Q1- A car moving at a speed of 35 m/s enters a curve that describes a quarter turn of radius 125 m. The driver gently applies the brakes, giving a constant tangential deceleration of magnitude 1.2 m/s^2.

a) Just before emerging from the turn, what is the magnitude of the car's acceleration?

The tangential velocity of the car is reduced to v when it comes out of the curve due to tangential acceleration and is given by the equation

[$v^2 = u^2 + 2as$]
Or $v^2 = 35^2 - 2*1.2*(3.14*125/2)$
Or $v^2 = 754$
Or $v = 27.46$ m/s

Hence radial acceleration just before it comes out of the curve is given by
$a_r = v^2/r = 754/125 = 6.03$ m/s^2

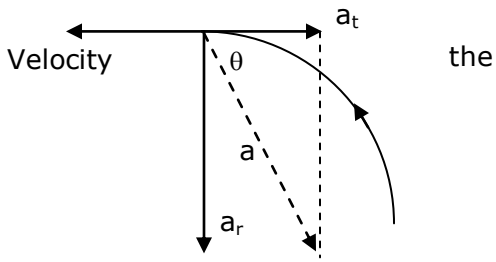
Both accelerations are perpendicular to each other and hence the magnitude of resultant acceleration is given by

$$a = \sqrt{a_t^2 + a_r^2} = \sqrt{1.2^2 + 6.03^2} = 6.15 \text{ m/s/s}$$

b) At that same moment, what is the angle θ between the velocity vector and the acceleration vector? Please enter your answer in degrees.

The angle the resultant makes with the tangent to the path is given by
$\tan\theta = a_r/a_t = 5.03$
and $\theta = 78.76$ deg.

This is the angle acceleration vector a makes with the tangent or a_r and in opposite with the velocity vector because the car is retarding. Hence the angle between the velocity vector and the resultant acceleration vector a will be
$180 - 78.76 = 101.24^0$



θ = 101.24^0

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