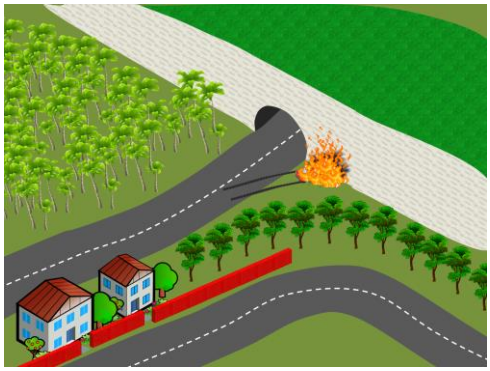
CAR CRASH INVESTIGATION WORKSHEET

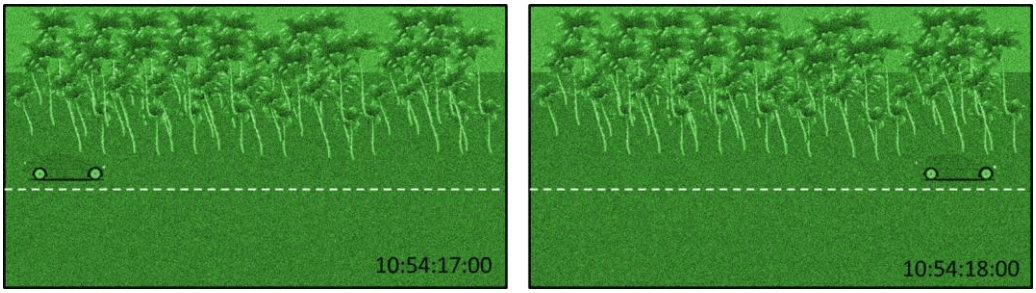


THE SCENARIO

Will, Besra 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.

QUESTION 1 (2 marks)

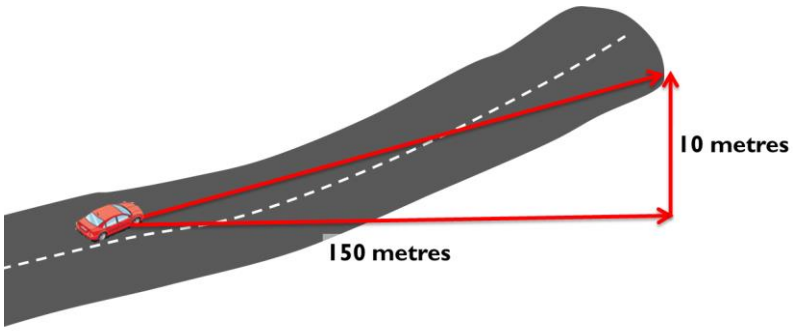
Calculate the speed of the car just before the crash based on the surveillance camera footage. Assume that the camera frames were taken 1 second apart, and the car travels 25 metres during that time. Convert the speed into units of *km/hr*.



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.