**Answer on** Question #64436, Physics / Mechanics | Relativity

1. Show that the basis of dimensional analysis that the following relations are correct.

a). v2-u2 = 2aS, Where (u) is the initial velocity, (v) is final velocity, (a) is acceleration of the body and (S) is the distance moved.

b). p = 3g/4rG, where (p) is the density of earth, (G) is the gravitational constant, (r) is the radius of the earth and (g) is acceleration due to gravity.

**Solution:**

a) $v^2-u^2 = 2aS$

dim $v=L\times T^{-1}$ (1)

Of (1) $\Rightarrow$ dim $v^2=L^2\times T^{-2}$ (2)

dim $u=L\times T^{-1}$ (3)

Of (3) $\Rightarrow$ dim $u^2=L^2\times T^{-2}$ (4)

Of (2) and (4) $\Rightarrow$ dim $v^2-u^2=L^2\times T^{-2}$ (5)

dim $a=L\times T^{-2}$ (6)

dim $S=L$ (7)

Of (6) and (7) $\Rightarrow$ dim $2aS= L\times T^{-2}\times L=L^2\times T^{-2}$ (8)

Of (5) and (8) $\Rightarrow$ dim $v^2-u^2=$dim $2aS$

b) $\rho = 3g/4rG$

dim $\rho=M\times L^{-3}$ (1)

dim $g=L\times T^{-2}$ (2)

dim $r=L$ (3)

dim $G=M\times L\times T^{-2}\times L^2\times M^{-2}= L^3\times T^{-2}\times M^{-1}$ (4)

Of (2), (3), (4) $\Rightarrow$ dim $3g/4rG = L\times T^{-2}/L\times L^3\times T^{-2}\times M^{-1}=M\times L^{-3}$ (5)

Of (1) and (5) $\Rightarrow$ dim $\rho$ =dim $3g/4rG$