Using Vector Components to Analyze Accelerations along Level Surfaces

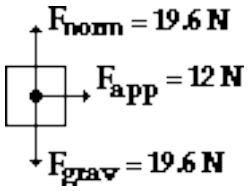
Read from **Lesson 3** of the **Vectors and Motion in Two-Dimensions** chapter at **The Physics Classroom**:

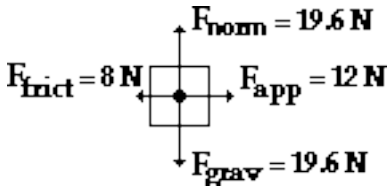
http://www.physicsclassroom.com/Class/vectors/u3l3d.html

MOP Connection: Forces in Two Dimensions: sublevel 2

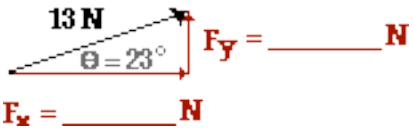
Review:

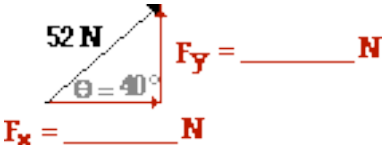
1. Determine the acceleration value for the following two objects. **PSYW**





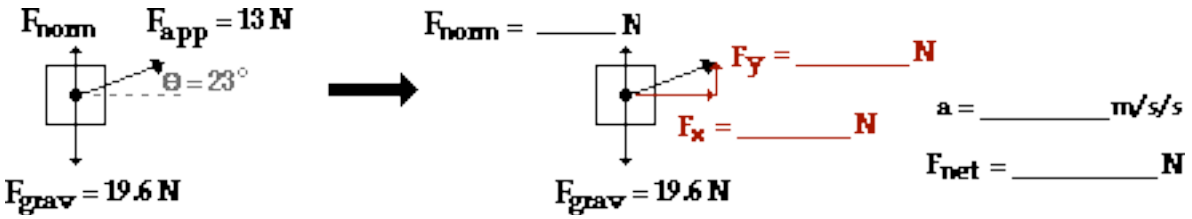
2. Resolve the following two forces into horizontal and vertical components.

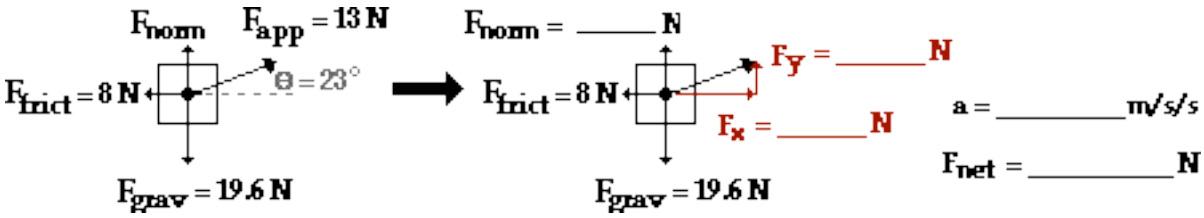


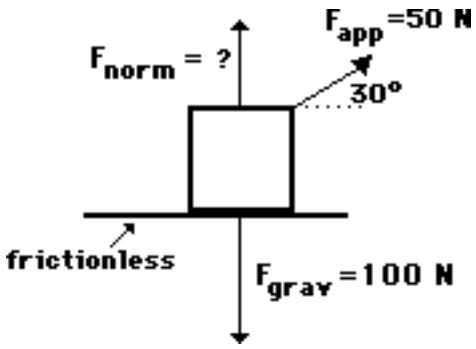


Physics Tip: Whenever you encounter a situation involving a force directed diagonally, make an effort to immediately convert the diagonal force into two perpendicular components. Use SOH CAH TOA to resolve any *uncooperative* force into two components - one being in the direction of the acceleration (or the motion) and the other being at right angles to it. Upon completing *the conversion*, ignore the uncooperative force and treat it as though it has been replaced by the two components.

3. Use the above Physics Tip and SOH CAH TOA to fill in the blanks and determine the acceleration value for the following two situations.

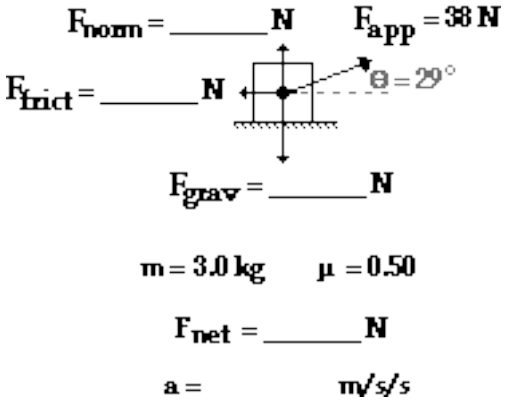


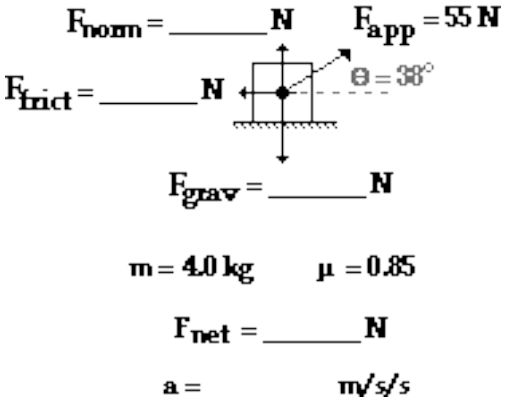




4. A 50-N applied force (30° to the horizontal) accelerates a 10-kg box across a horizontal sheet of ice (see diagram). Ben Thayer, Don Thatt, and Warren Peace are discussing the problem. Ben suggests that the normal force is 50 N; Don suggests that the normal force in the diagram is 75 N; and Warren suggests that the normal force is 100 N. While all three answers seem reasonable, only one is correct. Which is the correct normal force? _____ What error are the incorrect students likely making?

5. Fill in the blanks for the following two situations. **PSYW**





6. A box is pulled at a <u>constant speed</u> of 0.4 m/s across a frictional surface. Perform an extensive force analysis of the diagram and fill in the blanks. **PSYW**