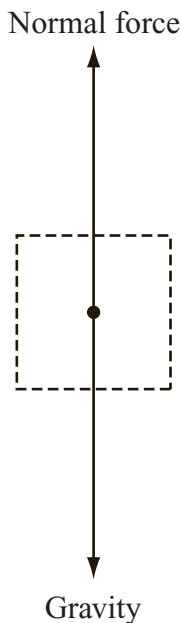


A free-body force diagram for a heavy wooden bookcase at rest in a classroom is below.



Two students push the bookcase across the floor of the classroom.

- Compare the amount of force needed to start the bookcase moving to the amount of force needed to keep it moving at a constant speed.
- On the grid in your Student Answer Booklet, copy the free-body force diagram. Add to your diagram the horizontal forces acting on the bookcase when it is pushed at a constant speed. Include labels and use the grid squares to represent the relative magnitude of **each** force acting on the bookcase.
- Identify one change to the bookcase or the floor that would affect the amount of force required to move the bookcase.
- Explain how the change you identified in part (c) affects the amount of force required to start the bookcase moving or to keep it moving.