TI-nspire™

Population predictions
Teacher Notes

Introduction

The aim of this activity is to enable pupils to develop a simple model of population growth and use it to make predictions. Pupils can use the website www.worldometers.info to extract real-time data about births and deaths, populations and lots of other information. They record these values in a TI-Nspire spreadsheet and plot graphs of the values from which mathematical models of population can be developed.

Resources

TI-Nspire handhelds or computer software.
Internet access, preferably on a projected screen.
At least one stopwatch, preferably more (most pupils will have these on their mobile phones).
There is no tns file provided for this activity as it is easy to start with a new blank TI-Nspire document—basic instructions are given below

Skills required

Ability to enter data into a TI-Nspire.
Good numerical ability.
Substituting values into a linear function.

The activity

Start the lesson by showing pupils the website www.worldometers.info. This provides real-time data of world statistics such as population. The image below shows the world population data displayed on 29 November 2009.

🌐 **World Population**

6,809,131,587	Current World Population
126,902,492	Births this year [1]
270,287	Births today [2]
55,447,634	Deaths this year
118,097	Deaths today
152,190	Net population growth for today [3]

1) "this year" = from January 1 (00:00) up to now
2) "today" = from the beginning of the current day up to now
3) "net population growth" = births minus deaths

Discuss with pupils the various aspects of the statistics. Discuss with pupils how to find a model for one of the statistics. For example, pupils may choose to record the current world population every 10 seconds for 3 minutes as in the screen-shot below. The second screen-shot below shows a graph of the population against time.
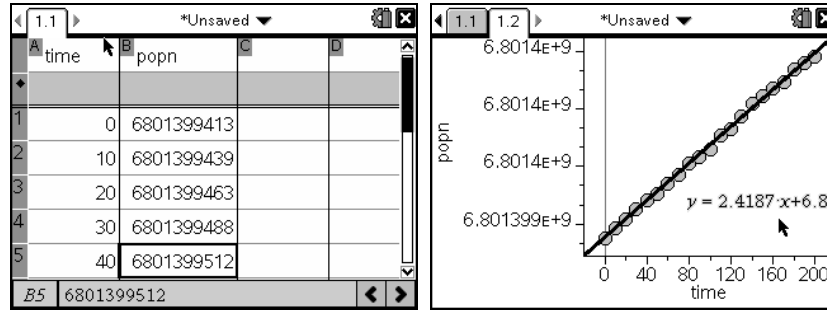
Here are basic instructions in order to produce screens like this on a TI-Nspire handheld.

1) Open a new TI-Nspire document with a Lists & Spreadsheets page.

Press (⌂ on)(1)(4).

2) Add variable names in the top row of the spreadsheet.

Press ▲▲ followed by a variable name such as "time".
Press (enter)▲▶ and enter the second variable followed by (enter).

3) Enter the recorded data in columns A and B.

Move around the cells using the cursor keys.
After each value press (enter).

4) Add a Data & Statistics page.

Press (ctrl)(doc▾)(5).

5) Choose the variables for the two axes of the graph.
TI-Nspire will automatically choose suitable scales for the recorded data.

Move the cursor to the bottom of the screen, click 🖱, choose the required variable and 🖱 again.
Repeat on the left edge of the screen.

Pupils may then use a linear regression line to find the equation that fits the data (press (menu)(4)(6)(1)). They may then use this model to answer questions such as the following:

1. What will the population be in 1 hour's or 1 day's or 1 year's time?
2. What will the population be by next lesson?
3. How long will it be before the population reaches 7 billion?

Extension

Return to the activity and the wordometers website the following lesson. Was the prediction the pupils made for the population accurate? What does this tell us about the model? For example, is it really a linear model or could it be something else? To investigate this, pupils could be asked to plot different non-linear functions and zoom in on them. For example, on the Data & Statistics page a different function can be plotted using (menu)(4)(4). Alternatively various types of regression calculations can be carried out e.g. for exponential regression press (menu)(4)(6)(8).

Other data from the Worldometers website, such as that shown below, can be used for other investigations.

🌿 Environment

10,265,235	Forest loss this year (hectares)
5,470,384	Arable land lost due to soil erosion this year (hectares)
20,352,243,549	Carbon dioxide (CO_2) emissions this year, in tons
14.570965260	Current average temperature (Celsius)
13,510,670	Desertification this year (hectares)
126,483	Species that have gone extinct this year
8,925,666	Toxic chemicals released by industries into our air, land, and water this year (tons)
856,202,788	Kilometers Earth has traveled in space within our Solar System this year

The FAQ link on the website provides access to the algorithms and assumptions underlying the displayed data.

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