Free Body Diagrams

Objectives

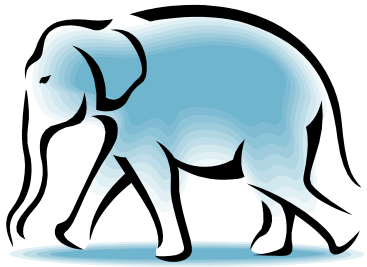
- Draw and label a free body diagram showing all forces acting on an object.
- Draw a pseudo-FBD showing all components of forces acting on an object.

Free Body Diagrams

- Free body diagrams (FBDs) are tools used to analyze physical situations.
- Free Body diagrams show all the forces acting on a single object.
- The object itself may be drawn as a dot.

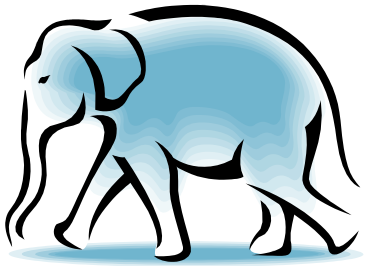
Falling Elephant Example

- A circus elephant falls off a tight rope. Neglect air resistance, draw a free body diagram for the falling elephant.



Falling Elephant Example 2

- A circus elephant falls off a tight rope,. Including air resistance, draw a free body diagram for the falling elephant.

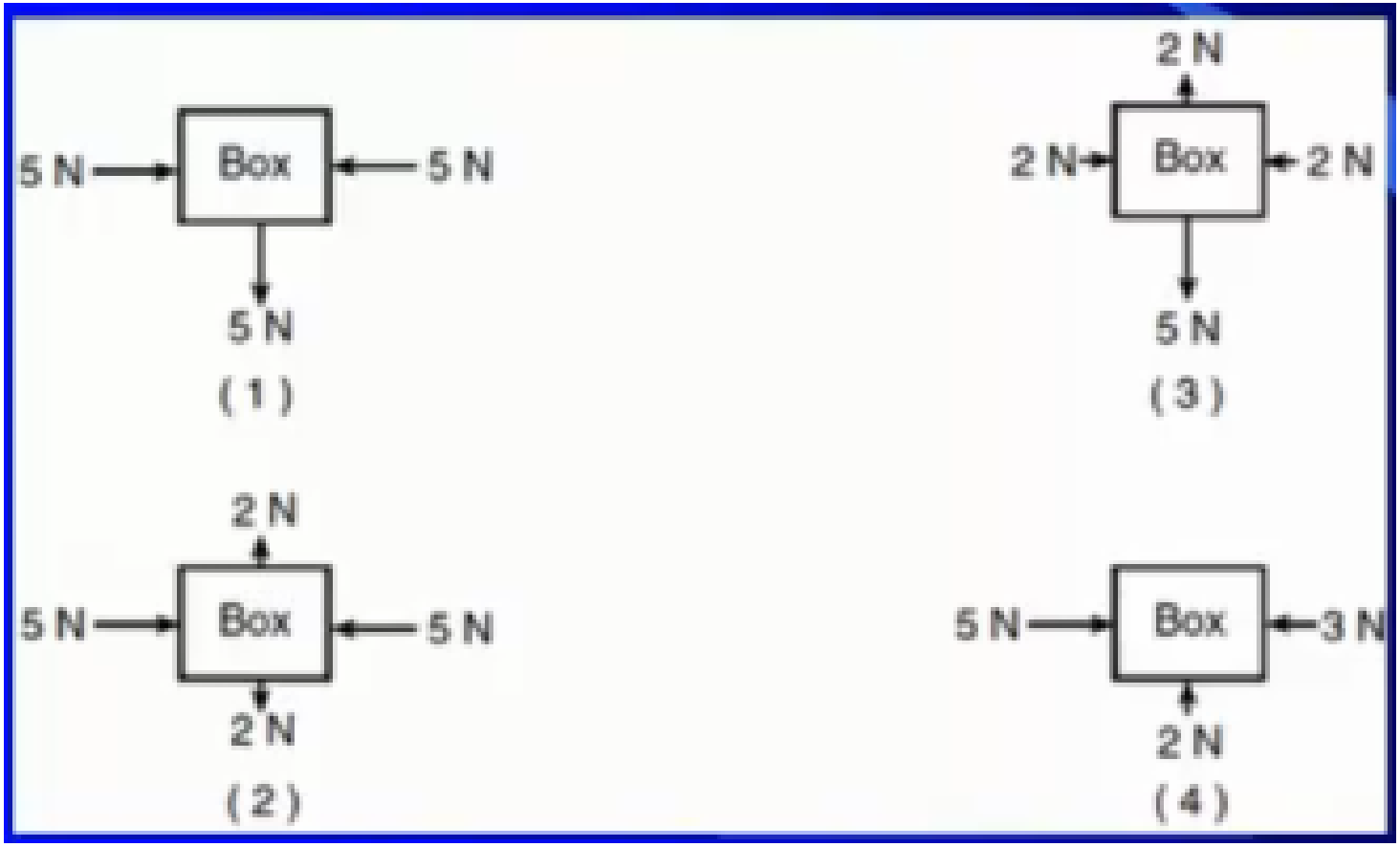


Soda on a Table

- Draw a free body diagram for cup of tea sitting on a table.

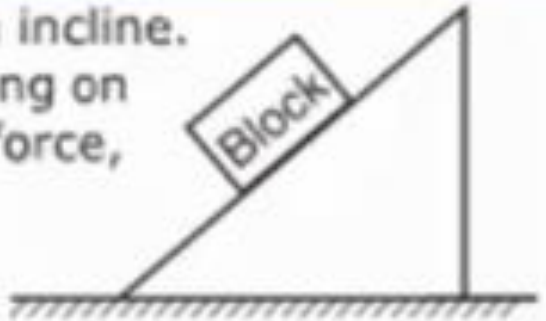
Box in Equilibrium

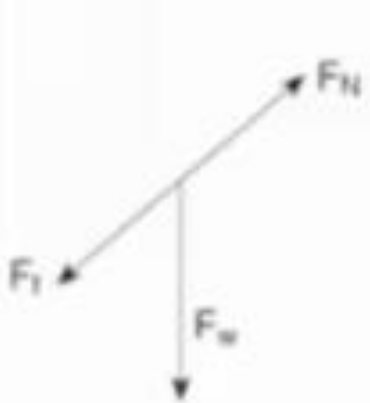
- Which Diagram represents a box in equilibrium?



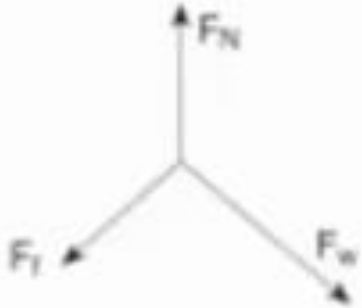
FBD Sample Problem

The diagram represents a block at rest on an incline. Which diagram best represents the forces acting on the block? (F_f = frictional force, F_N = normal force, and F_w = weight.)

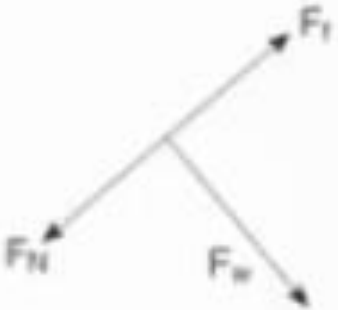




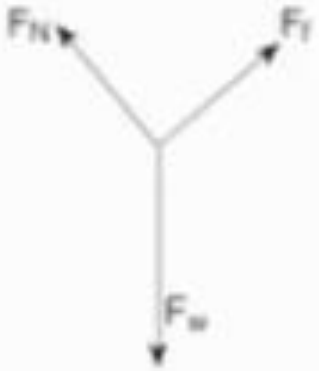
(1)



(2)



(3)



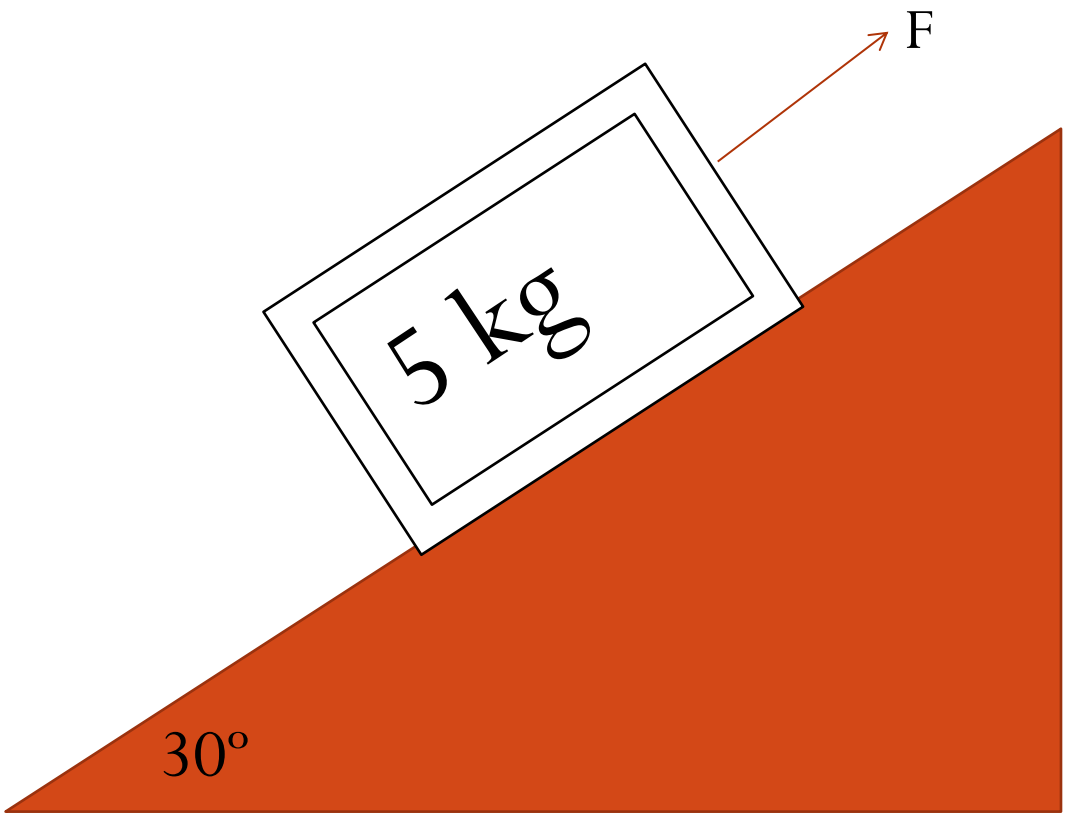
(4)

Pseudo-FBD

- When forces don't line up with the axes, you can draw a pseudo-FBD
- Break forces that don't line u with the axes into components that do.
- Redraw your diagram with all forces parallel to axes.

Objects on a Ramp

- Draw a FBD for a box sitting on a ramp.



Final Thoughts

- Remember that FBDs always show forces, not components of forces (those can only be used for pseudo-FBDs).
- Never label a force on a FBD as a centripetal force. Always use the cause of the force itself.