

## Answer on Question # 62711 – Physics – Mechanics | Relativity

1. Suppose we are told that the acceleration  $a$  of a particle moving with uniform speed  $v$  in a circle of radius  $r$  is proportional to some power of  $r$ , say  $r^n$ , and some power of  $v$ , say  $v^m$  i.e where  $k$  is a proportionality constant. Determine the values of  $n$  and  $m$  and write the equation for the acceleration. [5].

**Solution:**

Let acceleration be as follows:

$$a = kr^n v^m.$$

Since we know the dimensions of acceleration, radius and velocity, we can write a dimensional equation:

$$L/T^2 = L^n (L/T)^m = L^{n+m} / T^m.$$

The dimensional equation is balanced under conditions:  $n + m = 1$  and  $m = 2$ . Therefore,  $n = -1$ . The equation for acceleration is as follows:

$$a = kr^{-1} v^2 = k \frac{v^2}{r}.$$

**Answer:**  $a^2 = k \frac{v^2}{r}$ ,  $n = -1$ ,  $m = 2$ .

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