UNITED NATIONS SCHOOL
PHYSICS WORKSHOP
FIRST PERIOD
NINTH GRADE
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The workshop must be solved in the notebook and delivered in the first physics class in April.

KINEMATICS: Motion Along A Straight Line.

LEARNING GOAL: The students should be able to:

a. use average acceleration and instantaneous acceleration to describe changes in velocity;

b. solve for unknown quantities in equations involving one-dimensional uniformly accelerated motion;

c. apply equations and graphs to solve problems that involve straight-line motion with constant acceleration.

CONCEPTS:

Average Acceleration: is the rate at which velocity changes. Acceleration is a vector in the same direction as the change in velocity. Since velocity is a vector, it can change in magnitude or direction or both. Acceleration is, therefore, a change in speed or direction, or both.

$$a = \frac{v - v_0}{t} = \frac{\Delta v}{\Delta t}$$

a is average acceleration, Δv is change in velocity, and Δt is change in time

1. A roller coaster rapidly picks up speed a sit rolls down slope. As it starts down the slope, its speed is 4 m/s. but 3 seconds later, at the bottom of the slope, its speed is 22 m/s. What is its average acceleration?

Equation
$v = v_0 + at$
$x - x_0 = v_0 t + \frac{1}{2}at^2$
$v^2 = v_0^2 + 2a(x - x_0)$
$x - x_0 = \frac{1}{2}(v_0 + v)t$
$x - x_0 = vt - \frac{1}{2}at^2$

Uniformly Accelerated Motion: is motion of an object where acceleration is constant. In other words, the acceleration remains uniform.

2. A train accelerates uniformly from rest at a rate of 2.3 m/s² for 5.5 seconds. How far does the train travel during this acceleration phase?
3. A car decelerates uniformly from 55.2 km/h to 25.9 km/h in a distance of 82.4 meters. What is the car's deceleration rate?
4. An airplane accelerates uniformly from rest at a rate of 6.7 m/s² for 15 seconds before taking off. Calculate the takeoff velocity of the airplane.
5. A skateboarder accelerates uniformly from 3.5 m/s to 14.2 m/s in 8.1 seconds. Determine the skateboarder's acceleration during this time.
6. A rocket accelerates uniformly at a rate of 25.8 m/s² for 3.2 seconds before separating its boosters. Calculate the final velocity of the rocket after this acceleration phase.
7. A car decelerates uniformly from 25 m/s to 10 m/s in 5 seconds. Determine the deceleration rate of the car during this time interval.
8. A ball is kicked horizontally from a height of 2 meters above the ground with an initial velocity of 12.5 m/s. Assuming it experiences uniform horizontal acceleration due to air resistance, calculate the time it takes for the ball to hit the ground.
9. A car accelerates uniformly from 0 to 30 m/s in 6 seconds. If the car continues to accelerate at the same rate, determine how long it will take for the car to reach a speed of 60 m/s.
10. A train decelerates uniformly from 60 km/h to 40 km/h in 5 seconds. Determine the deceleration rate of the train during this time interval.