

## Back In Time?

ID: 11573

Time Required  
15 minutes

## Activity Overview

In this activity, students will explore the definition of a function graphically, with a set of ordered pairs, and by using an input-output diagram. Students experiment with input values that produce the desired output. Function notation is reinforced. Students can practice what they have learned and get immediate feedback with the extension/homework questions.

## Topic: Functions &amp; Relations

- *Function definition & notation*
- *Using ordered pairs, function machines and graphs.*

## Teacher Preparation and Notes

- *It would be beneficial for students to be familiar with navigating between pages (⌘ + ◀ or ⌘ + ▶), toggling (⌘ + ⌘) between applications on the same page, and using ⌘ + ⌫ or ⌘ + ⌘ to undo. On the function machine pages, if the input value (or function) entirely disappears, use the undo feature to bring it back. This can easily happen if the student only clicks once instead of double-clicks to change the text.*
- *This activity can serve as a good introductory exploration to functions.*
- *The student worksheet provides similar questions to those on the tns file. This can be a paperless activity.*
- ***To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter “11573” in the quick search box.***

## Associated Materials

- *BackInTime\_Student.doc*
- *BackInTime.tns*
- *BackInTime\_Soln.tns*

## Suggested Related Activities

To download any activity listed, go to [education.ti.com/exchange](http://education.ti.com/exchange) and enter the number in the quick search box.

- *Introduction to Functions (TI-Nspire technology) — 9419*
- *Evaluating Functions (TI-Nspire technology) — 9476*
- *Evaluating a Function Rule (TI-84 Plus and TI-Navigator) — 9568*
- *Find the Rule! (TI-Nspire technology) — 9189*

**Problem 1 – Graphical**

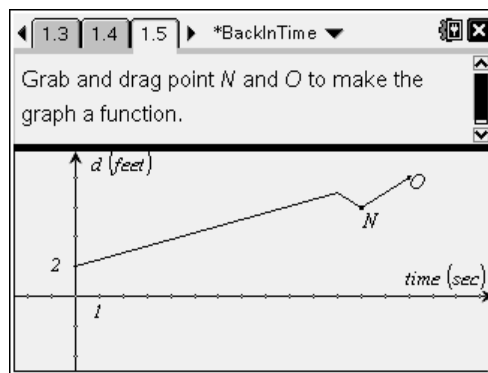
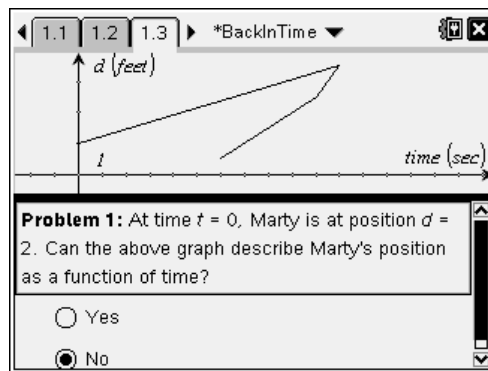
The definition for function is provided on page 1.2.

Page 1.3 has the student consider a graph of position vs. time. They are asked if this is a function. Since there is not one unique output of  $d$  for each value of  $t$  it is not a function. Students are instructed to check their answer using the self-check feature of the question. (Press **MENU > Check Answer** or **(ctrl) ▲**.)

Students then discuss with their neighbor why the answer is 'No' based on the definition, and under what circumstance could the graph occur. It could only occur if Marty went back in time.

Students then advance to page 2.2 to change the graph so that it is a function. An example of a solution is to the right.

Teachers can use this opportunity to discuss the concept of the vertical line test.

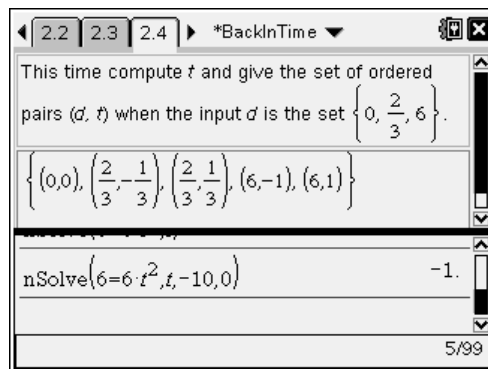
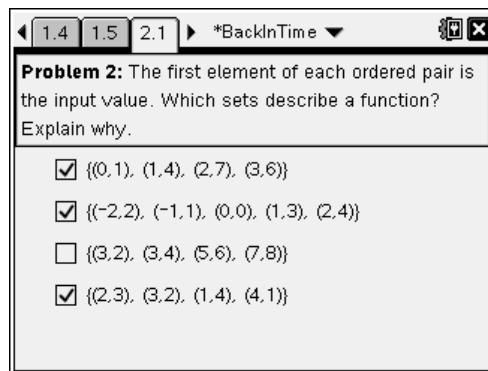


**Problem 2 – Set of ordered pairs**

To review the notation of a set of ordered pairs this section begins with a multiple choice question with multiple solutions. Students should realize that as long as there is only one unique output for each input then it describes a function, otherwise it can only be referred to as a relation. They will need to add a *Notes* page to explain page 2.1.

Another question that can be asked is "What are some examples of relations that are not functions?" Answers include inequalities, like  $y > 3x$ ,  $x$  as a function of  $y$  when  $y = x^2$ , and  $x$  as a function of  $y$  when  $y = |x + 2|$ .

On pages 2.3 and 2.4, students will calculate the output values for given input values using the formula  $d = \frac{1}{2} \cdot a \cdot t^2$  for when  $a = 12 \text{ ft/s}^2$ . The bottom portion of these pages has a *Calculator* application for students to use. For page 2.4, students can use the **nSolve** command or determine the outputs by hand.



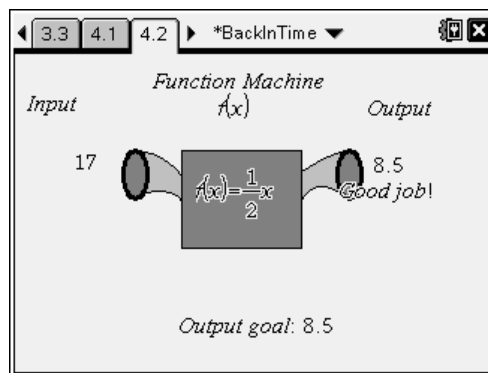
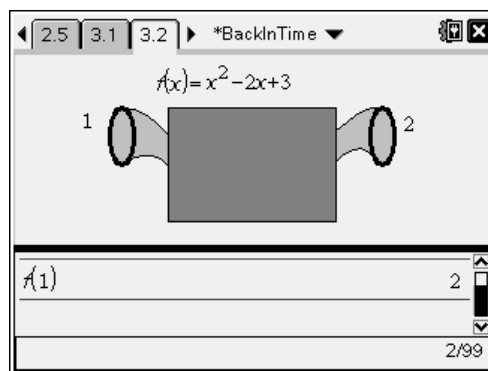
**Problems 3 and 4 – Function Machine**

The input and output can be explored using the function machine.

An interesting historical note is the same mathematician who popularized the use of the Greek letter pi ( $\pi$ ) for the ratio of the circumference to the diameter, was also the originator of the function notation.

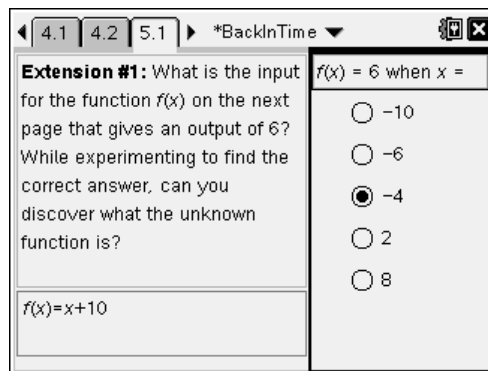
Students should become more familiar with this form of the equation using the *Calculator* application on the bottom of the split screen or Scratchpad.

For Problem 4, students will change the input by double clicking on the number underneath 'Input' on the left side of the machine and modifying the text. Their goal output is stated on the screen. Encourage students to determine what the function is.



**Extension/Homework – More Function Machine exploration**

The extension or homework problems follow the setup of Problem 4. For these functions, when the correct answer for the input is entered on pages 5.2 and 6.2, then the function amazingly appears. This instant feedback encourages the students.



For an additional extension, the function on page 3.2 can be modified by double-clicking and modifying the text. The teacher could have the students change the function to a linear function and ask the students to observe the relationship between the input and output.

