

Dog days or Dog years?

ID: 11681

Time required

15 minutes

Activity Overview

In this activity, students will use ordered pairs, table of values, and a scatter plot to determine a function that represents real world data. Students will respond to questions about dog ages in human years, domain, range, and how the slope appears to be changing in the data/graph. In the extension students will use what they have learned in the activity to analyze cat's ages.

Topic: Linear Functions

- Representing input/output values as ordered pairs
- Analyzing data from table of value and scatter plot
- Determining functions to represent linear data

Teacher Preparation and Notes

- Teacher preparation includes instruction with vocabulary such as domain and range, and how to plot data values on the coordinate plane.
- Much student learning can take place in a discussion of such “common knowledge” as a dog’s age is equal to 7 human years. The website mentioned in the file (onlineconversion.com) states that this is a common misconception, and that dog experts have provided the information used to program the online conversion calculator. The extension involves students finding an online conversion for a cat’s age. This can lead to excellent comparisons and higher order thinking by the student.
- Notes for using the TI-Nspire™ Navigator™ System are included throughout the activity. The use of the Navigator System is not necessary for completion of this activity.
- **To download the student and solution TI-Nspire documents (.tns files) and student worksheet, go to education.ti.com/exchange and enter “11681” in the quick search box.**

Associated Materials

- *DogDaysorDogYears.tns*
- *DogDaysorDogYears_Soln.tns*
- *DogDaysorDogYears_Student.doc*

Suggested Related Activities

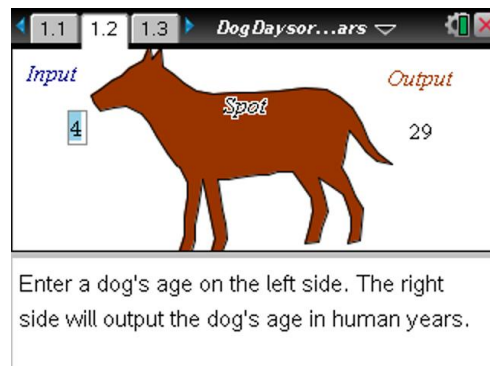
To download any activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

- *Body Relationships (TI-84 Plus with TI-Navigator)* — 8538
- *Balloons (TI-84 Plus family with TI-Navigator)* — 8535
- *Chirp, Jump, Scatter (TI-Nspire technology)* — 11515

Problem 1 – Ordered Pairs

The website www.onlineconversion.com was used to obtain the data used in this activity.

On page 1.2 is a dynamic function machine, where students are to change the number on the left side of the dog. The number on the right side is updated with each change. The dog is referred to as Spot on the worksheet and on the TI-Nspire document.



Using this model, students are to develop ordered pairs that follow the format **(dog's age, equivalent human age)**.

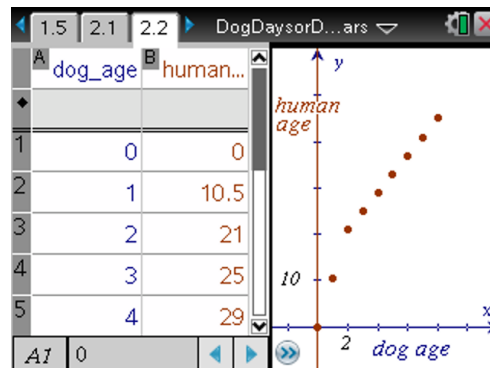
Encourage students to try ages other than whole numbers. (i.e., enter 6.5 for $6\frac{1}{2}$ years.)

On the worksheet, students are told that the common claim about dog's age in human years is each dog year is equal to 7 human years. They should be able to determine ordered pairs from this information, but if not explain to them that if a dog is 2 years old, its body is equal to that of a 14 year old human. If a dog lives 10 years, it is like being a 70 year old human.

Students should see that early on it may seem that Spot's age follows the claim, his age does not support the claim after about 6 years old.

Problem 2 – Table of Values and Scatter Plot


On page 2.2, students are given a table of values, dog's age in Column A and the equivalent human in Column B, and the scatter plot of this data.

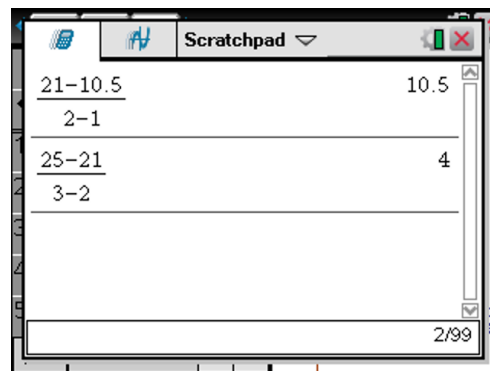


Discuss with students what information they can gather from the table or the scatter plot that they could not from the converter on page 1.2. They can use the **Graph Trace** feature to arrow through the data points on the scatter plot.

They should notice a pattern developing from the table, a steady increase in human age after dog age of 2. Students should notice a change in slope in the scatter plot at age 2.

The table ends at age 8 dog years. Ask students how they can predict the age of a dog older than 8. Then explain to students that they will be using the data to find functions which will help them make predictions.

Students are to use 2 two points from each part of the graph to write functions or equations of a line. They may need to use the *Calculator* scratchpad () to compute the slope.



TI-Nspire Navigator Opportunity: Screen Capture
See Note 1 at the end of this lesson.

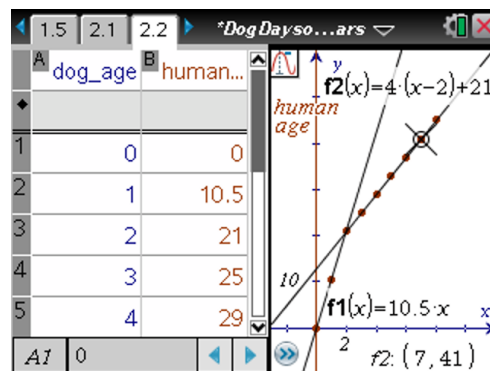
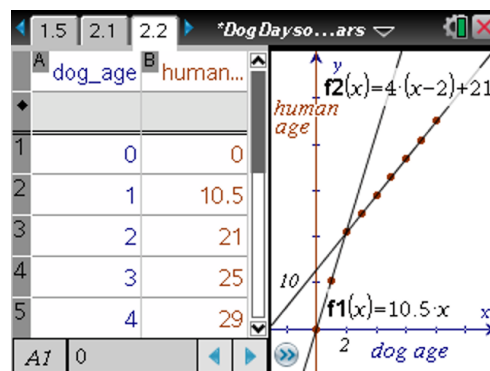
After writing the functions, students can graph them on the scatter plot back on page 2.2. They should press **ctrl** + **G** to reveal the function entry line. This could provide an introduction to a discussion about the use of piecewise functions. For this graph, it would be

$$f(x) = \begin{cases} 10.5x, & 0 \leq x < 2 \\ 4(x-2) + 21, & x \geq 2 \end{cases}$$

Students can now use the graph to predict the human age of a dog older than 8 using the **Graph Trace** feature.

They are to also determine the domain and range for the relationship between dog years and human years ($x \geq 0, y \geq 0$). If needed, remind students that the domain is the set of input values for a function (x -values of the ordered pairs) and the range is the set of output values for a function (the y -values of the ordered pairs).

In conclusion to the activity, students are to determine from their analysis of the data if the claim, 1 dog year = 7 human years, is true or false.



Extension/Homework – Cat Age Converter

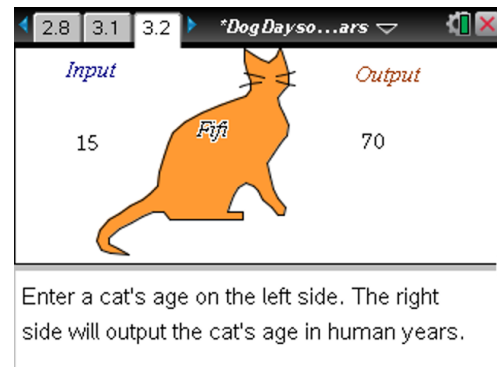
Page 3.2 is another dynamic input/output machine like the dog age converter on page 1.2. Students are to change the input on left side (cat's age) and the right side will automatically update. They should record the input/output values in the spreadsheet on page 3.3. Column A is titled **cat_age** and Column B is titled **human_age**.

Students should make a scatter plot and then find functions to represent the different parts of the plot.

The piecewise function that can be used to describe the data is

$$f(x) = \begin{cases} 21x, & 0 \leq x \leq 1 \\ 10x + 11, & 1 < x \leq 2 \\ 3x + 25, & x > 2 \end{cases}$$

The website www.bettycat.com/home/ages.html was used to obtain the information for this extension.

**TI-Nspire Navigator Opportunities****Note 1****Problem 1: Screen Capture**

Use screen capture to verify students are following the instructions correctly and able to find the functions that model the data.