

BASIC SPEED CALCULATIONS

HOW TO...

determine the speed of a vehicle that skidded 93 feet over asphalt?

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www.atlantaeng.com

Jared McKinnon

jmckinnon@atlantaeng.com

Elvin Aycock, PE

ela@atlantaeng.com

Ms. Jones was driving through her neighborhood when suddenly a basketball rolled into her path. She immediately applied her brakes and skidded to a stop. She skidded 93 feet. The pavement surface was asphalt, dry and flat. It had a coefficient of friction of 0.7. The posted speed limit was 35 mph.

How fast was Ms. Jones traveling when she applied her brakes?

The formula for calculating the initial velocity of a vehicle sliding to rest is:

$$v_i = \sqrt{2gfd}$$

Where:

v_i - Velocity at the start of the skid, feet per second (fps)

g - Acceleration due to gravity, 32.2 feet per second squared ($\frac{ft}{sec^2}$)

f - Friction of roadway surface

d - Distance of the skid, feet (ft)

A vehicle skidding on a roadway is exerting a force on the roadway surface through the tires. The friction force between the roadway surface and tires plays a key role in allowing vehicles to stop in either a short or long distance for a given speed. Likewise, a long skid mark distance translates to a higher speed than a short skid mark distance for a given roadway surface.

When the drag factor must be determined in a real world situation, an engineer will conduct field tests to measure the friction or use friction tables derived from empirical data.



The information provided to us in this example is:

$$g = 32.2 \frac{ft}{sec^2}$$

$$f = 0.7$$

$$d = 93 \text{ ft}$$

Solving for the initial velocity:

$$v_i = \sqrt{2 \cdot (32.2 \frac{ft}{sec^2}) \cdot (0.7) \cdot (93 \text{ ft})}$$

$$v_i = 64.7 \frac{ft}{sec}$$

Converting the units from feet per second to miles per hour, the velocity is multiplied by a conversion factor of 0.68.

$$v_i = (64.7 \frac{ft}{sec}) \cdot (0.68 \frac{sec \cdot mile}{ft \cdot hr})$$

$$v_i = 44.0 \text{ mph}$$

Ms. Jones was traveling 44.0 miles per hour at the time she hit her brakes and began to skid.