



Mathemagic

- *The Thief* -



Educational Goals

- ❖ Develop logic
- ❖ Adopt a magic trick
- ❖ Understand the properties of divisibility rule by 9

Key Features of the Targeted Competencies

- ❖ To decode the elements of the situational problem
- ❖ To model the situational problem
- ❖ To apply different strategies to work out a solution
- ❖ To validate the solution
- ❖ To define the elements of the mathematical situation
- ❖ To mobilize mathematical concepts and processes appropriate to the given situation

Concepts Used

- ❖ Arithmetic operations (divisions, additions)
- ❖ Divisibility rule by 9
- ❖ Complementarity

Materials

- ❖ Magic trick video
- ❖ Several cards with digits 1 to 9
- ❖ Paper
- ❖ Pencils

Targeted Academic Levels
Grades 7 to 11

Mathematical Field Concerned



Suggested Teaching Methods



Time Required
Approximately 50 minutes



Suggested Process



Step 1: Introduction (15 minutes)

Play the magic trick video once (www.amazingmaths.ulaval.ca). Explain to the students that the trick is based on the divisibility rule by 9.

See the divisibility rule with the class: a number is divisible by 9 when the sum of its digits is divisible by 9. Give some examples when explaining the rule. Explain it with drawings on the board. Make groupings of 9 and see whether there are remainders left over or not (refer to the section *Why Does The Divisibility Rule by 9 Work?* in the Explanation Sheet).

P.-S.: Do not use the repetitive sum of digits in the number for this part (see sheet).

Step 2: Recreate the magic trick (10 minutes)

Repeat the trick with the class more slowly so that the students see the operation and actions of the magician. A student will be the spectator and the other students can formulate hypotheses and try to understand the trick.

Show the students the alternative way to use the divisibility rule by 9 (repetitive sum of digits in the number) and give some examples to show that it still works. Guide the students' thought process by asking them if the repetitive sum of numbers can influence the trick.

Step 3: Find the solution (15 minutes)

Place the students in teams of four. They must try to find the solution and how the trick works. Advise the students to note which elements of the trick they find important. Remind them of what they have recently learned about the divisibility rule by 9. Students should experiment with the digits that make up the subtraction's answer (remove, add, mix) and see if it influences the trick.

You can guide the reflection by asking the following questions:

- Why do we have to subtract?
- Why does the magician ask if the difference of the numbers contains 0s?
- How does the magician find the stolen number from the cards on the table?
- Can the repetitive sum of digits that make up a number give a clue to the magician?

Step 4: Reveal the solution (10 minutes)

Get the whole class back together. Give a reminder of the divisibility rule by 9 and ask the students what they saw at the beginning of the class on this notion. Ask a student in a team to explain to the class the conclusions they drew from the experiment and their hypotheses about the way the trick works. Write on the board each team's results. Refer to the Explanation Sheet for "The Thief" and explain to the students how the trick works. Compare with what they found.