Question #27844

An airplane lands on a runway with a velocity of 150 m/s how far will it travel until it stops if its rate of deceleration is constant at -3 m/s^2?
what is the answer to this question? please answer it simply so i can understand
what is deceleration
how can i pass my AP physics B exam?
Final question is a rocket is propelled upward with an acceleration of 25m/s^2 for 5s after that time the engine is shut off, the rocket continues to move upward. the maximum height in meters that the rocket will reach is what?

Solution:

An equation of equally decelerated motion is:

$S = v_0 t - \frac{1}{2} a t^2$ were v_0 is the initial velocity

The deceleration is the negative acceleration, the vector of deceleration have direction opposite to motion.

Such as

$v = v_0 - at$ the final velocity is equal to zero

$v_0 = at,\ t = \frac{v_0}{a}$

$$S = v_0 \frac{v_0}{a} - \frac{1}{2} a (\frac{v_0}{a})^2 = \frac{{v_0}^2}{a} - \frac{1}{2} \frac{{v_0}^2}{a}$$

$$S = \frac{{v_0}^2}{a}$$

$$S = \frac{150^2}{3} = 7500\ m$$

Answer 7500 m

As for question with rocket:

The maximum height is:

$H = H_1 + H_2$

where: H_1 is the height on the first stage of motion (equally accelerated motion)

H_2 is the distance on the next stage of motion – equally decelerated motion

$H_1 = \frac{1}{2} a t^2$

$H_2 = \frac{{v_1}^2}{g}$ were g is the acceleration due the gravity v_1 is the velocity after first stage of motion.

$$v_1 = at$$

$$H_2 = \frac{(at)^2}{g}$$

$$H = \frac{1}{2}at^2 + \frac{a^2t^2}{g}$$

$$H = \frac{1}{2}25 * 5^2 + \frac{25^2 * 5^2}{9.8} = 1906.89\ m$$

Answer: 1906.89 m