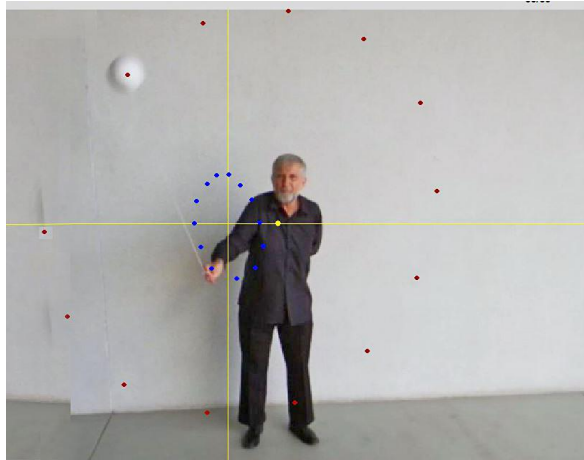


Conceptual questions

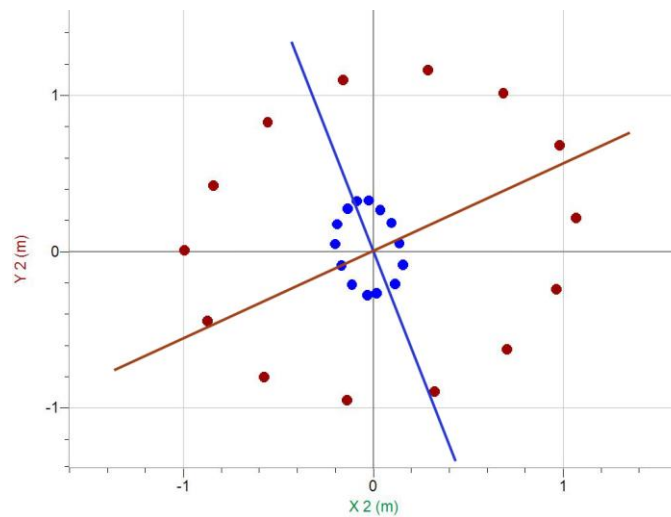
Torque

1 A polystyrene ball is swung in vertical motion.



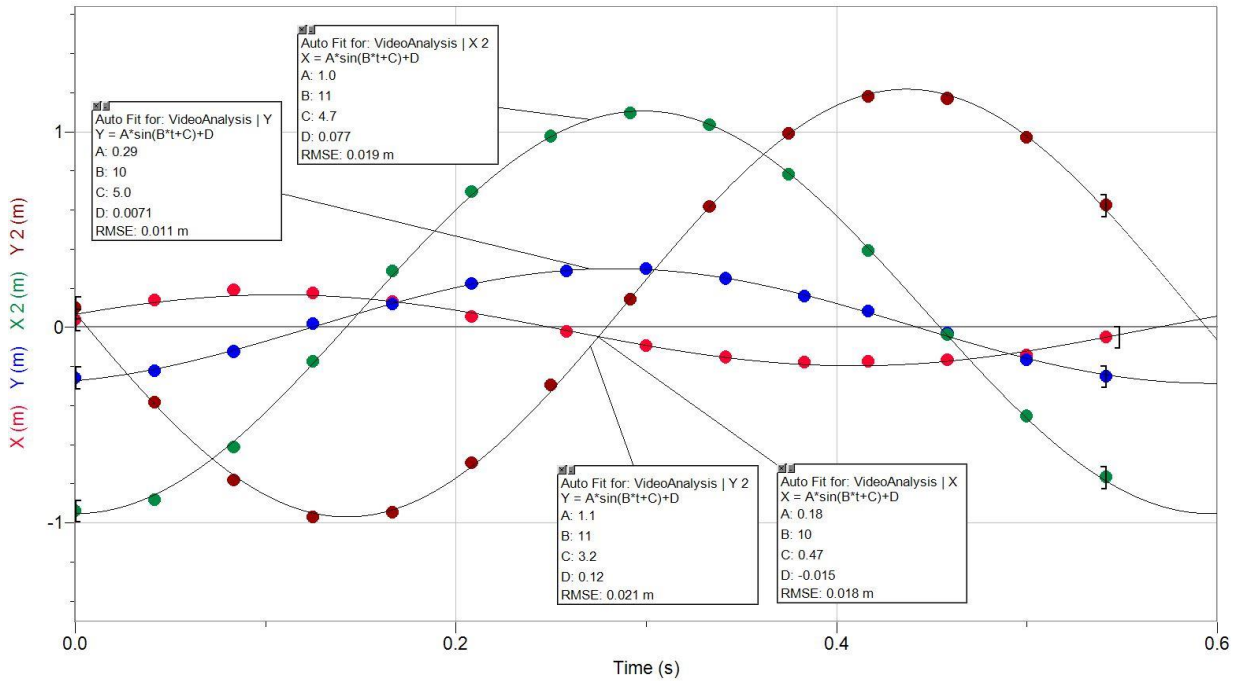
Part I

The graph shows the position of the hand and the ball as they move in a counterclockwise directions.



a Explain why the paths are not circular and the longer axes are not aligned?

The graph below shows data extracted from a video clip of the motion of the ball.



b What evidence do you see on the graph that the paths are not circular. (Two observations).

c By looking at the horizontal plots (X values) and the vertical plots (Y values) obtain estimates of the phase angle between the motion of the hand and the ball.

d Write down an estimate of the angular velocity of the ball.

Part 2

A student wants to use this idea to measure the drag on a ball of given radius due to air resistance as a function of speed.

a Give advice: how might he make the path of the ball more circular with a more constant angular velocity?

b How might he collect sufficient data in a short time?

c List the quantities that he would need measure and draw a vector diagram to show that you understand the analysis required.

d Given that the ball travels in turbulent flow what relationship would you expect him to find between drag force and velocity?

To be continued ...