

How do you use vectors to draw a free body diagram?
 How do you use a free body diagram to determine the net force on an object?

4-7 Solving Problems with Newton's Laws – Free-Body Diagrams

1. Draw a **sketch**.
2. For one object, draw a **free-body diagram**, showing all the forces acting *on* the object. Make the **magnitudes and directions** as accurate as you can. Label each force. If there are multiple objects, draw a separate diagram for each one.
3. Resolve vectors into components.
4. Apply Newton's **second law** to each component.
5. **Solve**.

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When a cord or rope pulls on an object, it is said to be under **tension**, and the force it exerts is called a **tension force**.

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4-8 Applications Involving Friction, Inclines

An object sliding down an incline has three forces acting on it: the **normal force**, **gravity**, and the **frictional force**.

- The normal force is always **perpendicular** to the surface.
- The friction force is **parallel** to it.
- The gravitational force points **down**.

If the object is at rest, the forces are the same except that we use the static frictional force, and the sum of the forces is zero.

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4-9 Problem Solving – A General Approach

1. Read the problem carefully; then read it again.
2. Draw a sketch, and then a free-body diagram.
3. Choose a convenient coordinate system.
4. List the **known** and **unknown** quantities; find relationships between the knowns and the unknowns.
5. Estimate the answer.
6. Solve the problem without putting in any numbers (**algebraically**); once you are satisfied, put the numbers in.
7. Keep track of dimensions.
8. Make sure your answer is **reasonable**.