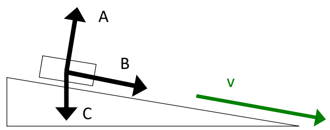
A glider slides down a tilted air track (no friction). Which direction is F_{net} on the glider?



A) A

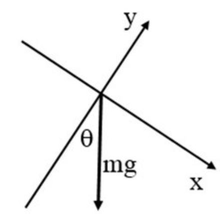
B) B

C) C

D) No direction, because $F_{net} = 0$

E) Some other direction

In a tilted *xy* coordinate system, the weight force vector $|\vec{\boldsymbol{W}}| = mg$ is straight down. The coordinates are tilted at an angle θ as shown. What is W_y, the *y*-component of the weight?



A) $+mg\sin\theta$

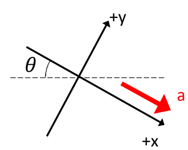
B) $-mg\cos\theta$

C) $-mg\sin\theta$

D) $+mg$

E) 0

In a tilted *xy* coordinate system, the acceleration vector $\vec{\boldsymbol{a}}$ is along the *x*-axis. The coordinates are tilted at an angle θ as shown. What are a_x, and a_y, the *x*- and *y*-components of the the vector $\vec{\boldsymbol{a}}$?



A) $a_x = +a\sin\theta,\ \ a_y = -a\cos\theta$

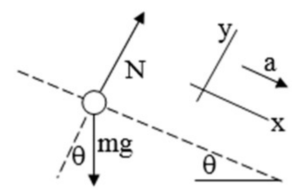
B) $a_x = +a\cos\theta,\ \ a_y = -a\sin\theta$

C) $a_x = -a,\ \ a_y = 0$

D) $a_x = 0,\ \ a_y = +a$

E) $a_x = +a,\ \ a_y = 0$

A student chooses a tilted coordinate system as shown, and then proceeds to write down Newton's 2nd Law in the form $\sum F_x = ma_x$, $\sum F_y = ma_y$. What is the correct equation for the *y*-direction $\sum F_y = ma_y$?



A) $N - mg\sin\theta = ma$

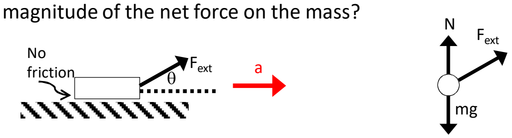
B) $N - mg\cos\theta = ma$

C) $mg\sin\theta = ma$

D) $N - mg\cos\theta = 0$

E) $N + mg = ma$

A mass m is pulled on a frictionless table by F_{ext} as shown. (Force magnitudes on the free-body diagram are not to scale, but directions are correct.) Note that the acceleration is to the right. What is the magnitude of the net force on the mass?



A) $N + F_{\text{ext}} + mg$

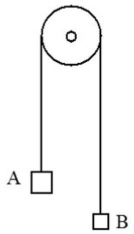
B) $N + F_{\text{ext}} \sin\theta - mg$

C) $N + F_{\text{ext}} \cos\theta - mg$

D) $F_{\text{ext}} \cos\theta$

E) None of these

An Atwood's machine is a pulley with two masses connected by a string as shown. The mass of object A, m_A, is twice the mass of object B, m_B. The tension T in the string on the left, above mass A, is…



A) $\text{T} = m_A g$

B) $\text{T} = m_B g$

C) Neither of these

You're on a Ferris wheel moving in a vertical circle. When the Ferris wheel is at rest, the normal force N exerted by your seat is equal to your weight mg. How does N change at the top of the Ferris wheel when you are in motion?

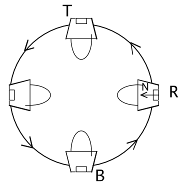
A) N remains equal to mg

B) N is smaller than mg

C) N is larger than mg

D) None of the above

A bucket containing a brick is swung in a circle at constant speed in a vertical plane as shown. The bucket is swung fast enough that the brick does not fall out. F_{net} on the brick has max magnitude at the…



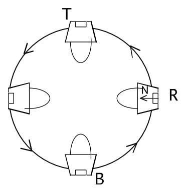
A) top (T).

B) bottom (B).

C) right (R).

D) Same everywhere!

Consider the normal force on the brick by the bucket when the bucket is at the three positions shown: R, T, B. The magnitude of the normal force is a maximum at position...



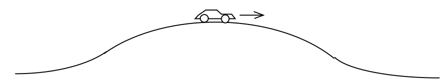
A) top (T).

B) bottom (B).

C) right (R).

D) Same everywhere!

A car of mass m, traveling at constant speed, rides over the top of a hill. The car stays on the road The magnitude of the normal force N of the road on the car is...

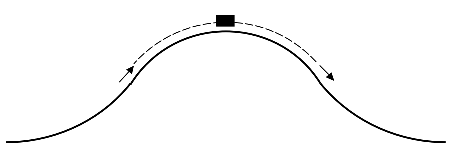


A) greater than the weight of the car, $N > mg$.

B) equal to the weight of the car, $N = mg$.

C) less than the weight of the car, $N < mg$.

A hockey puck which was recently hit by a stick, slides up and over an icy (frictionless) round hill. It stays on the hill. At the moment the puck is at the top of the hill, the speed is...



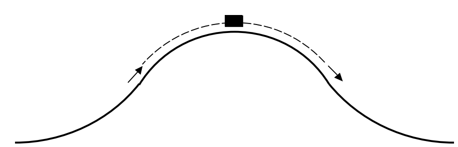
A) increasing.

B) constant, non-zero.

C) decreasing.

D) zero.

A hockey puck which was recently hit by a stick, slides up and over an icy (frictionless) round hill. It stays in contact with the ground. At the moment the puck is at the top of the hill, its instantaneous velocity is v. The radius of curvature is R. What is its acceleration?



A) Zero

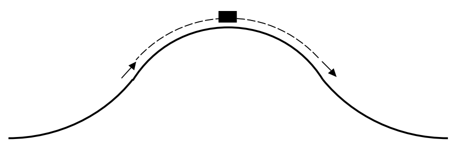
B) Exactly g

C) Exactly v^2/R

D) MORE than v^2/R

E) LESS than v^2/R

Consider the normal force on the hockey puck by the ground at the top of the hill and fill in the blank: the faster the puck is travelling, the _________ the normal force will be.

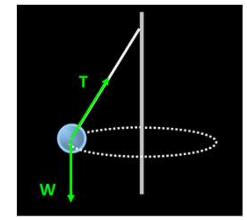


A) larger

B) smaller

C) Neither of these. The normal force is independent of the puck speed

In the game of tetherball, the struck ball whirls around a pole. In what direction does the net force on the ball point?



A) toward the top of the pole

B) toward the ground

C) along the horizontal component of the tension force

D) along the vertical component of the tension force

E) tangential to the circle

During a sharp left turn, you find yourself hitting the passenger door. What is the correct description of what is actually happening?

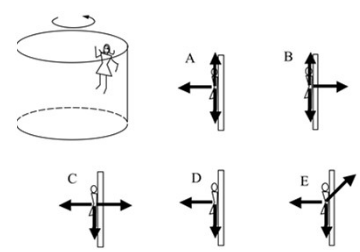
A) centrifugal force is pushing you into the door

B) the door is exerting a leftward force on you

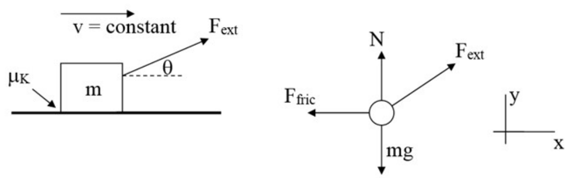
C) both of the above

D) neither of the above

A rider in a "barrel of fun" is stuck with her back to the wall. Pick the free body diagram.



A mass m is pulled along a rough table at <u>constant</u> velocity with an external force F_{ext} at some angle above the horizontal. The magnitudes of the forces on the free-body diagram have not been drawn carefully, but the directions of the forces are correct. Which statement is true?



A) $F_{\text{ext}} > F_{\text{fric}}$ and $N > mg$.

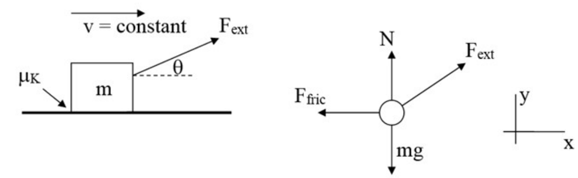
B) $F_{\text{ext}} < F_{\text{fric}}$ and $N < mg$.

C) $F_{\text{ext}} > F_{\text{fric}}$ and $N < mg$.

D) $F_{\text{ext}} < F_{\text{fric}}$ and $N > mg$.

E) None of these

What is the correct y-equation?



A) $F_{\text{ext}} \sin\theta - mg = ma$

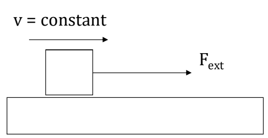
B) $\text{N} - F_{\text{ext}} \sin\theta - mg = 0$

C) $\text{N} + F_{\text{ext}} \sin\theta - mg = 0$

D) $\text{N} + F_{\text{ext}} \cos\theta - mg = 0$

E) None of these

A block of mass m on a table is pulled along the table by an external horizontal force of magnitude F_{ext}, as shown. The table has a rough surface so there is a frictional force of magnitude F_{fric} on block. The block is moving at constant speed v. How do the magnitudes of the external force F_{ext} and the friction force F_{fric} compare?

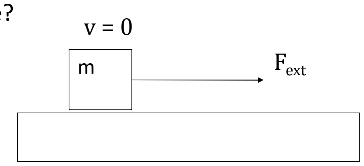


A) $F_{ext} = F_{fric}$

B) $F_{ext} > F_{fric}$

C) $F_{ext} < F_{fric}$

A block of mass m on a table is pulled by an external horizontal force of magnitude F_{ext}, but it does not move! The table has a rough surface so there is a static frictional force of magnitude F_{fric} on block. Which formula must be correct for the frictional force?



A) $F_{fric} = \mu_s mg$

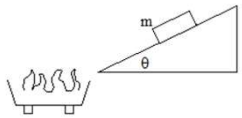
B) $F_{fric} = F_{ext} + \mu_s mg$

C) $F_{fric} = F_{ext} - \mu_s mg$

D) $F_{fric} = F_{ext}$

E) $F_{fric} = 0$

A physics text of mass m sits at rest on a wooden board inclined at an angle θ above a flaming hibachi. The coefficient of static friction between the book and the board is μ_s. How does the magnitude of the force of friction $|f|$ between the book and the board compare to the weight mg of the box?



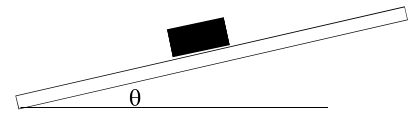
A) $mg > |f|$

B) $mg < |f|$

C) $mg = |f|$

D) mg can be either greater than, less than, or equal to $|f|$ depending on μ_s

A box of mass m is resting stationary on a board which is tilted at an angle θ from the horizontal. The coefficient of static friction between the box and the board is μ_s. The angle is rather shallow and the friction is large, so the box is not about to slip. What is the magnitude of the force of friction between the board and the box?



A) $\mu_s mg$

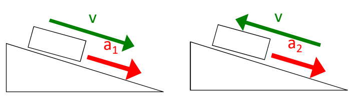
B) $\mu_s mg / \cos\theta$

C) $\mu_s mg \cos\theta$

D) $mg\sin\theta$

E) None of these

A mass slides down a rough inclined plane with acceleration $a_1 > 0$. The same mass is shoved up the same incline with a large, brief initial push. As it moves up the incline, its acceleration is a_2. Compare a_1 and a_2.



A) $a_1 > a_2$

B) $a_1 = a_2$

C) $a_1 < a_2$

A box sits on a flat board. You lift one end of the board, making an angle with the floor. As you increase the angle, the box will eventually begin to slide down. Why?

A) component of the gravity force parallel to the plane increased

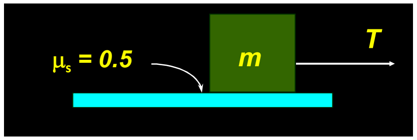
B) coefficient of static friction decreased

C) normal force exerted by the board decreased

D) both A) and C)

E) all of A), B), and C)

A box of weight 100 N is at rest on a floor where $\mu_s = 0.5$. A rope is attached to the box and pulled horizontally with tension $T = 30$ N. Which way does the box move?



A) The box moves to the left.

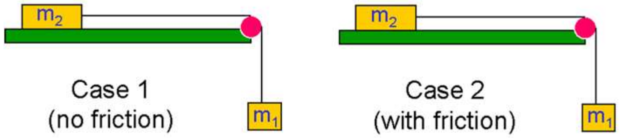
B) The box moves to the right.

C) The box moves up.

D) The box moves down.

E) The box does not move.

In which case is tension greater?

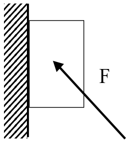


A) Case 1

B) Case 2

C) Both the same

A person holds a block against a vertical wall with force F at a known angle. The block weighs mg, and the coefficient of static friction is μ_s. Which direction is the friction force between the block and the wall?



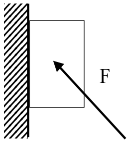
A) Up

B) Down

C) Zero

D) It depends…

A person holds a block against a vertical wall with force F at a known angle. The block weighs mg, and the coefficient of static friction is μ_s. The block is not moving. What is the magnitude of the friction force?



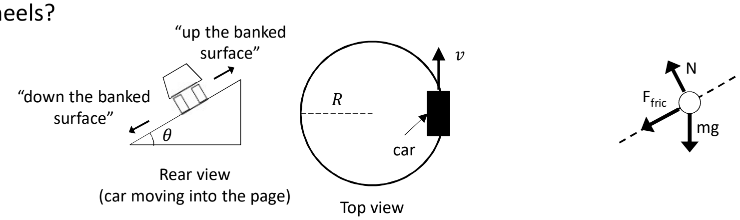
A) $f = \mu_s mg$

B) $f = \mu_s \cdot (\text{horizontal component of } F)$

C) $f = 0$

D) it depends…

A car rounds a banked curve without skidding. The radius of curvature of the curve is R. A possible free-body diagram (which may or may not be correct) is shown. What must be true about the magnitude of the force of friction on the wheels?

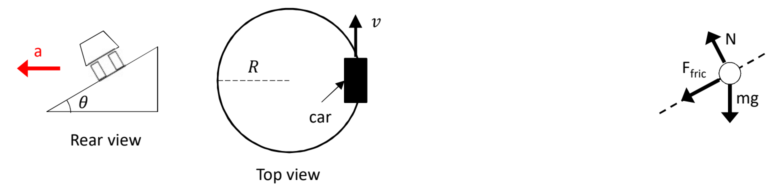


A) $f = \mu_s N$

B) $f = \mu_k N$

C) Neither of these is necessarily true

A car rounds a banked curve without skidding. The radius of curvature of the curve is R. A possible free-body diagram (which may or may not be correct) is shown. What can you say about the direction of the force of friction?

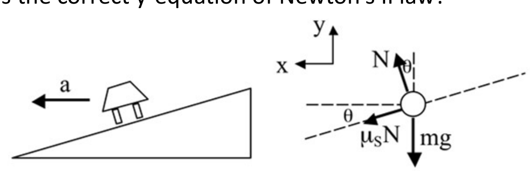


A) It must be in the direction shown in the FBD.

B) It must be in the opposite direction to the one shown in the FBD.

C) It depends on the speed of the car.

The free-body diagram for a car rounding a banked curve is shown. The car is going so fast that it is about to slip. The coordinate system has been chosen as shown. What is the correct y-equation of Newton's II law?



A) $N \sin\theta + \mu_s N \cos\theta - mg = 0$

B) $N - \mu_s N \sin\theta - mg \cos\theta = 0$

C) $N - mg \cos\theta = 0$

D) $N \cos\theta - \mu_s N \sin\theta - mg = 0$

E) None of these