

Homework Problem Set 4 - Solution

Exercise 5.4

(a) Action; hammer exerts force on nail. Reaction; nail exerts force on hammer. (b) Action; Earth pulls down on a book. Reaction; book pulls up on Earth. (c) Action; helicopter blade pushes air downward. Reaction; air pushes helicopter blade upward. (d) Action: The force of air resistance is slowing down the baseball. Reaction: The baseball is exerting a force on the surrounding air, making it move. (Hence the “swish”).

(In these examples, action and reaction may be reversed—which is called which is unimportant.)

Exercise 5.12

The billions of force pairs are internal to the book, and exert no net force on the book. For each force acting in one direction on one molecule, there is an equal but opposite force acting on another molecule, so that the net effect on the book as a whole cancels out. An external net force is necessary to accelerate the book.

Exercise 5.24

In accord with Newton’s 3rd law, the force on each will be of the same magnitude. But the effect of the force (acceleration = force divided by mass) will be different for each because of the different mass. The more massive truck undergoes less change in velocity than the Civic.

Exercise 5.26

The winning team pushes harder against the ground. The ground then pushes harder on them, producing a net force in their favor. The forces each team exerts on the other (the pulling) are equal according to Newton’s 3rd law, so the larger force exerted by the ground will determine which team has the larger NET force in their favor.

Exercise 5.19

You can only add forces that act ON the same object to figure out the net force and therefore the acceleration of that object. The first force described here acts on the car, but the second acts on me, so they cannot be added.