Answer on Question # 74787, Physics -Mechanics -Relativity:

Question: A particle of rest mass m_0 has a speed v= 0.8c. Find its relativistic momentum, its kinetic energy and total energy.

Solution: Rest mass of the particle = m_0

Speed of the particle v = 0.8c , where c = speed of light.

Now consider a constant $\beta = \frac{v}{c}$ = 0.8

And $\sqrt{1-\beta^2}$ = 0.6

We know relativistic momentum p = $\frac{m_0 \times v}{\sqrt{1-\beta^2}} = \frac{m_0 \times 0.8c}{0.6}$ = 1.33 $m_0 c$

Again relativistic kinetic energy T = $\frac{m_0 \times c^2}{\sqrt{1-\beta^2}} - m_0 c^2 = m_0 c^2 \left(\frac{1}{\sqrt{1-\beta^2}} - 1\right)$

$= m_0 c^2 \left(\frac{1}{0.6} - 1\right) = 0.67\ m_0 c^2$

Now, total relativistic energy E = $\sqrt{(p^2 c^2 + {m_0}^2 c^4)} = \sqrt{(1.7689\ {m_0}^2 c^4 + {m_0}^2 c^4)}$

$= 1.664\ m_0 c^2$.

Answer: So, relativistic momentum is 1.33 $m_0 c$, kinetic energy 0.67 $m_0 c^2$ and total energy 1.664 $m_0 c^2$.