

Kinetic Energy

Purpose: To discover the mathematical equation relating kinetic energy to mass and speed.

Getting Ready: Navigate to the **Kinetic Energy Simulation** found in the **Physics Interactives** section at **The Physics Classroom**.

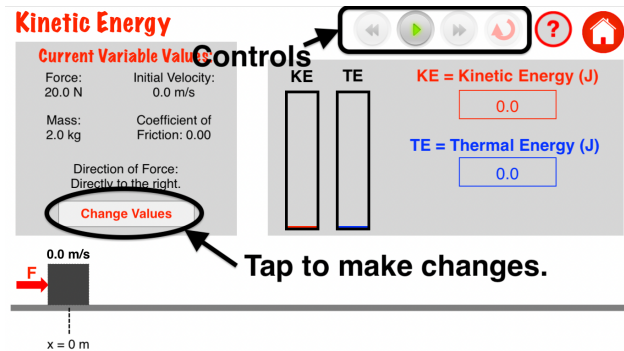
<https://www.physicsclassroom.com/Physics-Interactives/Work-and-Energy/Work-and-Kinetic-Energy>

Navigation:

www.physicsclassroom.com => Physics Interactives => Work and Energy => Work and Kinetic Energy

Getting Acquainted/Play:

This interactive consists of multiple parts. You will only use one of the parts. From the Main Menu, tap on the first option – **Put On The Force**. In the simulation window, observe the **control panel** in the top right for controlling the simulation (Play | Pause | Forward | Back | Reset). Also observe the grey box on the left that lists current values of the five variables that can be changed. Finally, observe the **Change Values** button; it can be used to change the values of the variables. Spend some time familiarizing yourself with the interface. Change some input parameters, play the animation, and observe the output displays. Once you're acquainted with *finding your way around*, continue with the directions.



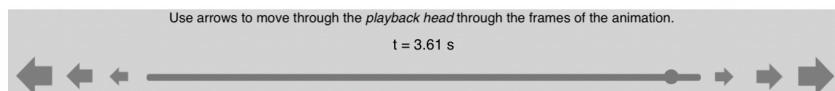
Part 1: Investigating Relationships

1. Tap on the **Change Values** button and set the values of the variables to those shown at the right.
2. Press the **Play** button in the control panel to run the simulation. Once the simulation ends, a *scrubber* appears below the simulation. You will use the scrubber to acquire values of kinetic energy and speed at various points.

Current Variable Values:

Force: 20.0 N	Initial Velocity: 0.0 m/s
Mass: 1.0 kg	Coefficient of Friction: 0.00

Tapping on the three arrows on the left and on the right



side of the scrubber allows you to review values from the simulation. The speed is displayed above the moving object. And the kinetic energy is displayed in the grey box in the top right of the simulation window. Acquire a variety of values and record in **Table 1**. The best values to record are those whose speed values are *nice values* like 1.0 m/s, 2.0 m/s, 3.0 m/s, etc.

3. Tap on the **Change Values** button again and change the Mass to 4.0 kg. Repeat Step 2 to acquire values of speed and kinetic energy for this new mass value. Record your Data in **Table 2**. Once more, the best values to record are *nice values*.
4. Once you have recorded a sufficient amount of data, proceed to Part 2.

Current Variable Values:

Force: 20.0 N	Initial Velocity: 0.0 m/s
Mass: 4.0 kg	Coefficient of Friction: 0.00

Table 1: Mass = 1.0 kg	
Speed (m/s)	KE (J)

Table 2: Mass = 4.0 kg	
Speed (m/s)	KE (J)

Part 2: Identifying the Equation

- Analyze your values of mass (**m**), speed (**v**), and kinetic energy (**KE**). Play with the numbers to see if you can determine an equation relating the **KE** to the **m** and the **v**. Once found, (... shout "Eureka" and ...) write the equation below in symbol form. We will call this equation your **Claim**.

Claim (equation): _____

- Discuss the **evidence** and the **reasoning** that supports your claim. That is, for what reasons (**reasoning**) should anyone should believe it's true? What data (**evidence**) have you collected that provided support for your claim? Use specific data in your discussion and use awesome logic to explain how your data have lead you to the **Claim** you are making. Write well!