



DYNAMICS AND TRAIL RUNNING

Answer the following questions in a Word file.

Filename: CMITE_Dynamics_Gnumber

Use the equations editor or the Excel spreadsheet if it is necessary.

Which forces are exerted when we run?

First, we need to state some assumptions about the running process.

- Each foot contacts the ground and is pushed by a reaction force (Newton's Third Law of Motion) which impules the body along a parabolic trajectory until the opposite foot strikes the ground
- The vertical component of the impulsive force at the instant the foot leaves the ground is equal to the horizontal force so as to reach maximum range

Second, answer the questions below:

1. Draw a scheme of the forces acting on a runner who runs on a flat surface. Calculate the forces. You can find additional info in this link: <http://www.real-world-physics-problems.com/physics-of-running.html>
2. Why both the vertical and the horizontal components of the force are equal? Watch this simulation which shows the relation between the launch angle and the range: http://www.animations.physics.unsw.edu.au/mechanics/chapter2_projects.html
3. Open the GPS track of your race
4. Study the uphill part of the race. Split the ascent in two parts by the control point. Calculate the grade percent incline and the inclination angle of each part. Learn about grades, slopes and angles: <http://www.1728.org/gradient.htm>
5. Do activity 1 again but on the inclined surface of activity 4. Calculate the forces. Draw out some conclusions
6. Study the downhill part of the race. Split the descent in two parts by the control point. Calculate the grade percent decline and the declination angle of each part
7. Do activity 1 again but on the inclined surface of activity 6. Calculate the forces. Draw out some conclusions

If you need to revise the basics of Dynamics, click on the following link:

<http://www.schoolphysics.co.uk/age16-19/Mechanics/Dynamics/>