Q1. A 1500kg car is driving around a 400m circular track. It completes one lap in 25 seconds.  
  
  
  
  
  
  
  
  
a) Calculate the velocity, assuming it is constant.

b) On the diagram above, draw vectors to show the car’s velocity and acceleration.

c) Calculate the centripetal force acting on the car as is goes around the track.

d) What is providing this force?

e) Explain why the car will slide off the track if it goes too fast.

Q2. The car can go faster if the track is banked, as shown below.  
  
  
  
  
  
a) Complete the diagram above to show the following forces:  
  
**Gravity Support Force**Ignore friction for now.  
  
b) We want to calculate the **net** force. To do this, we can split up the support force into horizontal and vertical components.

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1. What is the y-component of the support force? (hint: is the car accelerating upwards or downwards?)
2. Use trigonometry to work out the x-component of the support force.
3. Hence state the net force on the car (size and direction).

c) Calculate the velocity of the car,

d) Explain why banked corners are safer than flat ones.

EXTENSION:  
  
1) What would happen if the car sped up? Explain your answer  
2) What would happen if the car slowed down? Explain you answer  
3) What happens if you introduce friction into Q2?