

Work Sheet 4a - Newton's laws: $F = ma$

Introduction

In this Investigation you are presented with two different masses. One mass is acted on by a force, which is given. Your task is to first calculate the acceleration produced by this force, and then to apply a force to the second mass which will make it accelerate at the same rate. Working on the investigation should reinforce your understanding of the important equation

$$F = ma.$$

Preparation

Before you start, review the Introduction, Study Points and Examples sections of the topic. In particular make sure you are familiar with Newton's second law of motion and the equation $F = ma$. You will also find it useful to review Examples 1 and 2.

Getting started

The details of the masses, the forces on them and their accelerations appear in the table at the top of the screen. Initially, the mass of and force on Mass 1, together with either the mass of or the force on Mass 2 are displayed.

Given the force on Mass 1 use the equation $F = ma$ to calculate its acceleration. Enter your result in the appropriate box.

Now, given either the mass of or force on Mass 2, calculate the value of the other quantity required to make it accelerate at the same rate as Mass 1. Enter this value in the box.

Checking your results

Click Go to see how the forces actually affect the masses. The two masses will accelerate from left to right across the screen. If your calculations were correct then both masses will accelerate at the same rate.

Click New Problem for another example. As well as trying to make the masses accelerate at the same rate you could try making one accelerate at twice or three times the rate of the other.

What ratio of accelerations is required to make one mass cross the full width of the screen in the same time as the second mass travels half the screen width?