**Unit 5 t Unit Test**

For questions 1-5, consider the cart on a track below. A pulling force is shown acting to the right. Assume that there is no resistance to motion from the surface (no friction) can be ignored.



For each question, one or more features of the system has been changed. You are to indicate **what effect the change will have on the acceleration.**

Use the following answer key:

A. The acceleration will be greater in the new scenario than the original.

B. The acceleration will be less in the new scenario than the original.

C. The acceleration remains the same in the new scenario as the original.

D. It's not possible to tell from the information provided.

\_\_\_\_\_1. The mass of the cart is increased to 2 kg.

\_\_\_\_\_2. The pulling force is increased to 1.0 N.

\_\_\_\_\_3. *Both* the mass of the cart and the pulling force are doubled.

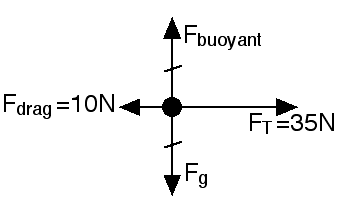
\_\_\_\_\_ 4. The *length* of the string pulling the cart is increased.

\_\_\_\_\_ 5. The 0.5 N force is applied to two *500g* carts hooked together as shown.



**Quick questions 6-8**. Show your work in the space provided.

1. The force diagram to the right is for a 10 kg object. Determine its acceleration.



1. A person applies a horizontal force of 750 N to push a 250 kg crate across a level floor at constant speed.
   1. Determine the frictional force resisting the motion because of the surface acting on the crate.
   2. Assuming the same surface resistance as in the above, what acceleration would the crate have if the force were increased to 1000 N?
2. A 700 kg elevator has an acceleration of 2.5 m/s2… determine the force of tension on the cable if:
3. the elevator is accelerating up.

1. the elevator is accelerating down.
2. With your eyes closed, can you tell which direction you are moving in an elevator?

Can you tell which direction you are accelerating? Explain.

**Multiple Choice**: Select ONE answer per question in Questions 9-11.

\_\_\_\_\_ 9. If it is known that a non-zero net force is acting on an object, then which of the following must be assumed regarding the object's motion?

A. The object is at rest.

B. The velocity of the object is constant.

C. The object has a non-zero acceleration.

D. The object is at equilibrium.

\_\_\_\_\_ 10. A tennis ball and a solid steel ball of the same diameter are dropped at the same time. Which ball has the greater amount of **force** acting on it?

A. The tennis ball

B. The steel ball

C. They both have the same amount of force acting on them.

\_\_\_\_\_ 11. A tennis ball and a solid steel ball the same diameter are dropped at the same time. Ignoring air resistance effects, which ball has the greater **acceleration**?

A. The tennis ball

B. The steel ball

C. They both have the same acceleration.

12. \_\_\_\_\_ You’re in the back of a friend’s pickup truck when it stalls on a hill. You jump out, get behind the truck and push with all your might (300 N) attempting to keep the truck from accelerating down the hill. The force the truck exerts on you is:

A. greater than 300 N .

B. 300 N.

C. less than 300 N.

13. \_\_\_\_\_ One force that is always on you is the gravitational force on you by the Earth. What is the force pair to this force?

A. the normal force on you by the Earth.

B. the gravitational force on the Earth by you.

C. the frictional force on you by the Earth.

D. none of these.

14. \_\_\_\_\_ A horse exerts a 500 N force on a heavy wagon, causing it to accelerate. How much force does the wagon exert on the horse?

A. less than 500 N.

B. 500 N.

C. more than 500 N.

D. it’s not possible to tell.

**Problem Solving** (For problems 15 and 16, be sure to draw a force diagram!)

15. A football player hits a 75 kg training sled with 500 Newtons of force applied parallel to the ground. The surface force resisting motion is 425N.

a. Draw a quantitative force diagram for the sled in the space below:

b. Calculate the acceleration of the training sled.

c. A second player comes along and applies an additional 300 Newtons of force in the same direction.

* Draw a force diagram for the new situation.

* Calculate the motion of the training sled now.



16. Consider the block on a surface as shown to the right.

1. If a 0.5 N force is applied to the cart on a frictionless surface, what is its acceleration?
2. How fast will the block be moving if the force is applied for 8.0s?

c. In the above situation, how could the acceleration be *doubled*? Explain.