Topic 24: Exercises on Motion on a Banked Track
Level 3

1. A car describes a horizontal circle of radius 100 m at a speed of 60 kmh^{-1} on a track which is banked at an angle α. Taking $g = 10\ ms^{-2}$ show that if $\tan\alpha = \frac{5}{18}$, the car has no tendency to slip.

2. A railway line has been constructed around a circular curve of radius 600 m. The distance between the rails is 1.5 m and the outside rail is 0.1 m above the inside rail. Find the speed which eliminates a sideways thrust on the wheels for a train on this curve.

$20ms^{-1}$ if $g = 10\ ms^{-2}$ and $19.8ms^{-1}$ if $g = 9.81\ ms^{-2}$

3. A railway line is taken round a circular bend of radius 1000 m. The distance between the rails is 1.5 m and the line is banked by raising the outer rail a height h above the inner rail. For an engine travelling around the bend, the sideways thrust on the inner rail at $10\ ms^{-1}$ is equal to the sideways thrust on the outer rail at $20\ ms^{-1}$. Find the value of h.

38.3 mm