When the rocket engines of a starship are suddenly turned off, while traveling in empty space, the starship will

A) stop immediatelyB) slowly slow down, and then stopC) go faster and faster

D) move with a constant speed



You are driving your car down a straight road at a constant velocity of 65 mph. What can you conclude about the forces acting on your car?

- A) There must be greater forward forces acting on the car than backward forces, or the car would not go forward.
- B) The forces acting to make the car go forward must be equal to the forces acting to make the car go backward.
- C) There are no forces acting on the car at a constant velocity
- D) There is not enough information to say anything.

A net force **F** is required to give a mass m an acceleration **a**. If a net force of 6**F** is applied to a mass 2m, what acceleration results.

- A) a
- B) 2**a**
- C) 3a
- D) 4**a**
- E) 6**a**

A constant force is exerted on a cart that is initially at rest on an air track. Friction between the cart and the track is negligible. The force acts for a short time interval and gives the cart a certain final speed. To reach the same final speed with a force that is only half as big, the force must be exerted on the cart for a time interval

A) four times as long asC) equal toE) a quarter of

B) twice as long asD) half as long as

that for a stronger force.

A constant force is exerted for a short time interval on a cart that is initially at rest on an air track. This force gives the cart a certain final speed. We repeat the experiment but, instead of starting from rest, the cart is already moving with constant speed in the direction of the force at the moment we apply the force. After we exert the same constant force for the same short time interval, the increase in the cart's speed

A) is equal to two times its initial speed.

B) is equal to the square of its initial speed.

C) is equal to four times its initial speed.

D) is the same as when it started from rest.

E) cannot be determined from this information.

A horse pulls a cart along a flat level road. Consider the following four 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 force of the horse pushing sideways on the road.
(4) The force of the road pushing sideways on the horse.
Which two forces form an "action-reaction" pair which obey Newton's third law.
A) (1) and (4) C) (2) and (4) E) (2) and (3)

B) (1) and (3) D) (3) and (4)

A book is resting on the surface of a table. Consider the following four forces that arise in this situation.

(1) the force of the earth pulling on the book

(2) the force of the table pushing on the book

(3) the force of the book pushing on the table

(4) the force of the book pulling on the earth

Which two forces form an "action-reaction" pair which obey Newton's third law?

A) 1 and 2	C) 1 and 4	E) 3 and 4
B) 1 and 3	D) 2 and 4	

A book is resting on the surface of a table. Consider the following four forces that arise in this situation.

(1) the force of the earth pulling on the book

(2) the force of the table pushing on the book

(3) the force of the book pushing on the table

(4) the force of the book pulling on the earth

The book has zero acceleration. Which pair of forces, excluding the "action-reaction" pairs, must be equal in magnitude and opposite in direction?

A) 1 and 2	C) 1 and 4	E) 2 and 4
B) 1 and 3	D) 2 and 3	

Consider a car at rest. We can conclude that the gravitational pull of the Earth on the car and the upward constant force of Earth on it are equal and opposite because

- A) the two forces form an interaction pair (Newton's third law).
- B) the net force on the car is zero (Newton's second law).
- C) neither of the above.

A 2.0 kg projectile is fired at an angle of 20 degrees. What is the magnitude of the force on the projectile when it is at the highest position in its trajectory?

A) zero
B) 6.7 N
C) 9.8 N
D) 18.4 N
E) 19.6 N

Consider a person standing in an elevator that is moving upward at a constant velocity. The upward normal force N exerted by the elevator floor on the person is

A) larger thanB) identical toC) smaller than

the downward weight W of the person

Consider a person standing in an elevator that is *accelerating upward*. The upward normal force N exerted by the elevator floor on the person is

A) larger thanB) identical toC) smaller than

the downward weight W of the person

In the 17th century, Otto von Guricke fitted two hollow bronze hemispheres together and removed the air from the resulting sphere with a pump. Two eight horse teams could not pull the halves apart even though the hemispheres fell apart when air was readmitted. Suppose von Fuicke had tied both teams of horses to one side and bolted the other side to a heavy tree trunk. In this case, the tension on the hemispheres would be A) twice

B) exactly the same as

C) half

what it was before.

A 4 kg block and a 2 kg block can move on the horizontal frictionless surface. The blocks are accelerated by a +12 N force that pushes the larger block against the smaller one. Determine the force that the 2 kg block exerts on the 4 kg block.



A locomotive engine pulls a series of wagons and accelerates forward. Which is the correct analysis of the situation?

- A) The train moves forward because the engine pulls slightly harder on the wagons than the wagons pull on the engine.
- B) Because action always equals reaction the engine cannot pull the wagons forward. Wagons and engine pull on each other with the same force.
- C) The engine gets the wagons going with a tug during which the force on the wagons is momentarily greater than the force exerted by the wagons on the engine.
- D) The engine's force on the wagons is as strong as the wagon's force on the engine, but the frictional force on the engine is forward and large while the frictional force on the wagons is backward and small.
- E) The engine can pull the wagons only if it weighs more.

An object is held in place by friction on an inclined plane. The angle of the inclination is increased until the object starts moving. If the surface is kept at this angle, the object

A) slows down.

B) moves at uniform speed.

C) speeds up.

D) none of the above.



