Back In Time?

ID: 11572

Time Required
15 minutes

Activity Overview

Students will explore the definition of a function graphically, with a set of ordered pairs, and by using an input-output model with the graphing calculator. This model dynamically allows students to discover the function by experimenting with input values that produce the desired output. Function notation is also reinforced.

Topic: Functions & Relations

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

Teacher Preparation and Notes

- *This activity can serve as a good introductory exploration to functions.*
- *If time is limited, Problem 4 can be used as an extension or homework problems.*
- ***To download the student worksheet and calculator file, go to education.ti.com/exchange and enter "11572" in the quick search box.***

Associated Materials

- *Alg1Week09_BackInTime_worksheet_TI84.doc*
- *MACHINE.8xp (program)*

Suggested Related Activities

To download any activity listed, go to 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-Navigator) — 9568*
- *Find the Rule! (TI-Nspire technology) — 9189*
- *Function Notation (TI-84 Plus family) — 1566*
- *Advanced Algebra Nomograph (TI-84 Plus family) — 8720*

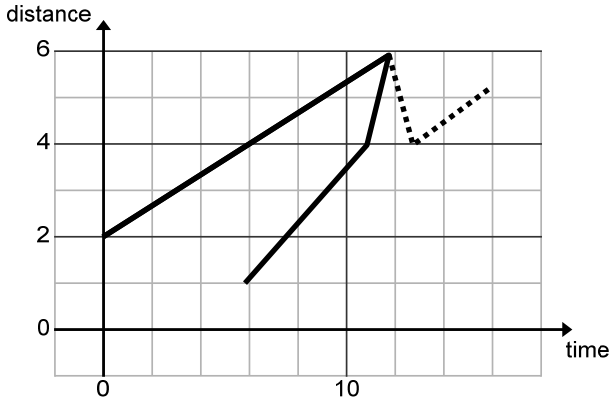
Problem 1 – Graphical

The students are asked to 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 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 redraw the graph so that it is a function. An example of a solution is to the right.

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.

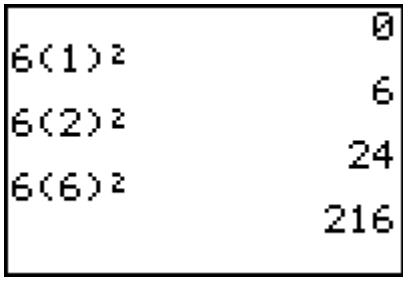
Another question that can be asked is "What are some examples of relations that are not functions?" Answers include inequalities, like $y > 3x$, x as a function of y when $y = x^2$, and x as a function of y when $y = |x + 2|$.

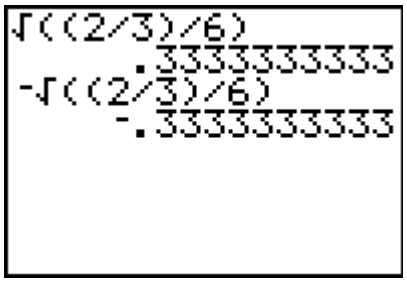
Students will calculate the output values for given input values using the formula $d = \frac{1}{2} \cdot a \cdot t^2$ for when a = 12 ft/s^2. The formula can be simplified to $d = 6 \cdot t^2$.

To compute *d*, students can substitute the *t*-values directly into the formula as shown in the first screenshot.

To compute *t*, students need to either solve for *t* $\left(t = \pm\sqrt{\frac{d}{6}} \right)$ and then substitute the *d*-values into the formula as shown in the second screenshot.

Or they can use the **solve** command.

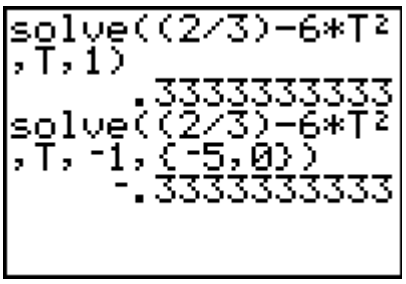




The solve command has parameters **solve(expression, variable, guess, {low bound, high bound})**.

Note that the low bound and high bound are option, but if used must be placed in braces.

The expression needs to be equal to zero, but low and high bounds do not have to entered.



Press 2nd [CATALOG] LN and scroll down to select **solve(**.

Student Answers

4. Functions are A, B and D because for every input value there is only one output value.

5. (0, 0), (1, 6), (2, 24), (6, 216)

6. (0, 0), $\left(\frac{2}{3}, \frac{1}{3}\right)$, $\left(\frac{2}{3}, -\frac{1}{3}\right)$, (6, 1), (6, –1)

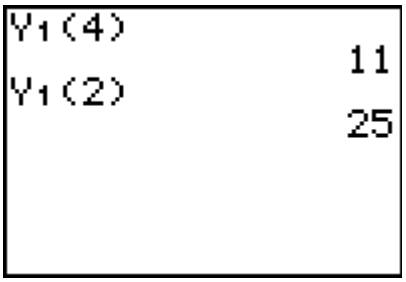
7. The first set is a function because it has only one output for every input.

8. A. *d* is a function of *t*

Problems 3 – Function notation

In this problem, students will explore using function notation on the calculator entering input values to find the output value.

Students will enter the function next to **Y1** on the Y= screen. Then to find f(4), they will enter **Y1(4)** on the Home screen. For Question 10, students will need to update the function next to Y1.



Student Answers

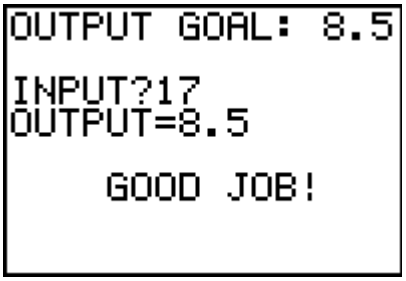
9. $f(4) = 4^2 – 2(4) + 3 = 11$

10. $f(2) = 3(2)^2 + 5(2) + 3 = 25$

Problem 4 – Function Machine

For this problem, students will need the program **MACHINE**. This program has 3 options, each option is a different function. When students enter an input value, it will return the output value.

Students need to determine which input will give the goal output and then determine the correct function that determines the given output.



Student Answers

11. 17 **12.** f(*x*) = 0.5*x* **13.** –4 **14.** f(*x*) = *x* + 10

15. 20 **16.** f(*x*) = 4*x* + 3