6 The path followed by a motorcycle round a circular racetrack is modelled as a horizontal circle of radius 50 m. The track is banked at an angle θ to the horizontal, where $\sin\theta = \frac{3}{5}$. The motorcycle travels round the track at constant speed.

The motorcycle is modelled as a particle and air resistance can be ignored.

In an initial model it is assumed that there is no sideways friction between the motorcycle tyres and the track.

Using this model,

(a) find the speed, in m s^{-1}, of the motorcycle.

(5)

In a refined model it is assumed that there is sideways friction.

The coefficient of friction between the motorcycle tyres and the track is $\frac{1}{4}$

It is still assumed that air resistance can be ignored and that the motorcycle is modelled as a particle.

The motorcycle's path is unchanged.

Using this model,

(b) find the maximum speed, in m s^{-1}, at which the motorcycle can travel without slipping sideways.

(8)

(Total for Question 6 is 13 marks)