**Assignment: Analysing the Motion of a Badminton Birdie Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. A badminton birdie was videotaped as it was given a gentle upward hit. Look at its motion **after** it leaves the racquet. Sketch the path that the birdie took. Label where it is speeding up and where it is slowing down.
2. Describe the motion in complete sentences using words like; speeding up, slowing down, stopping, changing direction, moving up, moving down.
3. The horizontal and vertical positions - x and y – were measured every 0.03 seconds using Tracker software. The first three data points are shown in the table below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| t(s) | x(m) | y(m) | Vx (m/s) | Vy (m/s) |
| 0.000 | 0.000 | 0.000 |  |  |
| 0.029 | 0.243 | 0.294 |  |  |
| 0.062 | 0.470 | 0.551 |  |  |

1. Calculate the horizontal velocity during the first time interval (0.000 to 0.029). Show your steps below and then enter the result in the table above.
2. Repeat for the horizontal velocity for the second time interval (0.029 to 0.062).

1. Repeat for the vertical velocity for the first time interval.

1. Repeat for the vertical velocity for the second time interval.
2. Excel can do this repetitious work for you. Go to the Danforth folder, Student Share (STU), Tevlin, College Physics, Motion. Open the Excel file Badminton Lob. Save it as a file with your name as the file name.   
   a) Write a formula that will calculate the horizontal velocities. What did you have to type in the first cell (F3)?

b) Write a formula that will calculate the vertical velocities. What did you have to type in the first cell (G3)?

1. Graph the horizontal velocity (vertical) against time (horizontal). Show this graph to the teacher. Make a sketch below that shows the best-fit trend line, equation and scale – but not the data points.
2. Graph the vertical velocity (vertical) against time (horizontal). Show this graph to the teacher. Make a sketch below that shows the best-fit trend line, equation and scale – but not the data points.
3. What causes the horizontal speed to get slower and slower?
4. What causes the vertical speed to get slower?
5. What causes the vertical speed to get faster?
6. Why does the vertical speed become negative but the horizontal speed does not?
7. Email the Excel file to [roberta.tevlin@tdsb.on.ca](mailto:roberta.tevlin@tdsb.on.ca) Note: If you need help with this or do not have Excel come to A76 at lunch on day 2.