

## BMX Stunt Bike Riding Investigation

### BMX Movie and VidShell Instructions and Graphics Calculator Commands for Finding the Least Squares Regression Line

For teacher (u: drive) and students (s: drive) all files are saved in the **share** drive in:  
**share/Year 10/Year 10 Maths/BMX Assignment**

1. Run BMX Movie by:

- Opening folders **share/Year 10/Year 10 Maths/BMX Assignment /BMX Movies**, and
- double clicking on **BMX Events Movie 2005**.

Use play, rewind, etc buttons to control the movie. Repeat the movie or parts of it to assist the introduction sequence of the lesson.

2. Start **VidShell** by

- double clicking on the **Shortcut to tb70run** icon on your desktop (**note: in Media Room** click on the start button and double click on **VidShell**)
- double clicking on **vidshell.tbk**
- clicking once anywhere on VidShell screen
- clicking once on show button information.

3. Open first video clip **Ben Dirt Jump 22** by

- clicking once on video camera button/other source
- in drives section clicking once on **▼ /u: share** and then double clicking on **Year 10/Year 10 Maths/BMX Assignment** and double clicking on **Ben Dirt Jump 22**.


**Note: students use Ahmed Dirt Jump 25 that is in the same folder as the Ben Dirt Jump, for the BMX assignment questions. Assign a different copy of Ahmed Dirt Jump 25 to each group. There are 9 copies named:**

**Ahmed Dirt Jump 25 1 to Ahmed Dirt Jump 25 9**

4. Calibrate the diagram by clicking on the **Mouse and Ruler Icon**, click okay and then

- draw a line between the top of the up and down ramps by positioning the cross at the top of the up ramp where the rider leaves the ramp and, keeping the left mouse button down move the cross to the left side of the down ramp. When the mouse button is released enter the distance and the measurement unit. For **Ahmed Dirt Jump 26** and **Ben Dirt jump 22** the distance is 3.6 m and for **Ahmed Dirt Jump 25** the distance is 4.95 m.

5. Rewind the video clip by clicking the **Rewind button** and then click the **Step forward button** to where you want to start recording coordinates for the rider's flight path.

6. Click once on  button, click at the base of the approach to the up ramp (see note below) to position the origin and respond as follows:

- increasing positive X will be towards the left
- increasing positive Y will be upwards.

**Note:** you may wish to position the origin at the top of the up ramp and adjust the way in which you find the maximum height of the rider.

7. Click **Table button** to set up table for recording x and y values and then answer as follows:

- What is the difference between frames in seconds for the data points you are collecting? Answer: 1/25 sec.
- Will you be recording positional data (x,y,t) or rotational data (r,theta,t)? Answer: positional data
- Will this data be recorded from a standard or rotated coordinate system, which you have previously defined? Answer: standard.

8. To record values in table move straight to clicking points do not click on **Points button** first. Use the mouse pointer to click in the rider's center of gravity. Use the middle of his waist. Step the video forward using the **Step Forward Button** and continue to click the rider's center of gravity. Record ten points.

9. To erase any points from the graph and table, click the button that has a cross through a point and then click on the point to be erased. To erase all points click on the button that has a cross through a number of points.

10. Copy the table values to a workbook, enter them into a graphics calculator and fit a quadratic least squares regression line to the data.

11. To measure the maximum height of the rider using VidShell, place a point at rider's maximum height and at ground level and then click **distance between two points** button and follow the directions.

### **Graphics Calculator Statistical Commands for Finding the Quadratic Least-Squares Regression Line Equation**

1. Enter x and y coordinates into the calculator by pressing:

STAT/EDIT and entering the x coordinates in L<sub>1</sub> and the y coordinates in L<sub>2</sub>.

2. To find the quadratic least-squares regression line press:

Stat/CALC/QuadReg/2<sup>nd</sup>1/,/2<sup>nd</sup>/,/VARS/Y-VARS/1/Y<sub>1</sub>

Remember x coordinates must be in L<sub>1</sub> and the y coordinates must be in L<sub>2</sub>. The a, b and c values are for  $y = ax^2 + bx + c$ . Using this sequence of commands the quadratic least-squares regression equation will be copied into the Y= screen so it can be graphed straight away.