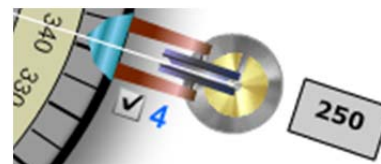


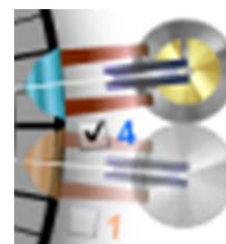
### 3 – The Force Table User’s Guide:

06/10/2014

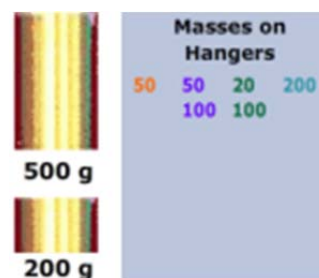
**Pulleys and mass hangers.** Around the table are four color-coded pulley systems: orange, purple, blue, and green. A string from the central ring passes over the pulley and attaches to a mass hanger. By clicking and dragging the colored triangular pointer of the pulley, you can move it around the perimeter of the table. Note that the pulleys can't pass one another, so it's good to plan ahead. In the sample lab activity provided students are given guidance on which hangers to use as they assemble a system of masses. The hangers themselves have masses of 50 g, which is initially shown in the gray boxes next to each hanger but not in the 'Masses on Hangers' table.



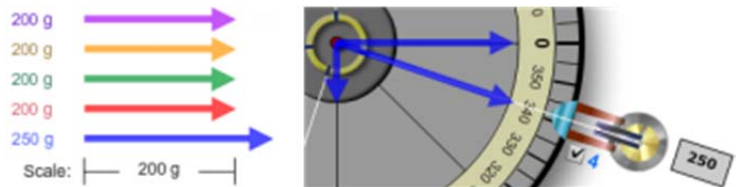
**Disable hangers.** On each pulley system there is a check box to enable or disable that pulley and its mass hanger. When the box is unchecked, that mass hanger will be deactivated, that is, made temporarily massless. It won't be removed from the table all together, and if the box is rechecked it will be active again with whatever masses it had previously. A deactivated pulley system is displayed 'ghosted' in both table views.



**The masses.** There are six different sizes of brass masses on the right-hand side of the screen. Masses can be added to hangers by clicking and dragging on a mass and dropping it on the silver disc part of the hanger. This only works when the hanger is enabled (the checkbox is clicked). As masses are added to hangers, the different mass totals are shown in the table on the right, in the order they were placed on the hanger, from newest to oldest. The total mass on the hanger, including the mass of the hanger itself, is shown in the gray boxes next to each hanger. To remove a mass from a hanger, click and drag this gray box and the most recent (the top mass) will be removed and you can drop it anywhere.

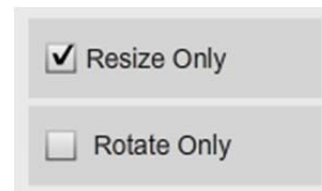


**The vectors.** There are 5 vectors in the top left corner of the screen that can be used to visualize the forces acting on the central ring. Click and drag the body of a vector to move it. Releasing it with its tail near the central pin will cause the vector to attach to the pin. It can be easily dragged away.



To change the length and direction of a vector click on and drag its arrowhead. The magnitude values in the upper left will update.

You may want to rotate a vector without changing its size, or you may want to change its size without altering its angle. If that's the case you can check one of the boxes to the right before dragging the arrowhead. You can also override these checkboxes by holding "R" or "L" on your keyboard while you drag the arrowhead, and that will only change the "Rotation" or the "Length."



Sometimes, it may be helpful to place the vectors at exactly some multiple of 90 degrees without having to guess or precisely measure. Clicking the check-box for '**Snap to 90 degrees**' tells the system to assist you in setting the direction of vectors. With 'Snap' on, if you release the tip of a vector when it's direction is near a 90-degree angle, the system will set the vector to exactly that angle.



**X and Y Components** of a particular vector can be displayed by clicking the box beside the 'Show Components' arrow of the matching color. The components can be dragged away from their main vector to illustrate the addition of vectors by components.

Show Components



**The brightnesses** of the main vectors and their components can be controlled with the Vector Brightness slider.

Vector Brightness



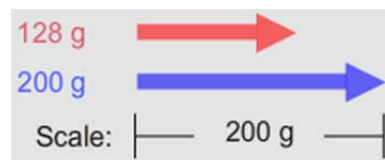
When a vector is no longer needed it can be returned to its 'home' by clicking the little house of the matching color.

Home Vectors

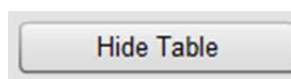


**Vector Scale.** The vectors can be used to represent forces or masses on the hangers. The magnitude scale of each vector can be selected from the “Set Vector Scale:” drop down menu, and the units of the vector can be selected from the adjacent drop down menu. When a vector is adjusted in length its new magnitude is updated in the upper left hand corner. Below the vectors, there is also a scale reminder to show the length on the screen that corresponds to the base values selected from the drop down menus.

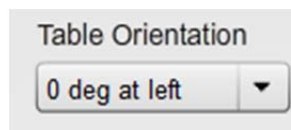
Set Vector Scale:  ×



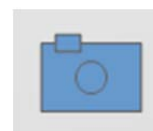
**Hide Table.** There is a button on screen that allows you to hide/show the table and all of its components if you want a large, clear space to see or work with the vectors.



**Table Orientation.** You can rotate the markings on the table to any 90 degree orientation using the drop box menu.



**Snapshot.** As with most of our labs, you can take a screenshot of any portion of the screen by clicking on the Snapshot icon and then clicking and dragging a box around what you want to capture. A dialog will then appear asking you what you want to call the image and where you want to save it. In most labs, a timestamp will be added to the image to keep track of it better.



#### General Tips and Notes.

- The main view of the force table is the central top-down version in the middle of the screen. A more side-on version is shown in the upper right corner and is there to help show the dynamics of the situation. It is for viewing only and the hangers can't be adjusted there.
- It is possible to completely hide the main vectors if you slide the Vector Brightness slider all the way to the left if you don't have the Components visible. If you can't find any of your vectors, try to adjust this Brightness slider first.