Answer on Question #65608, Physics / Mechanics | Relativity

A bowling ball weighs 12.0 pounds and the length of a bowling lane is 60 feet, assume that you can treat the ball in the lane as a particle on a line. What is the quantum number that corresponds to the balls velocity of 7.55 miles per hour?

Solution:

$E = 1/2\ mv^2$

m = 12.0 pounds = 5.4 kg

v = 7.55 miles / hour = 3.38 ms^{-1}

a = 60 feet = 18.3 m

$E = ½ \times 5.4\ kg \times (3.38\ ms^{-1})^2 = 30.8\ J$

$E = n^2 h^2 / 8ma^2$

$n^2 = 8Ema^2 / h^2$

$n^2 = 8 \times 30.8\ J \times 5.4\ kg \times (18.3\ m)^2 / (6.62 \times 10^{-34})^2 = 1.02 \times 10^{72}$

$n = 10^{36}$

Answer: 10^{36}