

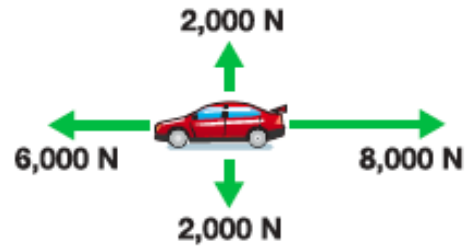
## NEWTON'S LAWS PRACTICE PROBLEMS

Answer the following questions in your science notebook. Show all of your work for math problems (equation, plug-in numbers, box answer). Restate the question in your answer for answers that you explain in words.

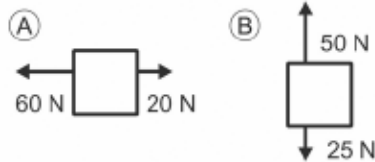
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### NET FORCE & NEWTON'S 1<sup>ST</sup> LAW OF MOTION

1. Describe the motion of the race car shown in the graphic to the right. Assume the car is moving forward. Is it speeding up or slowing down?



2. Find the net force on each box.



3. You weigh a bear by making him stand on four scales as shown. Draw a free-body diagram showing all the forces acting on the bear. If his weight is 1,500 newtons, what is the reading on the fourth scale?



4. A bowling ball has a mass of 6 kilograms. A tennis ball has a mass of 0.06 kilogram. How much inertia does the bowling ball have compared to the tennis ball?
5. Make a free-body diagram of someone pushing a refrigerator that shows:
- A net force of 100 N with the refrigerator being pushed to the right.
  - The refrigerator in equilibrium.

### NEWTON'S 2<sup>ND</sup> LAW OF MOTION

6. A 100 kg bag of sand has a weight on 100 N. When dropped its acceleration is what?
7. What is the net force required to give an automobile of mass 1600 kg an acceleration of  $4.5 \text{ m/s}^2$ ?
8. What is the acceleration of a wagon of mass 20 kg if a horizontal force of 64 N is applied to it? (ignore friction)
9. What is the mass of an object that is experiencing a net force of 200 N and an acceleration of  $500 \text{ m/s}^2$ ?
10. During a test crash, an air bag inflates to stop a dummy's forward motion. The dummy's mass is 75 kg. If the net force on the dummy is 825 N toward the rear of the car, what is the dummy's deceleration?

11. A bicycle takes 8.0 seconds to accelerate at a constant rate from rest to a speed of 4.0 m/s. If the mass of the bicycle and rider together is 85 kg, what is the net force acting on the bicycle? (Hint: first, calculate acceleration)

### *NEWTON'S 3<sup>RD</sup> LAW OF MOTION*

12. For each of the following interactions, identify action and reaction forces (action-reaction pairs):
- A hammer hits a nail
  - Earth's gravity pulls down on you
  - A helicopter blade pushes air downward
  - You step off a curb
  - You pat your friend on the back
  - A wave hits a rocky shore
13. Which exerts more force, the Earth pulling on the moon or the moon pulling on the Earth? Explain.
14. When a heavy football player and a light one run into each other, which player hits the other with more force? Explain. Which one is hurt more by the collision? Explain.
15. Jane has a mass of 40 kg. She pushes on a 50 kg rock with a force of 100 N. What force does the rock exert on Jane?
16. You dribble a basketball while walking on a basketball court. List and describe the pairs of action-reaction forces in this situation.

### *APPLY ALL OF NEWTON'S LAWS!!*

17. When Jane drives to work, she always places her pocketbook on the passenger's seat. By the time she gets to work, her pocketbook has fallen on the floor in front of the passenger seat. One day, she asks you to explain why this happens in terms of physical science. What do you say?
18. You are waiting in line to use the diving board at your local pool. While watching people dive into the pool from the board, you realize that using a diving board to spring into the air before a dive is a good example of Newton's third law of motion. Explain how a diving board illustrates Newton's third law of motion.
19. You know the mass of an object and the force applied to the object to make it move. Which of Newton's laws of motion will help you calculate the acceleration of the object?