Lesson Plan to accompany a LEGO® set. This lesson can be used and adapted for various sets or a collection of pieces. Instructions for ‘An Amazing Number Machine’ available at www.calderbankacademy.com

Learning Objectives for All Students:

Cognitive Objectives (Knowledge and Understanding):

- Recognise number patterns and sequences (e.g., adding 2, subtracting 1).
- Explain the concept of input and output in a mathematical "machine."
- Identify and describe the rule or function of the number machine.
- Recall and apply basic addition and subtraction facts.

Affective Objectives (Attitudes and Values):

- Appreciate the fun and creative aspects of mathematics.
- Demonstrate a sense of curiosity and excitement about discovering mathematical rules.
- Value the importance of observation and logical thinking in solving problems.
- Express their ideas and feelings about the process of cracking the code of the number machine.

Psychomotor Objectives (Skills):

- Participate actively in the lesson activities and discussions.
- Collaborate with others to build their own number machine models.
- Communicate their ideas and thoughts effectively to their group.

Remember to:

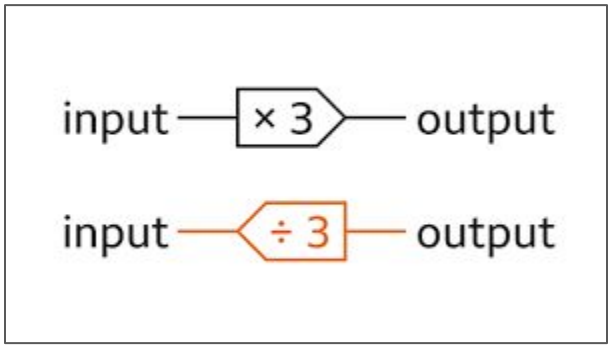
- **Adapt** these objectives to the specific needs and abilities of your students.
- **Clearly communicate** the learning objectives to the children at the beginning of the lesson.
- **Use a variety of assessment methods** to evaluate whether the objectives have been met (e.g., observation, discussion, creative expression).

By setting clear learning objectives, you can ensure that your "Number Machine" lesson is engaging, meaningful, and impactful for all your School students.

Welcome Introduction:

Introduction and Check-In (10 minutes)

- Welcome: Greet the students and create an engaging, welcoming atmosphere.
- Icebreaker: Ask a question like, "What's your favorite number and why?" or "If you could invent a machine that did anything, what would it do?"
- Introduce the Theme: Show the children some LEGO® bricks. Explain that today, they will become "Number Engineers" and will use the bricks to build and understand a magical number machine.



‘Number Engineering’ Building Task:

Hands-on Problem-Solving (20 minutes)

- Set the Scene: Explain that a "number machine" is a special machine that takes a number (the input), does something to it, and then spits out a new number (the output). Their job is to build a machine that represents a specific rule.
- Divide into Groups: Divide the children into small groups and provide each group with LEGO® bricks.

Task 1: The 'Mystery Rule' Machine:

- Give each group a simple number pattern, for example, a list of input and output numbers:
  - Input 2, Output 4
  - Input 3, Output 5
  - Input 5, Output 7
- Their challenge is to figure out the rule of the machine (in this case, "+2").
- Once they've cracked the code, they should build a LEGO® model that physically represents their machine. Encourage them to get creative with how they show the number going in and the new number coming out.

Task 2: Building Your Own Machine:

- Once they've completed the first task, challenge the groups to invent their own number machine with a different rule (e.g., "+3," "-1," "x2").
- They should build the machine and then create a small poster or chart showing a few inputs and outputs for their classmates to figure out.

‘Amazing Thinking’ Task:

Connecting the Build to the Maths (15 minutes)

- Group Presentation: Invite each group to present their invented number machine.
- 'Crack the Code': The rest of the class can try to "crack the code" and figure out the rules for each group's machine.
- Discussion: Ask questions to deepen their understanding, such as:
  - "How did you know what the rule was for our first machine?"
  - "What was the trickiest part about figuring out the rule?"
  - "How did your LEGO® model help you understand what was happening to the number?"
- Explore the Story: Read a short, engaging story about a number machine or a similar concept to connect their hands-on activity with a narrative.

Evaluations and Reflection of Learning:

Discussion and Creative Expression (10 minutes)

- Discussion:
  - Younger Children: Ask them to describe their favorite part of building the machine. "What number was the most surprising to come out?"
  - Older Children: Ask them to explain the difference between a pattern and a rule. "How could you make your machine more complicated? What other mathematical operations could we add?"

- Creative Expression (Optional):
  - Encourage the children to draw their number machine and label the input, the rule, and the output.
  - Challenge them to write a new number pattern for a friend to solve.

Plenary and Finish:

Review and Conclusion (5 minutes)

- **Review Key Concepts:** Briefly summarize the lesson, reinforcing the concepts of input, output, and rules in a fun way. Remind them that math is all about finding patterns and solving puzzles.
- **Take-Home Activity (Optional):** Suggest that they try to find number patterns around their homes, like counting how many of something they have and then adding one more.

Adaptations:

- **Younger Children:** Use only simple rules like "+1" or "-1." You can also provide them with the rule and have them focus on the building aspect.
- **Older Children:** Introduce more complex rules like "x2 + 1" or "x2 - 1." Challenge them to use a wider variety of bricks to represent different parts of their machine.
- **Time:** Adjust the time allocated to each phase based on the needs and engagement of your students.

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