

Verification of Newton's Second Law, $F = ma$ Using Dynamics

Tolentino, Angela Rhoe G.

Studying BS Physics Minor Economics in De La Salle University

Maryville Dormitory 2456 Taft Avenue, Malate, Manila

angela_tolentino@dlsu.ph

Abstract

To verify Newton's Second Law, $F = ma$, this experiment was done to check if m_1g is equal to $(m_1 + m_2)a$ when friction is ignored. [5] To obtain the acceleration, the cart was started from rest and the time (t) it takes for it to travel certain distance (d) was measured. [2] $(m_1 + m_2)a$ Was replaced with specific values gathered through the experiment but according to the results we have obtained $(m_1 + m_2)a$ is not equal to m_1g and it showed a large percent difference in table 1.2. The verification of Newton's Second Law failed that $(m_1 + m_2)a$ is equal to m_1g , based on the experiment it shows that $(m_1 + m_2)a$ is not equal to m_1g because from the results $17712.78 \neq 514500$ and had a percent difference of 67.03%. The verification is proven failed because it is not also equal in set two and three shown in table 1.2.

1. Introduction

Based on ordinary experience you can tell how a force exerted on a body affects its motion. A force may speed up the motion or slow it down depending on the direction of the body. The force produces a change in the velocity. Therefore force causes a body to accelerate.

Newton perceived this effect of the motion of an object. The quantitative relationship between force and acceleration is precisely given in his second law of motion. This law states that the acceleration of a body is directly proportional and is in the same direction as the net force applied to it and is inversely proportional to the mass of the body. It can be written mathematically as

$$a = k \frac{F}{m}$$

If $k = 1$, then $F = ma$

Where F = net force

a = acceleration

m = mass of the body

To say that one quantity is proportional to another is to make a precise mathematical statement. Acceleration is directly proportional to the net force. This part of the law says that if the force is doubled, then the acceleration is also doubled; if it is tripled then, then acceleration is also tripled, and so on. In symbolic: If F causes a , then $2F$ will cause $2a$; $3F$ will cause $3a$; and $1/2F$ will cause $1/2 a$. [1]

Force and acceleration are vector quantities. They always have the same direction.

From experience and observation, you know that if you have several objects and you apply the same force to each, the objects will not move at the same rate. Why? The answer to this question can be found in the second part of Newton's second law. It states the quantitative relation between mass and acceleration, that is, inversely proportional to the mass. This means that if the force is constant, an

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