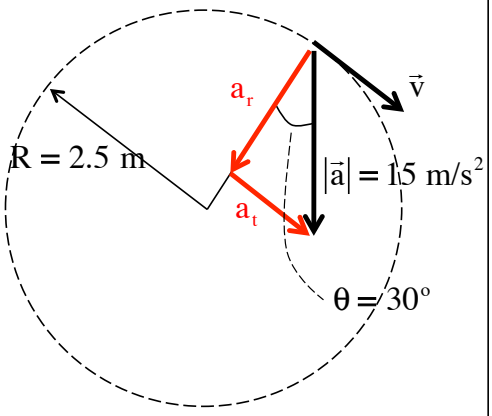
Problem 4.32

This problem is designed to make you look at the various acceleration quantities from a slightly different perspective. The sketch is the same as given, plus a presentation of the acceleration components.



a.) From the sketch, the particle's radial (centripetal) acceleration is:

$$\begin{aligned} a_r &= |a|\cos\theta \\ &= \left(15.0\ \text{m/s}^2\right)\cos 30^o \\ &= 13.0\ \text{m/s}^2 \end{aligned}$$

b.) The speed can be found using the relationship between the centripetal acceleration and the tangential velocity, or: $a_r = \dfrac{v^2}{R}$

$$\Rightarrow \quad \left(13.0\ \text{m/s}^2\right) = \frac{v^2}{(2.50\ \text{m})}$$

$$\Rightarrow \quad v = 5.70\ \text{m/s}$$

c.) The particle's tangential acceleration can be found using the sketch. That is:

$$\begin{aligned} a_t &= |a|\sin\theta \\ &= \left(15.0\ \text{m/s}^2\right)\sin 30^o \\ &= 7.50\ \text{m/s}^2 \end{aligned}$$