

© Franco Normani  
real-world-physics-problems.com  
Jan. 6, 2020

This is a 1-D problem involving constant acceleration.

The takeoff speed of a commercial jet is  $260 \text{ km/h}$ . If the runway is  $2.1 \text{ km}$  long, what is the minimum constant acceleration of the jet?

Solution:

Use the kinematic equation:  $v_2^2 = v_1^2 + 2ad$

$v_1 = 0$  (starts from rest)

$v_2 = 260 \text{ km/h}$  (takeoff speed)

$d = 2.1 \text{ km}$  (runway distance)

$a = ?$  (acceleration of jet)

Substitute:

$$(260)^2 = (0)^2 + 2a(2.1)$$

$$a = 16095 \text{ km/h}^2 = 1.24 \text{ m/s}^2$$

The minimum constant acceleration of the jet is  $1.24 \text{ m/s}^2$  (answer).