

WHICH ONE IS HEAVIER?

A. Question: *Do machines reduce the input of effort necessary to move a mass?*

B. Materials Needed:

1. A 200g and a 300g weight.
2. A spring scale (500g maximum).
3. A 30cm plastic ruler and a stack of books.

C: Procedure:

1. Place three or four textbooks on top of each other.
2. Place the two weights next to the stack of books and tell students that your task is to move the weights up on top of the stack.
3. Ask students: “Which one will take more effort to move?” Place the ruler on an incline (one end on top and the other end on the table), and pull the 300g weight over the ruler up on the stack of books with the spring scale (read the effort off this scale while moving the load).

D: Anticipated Results:

Students should experience that it takes more effort to move the 200g mass straight up, than it takes to move the 300g mass along the inclined plane.

E: Thought Questions for Class Discussion:

1. How much effort did it take to move the 200g weight straight up?
2. How much effort did it take to move the 300g weight over the incline on the top stack?
3. Why was the effort much less than the 300g on the incline?
4. How are the force components working on the incline?
5. What are other applications on the inclined plane?

F: Explanation:

It takes much less effort to move the 300g mass over the inclined ruler, than it takes to move the 200g mass straight up, as the incline component force (W') is much smaller. The less steep the slope of the incline, the smaller the effort. The weight on the incline (W) may be decomposed into a component perpendicular to the incline (W'') and one along the incline (W'). The effort would be slightly larger than W' (to overcome friction). Other applications are: the screw, the wedge, axe, chisel, etc.