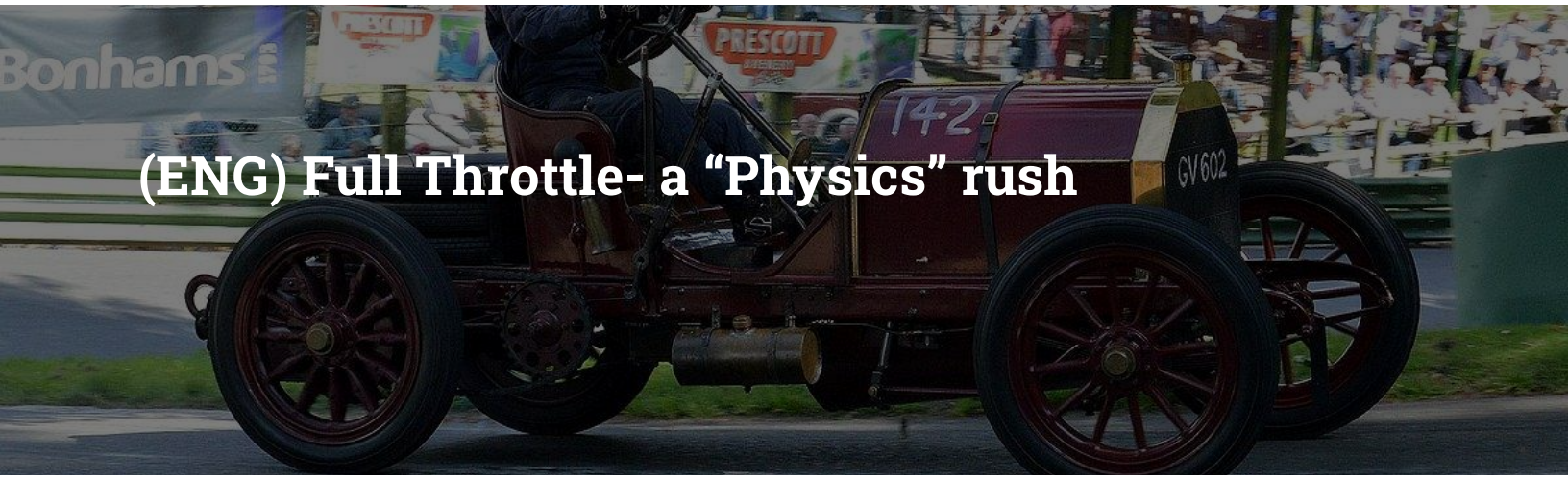


(ENG) Full Throttle- a “Physics” rush

Introduction

Step 1 - Motivational Stage

Step 2 - Investigational Stage

Step 3 - Consolidation Stage

Introduction

#Online activity #In-class activity #Inquiry-based learning #Experiential learning #Simulation #Teamwork

This physics activity aims to provide an understanding of path at steady accelerated motion through an experiment that explains the formula. It is an experiment in its own right so the creative part will be to create a car with Lego.

Learning Objectives

- [ ] Learn what is a path at steady accelerated motion.
- [ ] Learn how to demonstrate this motion in practice.

ACTIVITY DETAILS

Activity Details

Connection of the activity with Art

Construction, design

Link to local, national School Curriculum

Accelerated motion and Newton's second law/Path at steadily accelerated motion

Equipment required

- Toy machines, pulley,
- a weigher,
- a thread,
- a ruler,
- a stopwatch ora a timer,
- post it,
- chalks

Duration of activity

45 minutes

Sources

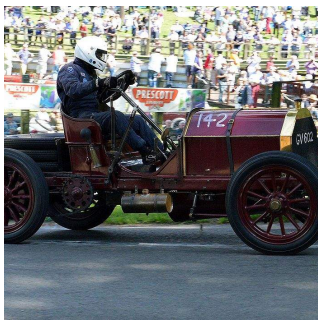
Photo credit: Wikimedia (free copyright)

Imagine 1:
Rogers Collings drives BJA Collings' 9236cc: Mercedes 60HP on a timed run at the VSCC hill climb at Prescott, 1903
Author: Dave_S
Source: https://www.flickr.com/photos/david_e_smith/20758376105/ (public domain)

Imagine 2:
Ferrari 458 Spider at Frankfurt Motor Show, 2011
Author: Autoviva
Source: Ferrari 458 Spider at the Frankfurt Motor Show IAA 2011(public domain)

Step 1 - Motivational Stage

Show pupils these pictures and ask them what they think it is and what they think we are going to study today.



The answer will probably be: a racing car. Then, introduce this lesson’s topic, which is uniformly accelerated rectilinear motion and will be experimented by organising a car race.

Step 2 - Investigational Stage

STUDENTS' TASKS

1

Task 1

Divide the class into groups of 4 or 5 pupils and give them a Lego kit for building a car (make sure it can be attached to a thread later).

If you have little time, give your pupils toy cars.

Each team should have its own car and a staff to support it.

Give your pupils 5 minutes to come up with a team name and have them write it on a small rectangle of paper: it will be the name plate.

2

Task 2

Take a bench and build the race track at the ends of which the pulley and the car will be placed.

You can use chalks or pens to mark out the track and place coloured post-it notes at precise distances from the starting point where you will place the cars:

- the first pit stop will be placed 10 cm from the start;
- the second one at 40 cm from the start
- the last one 90 cm from the start.

3

Task 3

Hook the pulley at the end, to which you will attach the wire that will be used to hook the machine that will be on the opposite side of the bench.

4

Task 4

Now place the weight in the pulley and have the first car in the race positioned.

Attach one end of the car to the pulley with the wire and equip the first team in the race with the chronometer.

When everyone is ready, unhook the weight you had attached to the pulley, it will be what gives the car the right force to make it move.

Pupils should note down the seconds taken by the cars to reach the stops marked on post-it notes.

In total, each team should therefore have 3 different data corresponding to the 3 milestones marked by the post-its.

Collect the data from all the competing teams and start the analysis.

5

Task 5

Write down the formulae of uniformly accelerated rectilinear motion on the digital whiteboard and explain the principle to them. Now take the experiment they did with the cars as an example.

You have to prove that a body starting from a standstill and moving by uniformly accelerated motion covers distances that are proportional to the square of the elapsed time.

$$d=12*a*t^2$$

So if the time available doubles, the distance increases by 2 to the second; if it triples by 3 to the second.

Take the data collected from your pupils divided into teams and do the calculations to see how practice can approximate theory.

Step 3 - Consolidation Stage

Before proceeding with the consolidation stage, clarify WHY you are using a conditional "can approximate": remind them that motion actually only accelerates steadily if friction and air resistance are close to zero and that in the experiment you just did this is impossible, therefore, the results may not exactly match the formula.

Use a few minutes at the end to recreate the competition groups again and have the team discuss the concepts they have learned. Walk around the desks while they discuss so that you can understand their level of understanding and build on that to take up this concept perhaps in another lesson starting with the experiment.

End of the activity

EXIT