Read 4.5

GP 3 on D2L (8:30 section no scores yet)

Group tomorrow

office hours 1:30-2:30 today

Review

Mass is a measure of Inertia

↑

objects resistance to change motion

SI units of mass kg

Weight : gravitational force acting on an object

$w = mg$ (unit N)

Freefall

$w = ma$

$a = g$

$w = mg$

If no gravity, no weight

but object still has mass

Problem: A car has a weight of 3500 lbs. What is the mass of the car in British units?

$$w = mg$$

$$m = \frac{w}{g} = \frac{3500\ lbs}{32\ ft/s^2} = 109\ slugs$$

$$m = \frac{w}{g}$$

weight of 9.8 N

$$m = \frac{9.8\ N}{9.8\ m/s^2} = 1\ kg$$

Interactive Question

(B)

Object A is more massive than object B. Which of the following statements is true?

A) Both object A and object B experience the *same* gravitational force.

B) Both object A and object B experience the *same* gravitational acceleration.

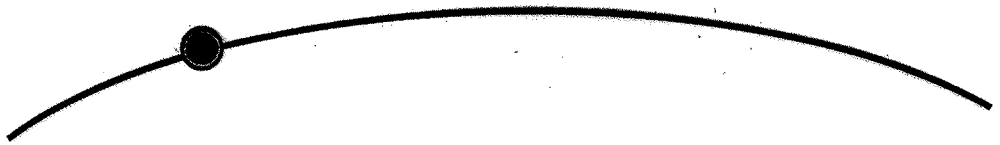
C) Object A experiences a *greater* gravitational force and *greater* gravitational acceleration than object B.

D) More than one of the above is true

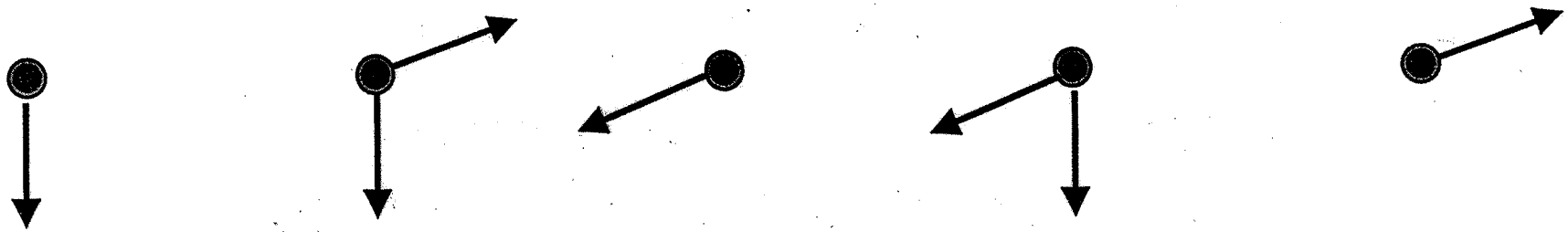
(A)

Interactive Question

A ball is thrown through the air and follows the path shown. It is traveling from the left to the right.



When the ball is at the position shown, which of the following diagrams correctly shows the forces acting on the ball, neglecting air resistance.

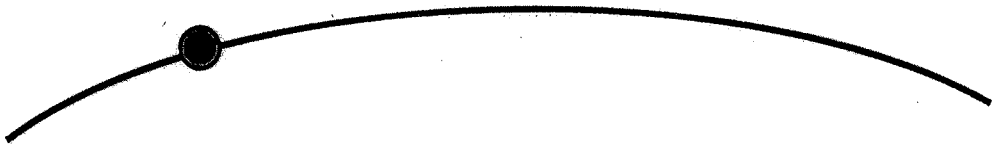


(A) (B) (C) (D) (E)

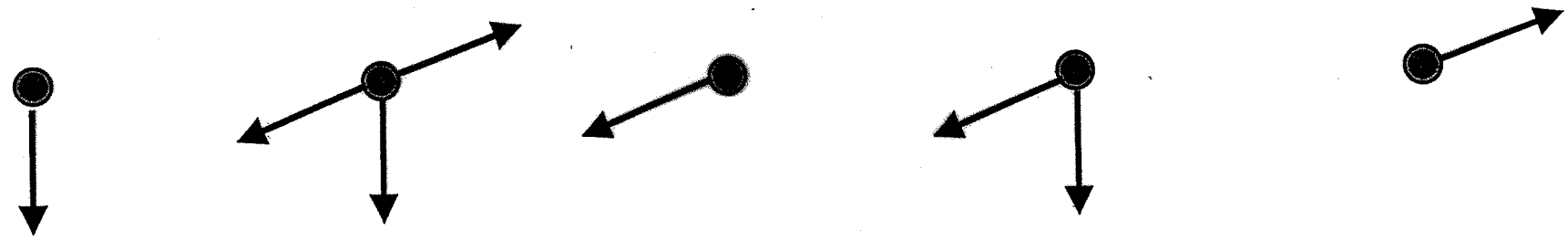
D

Interactive Question

A ball is thrown through the air and follows the path shown. It is traveling from the left to the right.

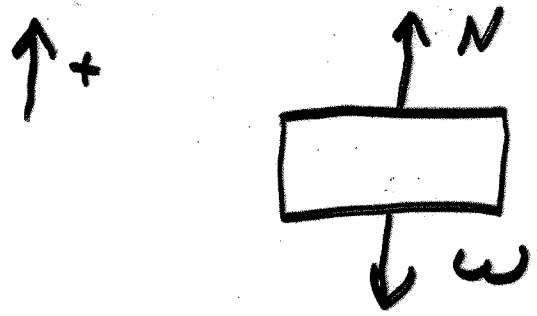


When the ball is at the position shown, which of the following diagrams correctly shows the forces acting on the ball, not neglecting air resistance.



(A) (B) (C) (D) (E)

Problem: A book with a mass of 0.80 kg is stationary on a table. What is the normal force acting on the book?



$\vec{F}_{net} = m\vec{a}$

Vertical

$F_{net} = ma$ $\quad a = 0$

$N - w = 0$

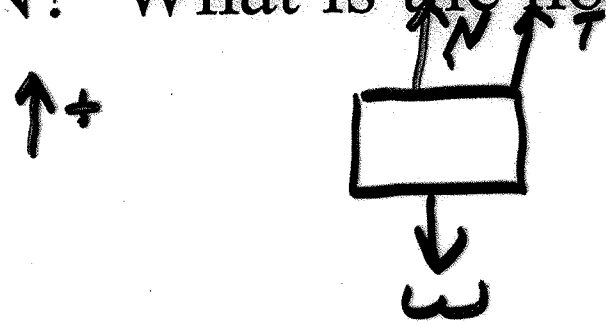
$N = w = mg$

$N = (0.8\,kg)(9.8\,m/s^2)$

$\boxed{7.8\,N}$

The normal force is not always equal to the weight, as this problem illustrates.

Problem: A book with a mass of 0.80 kg is stationary on a table. You tie a string to the book and pull up with a force of 2.5 N? What is the normal force acting on the book?



Vertical direction

$F_{net} = ma \quad a = 0$

$N + T - w = 0$

$N = w - T$

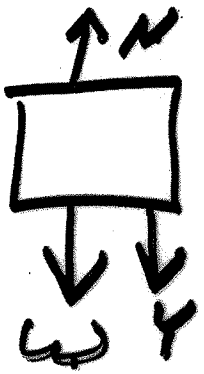
$N = mg - T$

$N = (0.80)(9.8\ m/s^2) - 2.5\ N$

5.3 N

Problem: A book with a mass of 0.80 kg is stationary on a table. You have a weight of 640 N and sit on the book. What is the normal force acting on the book?

↑+y



Vertical

$F_{net} = ma = 0$

$N - \omega - Y = 0$

$N = Y + \omega$ $\qquad \omega = mg$

$N = (640N) + (.8kg)(9.8 m/s^2)$

$N = 648\ N$

Interactive Question

(B)

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 than
B) identical to
C) smaller than

the downward weight W of the person

Interactive Question

(A)

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 than
B) identical to
C) smaller than

the downward weight W of the person