Skid Mark Equation

$$V_i = \sqrt{2g\mu d}$$

$V_i = initial\ velocity$

$g = 9.8 m/s^2$

$\mu = coefficient\ of\ friction$

$d = length\ of\ the\ skid\ marks$

The equation is used to find the speed a car or other object was going when it tries to stop using friction. When a car slams its brakes to stop, the only force acting on the car is friction. Below is an example:

Example 1: *A police officer at a vehicle accident scene measures the skid marks that a car made to determine the speed of the car before they began hitting their brakes. The length of the skid marks were 45meters long. The coefficient of friction between the tires and the road was found to be 0.71. What was the initial velocity of the car before it starting making the skid marks*?

$$V_i = \sqrt{2g\mu d} = \sqrt{2(9.8)(0.71)(45)} = \boxed{25\ m/s}$$

It's also possible to find the distance it will take you to stop. To do this you would have to know all other variables such as how fast were you going, and the coefficient of friction between the road and your tires.

Example 2: *A car is traveling at 30 m/s (which is about 67mph). The person driving sees a small dog crossing the street 80m in front of them. They slam their brake and with a coefficient of friction of 0.60 will the person hit the dog, or will they stop in time? To solve this, we need to figure out how many meters it takes the car to stop and compare that to the 80m the dog is from the car.*

$V_i = \sqrt{2g\mu d}$, *but we need to use algebra to solve for* "d" and we get

$$d = \frac{V_i^2}{2g\mu}$$

$$so, d = \frac{30^2}{2(9.8)(.60)} = \mathbf{76.53m\ or\ 77m}\ in\ proper\ sig\ figs$$

So it looks like the dog is safe but only by about 3 meters!!!

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Also, you can use the equation to find the coefficient of friction. We did this together outside. We dragged a table at constant velocity then let it go. We measured the original velocity using the high speed camera and measured the distance it took to stop using tape on the ground (one tape per meter). The only difference is there was no skid marks, but friction still was responsible for stopping the table and nothing else, so this equation still applies.

Example 3:

The teacher dragged a table on the floor at 12m/s. When let go, the table slowed to a stop 19.8m later. What is the coefficient of friction between the floor and the table top?

$$v_i = \sqrt{2g\mu d} \; solved \; for \; \mu \; is:$$

$$\mu = \frac{v_i^2}{2gd}$$

$$\mu = \frac{12^2}{2(9.8)(19.8)} = \mathbf{0.37}$$