A stone of mass m is thrown upward at a $30°$ angle to the horizontal. At the instant the stone reaches its highest point, why is the stone neither gaining nor losing speed?

(A) Because the acceleration of the stone at that instant is zero
(B) Because the net force acting upon the stone at that instant has magnitude $m\vec{g}$
(C) Because the angle between the stone's velocity and the net force exerted upon the stone is $90°$
(D) Because the stone follows a parabolic trajectory and the peak of the trajectory is where the parabola has zero slope

A ladder at rest is leaning against a wall at an angle. Which of the following forces must have the same magnitude as the frictional force exerted on the ladder by the floor?

(A) The force of gravity on the ladder
(B) The normal force exerted on the ladder by the floor
(C) The frictional force exerted on the ladder by the wall
(D) The normal force exerted on the ladder by the wall

Speed	10 m/s	20 m/s	30 m/s
Braking Distance	6.1 m	23.9 m	53.5 m

To analyze the characteristics and performance of the brakes on a 1500 kg car, researchers collected the data shown in the table above. It shows the car's speed when the brakes are first applied and the corresponding braking distance required to stop the car. The magnitude of the average braking force on the car is most nearly

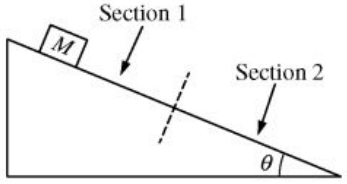
(A) 75,000 N
(B) 30,000 N
(C) 12,000 N
(D) 1600 N

An object starts from rest and slides with negligible friction down an air track tipped at an angle θ from the horizontal. A student records values of the object's position along the track at various times. The value of θ can best be determined from which of the following?

(A) The y-intercept of a graph of position as a function of time
(B) The y-intercept of a graph of position as a function of the square of time
(C) The slope of a graph of position as a function of time
(D) The slope of a graph of position as a function of the square of time

. A person is running on a track. Which of the following forces propels the runner forward?

(A) The normal force exerted by the ground on the person
(B) The normal force exerted by the person on the ground
(C) The force of friction exerted by the ground on the person
(D) The force of friction exerted by the person on the ground



The inclined plane in the figure above has two sections of equal length and different roughness. The dashed line shows where section 1 ends and section 2 begins. A block of mass M is placed at different locations on the incline. The coefficients of kinetic and static friction between the block and each section are shown in the table below.

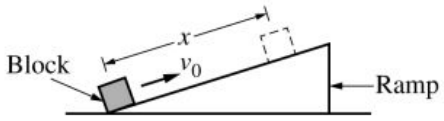
Coefficient of Friction	Section 1	Section 2
Static	μ_{S1}	$\mu_{S2} (> \mu_{S1})$
Kinetic	μ_k	$2\mu_k$

. If the block is at rest on section 1 of the incline, what is the magnitude of the force of static friction exerted on the block by the incline?

(A) $\mu_{S1} Mg\cos\theta$
(B) $\mu_{S1} Mg\tan\theta$
(C) $Mg\sin\theta$
(D) $Mg/\tan\theta$

FR:

A student strikes a block at the bottom of a ramp, giving it an initial speed v_0 up the ramp, as shown at right. There is friction between the ramp and the block as it slides a distance x up the ramp and then slides back down.



(a) On the dots below, which represent the block as it is sliding up the ramp and down the ramp, draw and label the forces (not components) exerted on the block. Represent each force by a distinct arrow starting on, and pointing away from, the dot. The dashed lines are drawn at the same angle as the surface of the ramp.

Up the Ramp Down the Ramp

(b) The block takes time t_{up} to slide up the ramp a distance x. The block then takes time t_{down} to slide back down to the bottom of the ramp, where it has speed v_f. Is t_{down} greater than, equal to, or less than t_{up}?

____ $t_{down} > t_{up}$ ____ $t_{down} = t_{up}$ ____ $t_{down} < t_{up}$

In a clear, coherent paragraph-length response that may also contain figures and/or equations, explain your reasoning. If you need to draw anything other than what you have shown in part (a) to assist in your response, use the space below. Do NOT add anything to the figures in part (a).