DIRECTIONS
Choose the best answer choice for each of the following questions.

1. The firefighter feels the hose pushing backwards. What is the most likely cause of this?
   a. The hose material is very elastic.
   b. Since the hose is at rest, it tends to stay at rest.
   c. The force exerted on the water equals the mass of the water times its acceleration.
   d. The escaping water exerts an equal and opposite force on the hose.

2. If the same force is applied to each of these balls, which one will have the LEAST acceleration?
   - f. $m = 1.0 \text{ kg}$
   - g. $m = 7.3 \text{ kg}$
   - h. $m = 0.75 \text{ kg}$
   - j. $m = 0.5 \text{ kg}$

3. A ramp is 3 meters long and 1 meter high. Under ideal conditions, this ramp would reduce the force needed to raise an object by a factor of three. However, friction is a force that opposes motion between two surfaces that are touching. According to the chart, which kind of friction opposes motion with the greatest force?
   a. No friction
   b. Static friction
   c. Sliding friction
   d. Rolling friction

<table>
<thead>
<tr>
<th>Weight of Object</th>
<th>No Friction</th>
<th>Static Friction</th>
<th>Sliding Friction</th>
<th>Rolling Friction</th>
</tr>
</thead>
<tbody>
<tr>
<td>480 N</td>
<td>160 N</td>
<td>192 N</td>
<td>178 N</td>
<td>166 N</td>
</tr>
<tr>
<td>900 N</td>
<td>300 N</td>
<td>360 N</td>
<td>333 N</td>
<td>310 N</td>
</tr>
<tr>
<td>750 N</td>
<td>250 N</td>
<td>300 N</td>
<td>278 N</td>
<td>259 N</td>
</tr>
</tbody>
</table>
4. According to the diagram, which statement best describes what happens when two astronauts collide in space?

f. Their force increases.
g. Their velocity increases.
h. Their momentum is conserved.
j. Their momentum increases.

5. The table shows the total vertical distance a free-falling body travels for each second it falls. About how far does the free-falling body travel between 4 and 5 seconds?

<table>
<thead>
<tr>
<th>Time (sec)</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>4.9</td>
</tr>
<tr>
<td>2</td>
<td>19.6</td>
</tr>
<tr>
<td>3</td>
<td>44.1</td>
</tr>
<tr>
<td>4</td>
<td>78.4</td>
</tr>
<tr>
<td>5</td>
<td>122.5</td>
</tr>
</tbody>
</table>

a. 44 m  
b. 54 m  
c. 144 m  
d. 154 m

6. The man applies a force to the box, but the box does not move. The force of friction is acting on the box to cancel the force of his push. What is the most likely cause of this friction?

f. The floor is not polished to a smooth finish.
g. The box is too heavy for a single person to push across the floor.
h. The uneven surfaces of the box and the floor are sticking together.
j. The man is not pushing the box with enough force.

7. Felicia wanted to pull out a particular issue from a pile of magazines. First, she tried pulling slowly, and the whole pile began to move. Then she tried pulling quickly, and the issue she wanted came out without the pile moving. The pile did not move when she pulled quickly because of the ________.

a. smooth surface of the magazines  
b. inertia of the pile and friction  
c. larger force Felicia applied  
d. friction between the magazines
1. Which of these keeps the satellite moving in a circular orbit?
   A. gravity  
   B. friction  
   C. air resistance  
   D. inertia

2. Which of these is measured in newtons?
   F. acceleration  
   G. mass  
   H. momentum  
   J. weight

3. Which of the following is not an example of unbalanced forces acting on an object?
   A. an acorn falling from a tree  
   B. a car moving at a constant speed of 55 miles per hour  
   C. a motorcycle changing speed from 50 miles per hour to 70 miles per hour  
   D. a truck slowing down as it approaches a red light

4. Which statement provides the best description of terminal velocity?
   F. Terminal velocity is the last velocity of an object recorded by a scientist.  
   G. A skydiver never reaches terminal velocity.  
   H. Terminal velocity is the highest velocity that a falling object will reach.  
   J. Terminal velocity is the velocity a skydiver reaches just before touching the ground.

5. A group of students is playing tug-of-war. The students on both sides of the rope are pulling with equal force. This is an example of
   A. unbalanced forces  
   B. displacement  
   C. acceleration  
   D. balanced forces

6. The biggest problem with driving a car that has worn-out tires is that the tires might
   F. reduce gas mileage  
   G. not produce enough friction to stop the car  
   H. cause a bumpy ride  
   J. increase the car’s momentum
7 Which scientific law does the diagram represent?

A law of gravity
B Newton’s first law of motion
C Newton’s second law of motion
D Newton’s third law of motion

8 As the skydiver falls to Earth, her parachute helps her land safely by

F increasing air resistance
G acting like a helium-filled balloon
H warming the surrounding air
J blocking the Sun’s rays

Directions: Read Number 9 below. Then, on the lines that follow, write your answer in complete sentences.

9 Explain how weightlessness happens in a space shuttle orbiting Earth.