

Matchsticks

Teacher Notes

This activity has been developed from an initial idea by Cindy Hunt and Linda Lewendon of Davison High School, Worthing.

Introduction

How many matchsticks?



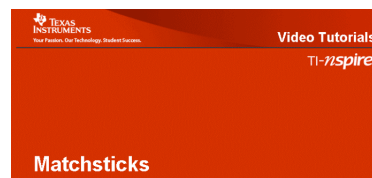
The screenshots show the TI-Nspire interface for the 'MATCHSTICK PROBLEM'. The first screenshot shows the problem instructions. The second shows a spreadsheet with data for 1 to 5 squares and a corresponding graph with a line of best fit $f1(x) = 1.5x + 6.64$. The third shows the spreadsheet with data for 1 to 5 squares and a graph with a line of best fit $f1(x) = 3 \cdot x + 1$. The fourth shows a reflection box titled 'What I have noticed:' with the text 'The results went up by each time' and 'The formula for the pattern is'. The fifth shows a summary of three problems.

It is one thing to realise that the number of matchsticks increases by 3 each time and quite another to realise that the formula is not $m=1+3$ or $m=31+4$, for example. Students can grab and move the line to fit the plotted points and so find the correct formula.

The TI-Nspire document provides space for four matchsticks patterns to be investigated.

On page 2 of these notes there are instructions that students may need if they are not familiar with using TI-Nspire. Page 3 has suggestions for ways of using this activity in the classroom.

In addition to the following notes, there is also a video tutorial showing the process of entering data, trying out functions and editing them. Please note that the video was made with an earlier version of TI-Nspire and there are slight differences on the screens compared with the current version.



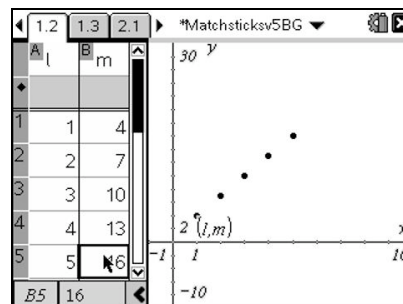
How to use the Matchsticks document

Entering data in the spreadsheet

- Move to page 1.2: press **(ctrl)** **(right arrow)**
- Move to column B: press **(right arrow)**
- Enter the data: press **(4)** **(enter)** etc.

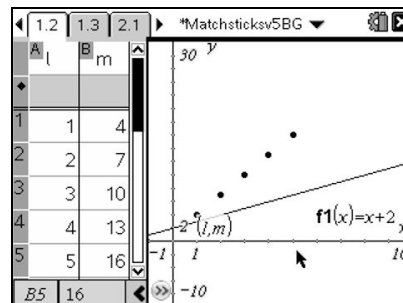
Notice:

- the columns headings are l and m.
- the points are plotted automatically.



Trying a formula

- Move to the right side of the screen: press **(ctrl)** **(tab)**
- Press **(tab)**.
- Enter a function of x alongside $f_1(x)=$
- Press **(enter)**
- Here the wrong rule has been entered – the line does not fit the points



Moving the incorrect line

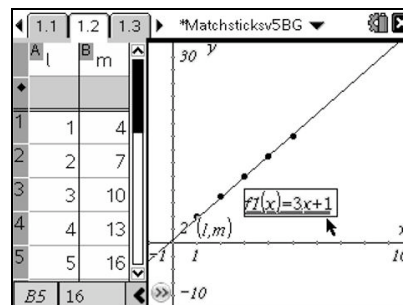
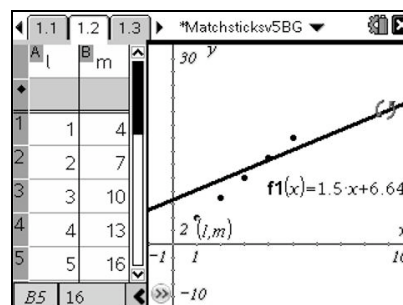
- Move to the centre of the line and see the icon \oplus
- To grab the line press **(ctrl)** **(mouse icon)**
- Drag the line up or down to a new position.
- See how the function label changes.
- To drop the line press **(mouse icon)**

Now move towards the end of the line and see the icon shown on the right. Grab and drag the line to turn it round, changing its slope.

Correcting the function

- Either:
 - move to the function label and press **(enter)** **(enter)**.
- Or:
 - go back to $f_1(x)$ in the entry line by pressing **(tab)**.

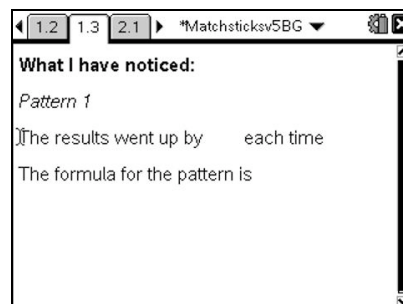
Then you can edit the function



How to write down what you notice

- To move to the next page press **(ctrl)** **(right arrow)**.
- Move the cursor to the space and type a number.
- Move the cursor down and type the formula.

Then you can go on to another matchsticks pattern and enter your data on page 2.1.



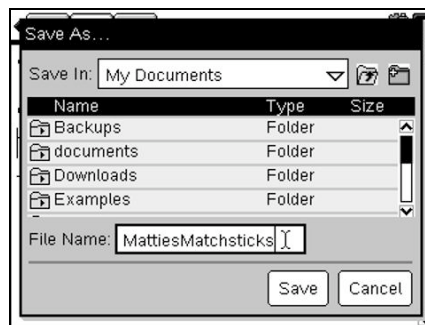
Ideas for using Matchsticks

Full-class discussion

You may wish to go through the first example with the whole class using the TI-Nspire computer software projected onto a screen or interactive whiteboard, concentrating in the first instance on the mathematics rather than on how to control the technology. The video tutorial may then provide a useful recap of what you have done and the processes involved in doing it. You could also project or photocopy for students the instructions on the previous page of these notes.

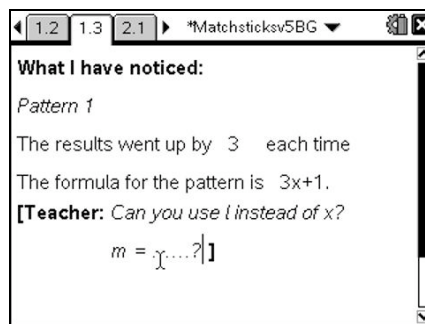
Individual work

The document asks students to enter data and functions and then to write their conclusions on the notes pages. This means they will be creating their own version of the document on the handheld, so a recommended first step is for them to save the file under a new name. They will need the Save As option from the File menu: press: $\text{doc} \downarrow \text{1} \text{5}$.



The Save As dialogue box

With the Teacher Edition of the TI-Nspire software there is a mechanism for teachers to insert comments on students' notes pages. From the Insert menu choose option 3:Comment/1:Teacher.



A comment inserted by the teacher

Some other matchsticks patterns

