Answer on Question#37445 – Physics – Mechanics

We will use kinematic equation

$$v_f^2 = v_0^2 + 2ad,$$

where $v_f = 0$ - final velocity, $v_0 = 14.6 \frac{\text{m}}{\text{s}}$ - initial velocity, a – acceleration, d – distance.

The forces acting on the truck once the brakes are applied are the component of gravity down the hill, $mg \sin\theta$, and the friction acting up the hill, $\mu mg \cos\theta$ where μ is the coefficient of kinetic friction. Therefore, choosing down the hill as the positive direction, we have

$$ma = mg \sin\theta - \mu mg \cos\theta,$$

or

$$a = g \sin\theta - \mu g \cos\theta.$$

So

$$d = -\frac{v_0^2}{2a} = \frac{v_0^2}{\mu g \cos\theta - g \sin\theta}.$$

$$d = \frac{14.6^2}{9.81 * (0.915 * \cos 18\,° - \sin 18\,°)} = 38.7\ m.$$

Answer: $38.7\ m$.