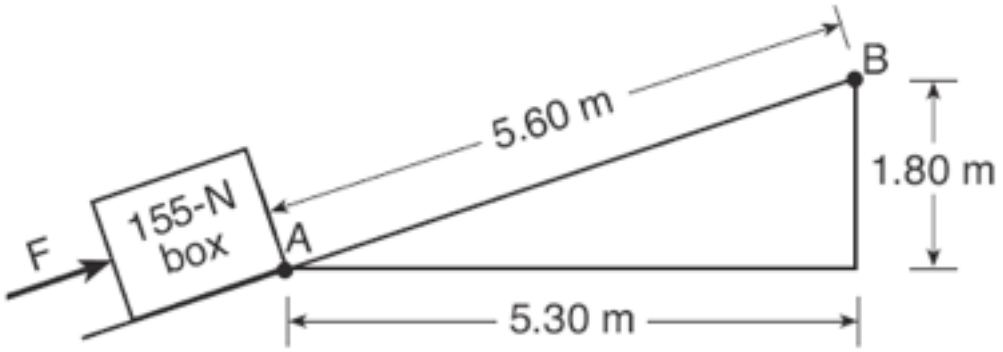
Potential Energy

The gravitational potential energy, with respect to Earth, that is possessed by an object is dependent on the object's

(A) acceleration
(B) momentum
(C) position
(D) speed

The gravitational potential energy, with respect to Earth, that is possessed by an object is dependent on the object's

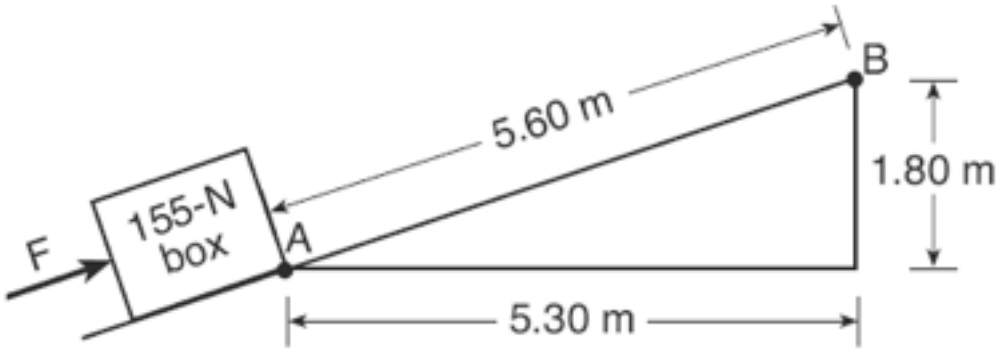
(A) acceleration
(B) momentum
(C) position
(D) speed



The diagram represents a 155-N box on a ramp. Applied force *F* causes the box to slide from point *A* to point *B*. What is the total amount of gravitational potential energy gained by the box?

(A) 28.4 J (B) 279 J

(C) 868 J (D) 2740 J



The diagram represents a 155-N box on a ramp. Applied force *F* causes the box to slide from point *A* to point *B*. What is the total amount of gravitational potential energy gained by the box?

(A) 28.4 J **(B) 279 J**

(C) 868 J (D) 2740 J

A 60-kg student climbs a ladder a vertical distance of 4.0 meters in 8.0 seconds. Approximately how much total work is done against gravity by the student during the climb?

(A) 2.4×10^3 J
(B) 2.9×10^2 J
(C) 2.4×10^2 J
(D) 3.0×10^1 J

A 60-kg student climbs a ladder a vertical distance of 4.0 meters in 8.0 seconds. Approximately how much total work is done against gravity by the student during the climb?

(A) 2.4×10^3 J
(B) 2.9×10^2 J
(C) 2.4×10^2 J
(D) 3.0×10^1 J

While riding a chairlift, a 55-kg skier is raised a vertical distance of 370 meters. What is the total change in the skier's gravitational potential energy?

(A) 5.4×10^1 J
(B) 5.4×10^2 J
(C) 2.0×10^4 J
(D) 2.0×10^5 J

While riding a chairlift, a 55-kg skier is raised a vertical distance of 370 meters. What is the total change in the skier's gravitational potential energy?

(A) 5.4×10^1 J
(B) 5.4×10^2 J
(C) 2.0×10^4 J
(D) 2.0×10^5 J

The work done on a slingshot is 40.0 joules to pull back a 0.10-kg stone. If the slingshot projects the stone straight up in the air, what is the maximum height to which the stone will rise?

(A) 0.41 m
(B) 41 m
(C) 410 m
(D) 4.1 m

The work done on a slingshot is 40.0 joules to pull back a 0.10-kg stone. If the slingshot projects the stone straight up in the air, what is the maximum height to which the stone will rise?

(A) 0.41 m
(B) 41 m
(C) 410 m
(D) 4.1 m

What is the gravitational potential energy with respect to the surface of the water of a 75.0-kg diver located 3.00 m above the water?

(A) $2.17 \cdot 10^4$ J
(B) $2.21 \cdot 10^3$ J
(C) $2.25 \cdot 10^2$ J
(D) $2.29 \cdot 10^1$ J

What is the gravitational potential energy with respect to the surface of the water of a 75.0-kg diver located 3.00 m above the water?

(A) $2.17 \cdot 10^4$ J

(B) $2.21 \cdot 10^3$ J

(C) $2.25 \cdot 10^2$ J

(D) $2.29 \cdot 10^1$ J

The total work done in lifting a typical high school physics textbook a vertical distance of 0.10 meter is approximately

(A) 0.15 J
(B) 1.5 J
(C) 15 J
(D) 150 J

The total work done in lifting a typical high school physics textbook a vertical distance of 0.10 meter is approximately

(A) 0.15 J
(B) 1.5 J
(C) 15 J
(D) 150 J

Power

A boat weighing 9.0×10^2 Newtons requires a horizontal force of 6.0×10^2 Newtons to move it across the water at 1.5×10^1 meters per second. The boat's engine must provide energy at the rate of

(A) 2.5×10^{-2} J
(B) 4.0×10^1 W
(C) 7.5×10^3 J
(D) 9.0×10^3 W

A boat weighing 9.0×10^2 Newtons requires a horizontal force of 6.0×10^2 Newtons to move it across the water at 1.5×10^1 meters per second. The boat's engine must provide energy at the rate of

(A) 2.5×10^{-2} J
(B) 4.0×10^1 W
(C) 7.5×10^3 J
(D) 9.0×10^3 W

What is the maximum amount of work that a 6000-watt motor can do in 10 seconds?

(A) 6.0×10^1 J
(B) 6.0×10^2 J
(C) 6.0×10^3 J
(D) 6.0×10^4 J

What is the maximum amount of work that a 6000-watt motor can do in 10 seconds?

(A) 6.0×10^1 J

(B) 6.0×10^2 J

(C) 6.0×10^3 J

(D) 6.0×10^4 J

A 70-kg cyclist develops 210 Watts of power while pedaling at a constant velocity of 7.0 m/s east. What average force is exerted eastward on the bicycle to maintain this constant speed?

(A) 490 N
(B) 30 N
(C) 3.0 N
(D) 0 N

A 70-kg cyclist develops 210 Watts of power while pedaling at a constant velocity of 7.0 m/s east. What average force is exerted eastward on the bicycle to maintain this constant speed?

(A) 490 N
(B) 30 N
(C) 3.0 N
(D) 0 N

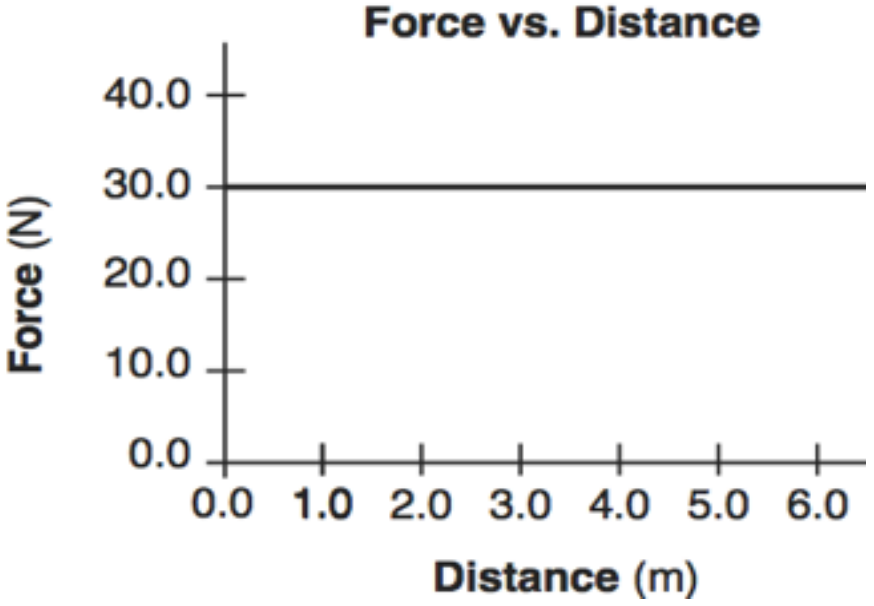
A small electric motor is used to lift a 0.50-kilogram mass at constant speed. If the mass is lifted a vertical distance of 1.5 meters in 5.0 seconds, the average power developed by the motor is

(A) 0.15 W
(B) 1.5 W
(C) 3.8 W
(D) 7.5 W

A small electric motor is used to lift a 0.50-kilogram mass at constant speed. If the mass is lifted a vertical distance of 1.5 meters in 5.0 seconds, the average power developed by the motor is

(A) 0.15 W
(B) 1.5 W
(C) 3.8 W
(D) 7.5 W

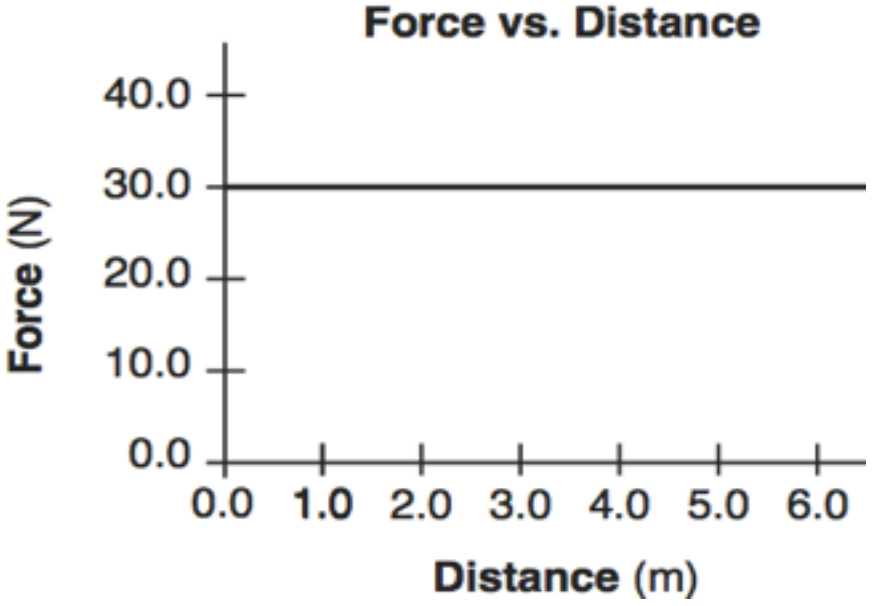
Conservation of Energy



A boy pushes his wagon at constant speed along a level sidewalk. The graph represents the relationship between the horizontal force exerted by the boy and the distance the wagon moves.

As the boy pushes the wagon, what happens to the wagon's energy?

(A) Gravitational potential energy increases.
(B) Gravitational potential energy decreases.
(C) Kinetic energy increases.
(D) Kinetic energy decreases.



A boy pushes his wagon at constant speed along a level sidewalk. The graph represents the relationship between the horizontal force exerted by the boy and the distance the wagon moves.

As the boy pushes the wagon, what happens to the wagon's energy?

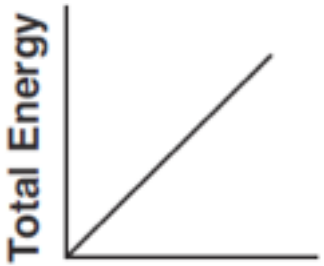
(A) Gravitational potential energy increases.

(B) Gravitational potential energy decreases.

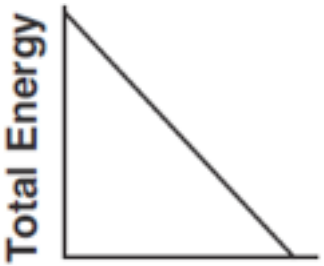
(C) Kinetic energy increases.

(D) Kinetic energy decreases.

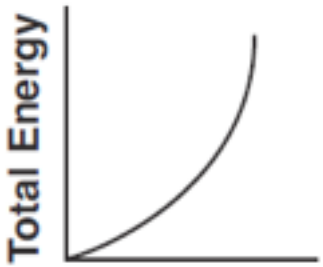
A ball is dropped from the top of a cliff. Which graph best represents the relationship between the ball's total energy and elapsed time as the ball falls to the ground? [Neglect friction.]



(1)



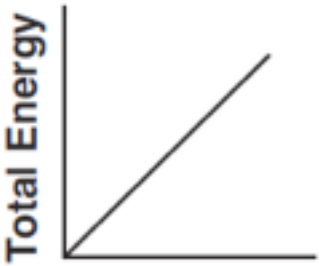
(3)



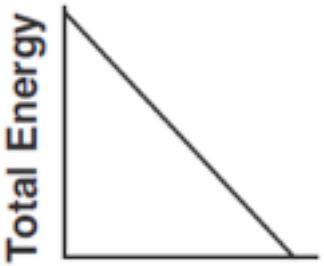
(2)

(4)

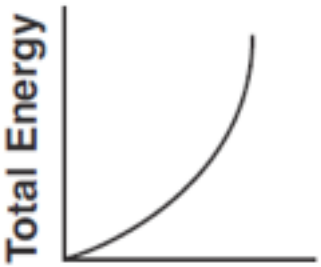
A ball is dropped from the top of a cliff. Which graph best represents the relationship between the ball's total energy and elapsed time as the ball falls to the ground? [Neglect friction.]



(1)



(3)



(2)

(4)

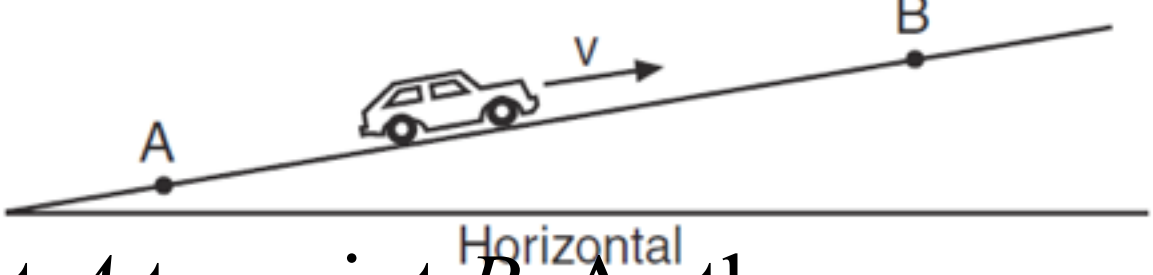
A child, starting from rest at the top of a playground slide, reaches a speed of 7.0 meters per second at the bottom of the slide. What is the vertical height of the slide? [Neglect friction.]

(A) 0.71 m
(B) 1.4 m
(C) 2.5 m
(D) 3.5 m

A child, starting from rest at the top of a playground slide, reaches a speed of 7.0 meters per second at the bottom of the slide. What is the vertical height of the slide? [Neglect friction.]

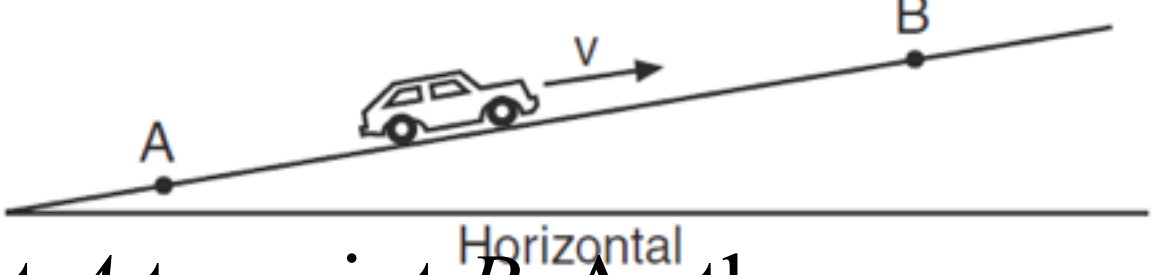
(A) 0.71 m
(B) 1.4 m
(C) 2.5 m
(D) 3.5 m

A car travels at constant speed v up a hill from point A to point B. As the car travels from A to B, its gravitational potential energy



(A) increases and its kinetic energy decreases
(B) increases and its kinetic energy remains the same
(C) remains the same and its kinetic energy decreases
(D) remains and its kinetic energy remains the same

A car travels at constant speed v up a hill from point A to point B. As the car travels from A to B, its gravitational potential energy



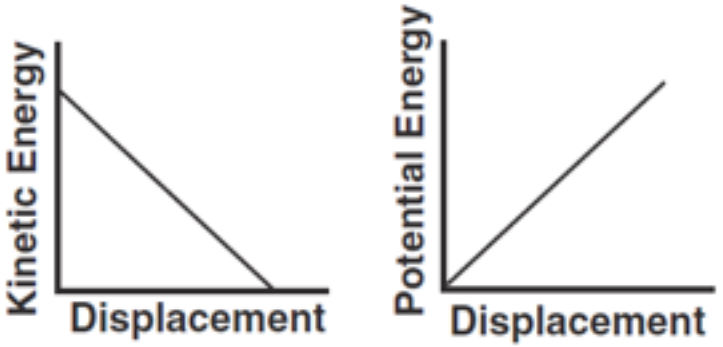
(A) increases and its kinetic energy decreases

(B) increases and its kinetic energy remains the same

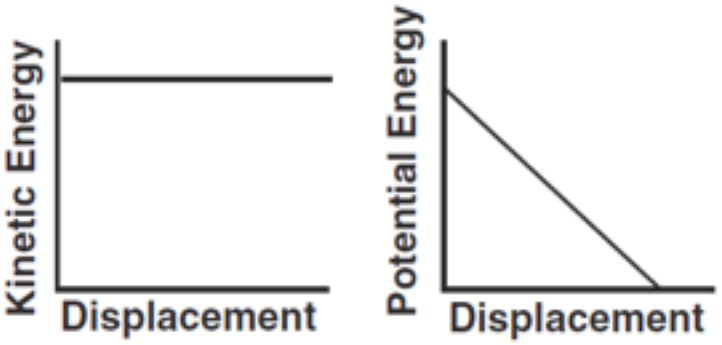
(C) remains the same and its kinetic energy decreases

(D) remains and its kinetic energy remains the same

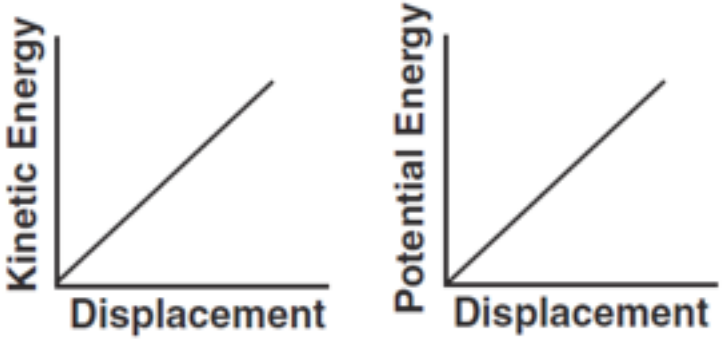
An object is thrown upward. Which pair of graphs best represents the object's kinetic energy and gravitational potential energy as functions of its displacement while it rises?



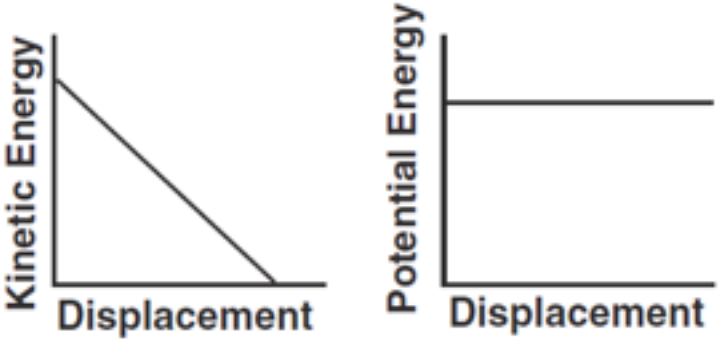
(1)



(3)

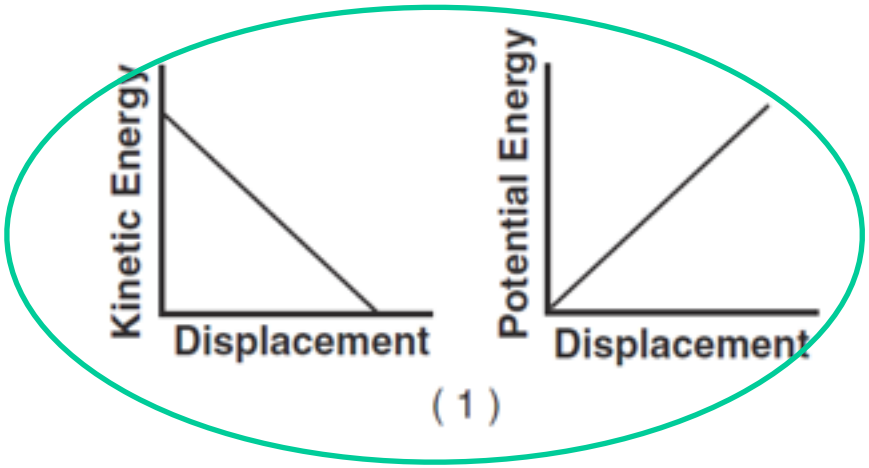


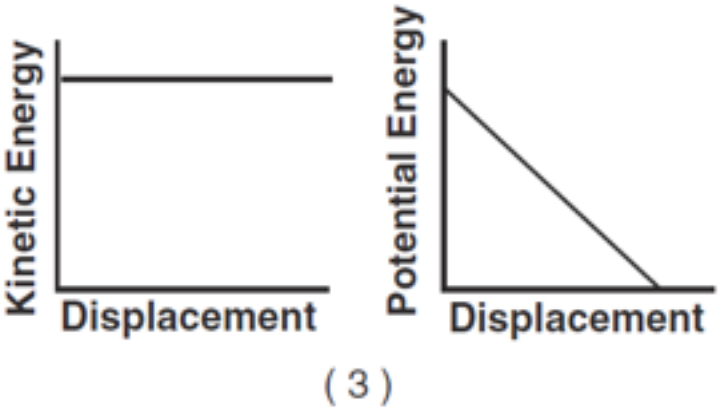
(2)

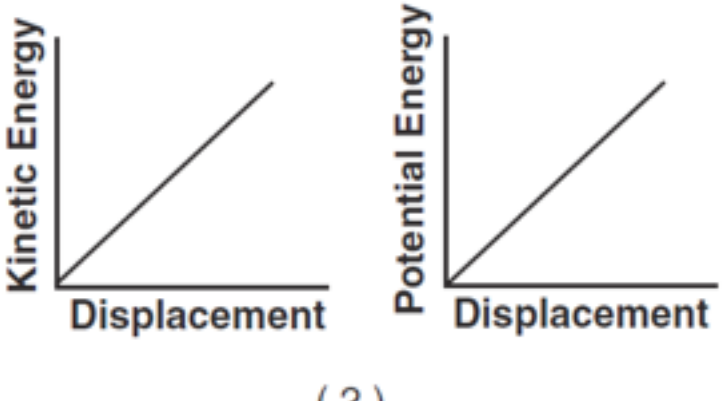


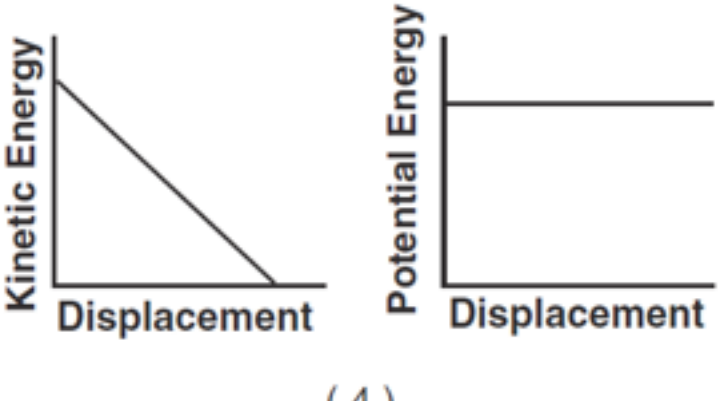
(4)

An object is thrown upward. Which pair of graphs best represents the object's kinetic energy and gravitational potential energy as functions of its displacement while it rises?









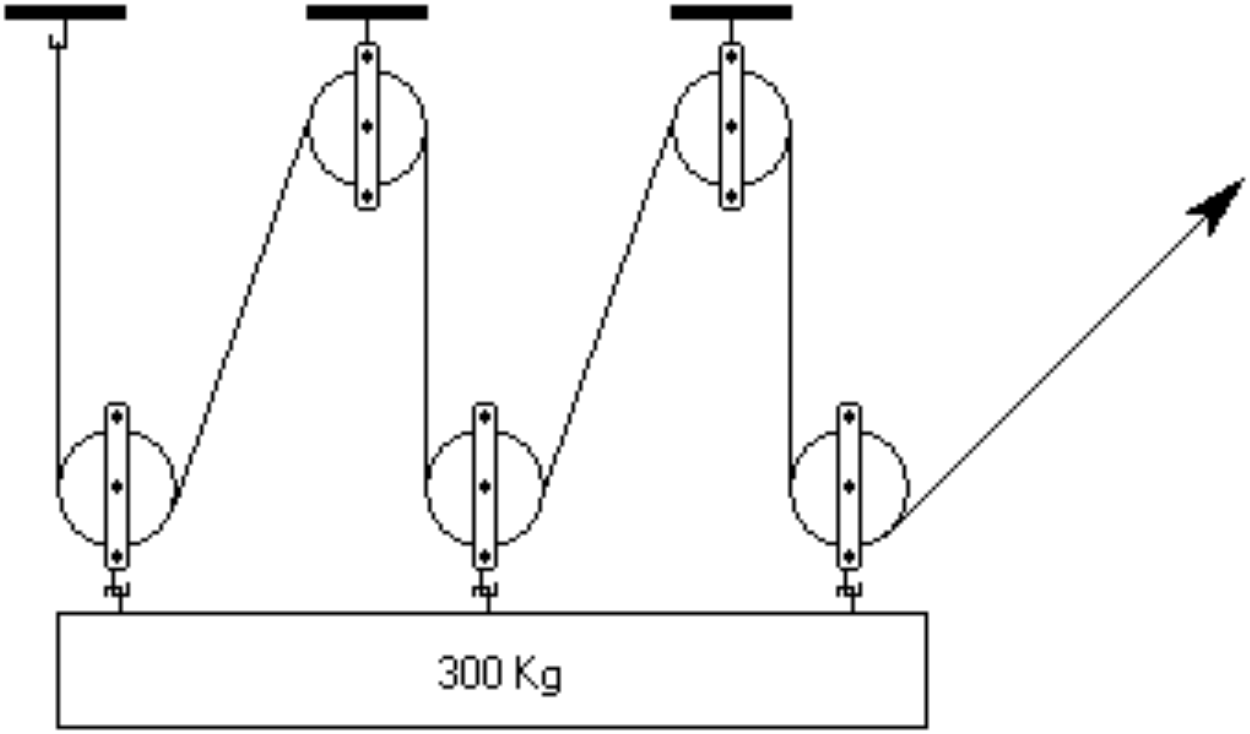
As a ball falls freely toward the ground, its total mechanical energy

(A) decreases
(B) increases
(C) remains the same

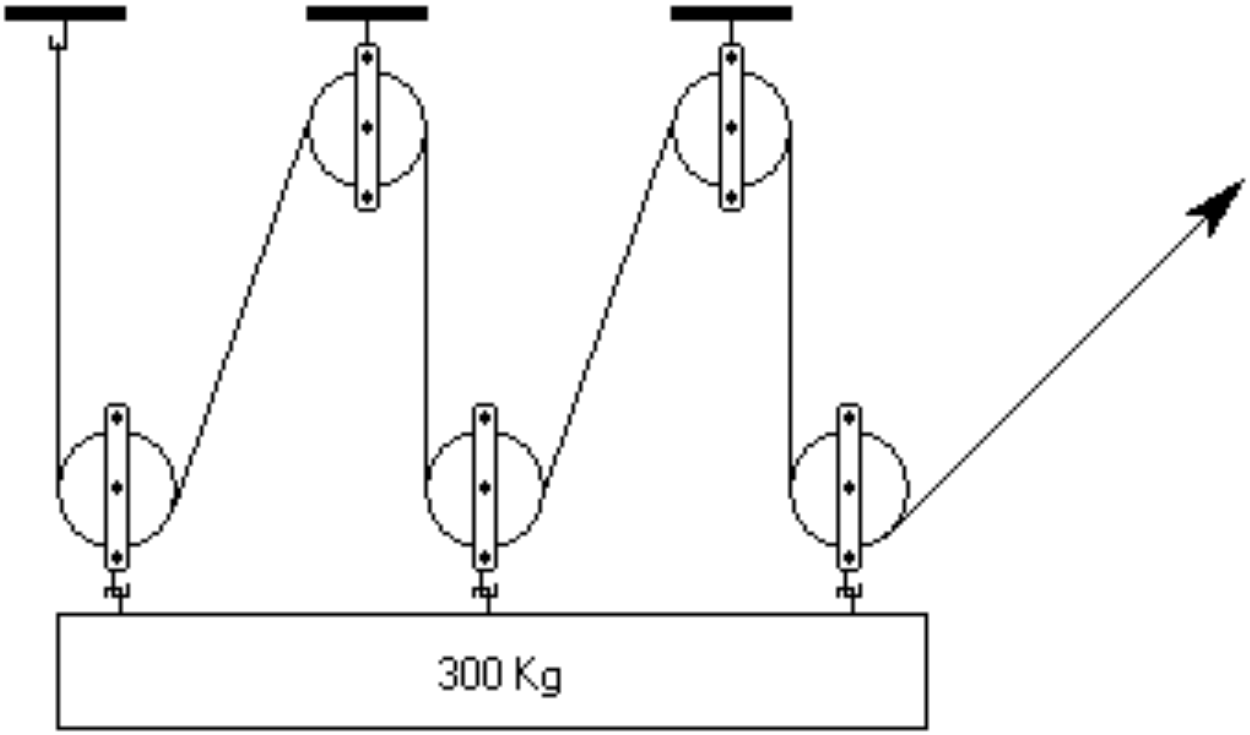
As a ball falls freely toward the ground, its total mechanical energy

(A) decreases
(B) increases
(C) remains the same

Machines



How much force is required to move the weight?



How much force is required to move the weight?

Answer: $F_{in} = 589$ N

A 250-kg object needs to be lifted onto a 2-m high loading dock from the street. What will be the change in Potential energy of the object?

A 250-kg object needs to be lifted onto a 2-m high loading dock from the street. What will be the change in Potential energy of the object?

Answer: $\Delta PE_g = 4905$ J

A 250-kg object needs to be lifted onto a 2-m high loading dock from the street. How long must a ramp be so only a 500-N must be applied by the working men?

A 250-kg object needs to be lifted onto a 2-m high loading dock from the street. How long must a ramp be so only a 500-N must be applied by the working men?

Answer: L = 9.81 m

A force of 1000-N must be applied to the corner of a car by a lever (jack) to lift it so the tire can be changed. The fulcrum is 5.0-cm from the end of the 1.0-m long of the jack. How much force must be applied to the other end for the jack?

A force of 1000-N must be applied to the corner of a car by a lever (jack) to lift it so the tire can be changed. The fulcrum is 5.0-cm from the end of the 1.0-m long of the jack. How much force must be applied to the other end for the jack?

Answer: F_{in} = 53 N