Going round and round in circles and getting somewhere.

1 Centripetal force holder

We have had difficulty of finding suitable holders or tubes for the usual circling bung with a hanging mass, experiment.

The solution is polybutylene pipe (15 mm diameter, $4.43/m) and a support sleeve in the top end (63c each) for a very smooth low friction surface on the end.

2 Centripetal force expt

We have changed form the "investigating the relationship between two variables" method to the "Ana Cox" version

Looks very simple to run and has a much clearer teaching point.

In it, all the variables are measured. The centripetal force is calculated and then compared with the weight force. See the results grid and sample results, (which are not brilliant), on separate sheets.

The comparison of F_{weight} and $F_{centripetal}$ are very clear on a graph. Making the axes scales equal to produce a 45 degree graph line makes the teaching point clearer.

Emphasises one measure of centripetal force is equal to the other

In order to have a wide spread of points, many different weights need to be used. A range of radii and (?) mass of bungs should be used too.

Before doing the measurements, it is worth students having the tactile/experiential situation of holding the string, instead of having weights, and sensing it is a real and ordinary force that is being investigated.

As a finale, use Murray's challenge; "How can you use a tennis ball to lift 2 litre bottle of milk (water)?" (Replace the bung with the ball and the weights with the liquid. Use a large radius.)

3 Centripetal force direction

Have the students in a large circle and set a self propelled car going with the instruction to make it go in a circle. Highlight they have to push the car inwards.

4 Construct an "acceleroscope" with a large (preserving) jar, a cork or something else that floats tied the to a string and fastened to the lid. Invert the jar. Move forward accelerating and decelerating. Make up a blab about it moving backwards as pendulums do … , to highlight and reinforce the float moves in the direction of acceleration.

Then, with the acceleration direction firmly established, have student(s) rotate on the spot with the bottle at arm's length and observe. This works well in a car - with someone else driving.

5 Rotational inertia

Have 2 large similar bottles such as 2 litre Coke bottles. Fill one with water. Have one in the freezer overnight so it is solid ice and the other with water. Raise the end of a long table a few centimetres. Ask the students which one will reach the bottom first, when released, or both the same. Try it. Discuss.

6 Measure inertia

Use bottle as above, filled with ice. You can get at a value of the rotational inertia by a circuitous, mathematical route. See separate sheet.

Emphasise; what rotational inertia of this value is like,
it is possible to measure very small values very simply,
range of uncertainties in estimate

7 Mass distribution for rotational inertia

Tactile/experiential situation.

Take a 2m aluminium ladder to class. Have students rotate it around the three perpendicular axes. Discuss. You could make an estimate of the values of the 3 rotational inertias.