

Assumptions: Fuel tank weight is negligible

Rate of water leakage is constant

Fuel consumption is directly proportional to the weight it carries

Truck travels the same distance under the same conditions

Model: Let T = the amount of fuel required to carry the weight of the truck

Let W = the amount of fuel required to carry the weight of a full water tank

Let F = the total amount of fuel in the fuel tank

Let x = the fraction of fuel spent to carry the weight of the truck and full water tank

$$\text{Equation 1: } \frac{1}{2} F = T + \frac{3}{4} W$$

$$\text{Equation 2: } \frac{1}{6} F = T$$

$$\text{Equation 3: } xF = T + W$$

Solution: From equation 2, $\frac{1}{6} F = T$

$$F = 6 T \text{ (Equation 4)}$$

$$\text{Substitute into equation 1, } \frac{1}{2} (6T) = T + \frac{3}{4} W$$

$$2 T = \frac{3}{4} W$$

$$W = \frac{8}{3} T \text{ (Equation 5)}$$

$$\text{Substitute equations 4 and 5 into equation 3, } x (6T) = T + \frac{8}{3} T$$

$$x = \frac{\frac{11}{3} T}{6 T} = \frac{11}{18}$$

The fraction of the fuel tank that would have been spent by the truck if there was no leak is $\frac{11}{18}$.