



Physics 3204

Worksheet #2: UNBANKED AND BANKED TURNS

- Which is the centripetal force for a car in a frictionless banked curve?
 - horizontal component of the normal force
 - horizontal component of the weight
 - vertical component of the normal force
 - vertical component of the weight
- By which factor does the centripetal force change if a car goes around a curve at $1/3$ of its original speed?
 - $1/3$
 - $1/9$
 - 3
 - 9
- A 1.0×10^3 kg car rounds a 50.0 m horizontal curve with a speed of 15 m/s. If it is travelling with a speed such that it just barely avoids slipping on the road, what is the force of static friction between the tires and the road?
 - 1.1×10^2 N
 - 3.0×10^2 N
 - 4.5×10^3 N
 - 9.8×10^3 N
- At what speed can a car safely negotiate a frictionless curve of radius 115 m if the road is banked at an angle of 35.0° ?
 - 8.97 m/s
 - 19.9 m/s
 - 28.1 m/s
 - 40.1 m/s
- What banking angle is required for a car to complete a 110.0 m radius frictionless turn at 24.5 m/s without skidding?
 - 29.1°
 - 33.8°
 - 56.2°
 - 60.9°
- A car travels at 21 m/s around a banked curve. If the radius of the curve is 75 m, what is the banking angle, assuming friction is negligible?
 - 0.54°
 - 1.6°
 - 31°
 - 81°
- A car, travelling at 25.0 m/s, successfully moves around a banked, frictionless turn angled at 7.32° . What is the radius of this banked curve?
 - 19.9 m
 - 37.7 m
 - 63.8 m
 - 496 m

8. A 1500 kg car rounds a curve on a flat road of radius 55 m at a speed of 16 m/s. Determine whether the car will make the turn on an icy road where $\mu_s = 0.20$. Show your calculations. **AUGUST 2009** [3]
9. What is the maximum speed a car can travel around a curve on a flat road if the radius of the curve is 1.20×10^2 m and the coefficient of static friction between the tires and road is 0.25? **AUGUST 2006** [4]
10. A car is rounding a flat, horizontal turn with radius 51 m. The coefficient of friction between the tires and the road is 0.30. **August 2007**
- i) Calculate the maximum speed at which the car can safely round the turn without skidding. [3]
- ii) Calculate the angle at which the road must be banked so that the car can safely round the turn when there is no friction between the tires and the road. [3]
11. A 1500 kg car travels at 25 m/s around a circular curve on a flat road. If the coefficient of static friction is 0.750, calculate the minimum radius of curvature the car can make. **June 2007**
12. What is the maximum speed at which a 1200 kg car can round a curve on a flat road, without slipping, if the radius of the curve is 88.0 m and the coefficient of static friction is 0.50? **JUNE 2005**
13. What is the maximum speed a car can travel around a curve on a flat road if the radius of the curve is 1.40×10^2 m and the tires and road have a coefficient of static friction of 0.35? **AUGUST 2004**
14. A car is moving around a horizontal curve with a radius of 50.0 m. If the coefficient of static friction is 0.75, what is the maximum speed for the car to travel safely around the curve without skidding? **JUNE 2004**