

Name: _____

Please read each question carefully, and SHOW YOUR WORK!!!

- 1-5: A small tugboat tows a 10,000 kg boat with a tension force (F_T) of 5,000 N.



In each of the following examples, one or more aspects of this will be changed. (Each problem refers to a change from this original setup.)

How will such a change affect the acceleration of the boats?

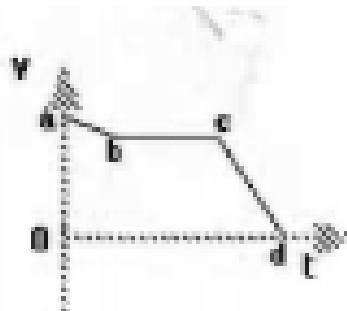
- A. The acceleration would decrease
 - B. The acceleration would remain the same
 - C. The acceleration would increase
1. The Tension force is changed to 10,000 N.
 2. The large boat's mass is changed to 15,000 kg.
 3. The large boat's mass is changed to 5,000 kg, and the Tension is changed to 10,000 N.
 4. The tugboat tows two smaller boats, each of mass 5,000 kg.
 5. The Tension force is doubled, and the mass is doubled.

6. Consider the following *velocity vs. time* graph

When is the **net force** acting on the object the greatest? (circle one)

A to B B to C C to D No way to tell

Explain your answer:



7. A 1500 kg truck is stopped at a traffic light. The driver accelerates to a speed of 20 m/s in 18 seconds. What is the **net force** acting on the truck during this time?

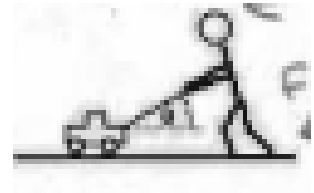
8. How much force would be required to accelerate a 17.5 kg box at 2.25 m/s^2 across a level surface if $\mu = 0.35$?

9. A 17.5 kg box is sliding down at 13° incline, with an acceleration of 1.7 m/s^2 . What is the coefficient of friction (μ) on the ramp?



10. A 12 kg box slides across the floor with an initial velocity of 8.0 m/s. It stops after sliding 16.3 m. Find how much friction was present.

11. A student pushes a 12.7 kg lawnmower. The handle makes a 26° angle with the ground as shown. If the friction is 47 N, find how much force the student must apply to the lawn mower in order to accelerate it at 1.8 m/s^2 .



12. A penny is dropped from the top of a skyscraper, and it accelerates downward. As the penny's velocity increases, air resistance increases. Describe what happens when the downward force of gravity equals the upward force of air resistance.
13. A 17 kg block is sliding along the floor. Nothing but the floor is touching the box. If the box goes from 11.4 m/s to a complete stop in 7.9 seconds.
- Find the Acceleration
 - Find the Friction Force.
 - Find the Normal Force.
 - Find the coefficient of friction (μ).