Answer on Question #69860-Physics-Classical Mechanics

A particle moves over the sides of an equilateral triangle of side l with constant speed v .The magnitude of average velocity and average acceleration as it moves from a to c.

Solution

The magnitude of average velocity is

$$V = \frac{d}{t} = \frac{l}{t}.$$

$$t = \frac{2l}{v}.$$

$$V = \frac{l}{\frac{2l}{v}} = \frac{v}{2}.$$

The magnitude of average acceleration as it moves from a to c is

$$a = \frac{\left|\overline{v_f} - \overline{v_\iota}\right|}{t}$$

$$\overline{v_f} = (v\cos 60\,, -v\sin 60)$$

$$\overline{v_\iota} = (v\cos 60\,, v\sin 60)$$

$$\overline{v_f} - \overline{v_\iota} = (0, -2v\sin 60)$$

$$\left|\overline{v_f} - \overline{v_\iota}\right| = 2v\sin 60 = \frac{2v\sqrt{3}}{2} = v\sqrt{3}.$$

Thus,

$$a = \frac{v\sqrt{3}}{\frac{2l}{v}} = \frac{\sqrt{3}}{2}\frac{v^2}{l}.$$