

Mixed Review*Forces and the Laws of Motion*

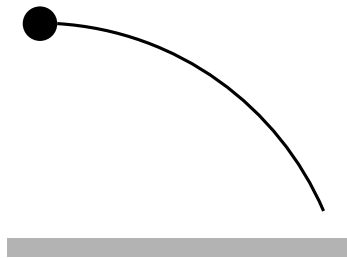
1. A crate rests on the horizontal bed of a pickup truck. For each situation described below, indicate the motion of the crate relative to the ground, the motion of the crate relative to the truck, and whether the crate will hit the front wall of the truck bed, the back wall, or neither. Disregard friction.

a. Starting at rest, the truck *accelerates* to the right.

b. The crate is at rest relative to the truck while the truck moves to the right with a constant velocity.

c. The truck in item b slows down.

2. A ball with a mass of m is thrown through the air, as shown in the figure.



a. What is the gravitational force exerted on the ball by Earth?

b. What is the force exerted on Earth by the ball?

c. If the surrounding air exerts a force on the ball that resists its motion, is the *total* force on the ball the same as the force calculated in part a?

d. If the surrounding air exerts a force on the ball that resists its motion, is the *gravitational* force on the ball the same as the force calculated in part a?

Chapter
4

HOLT PHYSICS
Mixed Review *continued*

3. Two blocks of masses m_1 and m_2 , respectively, are placed in contact with each other on a smooth, horizontal surface. A constant horizontal force F to the right is applied to m_1 . Answer the following questions in terms of F , m_1 , and m_2 .

a. What is the acceleration of the two blocks?

b. What are the horizontal forces acting on m_2 ?

c. What are the horizontal forces acting on m_1 ?

d. What is the magnitude of the contact force between the two blocks?

4. Assume you have the same situation as described in item 3, only this time there is a frictional force, F_k , between the blocks and the surface. Answer the following questions in terms of F , F_k , m_1 , and m_2 .

a. What is the acceleration of the two blocks?

b. What are the horizontal forces acting on m_2 ?

c. What are the horizontal forces acting on m_1 ?

d. What is the magnitude of the contact force between the two blocks?

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