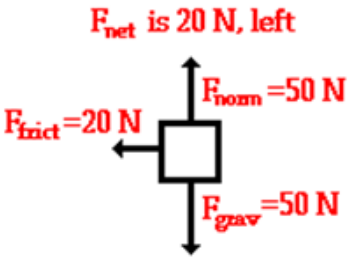
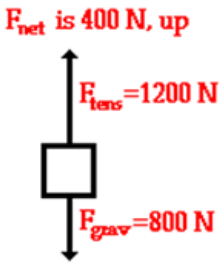
Notes #1: Free-Body Diagrams & F=ma Practice

Examples:

One Dimensional





In these examples, the forces cancel in at least one of the directions.
NET FORCE is the total force on the object.
NET FORCE includes direction.

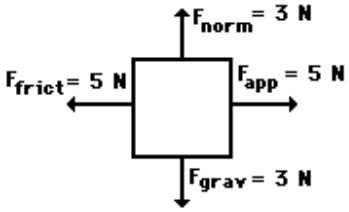
Practice Questions:

1. Free-body diagrams for four situations are shown.

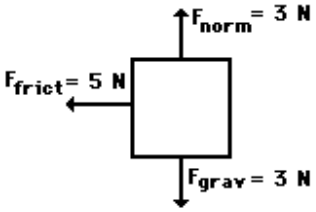
For each situation, **determine the net force acting upon the object.**

Include direction for net force.

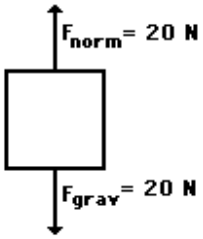
Situation A



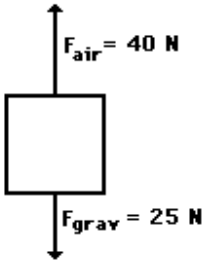
Situation B



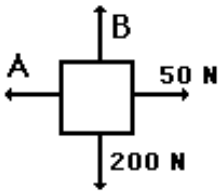
Situation C



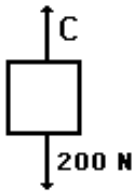
Situation D



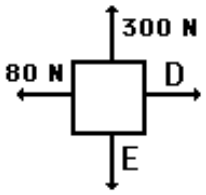
2. Free-body diagrams for four situations are shown below. The net force is known for each situation. However, the magnitudes of a few of the individual forces are not known. Analyze each situation individually and **determine the magnitude (sizes) of the unknown forces**.



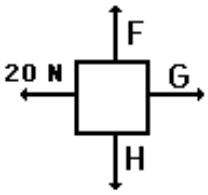
F_{net} = 0 N



F_{net} = 900 N, up



F_{net} = 60 N, left



F_{net} = 30 N, right

3. Draw a free-body diagram:
An egg is free-falling from a nest in a tree.
Neglect air resistance.

4. Coach Lankster and his wife were trying to move their new couch. Coach Lankster pulls with a force of 30 N while Mrs. Lankster pushes with a force of 25 N.

- **a.** Draw a FBD.
- **b.** What is the net force?

5. What acceleration will result when a 12 N net force applied to a 3 kg object?

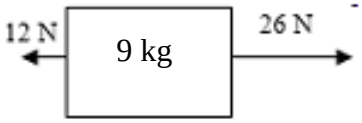
A 6 kg object?

6. A net force of 16 N causes a mass to accelerate at a rate of 5 m/s^2. Determine the mass.

7. A 15.0 kg box is on the floor. The box is being pushed by Katie to the right with a force of 30 N. The frictional force on the box is 4.5 N.

- **a.** Draw a free-body diagram of the box.
- **b.** Determine the magnitude and direction the box is accelerating. Show work!

8. What is the net force on the box below? How fast is the box accelerating? Show all work!



9. Two forces are applied to a 2 kg block on a frictionless horizontal surface, as shown in the diagram below. Calculate the acceleration of the block. Show all work!