

Module 5

Physics

Assignment #1

Read pages 141-156.

1. When was Isaac Newton born?
2. List three of Newton's accomplishments, besides the laws of motion.
3. What causes friction?
4. An object is sliding with a velocity of 5 meters per second east. What is the direction of the friction force?
5. What is inertia?
6. Write Newton's First Law of Motion.
7. You just bought a chocolate cream pie and place it on the back seat of your car in the middle of the seat. When you are driving, the car in front of you stops and you have to make a hard turn to the left to avoid hitting the other car. The pie slides across the back seat. Where will it splat – right side door, left side door, back of the front seat, back of the back seat? Why does it go to this location?
8. Write Newton's Second Law of Motion in words.
9. Write the formula for Newton's Second Law of Motion.
10. What does the symbol Σ mean?
11. What metric unit is used to measure force?
12. What English unit is used to measure force?
13. A batter hits a 0.140-kg baseball such that it accelerates at 16 m/s^2 . What force did the batter apply to the ball?
14. A man's truck runs out of gas and he pushes it with a force of 2150 N to the north. The truck has a mass of 8500.0 kg. What is the acceleration of the truck?
15. Write the formula to calculate weight.
16. What is the weight of a 40.0-kilogram box of rocks?
17. A force of 15.0 N acts on an object that has a mass of 3.6 kg.
 - a. What is the object's acceleration?
 - b. What is the object's weight in Newtons?
 - c. What would be the object's acceleration if the force were doubled?
18. The acceleration due to gravity on the moon is $1/6$ that of earth. The acceleration due to gravity on Jupiter is 2.36 times that of earth. A communications satellite has a mass of 480.0 kg. What is its weight in Newtons:
 - a. on earth?
 - b. on the moon?
 - c. on Jupiter?
19. An astronaut weighs 187 Newtons on the moon. What is his weight in Newtons:
 - a. on the earth?
 - b. on Jupiter?
20. What is a normal force?
21. A 370-pound gorilla stands on a level floor. What is the normal force that the floor exerts on the gorilla?
22. Explain the difference between static and kinetic friction.
23. Which is larger: static or kinetic friction?
24. Honors: What is the mass in slugs of a 220-pound Saint Bernard dog?

25. You take a ride on Elon Musk's rocket ship and are floating in space. The space helmet of another astronaut is floating around the cabin, so you decide to shove it towards the astronaut. When you shove the helmet forward, which way do you move?
26. Write Newton's Third Law of Motion.
27. Identify the action-reaction pairs in the following situations:
 - a. A basketball bounces on the court
 - b. A football player kicks a football
 - c. A baseball player catches a ball
28. A 340-kg bookcase is being pushed across the floor ($\mu_s = 0.4$, $\mu_k = 0.18$). What is the:
 - a. weight of the bookcase in Newtons?
 - b. normal force of the bookcase?
 - c. the friction force between the bookcase and the floor?
29. A 720.0-pound block of concrete needs to be removed from a construction site ($\mu_s = 0.5$, $\mu_k = 0.35$). The construction crew is going to use a bull dozer to push the block out of the way. What is the frictional force that the bull dozer must overcome to get the block to move?
30. A grand piano is being pushed across a stage ($\mu_s = 0.46$, $\mu_k = 0.23$) in preparation for a concert. While the 645-kg piano is sliding along, it is being pushed with a force of 2400.0 N. How fast will the piano accelerate?
31. What is the coefficient of kinetic friction between a 480-kg crate and the pavement if the frictional force is 1400.0 N?
32. Honors: You are dragging a 32.0 kg box through a parking lot ($\mu_k = 0.25$) and it is accelerating at 2.6 m/s^2 . Someone plunks another box on top and now the boxes are only accelerating at 1.6 m/s^2 . If the force you are exerting didn't change, what is the weight of the second box?
33. Honors: A 38-kg object has a velocity of 3 m/s forward. Eight seconds later, its velocity is 18 m/s forward. Assuming the object was subject to a constant total force, find the magnitude of the force.