

Licorice machine

Purpose

To use factors of numbers up to 100 to identify prime numbers

Outcomes

NS2.3: Uses mental and informal strategies for multiplication and division

MA2-6NA

Framework reference

To move students beyond Multiplication and division level 5

Materials

Notebook: *Licorice machine*

BLM: *Licorice machine*

Teaching points

- This lesson is based on the lesson *Licorice factory*. Lovitt. C and Clarke. D, *MCTP, Activity bank*, Volume 2, p441ff.
- Class discussion may lead to an investigation of numbers that have multiple factors.
- A prime number is defined as a number that has only two factors, itself and *one*. *One* is not a prime number.



Suggested *Short, focussed, frequent* activity

	Outline	Questions
Introduction	Display the first page of the notebook.	<p><i>This is the machine that cuts up the licorice at the licorice factory. The factory produces licorice of different lengths. Customers order licorice of any length and use the machine to cut it into an equal number of parts. For example, if a customer wants to cut a length of licorice into 17 equal parts, the customer places the licorice in the machine, presses the button for 17, and the machine cuts up the length of licorice into 17 equal parts.</i></p> <p><i>One day, a customer wanted the licorice cut into four pieces, but the four button would not work. Fortunately, an employee had an idea about how the machine could still be used to do this. She placed the licorice in the machine and pressed the two button. She then took the two equal pieces, placed them in the machine and pressed the two button again. Then the customer had four equal pieces, as requested.</i></p> <p><i>Later on, the six button stopped working.</i></p>




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	Outline	Questions
Introduction continued	<p>Organise the students into small groups and have them discuss how the licorice could still be cut into six equal pieces.</p> <p>Provide enough time for the students to discuss their ideas. Have some groups share their ideas with the class.</p> <p>If no student identifies a solution, tell the students that this could be done by using the <i>two</i> button first.</p> <p>Provide enough time for the students to discuss their ideas. Have some groups share their ideas with the class.</p> <p>If no student identifies the solution, tell the students that placing the two equal pieces in the machine and pressing the <i>three</i> button will result in six equal pieces.</p> <p>If no student identifies a solution, ask the students if another button could be used first.</p> <p>If the students are still unable to identify a solution, tell them that this could be done by using the <i>three</i> button first, followed by the <i>two</i> button.</p> <p>Proceed in the same manner to work out what would happen if the <i>ten</i> button stopped working.</p>	<p><i>What would happen then?</i></p> <p><i>What would you need to do next to have six equal pieces?</i></p> <p><i>Is there another way of cutting the licorice into six equal pieces?</i></p>
Concept development	<p>Use the <i>Fill</i> tool on the notebook to select a transparent colour, then fill the <i>four</i> and the <i>six</i> buttons on the licorice machine.</p> <p>Organise the students into pairs. Provide each pair with a copy of the <i>Licorice machine</i> BLM. Have the pairs of students</p>	<p><i>Because the machine was very big and had 100 buttons, the manager of the factory decided that the machine could be made smaller by removing the four and six buttons.</i></p> <p><i>Are there any other buttons that could be removed and replaced by a combination of other buttons?</i></p>



	Outline	Questions
Concept development continued	<p>identify which buttons could be removed and replaced by a combination of other buttons. Have the students highlight on their sheets, the buttons that could be removed. Provide sufficient time for the pairs of students to complete the task up to the 30th button. Have some pairs of students share the strategies that they are using to work out the problem. Discuss these strategies with the class.</p> <p>As a class, fill the buttons that could be removed and replaced by a combination of other buttons, up to the 30th button.</p> <p>Have the pairs of students continue their investigations up to the 100th button.</p> <p>When the students have completed their investigation, discuss the results.</p> <p> Have students take turns to identify buttons that could be removed and replaced by a combination of other buttons, and have them fill these numbers on the <i>notebook</i> page using the <i>Fill</i> tool.</p> <p>Fill the <i>one</i> button.</p>	<p><i>What does the one button do?</i> <i>Do we need the one button? Why?</i></p>
Strengthening the concept	<p>Display the completed <i>notebook</i> page.</p> <p>If the students do not know, explain that all numbers with only two factors are called <i>prime</i> numbers.</p> <p>Organise the students into small groups.</p> <p>Have the students discuss in their groups how a length of licorice could be cut into the following number of equal parts, using only the buttons that are left on the machine:</p> <p style="text-align: center;">33 54 78</p>	<p><i>Is there a name for all of the numbers on the machine that have not been filled?</i></p>

