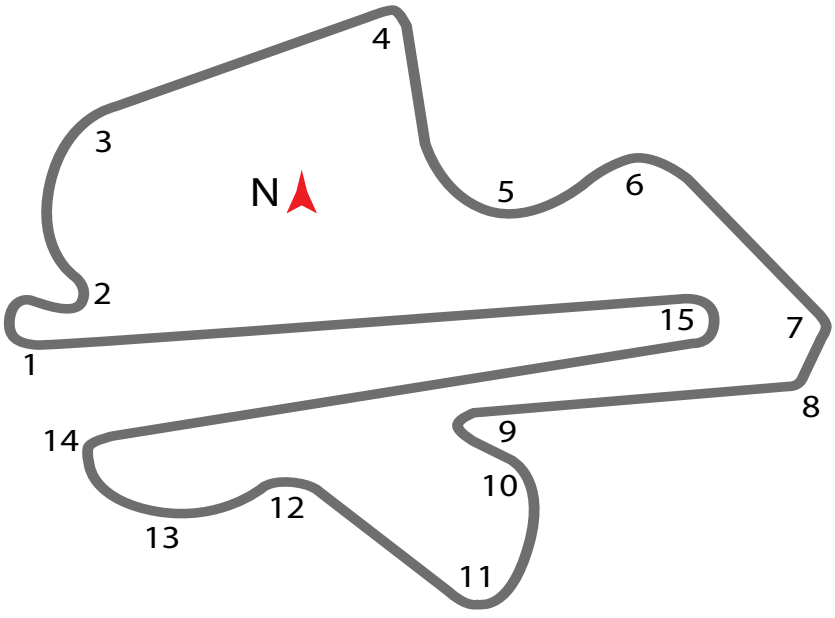
- Try to elicit from them that higher speed means that more distance is covered in a certain interval of time. Help them to understand this concept in their mind's eye, as well as using data to confirm it.
- Which parts of the time trial allow the fastest speed to be reached? What would this mean for the distance covered in each second of time on one of these parts of the circuit compared to one of the bends?
- The long straights allow the greatest speed to be reached, when the distance travelled in each second (per second) is much greated than on the turns.
- Introduce the learning objective for this episode with PPT slide 3.
- Show PPT slide 4 and ask the students to discuss it in pairs for a few minutes. In the course of their discussion, they should become aware that the measurements needed to calculate speed are the distance travelled and the time taken.
- You may also wish to introduce the equation:

$$\text{Average speed} = \frac{\text{Total distance travelled}}{\text{Total time taken}} \quad \begin{matrix}\text{(in metres)} \\ \text{(in seconds)}\end{matrix}$$

and a unit for speed, which is metres per second, written as m/s.

- This new knowledge can be consolidated by using data from the Sepang race circuit.
- For any students who do not already know, the Sepang International Circuit is a race track quite near to KL airport, and is where the Formula 1 Malaysian Grand Prix and other high-profile car and bike races are run.



Resources

- *PowerPoint* Presentation- Episode 1: How Fast? On your mark...Get set...Go!
- *Prezi* Presentation- Episode 1: How Fast? On your mark...Get set...Go!
- Activity Sheet 1.2 Distance-time graph
- Data from Video Clip - 'Go GO Go Challenge 2'
- Graph Paper
- 30cm rulers
- Pencils

Period 3, 4, 5
Activity Sheet 1.3–1.5 Gravity and Fall – Investigating parachute

- Introduce this practical investigation using PPT slide 11 and Student Activity Sheet 1.3.
- This investigation will look at the physics of falling objects, in this case a parachute.
- Give the students time to read the introduction on their Activity Sheet. Make sure that they understand that a parachute only lessens the effect of gravity on the object hanging from it – the parachute doesn't reduce gravity itself.
- A simple parachute can be made using a square of thin plastic sheeting. This can be sourced from many areas: plastic carrier bags for shopping, protective plastic sheets used when painting, or sheeting purchased from a scientific supplier.
- Some students find drawing a square onto plastic sheeting difficult and/or time-consuming; it is helpful if you provide them with cardboard templates of the correct dimensions to draw around.
- Show PPT slide 12. The students should attach cotton thread to the corners as shown below, then tie all four threads together and attach a paperclip to ensure the parachute falls correctly.

- Students should work in pairs to carry out the basis test of their parachute; they drop it from a height of 2 metres, and time how long it takes to fall to the ground. The parachute must be dropped away from the wall so that it falls without being impeded in any way. (The height can be marked on a wall using a measuring tape, or two metre rules can be loosely attached to the wall. For a fair trial of the different parachutes, it is the paperclip that must start at 2 metres high each time, not the top of the parachute.)

- They should repeat their drops five times, recording the timings, then find an average value. A useful discussion here relates to reliability of readings, and the accuracy to which the readings should be recorded.

- This average value is then compared with readings for a second, different, parachute.

- You may wish to discuss with students, or brainstorm, the variables which may affect how fast the parachute falls. The variables should include:
  - size/ area of the parachute
  - number of paperclips attached to the strings
  - the shape of the parachute
  - the material used to make the parachute
  - whether the parachute canopy contains a single hole, or several holes.

- Each pair of students should select one of these variables to test. Show PPT slide 13 as a reminder.

- The easiest (quickest) variables to test are either: the number of paperclips used (as more can easily be added) or the number of holes cut in the canopy (draw five circles on the original canopy and cut one more out for each test).

- The ideal is that five tests are carried out, each with repeat readings, and an average calculated. This allows students to create a graph and draw conclusions or detect trends from the data.

- An expected results table would look like this:

Variable tested	Time given for parachute to fall 2 metres (s)					Average time (s)

- Show PPT slide 14. The final activity looks at the skill of prediction. Students should select a different variable to investigate and predict what they expect to happen.
  A sentence to scaffold this might be:

  The variable I will test is…….. I expect that ……...

  This is because……

  When students have completed their practical recording, they should display their results in graph form, state their conclusion(s) and discuss how this matches their original predictions.

Resources

- *PowerPoint* Presentation - Episode 1: How Fast? On your mark...Get set...Go!
- *Prezi* Presentation - Episode 1: How Fast? On your mark...Get set...Go!
- Activity Sheet 1.3: Investigating parachute

Tools needed (every pair of students)

- Scissors
- Plastic sheeting
- Card template
- Thread
- Paper clip
- Stopwatch
- measuring tape or metre rules
- sticky tape
- step stool or some other safe place for the students to stand on so that they can reach about 2.6m high, to hold their parachutes with the paperclip at 2m.