Ch. 2 HW Newton's 1st Law

Extra Credit Option: Each student may obtain up to +5 points extra credit from this HW set to be added towards Exam I. (see Syllabus "Extra Credit' for details)

1) **(10 pts)** For each part, draw the requested vector (magnitude+direction)

a) **(5 pts)** Determine the tension in the right rope in **figure (a)**

b) **(5 pts)** Determine the resultant velocity vector in **figure (b)**

figure (a)

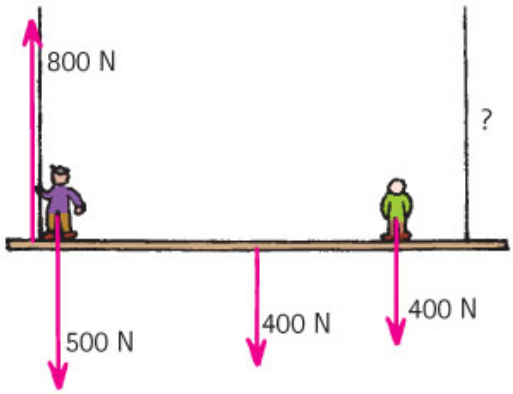
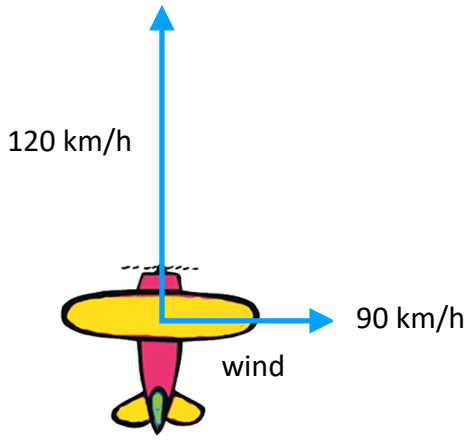


figure (b)



2) **(10 pts)** For each part, **draw** the requested vector (magnitude+direction)

a) **(5 pts)** A 1410-N boy stands on a pair of bathroom scales but leans towards the second scale so that it reads *twice* as much as the first one. What are the scale readings (i.e., normal force from each scale)

b) **(5 pts)** A boat traveling at 8-mi/h crosses a river with perpendicular 6-mi/h currents. Determine the resultant velocity vector of the boat.

figure (a)

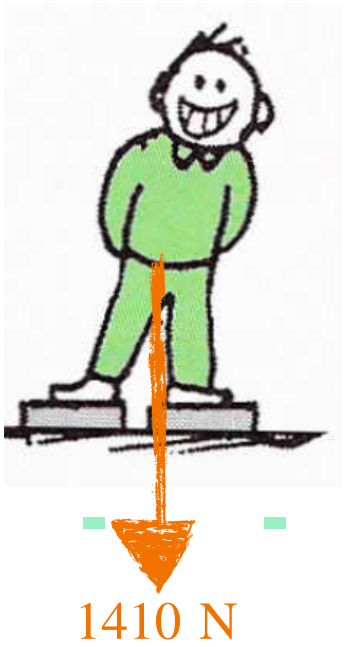
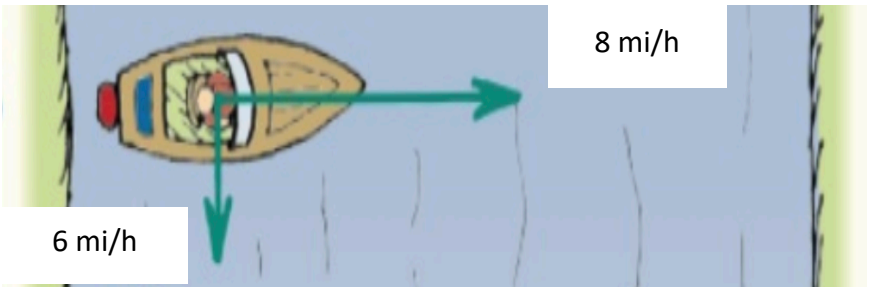


figure (b)



3) **(10 pts)** A box weights 20 N and sits on the floor

a) **(5 pts)** Draw all forces (magnitude + direction) acting on the box while it is at *rest* in **figure (a).** Write down the velocity and acceleration of the box.

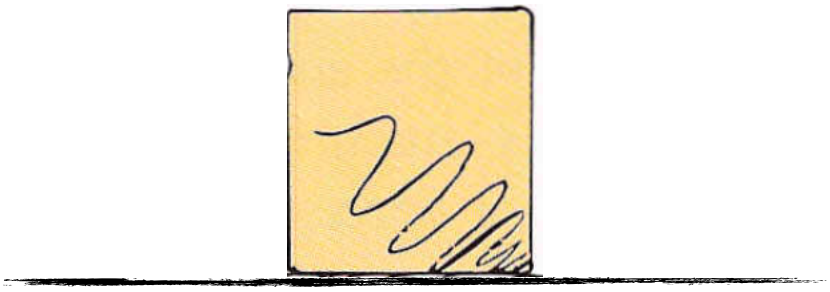


figure (a)

b) **(5 pts)** The box in **figure (b)** is pushed with a force of 50 N and it moves at a *constant velocity* of 1 m/s to the right. Draw the magnitude and direction of the frictional force on the box.

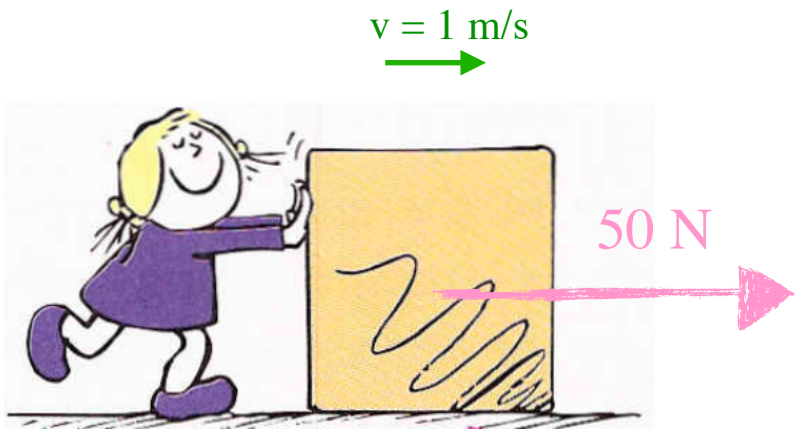


figure (b)

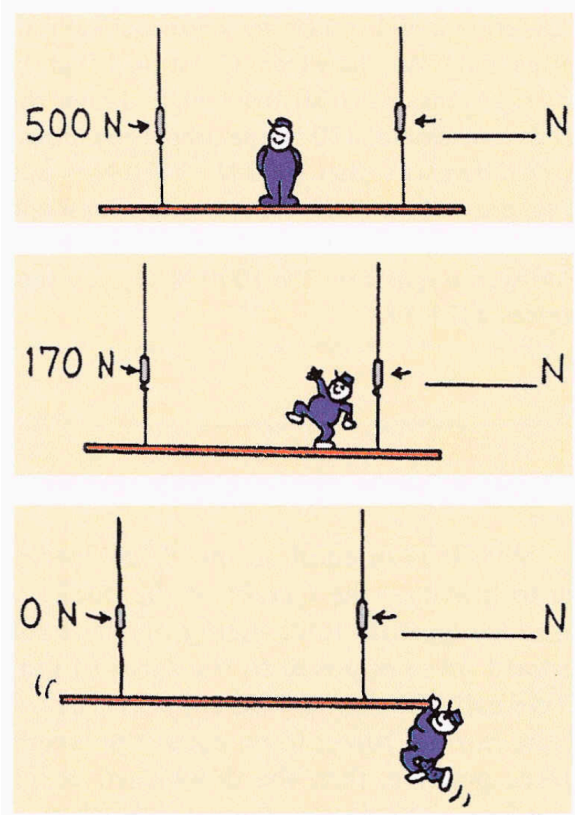
4) **(15 pts)** Burl stands alone in the scaffold at different locations.

a) **(5 pts)** When Burl stands alone in the exact middle of the scaffold, the left scale reads 500 N. What is the tension reading on the right scale ?

The total weight of Burl and the staging must be _____ N.

b) **(5 pts)** Burl stands farther from the left. What is the tension reading on the right scale ?

c) **(5 pts)** In a silly mood, Burl dangle from the right end. What is the tension reading on the right scale.



5) **(15 pts)** An airplane flies at *constant speed* (fig. (a)) in a horizontal straight path. In other words, the flying plane is in *equilibrium*. Two horizontal forces act on the plane. One is the thrust of the propellers that push forward, and the other is the force of air resistance (drag) that acts in the opposite direction.

a) **(5 pts)** Which force is greater ? Why ?

b) **(5 pts)** If the thrust is 1500 N, what is the drag force ?

c) **(5 pts)** If the thrust increases to 2500 N (in fig. (b)), and the drag force is 1500 N, what is the net force (magnitude+direction) on the plane ?

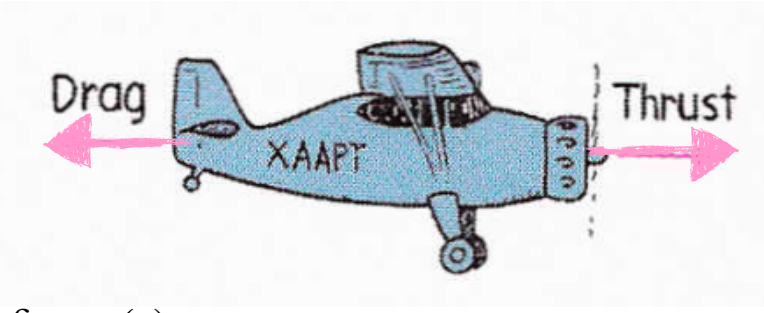


figure (a)

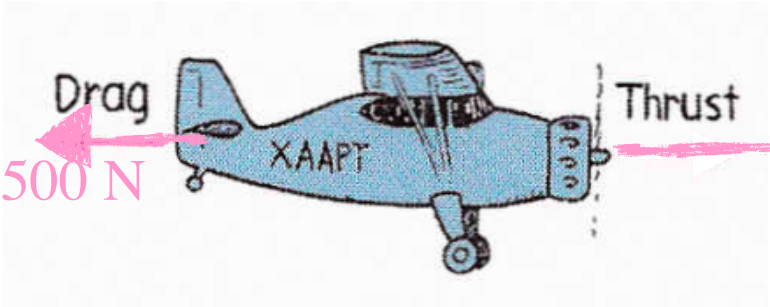


figure (b)

6) **(15 pts)** Nellie Newton weights 300 N and hangs at rest from the ends of the rope as shown for each case.

figure (a)

figure (b)

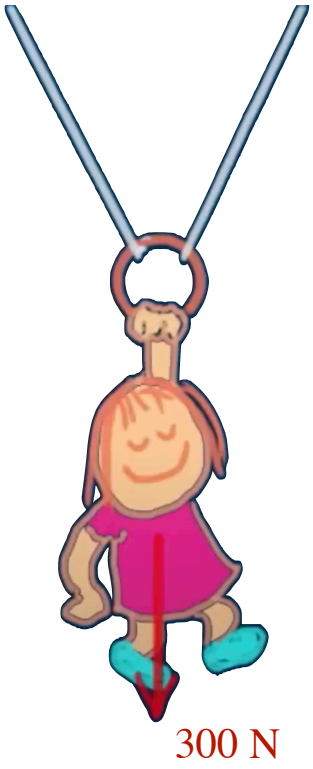


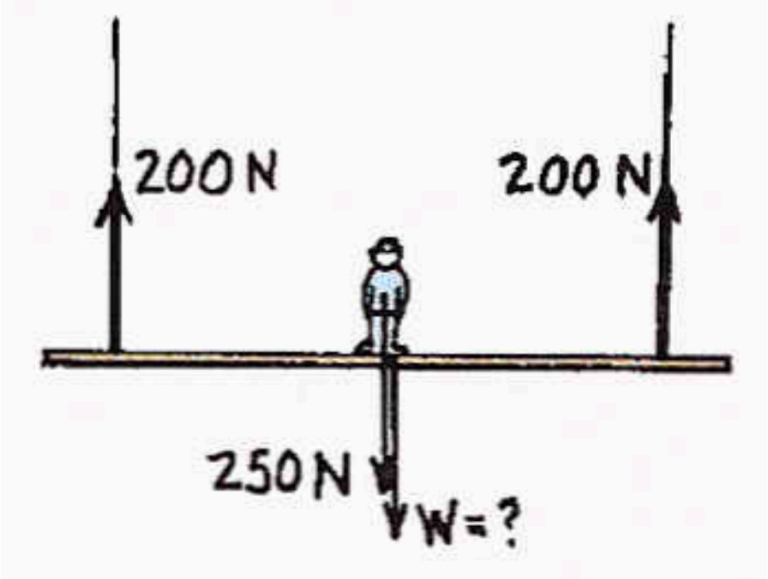
figure (c)

a) **(5 pts)** Draw the tension (magnitude+direction) on the rope in fig. (a)

b) **(5 pts)** Draw the tension (magnitude+direction) on each rope in fig. (b)

c) **(5 pts)** Draw the net tension force in fig. (c) and use the parallelogram rule to determine the components of the net tension on each of the ropes. Only need to draw the vectors to show qualitatively how large the tension on each rope is.

7) **(5 pts)** The sketch shows a painter's staging in mechanical equilibrium. The person in the middle weighs 250 N, and the tensions in each rope are 200 N. What is the weight of the staging ?



8) **(5 pts)** A staging that weighs 300 N supports two painters, one 250 N and the other 300 N. The reading in the left scale is 400 N. What is the reading in the right-hand scale?