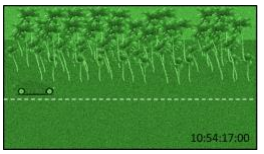
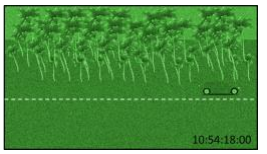
CAR CRASH INVESTIGATION WORKSHEET





Question 1 (2 marks)

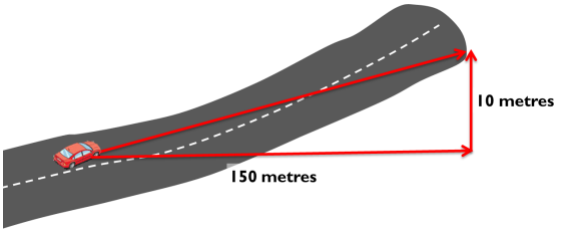
Will, Eliza and Drake are investigating the car crash investigation report filed by the police. At first sight it looks like an accident, but a closer investigation reveals suspicious mistakes in the report calculations.

Calculate the speed of the car just before the crash based on the surveillance camera footage. Assume that the camera frames were taken 1 second apart, and the car travels 25 metres during that time. Convert the speed into units of *km/hr*.

Question 2 (1 mark)

$$v_{end} = \sqrt{v_{initial}^2 - 2 \times g \times d_{braking} \times (f \pm G)}$$

The equation above calculates the final velocity of a car $_{vend}$ based on its initial velocity $v_{initial}$, the value of gravity g, the braking distance $d_{braking}$, the friction co-efficient f and the road gradient G.



Calculate the road gradient using the measurements in the diagram above, showing how much the road rises over a certain distance.

Question 3 (1 mark)

Using a friction co-efficient of 0.7, braking distance of 30 metres and a gravity value of 9.81, and the gradient and car velocities calculated in previous questions, work out the estimated final car velocity at the end of the skid marks.

Question 4 (4 marks)

Speeding downhill is even more dangerous than speeding on the flat ground because it takes longer to stop. Compared to a car travelling at 80 km/hr on a flat road, calculate the car speed which would have the *same stopping distance* on a downhill road with a gradient of -0.1. Use the same friction co-efficient as for the previous questions.