Mass of a Car

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In Class (Instructor)

In Class (Students)

Begin Here.

Students are assigned to groups of 3-4.

The instructor begins with a demonstration with a wheeled chair. The instructor pushes the chair (accelerating it) then lets go (allowing it to deccelerate).

As groups, students create free body diagrams and equations of motion describing the two stages (acceleration and deccelleration). The instructor should ensure the students don't forget friction during the acceleration phase.

01

The instructor introduces a problem: students are to measure the mass of a car. They will have access to several bathroom scales, a stopwatch, and a measuring device. Students discuss how this can be done using their equations of motion.

Groups plan out how they will take their measurements and what parameters they will need. They should find that they can get two equations with two unknowns (mass and μ_k) after taking measurements.

02

The plans are executed using several trial runs. Students can organize into groups to take on different roles in the experiment, which should be done as a class. Several methods should be attempted, but the best way is to find the acceleration while students push the car (with constant force measured on the scales) and again after the car is released. The acceleration can be found using kinematics (d, t, and v_0) or you can use objects such as sandbags dropped out of the window of the car at regular intervals as a sort of ticker tape.

03

Students use the data they have collected to calculate the mass of the car. If the ticker tape method was used, they should create a graph of velocity $vs.$ time, using the slope to determine the acceleration.

04

Students write up a lab report describing their experiment and result.

05

Work in Groups

Whole Class

Research

Writing

Problem Solving

Discussion

Instruction

Bloom's Taxonomy

Remember

Understand

Apply

Analyze

Evaluate

Create