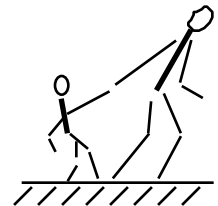


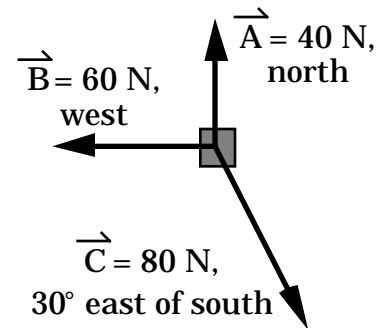
Name \_\_\_\_\_

Please work the problems on separate sheets of paper and staple *this* sheet to the front. Read each problem carefully. Show your work and/or give explanations for *all* answers. Make sure that your answers are given with a reasonable number of sig figs and that you have included appropriate units. Check your answers for physical *reasonableness*. I do give partial credit, but *only* if I can follow your work, so be as clear as possible about what you are doing.

1. [25 pts] A 30 kg child throwing a tantrum is sliding along the floor being pulled by his mother. The mother exerts a force of 200 N at an angle  $40^\circ$  above the horizontal. The coefficient of kinetic friction between the child's shoes and the ground is 0.60. Find the acceleration of the child.

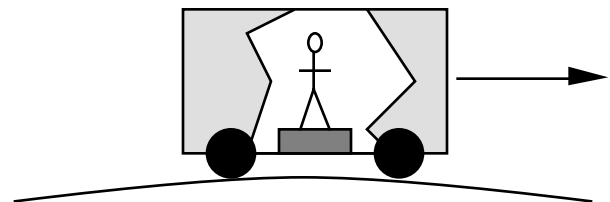


2. A box with a mass of 50 kg rests on frictionless ice with three ropes attached to it. The figure at right is a view from above showing the directions of the three horizontal tension forces applied to the box.

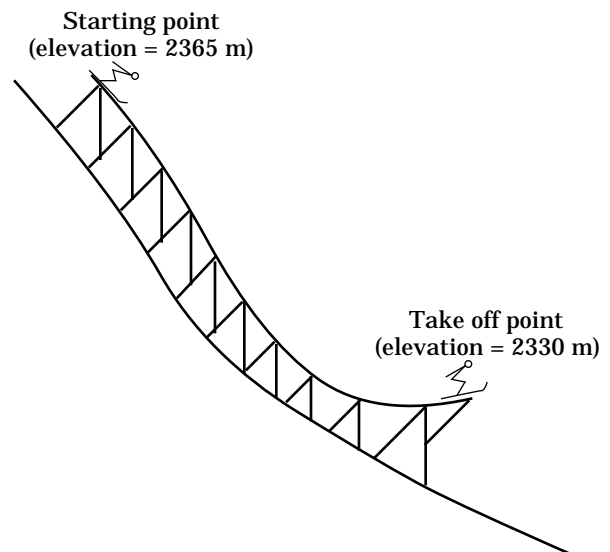


- a) [20 pts] Determine the *vector sum* of the three indicated forces and express your answer in the same *general* format as that shown for force  $\vec{C}$ .
- b) [5 pts] Find the acceleration  $\vec{a}$  of the box.

3. [25 pts] You are standing on a scale in a bus as it passes over the top of a hill. The roadway has a radius of curvature of 30 m and the scale reads half your normal weight. How fast is the bus traveling?



4. A 70 kg ski jumper slides from rest down a frictionless ramp as shown at right.



- a) [15 pts] How fast is she going at the take off point?
- b) [10 pts] If there *had* been friction and it did  $-4000$  J of work during the slide, how fast would she have been going at the take off point?