The stopping distance d of an automobile is directly proportional to the square of its speed v. A car required 45 feet to stop when its speed was 50 miles per hour. Find a mathematical model that gives the stopping distance d in terms of its speed v.

Your answer is d=

Given:

$$d = 45\,ft = 13.72\,m$$

$$v = 50\,\frac{miles}{hrs} = 22.35\,\frac{m}{s}$$

$$d(v) - ?$$

Solution.

According to the condition of the problem, $d = k \cdot v^2$. The constant value of k is $k = \dfrac{d}{v^2}$.

$$k = \frac{13.72\,m}{\left(22.35\,\dfrac{m}{s}\right)^2} = 0.0275\,\frac{s^2}{m}.$$

So, the stopping distance in terms of its speed is $d = 0.0275v^2$,

where v and d are measured in SI unites (m/s and m, respectively).

Answer: $d = 0.0275v^2$ (m), where $[v] = \dfrac{m}{s}$.